

JUSTUS-LIEBIG-



UNIVERSITÄT
GIESSEN

Der Präsident

**Mitteilungen der
Justus-Liebig-Universität Gießen**

Ausgabe vom
##.2018

7.34.00 Nr. 1

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge

Anhang: Muster-Modulbeschreibung

Chemie-MMC2	11B Organische Materialien	6 CP
	Organic Materials	
Required or required choice module	08 / Chemistry / Organic Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Winter Semester 2018/19	
Learning goals: Students can: <ul style="list-style-type: none">• discuss reactions to and of polymers,• recognize relationships between structures and properties of organic materials,• select the appropriate material for a given application problem,• understand the basic principles of molecular electronics and photochemistry,• apply their acquired knowledge to solving new problems,• understand and discuss current questions and results of organic materials research.		
Course content: <ul style="list-style-type: none">• Types of polymers, polymerization methods,• Transition metal-catalyzed polymerizations, mechanisms, reactions of polymers,• Characteristics and properties of polymers and other organic materials,• Processing of organic materials,• Carbon materials• Organometallic chemistry for forming C-C bonds,• Molecular electronics basics,• Liquid crystals,• OLEDs,• Computer-aided methods in materials research,• Organofluorine chemistry.		
Semester offered and duration: Each year, 1 semester, WiSe		
Responsible professors or position: Organic Chemistry Professors*		
Applicable to following degree programs: M.Sc. Chemistry / Required Choice Module, Specialization „Material Chemistry“, M.Sc. Material Sciences / Required Module		
Participation prerequisites: none		
Course format:	In-class time requirement	Preparation and review time requirement
Lecture	60	30
Practice	30	30
Exam	30 (incl. preparation)	

Total:	180 hours = 6 CP
Pre-exam-requirements: none	
Module exam: <ul style="list-style-type: none"> - Written exam (90-120 min) or oral exam (20-40 min); format will be announced at the beginning of the module. - Repeat exam: Written exam (90-120 min) or oral exam (20-40 min); format will be announced at the beginning of the module. - Formation of grade: written exam or oral exam (100%). 	
Course and exam language: German and/or English	
Please note: *currently: Prof. Dr. P. R. Schreiner, Prof. Dr. H. Wegner, Prof. Dr. R. Göttlich. Module advice and literature: see semester flyer / Appointment: see course catalog.	

Chemie-MP4	3B Festkörper-, Material- und Molekülchemie	6 CP
	3B Solid State, Material and Molecular Chemistry	
Required or required choice module	09 / Chemistry / Inorganic Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Summer Semester 2019	
Learning goals: Students can: <ul style="list-style-type: none">• apply advanced methods and concepts of describing chemical and physical properties of modern materials and present the results,• draw conclusions about the materials properties of the structure of a solid,• describe the characterizations of materials using modern experimental methods,• know sophisticated synthesis methods of inorganic chemistry,• plan complex syntheses taking occupational safety into account and using current literature; discuss them with fellow students.		
Module content: <ul style="list-style-type: none">• synthesis and structures of selected cluster compounds,• introduction to sol-gel chemistry ("soft chemistry"; <i>chimie douce</i>),• coordination polymers, molecular magnets and switches,• inorganic photochemistry,• special chapters of solid-state chemistry, materials science, and molecular chemistry.		
Semester offered and duration: Each year, 1 Semester, SoSe		
Responsible professors or position: Professors of Inorganic Chemistry and Physical Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required module, M.Sc. Materials Science/ required module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	60	30
Practice	15	15
Self-structured work	30	
Exam	30 (incl. preparation)	
Total:	180 hours = 6 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Written exam (90-120 min) or oral exam (20-40 min); format will be announced at the beginning of the module.
- Repeat-exam: Written exam (90-120 min) or oral exam (20-40 min); format will be announced at the beginning of the module.
- Formation of grade: written exam or oral exam (100%).

Course and exam language: German and/or English

Please note: *currently: Prof. Dr. S. Schindler, Prof. Dr. K. Müller-Buschbaum

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-MP3	2B Physikalische Chemie 4 – Struktur und Charakterisierung von Materie	6 CP
	2B Physical Chemistry 4 – Structure and Characterization of Matter	
Required or required choice module	08 / Chemistry / Physical Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Winter Semester 2018/19	
Learning goals: Students can: <ul style="list-style-type: none">• use spectroscopic methods with the help of advanced quantum chemical concepts and apply methods in a problem-oriented way,• apply fundamental aspects of the band model for the electronic characterization of materials,• apply methods of statistical thermodynamics to problems of condensed phases and spectroscopy,• use statistical concepts to calculate thermodynamic data of simple systems,• apply their acquired knowledge for the solution of new tasks and discuss these approaches in the group.		
Module content: <ul style="list-style-type: none">• deepening of quantum chemistry regarding the understanding of spectroscopic methods (e.g., transition moment, dipole selection rules, Zeemann Effect),• interaction of electromagnetic radiation with matter,• spectroscopy and structure elucidation with spectroscopic methods,• deepening of statistical thermodynamics (special chapters: e.g., solids, defects, quantum statistics),• application of statistical methods in spectroscopy,• generation of light (laser, synchrotron radiation, plasma sources, X-rays etc.).		
Semester offered and duration: Each year, 1 Semester, WiSe		
Responsible professors or position: Professors of Physical Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required module, M.Sc. Materials Science / required module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	45	25
Practice	30	50
Exam	30 (incl. preparation)	

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Total:	180 hours = 6 CP
Pre-exam performance: 50% of the maximum achievable points from the exercise sheets must be achieved; there are usually 20 points per exercise sheet. The max. achievable points will be announced at the beginning of the semester.	
Module exam: <ul style="list-style-type: none"> - Written exam (120 min) - Repeat exam: written exam (120 min) or oral exam (30 min), form will be announced at the beginning of the module. - Formation of grade: written exam or oral exam (100%) 	
Course and exam language: German and/or English	
Please note: *currently Prof. Dr. Herbert Over Module advice and literature: see semester flyer / Appointment: see course catalog.	

Chemie-MP1	OB Molekulare Katalyse	6 CP
	OB Molecular Catalysis	
Required or required choice module	08 / Chemistry / Organic Chemistry and Inorganic Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Winter Semester 2018/19	
Learning goals: Students can: <ul style="list-style-type: none">competently discuss molecular catalysts and their mechanisms,recognize relationships between structure and reactivity of a catalyst,optimizing catalysts in a targeted manner,use their acquired knowledge to solve new problems,recognize relationships between structure, reactivity, and selectivity.		
Module content: <ul style="list-style-type: none">complex chemistrytransition metal catalyzed reactionsOrganocatalysiskinetics and thermodynamics of catalysiscatalysis and photochemistryRedox catalysisStereoselective catalysisLigand designbiocatalysts		
Semester offered and duration: Each year, 1 semester, WiSe		
Responsible professors or position: Professors of Organic Chemistry and Professors of Inorganic Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	60	30
Practice	30	30
Exam	30 (incl. preparation)	
Total:	180 hours = 6 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Written exam (90-120 min) or oral exam (20-40 min); form will be announced at the beginning of the module.
- Repeat exam: Written exam (90-120 min) or oral exam (20-40 min); form will be announced at the beginning of the module.
- Formation of grade: written exam or oral exam (100%).

Course and exam language: German and/or English

Please note: *currently Prof. Dr. R. Göttlich, Prof. Dr. S. Schindler

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-MP2	1B Methodenmodul „Molekulare Analytik“	6 CP
	1B Method Module “Molecular Analytics”	
Required or required choice module	08 / Chemistry / Inorganic and Analytical Chemistry, Organic Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Winter Semester 2018/19	
Learning goals: Students can: <ul style="list-style-type: none">determine the structures and quantites of complex (bio) organic compounds with the help of spectroscopic, mass spectrometric, and chromatographic methods,independently select and apply complementary analytical techniques in a problem oriented way,know various current types of mass spectrometers as well as ionization and fragmentation methods,know advanced optical and chiroptical methods as well as advanced nuclear magnetic resonance techniques.		
Module content: <ul style="list-style-type: none">2D-NMR methods, heteronuclear measurements,chromatographic separation techniques and their hyphenation (GC, HPLC, nanoLC; chiral variants),IR, UV, and fluorescence spectroscopy; selection rules, applied group theory,chiroptical methods (ORD, CD, VCD),ionization methods, analyzer systems, and fragmentation techniques in mass spectrometry,structure elucidation with MS / MS methods, quantification, database connections,mass spectrometry imaging (MSI).		
Semester offered and duration: Each year, 1 semester, WiSe		
Responsible professor or position: Professorship of Analytical Chemistry, Professors of Organic Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required module, M.Sc. Materials Science, M.Sc. Food Chemistry / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	45	45
Practice	30	40
Exam	20 (incl. preparation)	
Total:	180 hours = 6 CP	

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Pre-exam performance: none
Module exam: <ul style="list-style-type: none"> - Written exam (120 min). - Repeat exam: written exam (120 min). - Formation of grade: written exam (100%).
Course and exam language: German and/or English
Please note: *currently Prof. Dr. B. Spengler, Prof. Dr. P. R. Schreiner Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-MP5	4B Organische Chemie 4: Reaktionsdesign	6 CP
	4B Organic Chemistry 4: Reaction Design	
Required or required choice module	08 / Chemistry / Organic Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Summer Semester 2019	
Learning goals: Upon completing the course, students are able to apply the basic principles and laws of physical-organic chemistry: <ul style="list-style-type: none">• independent planning and implementation of experiments to elucidate reaction mechanisms and their kinetics,• evaluation of bonding relationships and stereoelectronic effects in molecules and their impact on reaction processes as well as synthesis planning,• evaluation and optimization of organic transformations based on thermochemical considerations,• conceptual classification of basic organic chemistry reaction types.		
Module content: <ul style="list-style-type: none">• structure and bonding models of molecules,• advanced concepts of electronic structure theory,• concepts of strain energy and chemical stability,• solutions and non-covalent binding forces,• acid – base chemistry of organic substances,• stereochemistry,• potential energy hypersurfaces and kinetics,• experimental thermodynamics and kinetics,• organic reaction mechanisms,• pericyclic reactions,• photochemistry (basics).		
Semester offered and duration: Each year, 1 semester, SoSe		
Responsible professors or position: Professors of Organic Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	60	30
Practice	30	30
Exam	30 (incl. preparation)	

