MARTIN-LUTHER-UNIVERSITÄT
HALLE-WITTENBERG

Modulhandbuch

für den
Studiengang:

Polymer Materials Science

im Master - Studiengang 120 Leistungspunkte

vom 28.06.2013

Inhalt:

Anhang:

Präambel:

(1) Examination periods
There are two examination periods with four weeks duration directly after the semester (examination period A) or at the end of the semester break (examination period B). Final examinations finishing each module usually take place in the examination periods A or B. The assignment to examination period A or B is given in the general description of the respective modules. Modules covering more than one semester should finish in examination period B. Modules finals that require less preparation time can be arranged in the examination period A.
(2) Modules of the Master course (M.Sc. Polymer Materials Science)
All modules are compulsory or optional as indicated in the curriculum. Depending on the students` undergraduate background and interests, the module combinations Advanced Chemistry/Basic Physics and Measurement Methods/Polymer Synthesis Lab or Advanced Physics/Advanced Physics Lab/Basic Chemistry and Polymerization Lab have to be selected for
a specialization in Polymer Chemistry or Polymer Physics, respectively. Modules of the third semester should be selected according to the planned research topic of the Master Thesis. The Master Thesis work is carried out in the fourth semester after finishing all examinations of the previous semesters.
(3) Director and Examination Board
In order to improve and develop the courses, a faculty member is elected as a director and coordinator of the master course. The director collects information and feedback of the students and the teaching staff. He is responsible for changes of the curriculum and further developments.

Modul: Advanced Chemistry

Identifikationsnummer:

CHE.03133.02

Lernziele:

- in-depth study of the scientific concepts that are fundamental for the understanding of the synthetic strategies and the physical chemistry of polymers
- understanding and applying advanced concepts of synthetic organic chemistry
- learning to use the fundamentals of advanced physical chemistry
- deepening the important mathematical concepts
- learning to use computers for data base research and data processing
- using the software `Materials Studio`

Inhalte:

Lectures:

1. Physical Chemistry
   - phenomenological thermodynamics
   - chemical equilibriums
   - phase equilibriums
   - thermodynamics of mixtures
   - equation-of-state approach
   - ionic solutions and electrochemistry
   - surfaces and interfaces
   - chemical kinetics
   - intermolecular interactions
   - statistical thermodynamics
2. Mathematical Tools in Chemistry
   - statistics: distribution functions, data treatment, error handling, linear regression
   - calculus: integration, differentiation, solving simple differential equations, applications to reaction kinetics
   - linear algebra
   - trigonometry
   - complex numbers
   - Fourier transformation
3. Organic Chemistry
   - advanced synthesis strategies in organic chemistry
   - metal organic chemistry
   - special chemistry related to polymers and polymerization procedures
   - photochemistry

Lab Courses:

1. Physical Chemistry Lab
   - WAXS of metals and polymers, basics of crystallography
   - PVT measurements, equation-of-state thermodynamics
   - DSC and thermogravimetry
   - dynamic light scattering
   - surface and interfacial tension
   - determination of critical micelle concentration
   - polymer crystallization (polarized light microscopy, light scattering)
2. Data Base Research and Software Computer Lab
   - web of science, SciFinder, OPAC, Scirus, JabRef
   - chemical abstracts research
   - Origin, ChemOffice, ImageJ

- simulation of IR and NMR spectra

3. Organic Chemistry Lab
   - metal organic chemistry
   - Grignard chemistry
   - catalytical processes

Verantwortlichkeiten (Stand 20.07.2009):

Fakultät	Institut	Verantwortliche/r
Naturwissenschaftliche Fakultät II - Chemie, Physik und Mathematik	Chemie	Doz. Dr. Christian Wohlfarth

Studienprogrammverwendbarkeit (Stand 16.07.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Applied Polymer Science 120 LP 1. Version 2007	1.	Wahlpflichtmodul	Fachnote	15/102
Master	Polymer Materials Science 120 LP 1. Version 2009	1.	Wahlpflichtmodul	Fachnote	15/115

Teilnahmevoraussetzungen:

Obligatorisch:

keine

Wünschenswert:

for safety reasons, access to the Organic Chemistry Lab (semester 2) is restricted to people having completed either the Polymer Synthesis Lab or the Basic Chemistry and Polymerization Lab in semester 1

Dauer:

2 Semester

Angebotsturnus:

jedes Wintersemester

Studentischer Arbeitsaufwand:

450 Stunden

Leistungspunkte:

15 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Lecture Physical Chemistry	3	45	Wintersemester
Lecture Mathematical Tools in Chemistry	1	15	Wintersemester
Lab Course Physical Chemistry	2	30	Wintersemester
Lab Course Data Base Research and Software	2	30	Wintersemester
Seminar on Physical Chemistry	1	15	Wintersemester
Seminar on Mathematical Tools in Chemistry	1	15	Wintersemester
Lecture Organic Chemistry	3	45	Wintersemester
Lab Course Advanced Organic Chemistry	3	45	Sommersemester
private study	0	210	Winter- und Sommersemester

Studienleistungen:

- completion of lab course protocols; seminar problem set solutions

Modulvorleistungen:

- keine

Modulteilleistungen:

Modulteilleistungen	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
written examination Physical Chemistry	written examination Physical Chemistry	written examination Physical Chemistry	40 %
written examination Math. Tools in Chemistry	written examination Math. Tools in Chemistry	written examination Math. Tools in Chemistry	20 %
written examination Organic Chemistry	written examination Organic Chemistry	written examination Organic Chemistry	40 %

Termine für alle Modulteilleistungen:

1.Termin: up to 4 weeks after the end of the lectures

1.Wiederholungstermin: up to the beginning of the lecture period of the following semester

2.Wiederholungstermin: up to the examination of the same module in the next year

Modul: Advanced Physics

Identifikationsnummer:

PHY.03134.02

Lernziele:

- acquintance with the scientific concepts that are fundamental for the understanding of the physics and the physical chemistry of polymers
- learning to use the fundamentals of advanced physical chemistry
- learning and applying the concepts of soft condensed matter physics
- applying the mathematical tools of statistical mechanics
- learning to use computers for data base research and data processing

Inhalte:

Lectures:

1. Physical Chemistry
   - phenomenological thermodynamics
   - chemical equilibria
   - phase equilibra
   - thermodynamics of mixtures
   - equation-of-state approach
   - ionic solutions and electrochemistry
   - surfaces and interfaces
   - chemical kinetics
   - intermolecular interactions
   - statistical thermodynamics
2. Physics of Soft Condensed Matter
   - structure and dynamics of liquids (existence, pair correlation function, glass transition)
   - liquid crystals (classification, structure and defects in nematics, nematic-to-isotropic phase transition, elastic properties and Fredericks-transition)
   - colloidal dispersions – heterogeneous systems (Brownian motion, forces between colloids, colloidal phase transitions)
   - polymers (conformations – ideal chains, rubber elasticity, introduction into semi-crystalline polymers)
   - surfactants – supramolecular structures and self-organization (micelles and membranes)
3. Statistical Physics
   - basics of statistical mechanics
   - dilute systems: perturbation approach, cluster expansions
   - dense systems: ferromagnets as an example for mean field approaches
   - phase transitions: Landau theory, scaling, renormalization group
   - rigorously solvable models, 1d Ising model
   - perturbation approaches based on results for hard-core models
   - physical kinetics: Fokker-Planck equation, Langevin equation, FDT

Lab Courses:

1. Physical Chemistry Lab
   - WAXS of metals and polymers, basics of crystallography
   - PVT measurements, equation-of-state thermodynamics
   - DSC and thermogravimetry
   - dynamic light scattering
   - surface and interfacial tension
   - determination of critical micelle concentration
   - polymer crystallization (polarized light microscopy, light scattering)

2. Data Base Research and Software Computer Lab

web of science, SciFinder, OPAC, Scirus, JabRef
chemical abstracts research
Origin, ChemOffice, ImageJ
simulation of IR and NMR spectra

Verantwortlichkeiten (Stand 08.11.2012):