Total:	180 hours = 6 CP
Pre-exam performance: In the course of the lecture period, exercises (e.g., also in the form of practice exams) are given and scored. To be admitted to the exam, 50% of the points in the exercises must be achieved. The students are given the tasks at least one week before the submission deadline and receive them back graded.	
Module exam: <ul style="list-style-type: none"> - Written exam (90-120 min) or oral exam (20-40 min); form will be announced at the beginning of the semester. - Repeat exam: Written exam (90-120 min) or oral exam (20-40 min); form will be announced at the beginning of the semester. - Formation of grade: written exam or oral exam (100%). 	
Course and exam language: German and/or English	
Please note: *currently Prof. Dr. P. R. Schreiner, Prof. Dr. H. Wegner, Prof. Dr. R. Göttlich Module advice and literature: see semester flyer / Appointment: see course catalog.	

Chemie-MP6	5B Methodenmodul „Analytik von Festkörpern“	6 CP
	5B Method Module “Analytics of Solids”	
Required or required choice module	08 / Chemistry / Physical Chemistry and Inorganic Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Summer Semester 2019	
Learning goals: Students can: <ul style="list-style-type: none">• identify suitable spectroscopic methods from PC / AC in a problem-oriented manner,• apply electrochemical measuring methods to various problems of energy storage,• understand the basic concepts of diffraction and can apply them,• determine the atomic structure of (crystalline) solids by means of X-ray diffraction,• determine the electronic structure of solids and chemical complexes,• determine and critically evaluate the active surface and size distribution of the particles of powder samples.		
Module content: <ul style="list-style-type: none">• systematic classification of the methods of PC and AC and their application,• spectroscopy: XPS, solid state UV-Vis, Raman, Auger, ToF-SIMS,• microscopy: scanning and transmission electron microscopy, scanning microscopy, Auger microscopy, confocal and Raman microscopy,• electrochemical measurement methods: impedance spectroscopy, CV, cyclic curves, ...• Physisorption / Chemisorption, DLS,• theory of diffraction,• single crystal analysis (experimental setup and structural solution),• indexing the space group,• X-ray powder diffractometry,• Rietveld refinement, pair distribution function analysis.		
Semester offered and duration: Each year, 1 semester, SoSe		
Responsible professors or position: Professors of Physical Chemistry, Professors of Analytical Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required module, M.Sc. Materials Science / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	45	25
Practice	30	50

Exam	30 (incl. preparation)
Total:	180 hours = 6 CP
Pre-exam performance: none	
Module exam: <ul style="list-style-type: none"> - Written exam: (120 min) or oral exam (30 min), form will be announced at the beginning of the semester. - Repeat exam: written exam (120 min) or oral exam (30 min), form will be announced at the beginning of the semester. - Formation of grade: written exam or oral exam (100%). 	
Course and exam language: German and/or English	
Please note: *currently Prof. Dr. H. Over, Prof. Dr. S. Schindler Module advice and literature: see semester flyer / Appointment: see course catalog.	

Chemie-MCG1	6B Elektrochemie—von Grundlagen zur Anwendung	6 CP
	6B Electrochemistry—From Basics to Application	
Required or required choice module	08 / Chemistry / Physical Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Winter Semester 2018/19	
Learning Goals: Students can: <ul style="list-style-type: none">• discuss the essential basics of electrochemistry and its applications,• name the most important areas of application of electrochemical processes,• assign and describe the frequently used experimental methods,• discuss and apply the theoretical concepts of electrochemistry in connection with physical-chemical problems.		
Module content: <ul style="list-style-type: none">• thermodynamic and kinetic principles of electrochemistry (electrolytes, electrodes, cells),• potentials, models for the electrical double layer,• experimental methods (characterization of electrolytes, electrodes and cells),• areas of application: battery and fuel cell technology, electrolysis, sensors, corrosion.		
Semester offered and duration: Each year, 1 semester, WiSe		
Responsible professors or position: Professors of Physical Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required choice module, specialization “Interface Chemistry” (<i>Chemie von Grenzflächen</i>), M.Sc. Materials Science / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	45	15
Practice	30	60
Exam	30 (incl. preparation)	
Total:	180 hours = 6 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Written exam (120 min) or oral exam (30 min), form will be announced at the beginning of the semester.
- Repeat exam: Written exam (120 min) or oral exam (30 min), form will be announced at the beginning of the semester.
- Formation of grade: Written exam or oral exam (100%)

Course and exam language: German and/or English

Please note: *currently Prof. Dr. J. Janek

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-MCG2	7B Physikalische Chemie und Materialforschung: Grenzflächenchemie	6 CP
	7B Physical Chemistry and Materials Research: Interface Chemistry	
Required or required choice module	08 / Chemistry / Physical Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Summer Semester 2019	
Learning Goals: Students can: <ul style="list-style-type: none">• discuss and apply the most important concepts of solid-state defect chemistry to interface problems,• develop and discuss approaches to problems from the field of colloid chemistry using a group approach,• use the physical-chemical principles of the surfaces of solids to solve problems in the field of heterogeneous catalysis,• discuss scientific issues together as part of the self-study.		
Module content: <ul style="list-style-type: none">• physical chemistry of defects in bulk materials and in interfaces of a solid,• colloids: structure and building of colloids, special procedures for the preparation of colloids, special investigation methods for colloids; modern applications of colloids, stability of colloidal solutions (DLVO theory)• surface chemistry: fundamentals of the interaction of surface structure and reactivity, adsorption and heterogeneous catalysis, methods of investigation of surface chemistry and basic theoretical concepts, thermodynamics and kinetics of surfaces, surface tension.		
Semester offered and duration: Each year, 1 semester, SoSe		
Responsible professors or position: Professors of Physical Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required choice module, specialization “Interface Chemistry” (<i>Chemie von Grenzflächen</i>), M.Sc. Materials Science / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	45	45
Practice	30	30
Exam	30 (incl. preparation)	
Total:	180 hours = 6 CP	

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Pre-exam performance: none
Module exam: <ul style="list-style-type: none"> - Written exam (120 min). - Repeat exam: written exam (120 min) or oral exam (45 min), form will be announced at the beginning of the semester. - Formation of grade: written exam or oral exam (100%)
Course and exam language: German and/or English
Please note: *currently Prof. Dr. Bernd Smarsly Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-MML1	8B Technologie und Methodik der Massenspektrometrie	6 CP
	8B Technology and Methodology of Mass Spectrometry	
Required or required choice module	08 / Chemistry / Inorganic and Analytical Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Winter Semester 2018/19	
Learning goals: Students can: <ul style="list-style-type: none">understand the basic properties and separation principles of mass spectrometers,understand the technical design of important types of ion sources, mass analyzers, ion detectors and data processing systems,understand and use methods of instrument development of mass spectrometric components,recognize performance limits and potentials of technical approaches,transform applicational questions into suitable technical solutions,develop and validate analytical methods,understand high-throughput and automation processes.		
Module content: <ul style="list-style-type: none">perspectives of mass spectrometric principles,current technical solutions and devices in mass spectrometry,physical basics of mass spectrometric instruments,data processing and image processing methods,Fourier transformation,high-throughput (HT) analysis,method development and validation,quality assurance according to DIN EN ISO 17025.		
Semester offered and duration: Each year, 1 semester, WiSe		
Responsible professors or position: Professorship of Analytical Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required choice module, specialization “Mass Spectrometry in Environmental and Life Sciences” (<i>Massenspektrometrie in Umwelt- und Lebenswissenschaften</i>)		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	15	45
Practice	60	60

Exam	10 (incl. preparation, included above)
Total:	180 hours = 6 CP
Pre-exam performance: none	
Module exam: <ul style="list-style-type: none"> - Oral exam (30 min) or written exam (120 min). Form will be announced at the beginning of the semester. - Repeat exam: Oral exam (30 min) or written exam (120 min). Form will be announced at the beginning of the semester. - Formation of grade: oral exam or written exam (100%). 	
Course and exam language: German and/or English	
Please note: *currently Prof. Dr. B. Spengler Module advice and literature: see semester flyer / Appointment: see course catalog.	

Chemie-MML2	9B Angewandte molekulare Analytik	6 CP
	9B Applied Molecular Analysis	
Required or required choice module	08 / Chemistry /Inorganic and Analytical Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Summer Semester 2019	
Learning Goals: Students can: <ul style="list-style-type: none">• understand the interdisciplinary interplay of chemistry, biology, geological, and environmental science and recognize synergies,• transform scientific observations and questions into analytical strategies,• recognize properties and possibilities of mass spectrometry in biological and environmental sciences,• recognize the information content of organic and inorganic chemical signatures in biological and environmental chemical systems,• independently develop application-specific analytical methods,• develop strategies to make this information useful for the solution of systemic questions,• solve typical tasks of bio and environmental analysis in case studies,• understand high-throughput analysis in life sciences• classify the analysis as part of an economical production process.		
Module content: <ul style="list-style-type: none">• perspectives of mass spectrometry,• sample collection and sample preparation,• bioanalytical methods of mass spectrometry,• histological and immunochemical methods,• isotope analysis,• particle analysis,• age and origin analysis (source tracing),• mass spectrometric high-throughput analysis,• imaging methods,• statistical procedures and multivariate calibration,• applications in industry, government agencies and medicine.		
Semester offered and duration: Each year, 1 semester, Winter Semester		
Responsible professors or position: Professorship of Analytical Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required choice module, specialization “Mass Spectrometry in Environmental and Life Sciences” (<i>Massenspektrometrie in Umwelt- und Lebenswissenschaften</i>)		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Lecture	30	45
Practice	45	60
Exam	10 (included above)	
Total:	180 hours = 6 CP	
Pre-exam performance: none		
Module exam: <ul style="list-style-type: none">- Oral exam (30 min) or written exam (120 min). Form will be announced at the beginning of the semester.- Repeat exam: oral exam (30 min) or written exam (120 min). Form will be announced at the beginning of the semester.- Formation of grade: oral exam or written exam (100%).		
Course and exam language: German and/or English		
Please note: *currently Prof. Dr. B. Spengler Module advice and literature: see semester flyer / Appointment: see course catalog.		

Chemie-MMC1	10B Thermoelektrische Materialien	6 CP
	10B Thermoelectric Materials	
Required or required choice module	08 / Chemistry / Inorganic Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Summer Semester 2019	
Learning Goals: Students can: <ul style="list-style-type: none">gain advanced knowledge of the concepts for describing charge and heat transport in solids,gain knowledge of the relationships between structure and function properties of thermoelectric materials based on semiconductor-physical concepts,understand thermoelectric elements from the perspective of Continuum Theory,know important thermoelectric material classes,acquire an overview of the methods for characterizing thermoelectric material properties,know system aspects and application situations of thermoelectric applications.		
Module content: <ul style="list-style-type: none">TE effects,consideration of semiconductor physics: transport coefficients, charge carrier, and phonon scattering,TE Continuum Theory,measurement of thermoelectric properties,TE materials and manufacturing processes,TE system technology and applications.		
Semester offered and duration: by arrangement, 1 semester, SoSe		
Responsible professors or position: Professors of Inorganic Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required choice module, specialization “Material Chemistry” (<i>Materialchemie</i>), B.Sc. Chemistry, B.Sc. / M. Sc. Materials Science, B.Sc. / M.Sc. Physics / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	45
Seminar	15	15
Internship	15	8
Self-structured work	30 (in seminar)	

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Exam	22 (incl. preparation)
Total:	180 hours = 6 CP
Pre-exam performance: Presentation (oral)	
Module exam: <ul style="list-style-type: none"> - Presentation (oral), written exam (120 min). - Repeat exam: oral exam (30 min) (100%). - Formation of the grade: oral presentation (40%), written exam (60%). 	
Course and exam language: German and/or English	
Please note: *currently Prof. Dr. E. Müller Module advice and literature: see semester flyer / Appointment: see course catalog.	

Chemie-MMC3	12B Moderne Konzepte der anorganischen Chemie	6 CP
	Modern Concepts of Inorganic Chemistry	
Required or required choice module	08 / Chemistry / Inorganic Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Summer Semester 2019	
Learning Goals: Students can: <ul style="list-style-type: none">recognize relationships between synthesis, structures, and properties of select inorganic compounds,select and apply suitable methods for the characterization of inorganic compounds.		
Module content: <ul style="list-style-type: none">modern concepts in inorganic chemistry (e.g., synthesis under unusual conditions or via metastable states),self-organization of matter,macromolecular inorganic chemistry,hybrid materials.		
Semester offered and duration: by arrangement, 1 semester, SoSe and/or WiSe		
Responsible professors or position: Professors of Inorganic Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required choice module, specialization “Material Chemistry” (<i>Materialchemie</i>), M.Sc. Materials Science / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	60
Practice	20	30
Self-structured work	40	
Exam	30 (incl. preparation; included above)	
Total:	180 hours = 6 CP	
Pre-exam performance: keine		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Written exam (90-120 min) or oral exam (20-40) min.
- Repeat exam: written exam (90-120 min) or oral exam (20-40) min.
- Formation of grade: written exam or oral exam (100%).

Course and exam language: German and/or English

Please note: *currently Prof. Dr. S. Schindler, N.N.

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-MMC4	13B Synthesemethoden der modernen Materialchemie	6 CP
	13B Synthetic Methods of Modern Materials Chemistry	
Required or required choice module	08 / Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Summer Semester 2019	
Learning Goals: Students can: <ul style="list-style-type: none">• master essential synthesis methods of modern inorganic materials chemistry,• master sophisticated preparation and characterization methods of inorganic materials chemistry,• master aspects of occupational safety		
Module content: <ul style="list-style-type: none">• Sol-Gel chemical synthesis of porous materials (metal oxides, carbons),• templating method for the targeted adjustment of pore sizes and pore morphology,• synthesis of inorganic nanoparticles,• characterization of nanoscopic materials using methods of solid-state analysis (XRD, physisorption, UV-Vis, TG-MS).		
Semester offered and duration: Each year, 1 semester, SoSe		
Responsible professors or position: Professors of Physical Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required choice module, specialization “Material Chemistry” (<i>Materialchemie</i>), M.Sc. Materials Sciences / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	10	10
Practice	80	80
Total:	180 hours = 6 CP	
Pre-exam performance: All test have been passed. Lab work successfully performed and all protocols have been accepted.		
Module exam: <ul style="list-style-type: none">- Oral exam (20-40 min).- Repeat exam: oral exam (20-40 min).- Formation of grade: oral exam (100%).		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Course and exam language: German and/or English

Please note: *currently Prof. Dr. Bernd Smarsly

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-MPO1	14B Matrixisolationstechnik / Reaktive Intermediate	6 CP
	14B Matrix Isolation / Reactive Intermediates	
Required or required choice module	08 / Chemistry / Organic Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Winter Semester 2018/19	
Learning Goals: Students can: <ul style="list-style-type: none">• understand the principles of matrix isolation,• carry out own experiments under matrix isolation conditions,• calculate molecular data by means of quantum mechanical methods to support the elucidation of spectra from matrix measurements,• document and present their results.		
Module content: <ul style="list-style-type: none">• matrix isolation techniques: sample preparation, device construction, vacuum and temperature control systems,• synthesis of suitable precursors for the generation of highly reactive and previously unknown molecules and intermediates under matrix isolation conditions,• generation and spectroscopy of reactive intermediates in matrices, independent measurements, and interpretation,• quantum mechanical calculations of IR and UV / Vis spectroscopic data.		
Semester offered and duration: Per arrangement, 1 semester, SoSe and/or WiSe		
Responsible professors or position: Professors of Organic Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required choice module, specialization “Physical Organic Chemistry” (<i>Physikalische Organische Chemie</i>), M.Sc. Materials Science / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Internship	40	60
Seminar	10	10
Self-structured work	25	
Exam	35 (incl. preparation)	
Total:	180 hours = 6 CP	

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Pre-exam performance: none
Module exam: <ul style="list-style-type: none"> - Protocols (60%) and concluding presentation (oral) (40%) in seminar. - Repeat exam: protocols (60%) and concluding presentation (oral) (40%) in seminar. - Formation of grade: protocols (60%) and concluding presentation (oral) (40%).
Course and exam language: German and/or English; Literature: English
Please note: *currently Prof. Dr. Peter R. Schreiner Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-MPO2	15B Moderne Methoden in der Organischen Synthese	6 CP
	15B Modern Methods in Organic Synthesis	
Required or required choice module	08 / Chemistry / Organic Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Winter Semester 2018/19	
Learning Goals: Students can: <ul style="list-style-type: none">• analyze organic molecules retrosynthetically,• recognize synthetic synthons and retrons,• recognize and apply different strategies for the synthesis of organic molecules,• use a wide range of organic reactions in complex syntheses.		
Module content: <ul style="list-style-type: none">• brief historical outline of organic retrosynthesis,• analysis of various synthesis examples from the literature,• development of synthesis approaches for complex molecules,• review of literature on chemical problems,• creation and implementation of own syntheses,• discussion and presentation of the results.		
Semester offered and duration: Per arrangement, 1 semester, SoSe or WiSe		
Responsible professors or position: Professors of Organic Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required choice module, specialization “Physical Organic Chemistry” (<i>Physikalische Organische Chemie</i>), B.Sc. Food Chemistry, M.Sc. Materials Science / required choice module		
Participation prerequisites: For B.Sc. students: pass Organic Chemistry 2		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	30
Seminar	15	15
Practice	30	60
Exam	35 (incl. preparation; included above)	
Total:	180 hours = 6 CP	

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Pre-exam performance: pass seminar presentation

Module exam:

- Written exam: (90-120 min) or oral exam (20-40 min), form will be announced at the beginning of the semester.
- Repeat exam: written exam: (90-120 min) or oral exam (20-40 min), form will be announced at the beginning of the semester.
- Formation of grade: final exam (100%).