Fakultät	Institut	Verantwortliche/r
Naturwissenschaftliche Fakultät II - Chemie, Physik und Mathematik	Physik	Prof. Dr. Wolfgang Paul

Studienprogrammverwendbarkeit (Stand 07.07.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Applied Polymer Science 120 LP 1. Version 2007	1.	Wahlpflichtmodul	Fachnote	15/102
Master	Polymer Materials Science 120 LP 1. Version 2009	1.	Wahlpflichtmodul	Fachnote	15/115

Teilnahmevoraussetzungen:

Obligatorisch:

keine

Wünschenswert:

keine

Dauer:

2 Semester

Angebotsturnus:

jedes Wintersemester

Studentischer Arbeitsaufwand:

450 Stunden

Leistungspunkte:

15 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Lecture Physical Chemistry	3	45	Wintersemester
Lecture Statistical Mechanics	1	15	Wintersemester
Lab Course Physical Chemistry	2	30	Wintersemester
Lab Course Data Base Research and Software	2	30	Wintersemester
Seminar on Physical Chemistry	1	15	Wintersemester
Seminar on Statistical Mechanics	1	15	Wintersemester
Lecture Soft Condensed Matter Physics	2	30	Sommersemester
Seminar on Soft Condensed Matter Physics	2	30	Sommersemester
private study	0	240	Winter- und Sommersemester

Studienleistungen:

- completion of lab course protocols; seminar problem set solutions; written examinations in Physical Chemistry and Physics of Soft Condensed Matter

Modulvorleistungen:

- keine

Modulleistung:

Modulleistung	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
oral or written examination	oral or written examination	oral or written examination	100 %

Termine für die Modulleistung:

1.Termin: examination period B

1.Wiederholungstermin: up to 6 months after the end of the semester

2.Wiederholungstermin: up to the examination of the same module in the next year

Modul: Advanced Physics Lab

Identifikationsnummer:

PHY.03136.02

Lernziele:

- Learning and training of practical abilities when using modern physical laboratory equipment
- Identification and assessment of error sources in physical experiments
- Evaluation, analysis and graphical presentation of experimental results
- Writing of scientific reports
- Presentation of scientific results in oral form
- Training of rhetorical abilities

Inhalte:

The students will perform five of the following experiments. Each experiment is carried out within three weeks.

- x-Ray diffraction (diffraction experiments at ion crystals and semi-crystalline polymers)
- scanning electron microscopy (spectroscopy of secondary electrons and cathodoluminescence spectroscopy)
- photoelasticity (elastic experiments of transparent stress models at two different photoelastic benches)
- nuclear magnetic resonance (Fourier method with pulsed excitation on a spectrometer using the earth magnetic field)
- metal desorption experiments in ultra-high vacuum techniques (vacuum generation and measurement; thermal desorption spectroscopy)
- scanning tunnelling microscopy (scanning techniques; atomic resolution at a graphite surface)
- measurement of the dielectric function (real and imaginary parts of the dielectric function of epoxy glue are measured as a function of temperature and frequency)

Verantwortlichkeiten (Stand 20.07.2009):

Fakultät	Institut	Verantwortliche/r
Naturwissenschaftliche Fakultät II - Chemie, Physik und Mathematik	Physik	Prof. Dr. Reinhard Krause-Rehberg

Studienprogrammverwendbarkeit (Stand 16.07.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Applied Polymer Science 120 LP 1. Version 2007	1.	Wahlpflichtmodul	keine Benotung	
Master	Polymer Materials Science 120 LP 1. Version 2009	1.	Wahlpflichtmodul	keine Benotung	

Teilnahmevoraussetzungen:

Obligatorisch:

keine

Wünschenswert:

keine

Dauer:

1 Semester

Angebotsturnus:

jedes Wintersemester

Studentischer Arbeitsaufwand:

150 Stunden

Leistungspunkte:

5 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Advanced Physics Lab Course	4	60	Wintersemester
Private Study	0	90	Wintersemester

Studienleistungen:

- attestations to the individual experiments; completion of lab course protocols

Modulvorleistungen:

- keine

Modulleistung:

Modulleistung	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
seminar presentation	seminar presentation	seminar presentation	100 %

Termine für die Modulleistung:

1.Termin: during the semester

1.Wiederholungstermin: up to 6 months after the end of the semester

2.Wiederholungstermin: up to the examination of the same module in the next year

Hinweise:

This module requires basic experimental skills, documented in an introductory test. In case of failure, the module Basic Physics and Measurement Methods becomes obligatory, and the module Advanced Physics Lab is to be taken in semester 3.