Course and exam language: German and/or English

Please note: currently Prof. Dr. H. A. Wegner, Prof. Dr. R. Göttlich

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-MPO3	16B Stereoselektive Synthese	6 CP
	16B Stereoselective Synthesis	
Required or required choice module	08 / Chemistry / Organic Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Winter Semester 2018/19	
Learning Goals: Students can: <ul style="list-style-type: none">understand the principles of stereoselective synthesis methods,know common chiral auxiliary groups,know and understand enantioselective catalysis,know common chiral ligands and catalysts,master practical methods for stereo- and enantioselective synthesis as well as separation and analysis of products,master retrosynthetic concepts for the presentation of stereoisomerically pure products.		
Module content: <ul style="list-style-type: none">models for diastereoselective synthesis: Cram, Felkin-Ahn, Zimmermann-Traxler, active and passive volume,Evans auxiliaries, auxiliary groups from natural products, Ender’s oximes,Bisoxazoline complexes, BINOL complexes, BINAP complexes, salen complexes and their use in stereoselective catalysis (including mechanisms),Bio-catalysts, enzymes in organic synthesis,racemate separation,chiral GC and HPLC, ORD,creation of a seminar paper on a selected current research topic.		
Semester offered and duration: Per arrangement, 1 semester, WiSe or SoSe		
Responsible professors or position: Professors of Organic Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required choice module, specialization “Physical Organic Chemistry” (<i>Physikalisch-Organische Chemie</i>), B.Sc. Chemistry, B.Sc. Food Chemistry, M.Sc. Materials Science / required choice module		
Participation prerequisites: For B.Sc. students: pass Organic Chemistry 2		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	30
Seminar	15	15
Practice	30	60

Exam	35 (incl. preparation; included above)
Total:	180 hours = 6 CP
Pre-exam performance: successful seminar presentation	
Module exam: <ul style="list-style-type: none"> - Written exam (90-120 min) or oral exam (20-40 min), form will be announced at the beginning of the semester. - Repeat exam: written exam (90-120 min) or oral exam (20-40 min), form will be announced at the beginning of the semester. - Formation of grade: final exam (100%). 	
Course and exam language: German and/or English	
Please note: *currently Prof. Dr. R. Göttlich, Prof. Dr. H. Wegner Module advice and literature: see semester flyer / Appointment: see course catalog.	

Chemie-MPO4	17B (Organo)Katalyse und Syntheseplanung	6 CP
	17B (Organo) Catalysis and Synthesis Planning	
Required or required choice module	08 / Chemistry / Organic Chemistry	1./2. Semester (if necessary in field of study)
	First offered in Winter Semester 2018/19	
Learning Goals: Students can: <ul style="list-style-type: none">plan and critically reflect stereoselective syntheses of unknown target molecules (retrosynthesis),review, question and discuss current literature,use (organo)catalytic reactions to solve theoretical synthesis problems.		
Module content: <ul style="list-style-type: none">modern multi-stage synthesis,advanced stereochemistry and its control,catalysis, organocatalytic methods,stereoselective methods and retrosynthesis,chiral reagents and auxiliaries.		
Semester offered and duration: Per arrangement, 1 semester, WiSe or SoSe		
Responsible professors or position: Professors of Organic Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required choice module, specialization “Physical Organic Chemistry” (<i>Physikalische Organische Chemie</i>), B.Sc. Chemistry, B.Sc. Food Chemistry, M.Sc. Materials Science / required choice module		
Participation prerequisites: For B.Sc. students: pass Organic Chemistry 2		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	45	45
Seminar	15	15
Practice	15	30
Exam	15 (incl. preparation)	
Total:	180 hours = 6 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Oral exam (20-40min) or written exam (90-120min), form will be announced at the beginning of the semester.
- Repeat exam: oral exam (20-40min) or written exam (90-120min), form will be announced at the beginning of the semester.
- Formation of grade: oral exam or written exam (100%).

Course and exam language: German and/or English

Please note: *currently Prof. Dr. Peter R. Schreiner, Prof. Dr. Hermann Wegner, Prof. Dr. Richard Göttlich
Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-MP7	18B Einblick in naturwissenschaftliche Forschung 1	10 CP
	18B Insight into Scientific Research 1	
Required or required choice module	08 and 07, Physics, Biology and Chemistry	3. Sem.
	First offered in Winter Semester 2018/19	
Learning Goals: Students can <ul style="list-style-type: none">• discuss the results of a project in the context of current literature.• make predictions about a project as well as plan and conduct new studies.• compile, present, and defend project results.		
Module content: <ul style="list-style-type: none">• work on a project in a working group in the natural sciences,• literature work on the project,• planning and carrying out examinations,• discussion of the project with employees and university lecturers,• creation of a project report and a presentation.		
Semester offered and duration: Each year, 1 semester, WiSe or SoSe		
Responsible professors or position: Professors of Chemistry, Biology and Physics		
Applicable to following degree programs: M.Sc. Chemistry / specialization module		
Participation prerequisites: passed 5 of the 6 compulsory modules of the first two semesters.		
Course Format:	In-class time requirement	Preparation and review time requirement
Seminar	8-16	10-20
Practice	150-220	30-60
Exam	1 (incl. above)	
Total:	300 hours (approx. 8 weeks full-time)	
Pre-exam performance: none		
Module exam: <ul style="list-style-type: none">- Report and presentation.- Repeat exam: editing of report and/or repeat presentation.- Formation of grade: report (50%) and presentation (50%).		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Course and exam language: German and/or English

Please note: Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-MP8	19B Einblick in naturwissenschaftliche Forschung 2	10 CP
	19B Insight into Scientific Research 2	
Required or required choice module	07 and 08, Physics, Biology and Chemistry	3. Sem.
	First offered in Winter Semester 2018/19	
Learning Goals: Students can <ul style="list-style-type: none">• discuss the results of the project in the context of current literature• make predictions about the project as well as plan and conduct new studies• compile, present and defend project results		
Module content: <ul style="list-style-type: none">• participation in a project in a working group in the natural sciences• literature work on the project• planning and carrying out examinations• discussion of the project with employees and university lecturers• creation of a project report and a presentation		
Semester offered and duration: Each year, 1 semester, WiSe or SoSe		
Responsible professors or position: Professors of Chemistry, Biology, and Physics		
Applicable to following degree programs: M.Sc. Chemistry / specialization module		
Participation prerequisites: passed 5 of the 6 compulsory modules of the first two semesters.		
Course Format:	In-class time requirement	Preparation and review time requirement
Seminar	8-16	10-20
Practice	150-220	30-60
Exam	1 (incl. above)	
Total:	300 hours (approx. 8 weeks full-time)	
Pre-exam performance: none		
Module exam: <ul style="list-style-type: none">- Report and presentation.- Repeat exam: editing of report and/or repeat presentation.- Formation of grade: report (50%) and presentation (50%).		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Course and exam language: German and/or English

Please note: Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-MP9	20B Spezielle Themen naturwissenschaftlicher Forschung	10 CP
	20B Specific Topics in Scientific Research	
Required or required choice module	08 / Chemistry / all institutes	3. Sem.
	First offered in Winter Semester 2018/19	
Learning Goals: Students can: <ul style="list-style-type: none">• assess and interpret advanced scientific relationships and own research results,• independently assess sophisticated scientific literature,• develop own solutions to scientific problems and use the appropriate methods,• plan and carry out a scientific project independently.		
Module content: <ul style="list-style-type: none">• topics from the current research of the working group,• independent literary work,• independent planning and execution of studies,• development of a project, creation of a work plan, implementation,• defense of the project.		
Semester offered and duration: Each year, 1 semester, WiSe or SoSe		
Responsible professors or position: Professors of Chemistry		
Applicable to following degree programs: M.Sc. Chemistry / research module		
Participation prerequisites: passed 5 of the 6 compulsory modules of the first two semesters, passed research module 1.		
Course Format:	In-class time requirement	Preparation and review time requirement
Seminar	8-16	10-20
Practice	150-220	30-60
Exam	1 (incl. above)	
Total:	300 hours (approx. 8 weeks full-time)	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Report and presentation.
- Repeat exam: editing of report and/or repeat presentation.
- Formation of grade: report (50%) and presentation (50%).

Course and exam language: German and/or English

Please note: Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-MP10	21B Master-Thesis	30 CP
	21B Master Thesis	
Required or required choice module	08 / Chemistry / all institutes	4. Sem.
	First offered Summer Semester 2010	
Learning Goals: The students have the competence to independently develop and complete a project based on a specific task from a field of chemistry, using scientific methods, evaluating and interpreting their results, and presenting as well as defending them as scientific work.		
Module content: <ul style="list-style-type: none">• conception of a work plan,• scientific literature,• development of measurement and evaluation methods, implementation and evaluation, discussion of the results,• preparation of a thesis,• put your own work in the context of other scientific results and applications.		
Semester offered and duration: Each year, 1 semester, WiSe or SoSe		
Responsible professors or position: Professors of Chemistry		
Applicable to following degree programs: M.Sc. Chemistry		
Participation prerequisites: passed 5 of the 6 compulsory modules of the first two semesters, passed research module 1.		
Course Format:	Time requirement	Preparation and review time requirement
Formation of independent scientific research	780	120
Exam	1 (incl. above)	
Total:	900 hours (approx. 6 months full-time)	
Pre-exam performance: none		
Module exam: <ul style="list-style-type: none">- Thesis, defense.- In the case of failed thesis: newly made thesis according to AIIB.- Formation of grade: thesis (70%), defense (30%).		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Course and exam language: German and/or English

Please note: Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W01	22B Metall- und Ligandenreaktivität	6 CP
	22B Metal and Ligand Reactivity	
	08 / Chemistry / Inorganic and Analytical Chemistry	
Learning Goals: Students can: <ul style="list-style-type: none">competently discuss molecular reactions of metal complexes in solution and their mechanisms,recognize relationships between structure and reactivity of a catalyst,establish reaction mechanisms in connection with kinetic measurements,use acquired knowledge to solve new problems,recognize relationships between structure, properties, reactivity, and selectivity of metal complexes,independently use and compare different synthesis processes.		
Module content: <ul style="list-style-type: none">metal complexes and their reaction behavior,free vs. coordinated ligands, "non-innocent" ligands, redox properties,inorganic reaction kinetics (measurement methodology, activation parameters, Eyring plots),kinetics and thermodynamics of reactions with metal complexes,template reactions,macrocycles and cryptands,molecular nodes,supramolecular chemistry,molecular machines.		
Semester offered and duration: Per arrangement, 1 semester, SoSe or WiSe		
Responsible professors or position: Professors of Inorganic Chemistry*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Sciences, B.Sc./M.Sc. Food Chemistry / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	30
Practice	15	30
Self-structured work	45	
Exam	30 (incl. preparation)	

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Total:	180 hours = 6 CP
Pre-exam performance: none	
Module exam: <ul style="list-style-type: none"> - Written exam (90-120min) or oral exam (20-40min), form will be announced at the beginning of the semester. - Repeat exam: written exam (90-120min) or oral exam (20-40min), form will be announced at the beginning of the semester. - Formation of grade: written or oral exam (100%). 	
Course and exam language: German and/or English	
Please note: *currently Prof. Dr. S. Schindler Module advice and literature: see semester flyer / Appointment: see course catalog.	

Chemie-W02	23B Studienprojekt	6 CP
	23B Study Project	
Required or required choice module	08 / Chemistry / all institutes	
Learning Goals: Students can: <ul style="list-style-type: none">• test the methods of a special field on the basis of a completed task and then use their knowledge and skills in teamwork,• expand own ability to research literature and discuss science,• use multimedia presentation techniques taking into account didactic aspects,• achieve planning competence in identifying the individual work steps for the successful processing of a performance requirements, including effective time and resource management.		
Module content: <ul style="list-style-type: none">• reviewing literature,• plants for the production and characterization of materials,• implementation of a work program,• discussion and presentation of the results,• formulation of weekly interim reports and a final report.		
Semester offered and duration: Per arrangement, 1 semester, SoSe or WiSe		
Responsible professors or position: Chemistry instructors		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Sciences, B.Sc./M.Sc. Food Chemistry / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Internship	120	15
Seminar	5	15
Exam	25 (incl. above)	
Total:	180 hours = 6 CP	
Pre-exam performance: Project assignment (internship) completed		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Report
- Repeat exam: edit report
- Formation of grade: report (100%)

Course and exam language: German and/or English

Please note: Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W03	24B Introduction to Chemistry in (Cyber)space	6 CP
	24B Introduction to Chemistry in (Cyber)space	
Required or required choice module	08 / Chemistry / all institutes	
Learning Goals: Students can: <ul style="list-style-type: none">recognize chemical content in the media and assess its credibility,recognize simple chemical questions and problems, and (with help) develop and elaborate solutions,verify or falsify theories,convey their results using simple presentation techniques and taking into account fundamental didactic aspects,plan and carry out their work steps taking into account efficient time and resource management.		
Module content: <ul style="list-style-type: none">work out individual chemical questions and problems in cyberspace,chemistry in space, e.g., Nutrition and energy supply,development of solutions,review of literature on chemical problems,creation and implementation of a work program,discussion and presentation of the results.		
Semester offered and duration: Per arrangement, 1 semester, SoSe or WiSe		
Responsible professors or position: Professors of Inorganic Chemistry, Professors of Physical Chemistry, Professors of Organic Chemistry*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Sciences, B.Sc./M.Sc. Food Chemistry / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	15	15
Seminar	15	15
Practice	30	30
Self-structured work	60 (in seminar)	
Total:	180 hours = 6 CP	

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Pre-exam performance: none
Module exam: <ul style="list-style-type: none"> - Final paper or presentation (will be announced at the beginning of the semester). - Repeat exam: repeat presentation or edit final paper. - Formation of grade: Final project (one of above mentioned) (100%).
Course and exam language: German and/or English
Please note: Currently Prof. Dr. S. Schindler, Prof. Dr. B. Smarsly, Prof. Dr. R. Göttlich Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W04	25B Advanced Chemistry in (Cyber)space	6 CP
	25B Advanced Chemistry in (Cyber)space	
Required or required choice module	08 / Chemistry / all institutes	
Learning Goals: Students can: <ul style="list-style-type: none">independently recognize complex chemical content in the media and assess its credibility,recognize complex chemical questions and problems, and independently develop and determine solutions,develop suitable theories and discuss them competently,convey their results using multimedia presentation techniques and taking advanced didactic aspects into account,independently plan and carry out milestones taking into account efficient time and resource management.		
Module content: <ul style="list-style-type: none">determine complex chemical questions and problems in cyberspace,independent development of solution approaches and development of theories,review literature on complex chemical problems,independent creation and implementation of a work program,competent discussion and presentation of the results.		
Semester offered and duration: Per arrangement, 1 semester, SoSe or WiSe		
Responsible professors or position: Professors of Inorganic Chemistry, Professors of Physical Chemistry, Professors of Organic Chemistry*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Sciences, B.Sc./M.Sc. Food Chemistry / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	15	15
Seminar	15	15
Practice	30	30
Self-structured work	60 (in seminar)	

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Total:	180 hours = 6 CP
Pre-exam performance: none	
Module exam: <ul style="list-style-type: none"> - Final paper or presentation (will be announced in the beginning of the semester). - Repeat exam: repeat presentation or edit final paper. - Formation of grade: Final project (one of above mentioned) (100%). 	
Course and exam language: German and/or English	
Please note: Currently Prof. Dr. S. Schindler, Prof. Dr. B. Smarsly, Prof. Dr. R. Göttlich Module advice and literature: see semester flyer / Appointment: see course catalog.	

Chemie-W05	26B Automation in der Chemie	6 CP
	26B Automation in Chemistry	
Required or required choice module	08 / Chemistry / all institutes	
Learning Goals: Students can: <ul style="list-style-type: none">• assess the advantages and disadvantages of different reactor systems,• transfer laboratory syntheses to suitable reactor systems,• detect and analyze problems of upscaling and develop suitable solutions,• apply new synthesis technologies in a targeted manner.		
Module content: <ul style="list-style-type: none">• reactor systems and reaction technologies,• reaction monitoring, control, and optimization,• batch process,• parallel synthesis,• combinatorics and synthesis robots,• Labview,• field trip.		
Semester offered and duration: Per arrangement, 1 semester, SoSe or WiSe		
Responsible professors or position: Professors of Inorganic Chemistry, Professors of Physical Chemistry, Professors of Organic Chemistry*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Sciences, B.Sc./M.Sc. Food Chemistry / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Seminar	30	30
Field trip	10	10
Internship	60	40
Total:	180 hours = 6 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Protocol log and report.
- Repeat exam: edit protocol log and/or report.
- Formation of grade: none; module counts as “passed” when the hour logs and report are accepted.

Course and exam language: German and/or English

Please note: Currently Prof. Dr. S. Schindler, Prof. Dr. B. Smarsly, Prof. Dr. R. Göttlich

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W06	27B Forschungsthemen der Anorganischen Chemie 1	3 CP
	27B Research Topics in Inorganic Chemistry 1	
Required or required choice module	08 / Chemistry / Inorganic Chemistry	
Learning Goals: Students can: <ul style="list-style-type: none">• understand concepts, objectives, and tasks in research questions and develop them with help,• find / develop suitable methods and approaches for solving inorganic chemistry problems,• derive new questions from observations,• master modern, research-relevant characterization methods both theoretically and experimentally.		
Module content: <ul style="list-style-type: none">• deepening of inorganic-chemical concepts from selected areas of<ul style="list-style-type: none">- complex chemistry,- material chemistry,- characterization methods of solids,- nanochemistry.		
Semester offered and duration: Per arrangement, 1 semester, SoSe or WiSe		
Responsible professors or position: Professors of Inorganic Chemistry, Professors of Physical Chemistry*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Sciences, B.Sc./M.Sc. Food Chemistry / required choice module		
Participation prerequisites: passed General and Inorganic Chemistry (<i>Allgemeine und Anorganische Chemie</i>)		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	15	15
Seminar	30	-
Exam	30 (incl. preparation)	
Total:	90 hours = 3 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Oral exam (30 min) or written exam (90 min), form will be announced at the beginning of the semester.
- Repeat exam: oral exam (30 min) or written exam (90 min), form will be announced at the beginning of the semester.
- Formation of grade: oral exam or written exam (100%).

Course and exam language: German and/or English

Please note: currently Prof. Dr. S. Schindler, Prof. Dr. B. Smarsly

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W07	28B Forschungsthemen der Anorganischen Chemie 2	6 CP
	28B Research Topics in Inorganic Chemistry 2	
Required or required choice module	08 / Chemistry / Institute of Inorganic Chemistry and Analytical Chemistry	
Learning Goals: Students can: <ul style="list-style-type: none">• understand concepts, objectives, and tasks in research questions and develop them with help,• find / develop suitable methods and approaches for solving questions of modern inorganic research,• derive new questions from observations,• master modern, research-relevant characterization methods both theoretically and experimentally.		
Module content: <ul style="list-style-type: none">• deepening of inorganic-chemical concepts from selected areas of<ul style="list-style-type: none">- complex chemistry,- materials chemistry,- characterization methods of solids,- nanochemistry.		
Semester offered and duration: Per arrangement, 1 semester, SoSe or WiSe		
Responsible professors or position: Professors of Inorganic Chemistry, Professors of Physical Chemistry*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Sciences, B.Sc./M.Sc. Food Chemistry / required choice module		
Participation prerequisites: passed General and Inorganic Chemistry (<i>Allgemeine und Anorganische Chemie</i>)		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	30
Seminar	30	30
Practice	15	15
Exam	30 (incl. preparation)	
Total:	180 hours = 6 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Oral exam (30 min) or written exam (90 min), form will be announced at the beginning of the semester.
- Repeat exam: oral exam (30 min) or written exam (90 min), form will be announced at the beginning of the semester.
- Formation of grade: oral exam or written exam (100%).

Course and exam language: German and/or English

Please note: currently Prof. Dr. S. Schindler, Prof. Dr. B. Smarsly

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W08	29B Forschungsthemen der Organischen Chemie	3 CP
	29B Research Topics in Organic Chemistry	
Required or required choice module	08 / Chemistry / Organic Chemistry	
Learning Goals: Students can: <ul style="list-style-type: none">• understand concepts, objectives, and tasks in research questions and develop them with help,• find / develop suitable methods and approaches for solving problems,• derive new questions from observations.		
Module content: <ul style="list-style-type: none">• deepening of organic-chemical concepts from selected areas of<ul style="list-style-type: none">- stereoselective synthesis,- reaction development,- synthesis planning,- physical-organic chemistry.		
Semester offered and duration: Per arrangement, 1 semester, SoSe or WiSe		
Responsible professors or position: Professors of Organic Chemistry*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Sciences, B.Sc./M.Sc. Food Chemistry / required choice module		
Participation prerequisites: passed Organic Chemistry 2 (<i>Organische Chemie 2</i>)		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	15	15
Seminar	30	-
Exam	30 (incl. preparation)	
Total:	90 hours = 3 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Oral exam (20-40min) or written exam (90-120min), form will be announced at the beginning of the semester.
- Repeat exam: oral exam (20-40min) or written exam (90-120min), form will be announced at the beginning of the semester.
- Formation of grade: oral or written exam (100%).

Course and exam language: German and/or English

Please note: *currently Prof. Dr. Peter. R. Schreiner, Prof. Dr. Hermann Wegner, Prof. Dr. Richard Göttlich
Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W09	30B Ausgesuchte Themen der organisch-chemischen Forschung	6 CP
	30B Selected Topics of Research in Organic Chemistry	
Required or required choice module	08 / Chemistry / Organic Chemistry	
Learning Goals: Students can: <ul style="list-style-type: none">• understand concepts, objectives, and tasks in research questions and develop them with help,• find / develop suitable methods and approaches for solving problems,• derive new questions from observations.		
Module content: <ul style="list-style-type: none">• deepening of organic-chemical concepts from selected areas of<ul style="list-style-type: none">- stereoselective synthesis,- reaction development,- synthesis planning,- physical-organic chemistry.		
Semester offered and duration: Per arrangement, 1 semester, SoSe or WiSe		
Responsible professors or position: Professors of Organic Chemistry*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Sciences, B.Sc./M.Sc. Food Chemistry / required choice module		
Participation prerequisites: passed Organic Chemistry 2 (<i>Organische Chemie 2</i>)		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	30
Seminar	30	30
Practice	15	15
Exam	30 (incl. preparation)	
Total:	180 hours = 6 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Oral exam (20-40min) or written exam (90-120min), form will be announced at the beginning of the semester.
- Repeat exam: oral exam (20-40min) or written exam (90-120min), form will be announced at the beginning of the semester.
- Formation of grade: oral or written exam (100%).

Course and exam language: German and/or English

Please note: *currently Prof. Dr. Peter. R. Schreiner, Prof. Dr. Hermann Wegner, Prof. Dr. Richard Göttlich
Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W10	31B Modern Drug Discovery: Infectious Diseases	6 CP
	31B Modern Drug Discovery: Infectious Diseases	
Required or required choice module	08 / Chemistry / Organic Chemistry	
Learning Goals: The students: <ul style="list-style-type: none">• have an overview of the essential aspects of drug development,• have a basic knowledge of drugs against infectious diseases and how they work,• can understand, process, present, and competently discuss scientific publications on the topics.		
Module content: <ul style="list-style-type: none">• processes in drug development in the pharmaceutical industry• infectious diseases, targets• antibiotics, modes of action• proteins as active ingredients• genomics in drug development		
Semester offered and duration: Per arrangement, 1 semester, SoSe or WiSe		
Responsible professors or position: Professors of Organic Chemistry, Honorary Professor*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Sciences, B.Sc./M.Sc. Food Chemistry / required choice module		
Participation prerequisites: passed Organic Chemistry 2 (<i>Organische Chemie 2</i>)		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	30
Seminar	30	60
Self-structured work	10 (in seminar)	
Exam	20 (incl. preparation)	
Total:	180 hours = 6 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Written exam (90-120 min) or oral exam (20-40 min) or presentation (20-40 min), form will be announced at the beginning of the semester.
- Repeat exam: written exam (90-120 min) or oral exam (20-40 min) or presentation (20-40 min), form will be announced at the beginning of the semester.
- Formation of grade: written or oral exam or presentation (100%).

Course and exam language: German and/or English

Please note: *currently Prof. Dr. P. Hammann

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie W-11	32B Pharmazeutische Chemie	6 CP
	32B Pharmaceutical Chemistry	
Required or required choice module	08 / Chemistry / Organic Chemistry	
Learning Goals: Students can: <ul style="list-style-type: none">• describe relationships between structure and effect of drugs,• explain structure-effect relationships,• present basic concepts of drug synthesis,• describe basic methods of analysis,• show biochemical reaction of the bio-transformation• isolate enantiomers,• recognize recurring structural elements.		
Module content: <ul style="list-style-type: none">• Lecture:<ul style="list-style-type: none">- bio-transformation with phase 1 and phase 2 reactors,- importance and definition of enanomers,- properties of the different drug groups using examples,- principal means of drug synthesis,- analytical methods for identifying active ingredients.• Practice:<ul style="list-style-type: none">- ensure learning of the content through accompanying exercise.		
Semester offered and duration: Per arrangement, 1 semester, SoSe or WiSe		
Responsible professors or position: Professors of Organic Chemistry, Honorary Professor*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Sciences, B.Sc./M.Sc. Food Chemistry / required choice module		
Participation prerequisites: passed Organic Chemistry 2 (<i>Organische Chemie 2</i>)		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	60
Practice	30	30
Self-structured work	10	-
Exam	20 (incl. preparation)	

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Total:	180 hours = 6 CP
Pre-exam performance: none	
Module exam: <ul style="list-style-type: none"> - Written exam (90-120 min) or oral exam (20-40 min) or presentation (20-40 min), form will be announced at the beginning of the semester. - Repeat exam: written exam (90-120 min) or oral exam (20-40 min) or presentation (20-40 min), form will be announced at the beginning of the semester. - Formation of grade: written or oral exam or presentation (100%). 	
Course and exam language: German and/or English	
Please note: *currently Prof. Dr. F. Runkel Module advice and literature: see semester flyer / Appointment: see course catalog; Literature: <ul style="list-style-type: none"> - <i>Lehrbuch der Pharmazeutischen Chemie</i>; Kanbe, Höltje - <i>Chemie für die Pharmazeutische Praxis: Lehrbuch und Nachschlagwerk</i>; Strauss 	

Chemie-W12	33B Risiko- und Qualitätsmanagement	6 CP
	33B Risk and Quality Management	
Required or required choice module	08 / Chemistry / Organic Chemistry	
Learning Goals: Students can: <ul style="list-style-type: none">• confidently deal with the terms and definitions of QM,• understand the importance of quality,• carry out and analyze risk assessments,• identify and name critical process steps,• accompany qualifications and validations in companies,• develop risk reduction measures.		
Module content: <ul style="list-style-type: none">• basic terms of risk and quality management,• quality management systems (DIN ISO),• strategies for managing and controlling risks in manufacturing companies,• risk assessments according to FMEA, HACCP, Kepner-Tregoe, FTA,• quality-related strategies (TQM, EFQM, TPM, KVP),• qualification and validation phases,• internal / external quality audits,• certification.		
Semester offered and duration: Per arrangement, 1 semester, SoSe or WiSe		
Responsible professors or position: Professors of Organic Chemistry, Honorary Professor*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Sciences, B.Sc./M.Sc. Food Chemistry / required choice module		
Participation prerequisites: passed Organic Chemistry 1 (<i>Organische Chemie 1</i>)		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	60
Practice	30	30
Self-structured work	10	-
Exam	20 (incl. preparation)	

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Total:	180 hours = 6 CP
Pre-exam performance: none	
Module exam: <ul style="list-style-type: none"> - Written exam (90-120 min) or oral exam (20-40 min) or presentation (20-40 min), form will be announced at the beginning of the semester. - Repeat exam: written exam (90-120 min) or oral exam (20-40 min) or presentation (20-40 min), form will be announced at the beginning of the semester. - Formation of grade: written or oral exam or presentation (100%). 	
Course and exam language: German and/or English	
Please note: *currently Prof. Dr. F. Runkel Module advice and literature: see semester flyer / Appointment: see course catalog; Literature: <ul style="list-style-type: none"> - Wagner, K. <i>PQM Prozessorientiertes Qualitätsmanagement</i>, Verlag Hanser Wirtschaft; Auflage: 3., current Aufl. (March 2006) - Brunner F.J. et al., <i>Taschenbuch Qualitätsmanagement. Leitfaden für Ingenieure und Techniker</i>, Verlag Hanser Wirtschaft - Zinner, <i>Qualitätsmanagement. Begriffe, Regeln, Formeln</i> - Weidner, <i>Qualitätsmanagement – Kompaktes Wissen – Konkrete Umsetzung – Praktische Arbeitshilfen</i> - Kamiske, Brauer, <i>ABC des Qualitätsmanagements</i> - Hermann, Fritz, <i>Qualitätsmanagement – Lehrbuch für Studium und Praxis</i> 	

Chemie-W13	34B Moderne Massenpektrometrie	6 CP
	34B Modern Mass Spectrometry	
Required or required choice module	08 / Chemistry / Inorganic and Analytical Chemistry	
	First offered in Winter Semester 2016/17	
Learning Goals: Students can: <ul style="list-style-type: none">• use various current mass spectrometers, ionization methods and fragmentation methods,• interpret the mass spectra obtained,• decide on a substance-specific basis which method is most suitable,• understand the basic physical, technological, and methodological principles of ionization, fragmentation and mass analysis,• maintain, modify, and re-build mass spectrometric instruments.		
Module content: <ul style="list-style-type: none">• mass spectrometric and chromatographic instrumentation• ionization methods under ambient conditions and in vacuum• fragmentation methods for structure determination• ionization mechanisms / behavior• evaluation of mass spectra		
Semester offered and duration: Each year, 1 semester, WiSe		
Responsible professors or position: Professors of Analytical Chemistry*		
Applicable to following degree programs: B.Sc. Chemistry, B.Sc. Food Chemistry, B.Sc. Materials Science / required choice module		
Participation prerequisites: passed <i>Chemie-BK17/BLC-19 Analytische Chemie</i>		
Course Format:	In-class time requirement	Preparation and review time requirement
Internship	60	50
Practice	30	40
Exam	30 (incl. above)	
Total:	180 hours = 6 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Oral exam (30 min) or written exam (120 min), form will be announced at the beginning of the semester.
- Repeat exam: oral exam (30 min).
- Formation of grade: oral or written exam (100%).

Course and exam language: German and/or English

Please note: *currently Prof. Dr. B. Spengler

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W14	35B Elektrochemie II – Elektrochemie und Grenzflächenchemie	6 CP
	35B Electrochemistry II - Electrochemistry and Interface Chemistry	
Required or required choice module	08 / Chemistry / Physical Chemistry	
	First offered in Summer Semester 2019	
Learning Goals: Students can: <ul style="list-style-type: none">• use the most important experimental methods of electrochemistry and interface chemistry,• measure the most important experimentally determinable quantities of electrochemistry and interface chemistry,• master typical measurement tasks in electrochemistry,• use important electrochemical measuring devices.		
Module content: <ul style="list-style-type: none">• basic experiments in electrochemical thermodynamics and kinetics,• basic models for evaluating electrochemical measurements.• electrochemical applications: electrolysis, batteries, sensors, corrosion, photo-electro chemistry.		
Semester offered and duration: Per arrangement, 1 semester, SoSe		
Responsible professors or position: Professors of Physical Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / required choice module		
Participation prerequisites: passed <i>Chemie-MCG1 Elektrochemie</i>		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	15
Internship	60	60
Exam	15	
Total:	180 hours = 6 CP	
Pre-exam performance: All tests passed. Lab work carried out. Internship passed.		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Oral exam (30 min): final colloquium.
- Repeat exam: oral exam (30 min): final colloquium.
- Formation of grade: oral exam (100%).

Course and exam language: German and/or English

Please note: *currently Prof. Dr. J. Janek

Module advice and literature: see semester flyer / Appointment: see course catalog.

The module Chemie-W16 “Praktische Spektroskopie” has been omitted.

Chemie-W17	Data Science	6 CP
	Data Science	
Required or required choice module	08 / Chemistry / Physical Chemistry	5. and 6. Sem. and/or 1. and 2. Sem.
Learning Goals: Students can: <ul style="list-style-type: none">• understand and apply "data science" and "big data" typical ways of thinking and working• understand the concepts of procedural, object-oriented, and protocol-oriented programming languages• develop algorithms for the analysis of experimental data sets• detect and visualize complex relationships in large amounts of data• use machine learning for the development of extensive software systems		
Module content: <ul style="list-style-type: none">• programming with Mathematica, procedural programming techniques• nonlinear data fitting• basics of mechanical learning• basics of visualization• examples of the application of mechanical learning and "big data" analysis in physical chemistry		
Semester offered and duration: Each year, duration 2 semesters, begins WiSe		
Responsible professors or position: Instructors of Physical Chemistry*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Science, B.Sc./M.Sc. Physics / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	60
Seminar	30	60
Exam	60 (incl. above)	
Total:	180 hours = 6 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Final project (program written by student) (60 h).
- Repeat exam: project edits.
- Formation of grade: final project (100%).

Course and exam language: German and/or English

Please note: *currently Priv.-Doz. Dr. Georg Mellau

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W8	Quantenchemie	6 CP
	Quantum Chemistry	
Required or required choice module	08 / Chemistry / Physical Chemistry	
	First offered in Winter Semester 2019/20	
Learning Goals: Students: <ul style="list-style-type: none">• have an overview of the approaches of quantum chemistry,• have in-depth knowledge of the wave function-based methods of quantum chemistry (multi-electron systems),• can independently perform quantum chemical calculations on chemical systems and interpret their results.		
Module content: <ul style="list-style-type: none">• advanced mathematical methods in quantum chemistry• Hartree-Fock method, LCAO-MO approximation, basic sets• semi-empirical methods• correlation methods• density functional theory and dispersion corrections• molecular properties, structure optimization• comparison with experimental data• overview and classification of the methods		
Semester offered and duration: Each year, 1 semester, WiSe		
Responsible professors or position: (Junior) Professor of Theoretical Chemistry*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Science / required choice module		
Participation prerequisites: for chemistry students: passed Chemie-BK07 Physikalische Chemie 2; for natural science: passed Chemistry-BK04 Mathematics; for materials science students: passed MatWiss-BA07 mathematics and MatWiss-BP04 theoretical physics.		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	10
Practice	30	50
Self-structured work	10 (lecture)	10 (practice)
Exam	40	

Total:	180 hours = 6 CP
Pre-exam performance: 50% of the maximum achievable points from the exercise sheets must be achieved; usually 20 points per exercise sheet. The max. achievable points will be announced at the beginning of the semester.	
Module exam: <ul style="list-style-type: none"> - Written exam (120 min) or oral exam (45 min); form will be announced at the beginning of the semester. - Repeat exam: written exam (120 min) or oral exam (45 min); form will be announced at the beginning of the semester. - Formation of grade: written or oral exam (100%). 	
Course and exam language: German and/or English	
Please note: *currently Prof. Dr. D. Mollenhauer Module advice and literature: see semester flyer / Appointment: see course catalog.	

Chemie-W19	Quantenchemie der Festkörper / Oberflächen	6 CP
	Quantum Chemistry of Solids / Surfaces	
Required or required choice module	08 / Chemistry / Physical Chemistry	
	First offered in Winter Semester 2019/20	
Learning Goals: Students: <ul style="list-style-type: none">• have a basic knowledge of quantum chemistry for solids,• understand common quantum chemical processes with periodic boundary conditions,• can independently perform quantum chemical calculations on simple solid-state and surface systems and interpret their results.		
Module content: <ul style="list-style-type: none">• advanced mathematical methods in quantum mechanics• band structures, state densities and bond analysis in solids• basics of the Hartree-Fock method• density functional theory, dispersion correction• pseudopotentials, basic functions• material modeling• structure optimization• description of surfaces / adsorption on surfaces		
Semester offered and duration: Each year, 1 semester, WiSe		
Responsible professors or position: (Junior) Professor of Theoretical Chemistry*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Science / required choice module		
Participation prerequisites: for chemistry students: passed Chemie-BK07 Physikalische Chemie 2; for natural science: passed Chemistry-BK04 Mathematics; for materials science students: passed MatWiss-BA07 mathematics and MatWiss-BP04 theoretical physics.		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	10
Practice	30	50
Self-structured work	10	10
Exam	40	

Total:	180 hours = 6 CP
Pre-exam performance: 50% of the maximum achievable points from the exercise sheets must be achieved; usually 20 points per exercise sheet. The max. achievable points will be announced at the beginning of the semester.	
Module exam: <ul style="list-style-type: none"> - Written exam (120 min) or oral exam (45 min); form will be announced at the beginning of the semester. - Repeat exam: written exam (120 min) or oral exam (45 min); form will be announced at the beginning of the semester. - Formation of grade: written or oral exam (100%). 	
Course and exam language: German and/or English	
Please note: *currently Prof. Dr. D. Mollenhauer Module advice and literature: see semester flyer / Appointment: see course catalog.	

Chemie-W20	Moleküldynamik	6 CP
	Molecular Dynamics	
Required or required choice module	08 / Chemistry / All Institutes	1. or 2. Semester
	First offered in Winter Semester 2019/20	
Learning Goals: Students can: <ul style="list-style-type: none">understand and apply abstract concepts in mathematicsrecognize and apply the most important concepts in molecular dynamicsunderstand the connection between quantum mechanics and classical mechanics in molecular physics and apply themuse scientific thinking and working methods to solve complex questions in connection with the application of mathematical methods		
Module content: <ul style="list-style-type: none">the connection between quantum mechanics and classical mechanicsmolecular dynamics in the time and frequency domaintheory of the transition state and molecular eigenstateshigh resolution molecular spectroscopyspectroscopy of hot molecular gases		
Semester offered and duration: Per arrangement, 1 semester, WiSe or SoSe		
Responsible professors or position: Instructors for Physical Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry, M.Sc. Materials Science, B.Sc./M.Sc. Physics / required choice module		
Participation prerequisites: passed <i>Chemie-BV08-Theoretische Chemie und Computational Chemistry</i>		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	60
Practice	30	60
Exam	30 (incl. above)	
Total:	180 hours = 6 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Oral exam
- Repeat exam: oral exam
- Formation of grade: oral exam (100%)

Course and exam language: German and/or English

Please note: *currently Priv.-Doz. Dr. George Mellau

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W21	Molekülsymmetrie und Spektroskopie	6 CP
	Molecular Symmetry and Spectroscopy	
Required or required choice module	08 / Chemistry / All Institutes	4., 5. or 6. sem. and/or 1. or 2. sem.
	First offered in Winter Semester 2019/20	
Learning Goals: Students can: <ul style="list-style-type: none">understand and apply abstract concepts of mathematicsrecognize and apply the most important concepts of molecular spectroscopy,use scientific thinking and working methods to solve complex questions in connection with the application of mathematical methods.		
Module content: <ul style="list-style-type: none">mathematical basics I: introduction to algebra (basics, mapping, linking, link table, group, isomorphism, equivalence classes, permutations)mathematical basics II: matrices (block diagonal matrix, determinant, eigenvalue problem and geometric interpretation, diagonalizability, eigenspaces, rotation matrix, reflection matrix)spectroscopic methods (electromagnetic radiation, radiation detectors, construction of spectrometers, FT spectrometers)point groups (symmetry elements and operations, rotation group, point group, Schönflies nomenclature)presentation theory (irreducible presentation, presentation board, character board, direct product)rotational spectroscopy (main axis system and the rigid, multi-atom rotator, rotation states)vibrational spectroscopy (normal vibrations, GF calculation, localized vibrations, selection rules)		
Semester offered and duration: Each year, 1 semester, WiSe or SoSe		
Responsible professors or position: Instructors for Physical Chemistry*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Science, B.Sc./M.Sc. Food Chemistry / required choice module		
Participation prerequisites: passed <i>Chemie-BK04-Mathematik für Naturwissenschaftler</i>		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	60
Practice	30	60
Exam	30 (incl. above)	
Total:	180 hours = 6 CP	

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Pre-exam performance: none
Module exam: <ul style="list-style-type: none"> - Oral exam - Repeat exam: oral exam - Formation of grade: oral exam (100%)
Course and exam language: German and/or English
Please note: *currently Priv.-Doz. Dr. George Mellau Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W22	Innovationsmanagement	3 CP
	Innovation Management	
Required or required choice module	08 / Chemistry / Institute for Organic Chemistry	
	First offered in Winter Semester 2019/20	
Learning Goals: Students can: <ul style="list-style-type: none">understand the concept of innovation and clearly differentiate it from related terms (e.g., "invention")understand operational decision-making processes for evaluating and managing innovationscorrectly assess the importance of innovations in various technology-driven industriesuse the reported creativity methods and analysis tools from the field of innovation management		
Module content: <ul style="list-style-type: none">definition of "innovation", types of innovation, examples of successful inventions and innovationsframework conditions for innovations, innovation strategies and processeslooking ahead & scouting innovationsidea generation and idea evaluationR&D and technology managementstrategic business development		
Semester offered and duration: According to announcement, 1 semester		
Responsible professors or position: Professors of Organic Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / M.Sc. Food Chemistry / M.Sc. Materials Science (required choice module)		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Block Seminar	30	60
Total:	90 hours = 3 CP	
Pre-exam performance: active participation in block seminar		
Module exam: <ul style="list-style-type: none">Oral exam (15-30 min) or written exam (45-60 min) or final paper; form will be announced at the beginning of the semester.Repeat exam: oral exam (15-30 min) or written exam (45-60 min) or final paper; form will be announced at the beginning of the semester.Formation of grade: oral exam, written exam or final paper (100%).		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Course and exam language: German; documents primarily in English

Please note: *currently Dr. Christian-H. Küchental

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W23	Moderne Themen aus der Physikalischen Chemie	6 CP
	Modern Topics in Physical Chemistry	
Required or required choice module	08 / Chemistry / Physical Chemistry	
Learning Goals: Students can: <ul style="list-style-type: none">• apply problem-oriented spectroscopic and microscopic processes with the help of further physical-chemical concepts,• understand and apply modern methods and aspects based on current original literature,• work out complex issues of physical chemistry interactively with the lecturer and apply them to complex problems of physical chemistry.		
Module content: <ul style="list-style-type: none">• deepening of physical chemical concepts from:<ul style="list-style-type: none">- thermodynamics,- chemical kinetics,- electrochemistry or- quantum chemistry.		
Semester offered and duration: Per arrangement, 1 semester, WiSe or SoSe		
Responsible professors or position: Professors of Physical Chemistry*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Science / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	45	60
Practice	60	30
Exam	30	
Total:	180 hours = 6 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Written exam (120 min) or oral exam (45 min); form will be announced at the beginning of the semester.
- Repeat exam: written exam (120 min) or oral exam (45 min); form will be announced at the beginning of the semester.
- Formation of grade: written or oral exam (100%).

Course and exam language: German and/or English

Please note: *currently Prof. Dr. Jürgen Janek, Prof. Dr. Herbert Over, Prof. Dr. Bernd Smarsly
Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W24	Spezielle Aspekte der Physikalischen Chemie	3 CP
	Special Aspects of Physical Chemistry	
Required or required choice module	08 / Chemistry / Physical Chemistry	
Learning Goals: Students can: <ul style="list-style-type: none">• apply problem-oriented spectroscopic and microscopic processes with the help of further physical-chemical concepts,• record, understand, and identify modern methods and aspects of physical chemistry using original literature and can apply these to problems• elaborate complex issues of physical chemistry interactively with the lecturer and apply to complex problems.		
Module content: <ul style="list-style-type: none">• deepening of physical chemical concepts from:<ul style="list-style-type: none">- thermodynamics,- chemical kinetics,- electrochemistry or- quantum chemistry.		
Semester offered and duration: Per arrangement, 1 semester, WiSe or SoSe		
Responsible professors or position: Professors of Physical Chemistry*		
Applicable to following degree programs: B.Sc./M.Sc. Chemistry, B.Sc./M.Sc. Materials Science / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	15	15
Practice	15	30
Exam	15	
Total:	90 hours = 3 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Written exam (120 min) or oral exam (45 min); form will be announced at the beginning of the semester.
- Repeat exam: written exam (120 min) or oral exam (45 min); form will be announced at the beginning of the semester.
- Formation of grade: written or oral exam (100%).

Course and exam language: German and/or English

Please note: *currently Prof. Dr. Jürgen Janek, Prof. Dr. Herbert Over, Prof. Dr. Bernd Smarsly
Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W25	Technische Chemie	6 CP
	Technical Chemistry	
Required or required choice module	08 / Chemistry / Physical Chemistry	
Learning Goals: Students can: <ul style="list-style-type: none">describe theoretical and experimental methods of studying and developing catalysts and apply them to technically interesting reactions in the chemical industry,use typical experimental methods of technical chemistry,prepare a basic analysis of the economic viability of technical processes.		
Module content: <ul style="list-style-type: none">technical thermodynamics of real systems;microkinetics of closed reaction sequences; approximation models for the interpretation of reaction rates; macrokinetic description of mass and heat transport;similarity theory;residence time characteristics and sales calculation of ideal and real reactors;analytical methods of catalyst characterization;molecular description of surfaces and catalytic reactions;selected examples of technical, industrial applications of homogeneous and heterogeneous catalysis.		
Semester offered and duration: Per arrangement, 1 semester, WiSe or SoSe		
Responsible professors or position: Professors of Physical Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry, M.Sc. Materials Science / required choice module		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	20
Practice	15	20
Internship	30 (hours present)	40
Exam	25	
Total:	180 hours = 6 CP	
Pre-exam performance: all protocols accepted		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Oral exam (30 min).
- Repeat exam: oral exam (30 min).
- Formation of grade: oral exam (100%).

Course and exam language: German and/or English

Please note: *currently Prof. Dr. Herbert Over

Module advice and literature: see semester flyer / Appointment: see course catalog.

Chemie-W26	Medizinische Chemie	6 CP
	Medicinal Chemistry	
Required or required choice module	08 / Chemistry / Institute for Organic Chemistry	
Learning Goals: Students can: <ul style="list-style-type: none">understand the necessary properties of active ingredientsspecifically modify connections so that they are suitable as therapeuticscompetently discuss basic pharmacokinetic propertiesunderstand and discuss results of therapeutic in vitro testsknow the basics of drug design		
Module content: <ul style="list-style-type: none">molecular basis of drugsmechanisms of actiontest systems, ADMET parametersvalue chain in the pharmaceutical industrylead structures, structure-effect relationship, lead structure optimizationpharmacophore models		
Semester offered and duration: Per announcement, 1 semester		
Responsible professors or position: Instructor of Organic Chemistry*		
Applicable to following degree programs: M.Sc. Chemistry / M.Sc. Food Chemistry / M.Sc. Materials Science (required choice module)		
Participation prerequisites: none		
Course Format:	In-class time requirement	Preparation and review time requirement
Lecture	30	60
Practice Seminar	30	60
Exam	20 (incl. preparation, incl. above)	
Total:	180 hours = 6 CP	
Pre-exam performance: none		

Allgemeine Bestimmungen für Bachelor- und Masterstudiengänge	##.2018	7.34.00 Nr. 1
--	---------	---------------

Module exam:

- Written exam (90-120 min) or oral exam (20-40 min) or presentation (20-40 min); form will be announced at the beginning of the semester.
- Repeat exam: written exam (90-120 min) or oral exam (20-40 min) or presentation (20-40 min); form will be announced at the beginning of the semester.
- Formation of grade: written or oral exam or presentation (100%).

Course and exam language: German and/or English

Please note: *currently Dr. A. Bauer

Module advice and literature: see semester flyer / Appointment: see course catalog.