Modul: Advanced Polymer Chemistry

Identifikationsnummer:

CHE.03146.02

Lernziele:

- knowledge of advanced concepts of polymer synthesis and characterization
- special polymer synthesis methods
- biopolymers synthesis and degradation mechanism
- industrially relevant polymerization processes

Inhalte:

Lectures:

1. Modern Concepts of Polymer Synthesis
   - modern concepts of controlled and living polymerization techniques
   - star block copolymers, dendrimers, hyper branched polymers, graft copolymers
   - polycondensation, metathesis polymerization, ROMP, ADMET
   - organic-inorganic hybrid materials
   - polymerization in alternative reaction media (ionic liquids, supercritical solvents)
   - Ziegler-Natta polymerization, metallocene/MAO polymerization
   - Click-chemistry, IPN, semi-IPN, graft polymerization
   - new industrially synthesized polymers (e.g. s-PS, s-PP)
2. Industrial Polymers
   - commercialization of small scale products
   - company strategies
   - polymers for applications in medicine and pharmacy

   Lab Course:
   Biological Polymer Synthesis
   - basic biochemical methods
   - enzymatic polymerizations
   - modifications of biopolymers
   - degradation of biopolymers
   - special analytical tools for the analysis of biopolymers
   - biopolymer applications

Verantwortlichkeiten (Stand 20.07.2009):

Fakultät	Institut	Verantwortliche/r
Naturwissenschaftliche Fakultät II - Chemie, Physik und Mathematik	Chemie	Prof. Dr. Wolfgang Binder

Studienprogrammverwendbarkeit (Stand 07.07.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Applied Polymer Science 120 LP 1. Version 2007	3.	Wahlpflichtmodul	Fachnote	10/102
Master	Polymer Materials Science 120 LP 1. Version 2009	3.	Wahlpflichtmodul	Fachnote	10/115

Teilnahmevoraussetzungen:

Obligatorisch:

keine

Wünschenswert:

keine

Dauer:

1 Semester

Angebotsturnus:

jedes Wintersemester

Studentischer Arbeitsaufwand:

300 Stunden

Leistungspunkte:

10 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Lecture Modern Concepts of Polymer Synthesis	3	45	Wintersemester
Lab Course Biological Polymer Synthesis	2	30	Wintersemester
Seminar Modern Concepts of Polymer Synthesis	2	30	Wintersemester
Seminar on Biological Polymer Synthesis	1	15	Wintersemester
Excursion Polymer Industry	0	10	Wintersemester
Private Study	0	170	Wintersemester

Studienleistungen:

- seminar problem set solutions; attestations to the individual experiments; completion of lab course protocols

Modulvorleistungen:

- keine

Modulleistung:

Modulleistung	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
oral or written examination	oral or written examination	oral or written examination	100 %

Termine für die Modulleistung:

1.Termin: examination period A

1.Wiederholungstermin: up to the beginning of the lecture period of the following semester

2.Wiederholungstermin: up to the examination of the same module in the next year

Modul: Advanced Polymer Engineering

Identifikationsnummer:

ZIW.03148.02

Lernziele:

- acquiring perspectives for the work as a polymer engineer
- gain familiarity with the most important concepts and experimental techniques for mechanical testing of polymers
- acquiring a basic knowledge about inorganic materials used to process or to be combined with polymers

Inhalte:

Lectures:

1. Testing of Polymers
   - elastic, viscoelastic and plastic deformation behaviour of polymers and phenomenological models
   - quasistatic test methods of polymers (tensile, compression, bending)
   - hardness measurement and test methods
   - charpy impact test and instrumented impact test methods for thoughness characterization
2. Polymeric Materials
   - chemical and physical structure
   - mechanical, thermal, optical, and electrical properties
   - structure-property relations
   - polymeric materials: structure, properties, applications
     a. thermoplastics (commodity polymers, polyesters, polyamides, high-performance polymers)
     b. elastomers
     c. thermosets

Lab Course:

Polymer Testing Lab

- characterization of elastic properties
- tensile test on plastics
- bend test
- compression test
- charpy impact test
- hardness measurement
- drop weight test
- tensile impact test

Verantwortlichkeiten (Stand 20.07.2009):

Fakultät	Institut	Verantwortliche/r
Zentrum für Ingenieurwissenschaften - Zentrum für Ingenieurwissenschaften	Zentrum für Ingenieurwissenschaften	Dr. Rene Androsch

Studienprogrammverwendbarkeit (Stand 08.07.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Applied Polymer Science 120 LP 1. Version 2007	3.	Wahlpflichtmodul	Fachnote	10/102
Master	Polymer Materials Science 120 LP 1. Version 2009	3.	Wahlpflichtmodul	Fachnote	10/115

Teilnahmevoraussetzungen:

Obligatorisch:

keine

Wünschenswert:

keine

Dauer:

1 Semester

Angebotsturnus:

jedes Wintersemester

Studentischer Arbeitsaufwand:

300 Stunden

Leistungspunkte:

10 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Lecture Testing of Polymers	2	30	Wintersemester
Lecture Polymeric Materials	2	30	Wintersemester
Lab Course Polymer Testing	2	30	Wintersemester
Seminar Polymeric Materials	1	15	Wintersemester
Excursion Polymer Industry	0	10	Wintersemester
Private Study	0	185	Wintersemester

Studienleistungen:

- completion of lab course protocols; seminar problem set solutions

Modulvorleistungen:

- keine

Modulleistung:

Modulleistung	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
oral or written examination	oral or written examination	oral or written examination	100 %

Termine für die Modulleistung:

1.Termin:	examination period A
1.Wiederholungstermin:	up to the beginning of the lecture period of the following semester
2.Wiederholungstermin:	up to the examination of the same module in the next year

Modul: Advanced Polymer Physics

Identifikationsnummer:

PHY.03145.02

Lernziele:

- deepening the understanding and the application of theoretical concepts in polymer physics
- understanding the electronic and optical properties of polymers; gaining an overview of related applications
- learning to know current trends in polymer physics and new experimental approaches

Inhalte:

Lectures:

1. Concepts of Theoretical Polymer Physics
   - statistical mechanics of polymer chains and chain models: RIS-model, models for flexible and semiflexible chains, mapping concepts, excluded volume problem
   - statistical thermodynamics of polymer solutions and melts: mean field concepts, Flory-Huggins theory, scaling approaches to polymer solutions, polymer-polymer interfaces
   - polymer dynamics: Rouse model, Zimm model, reptation concepts, mode coupling approaches, spinodal decomposition in polymer systems
   - many chain systems: RPA and scattering functions of polymer melts, replica con-cepts, tube concepts for entangled polymer networks, coarse grained polymer models and simulation methods
2. Modern Polymer Physics

   (special topics in current polymer physics research, variable program)

   exemplary list of topics:
   - block copolymers and polymer nanostructures
   - crystallization of polymers
   - polymer networks and elastomers
   - nanocomposites
   - polymer dynamics
   - modern scattering techniques
   - polymers for organic electronics, semiconducting polymers

Verantwortlichkeiten (Stand 20.07.2009):

Fakultät	Institut	Verantwortliche/r
Naturwissenschaftliche Fakultät II - Chemie, Physik und Mathematik	Physik	N.N.

Studienprogrammverwendbarkeit (Stand 07.07.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Applied Polymer Science 120 LP 1. Version 2007	3.	Wahlpflichtmodul	Fachnote	10/102
Master	Polymer Materials Science 120 LP 1. Version 2009	3.	Wahlpflichtmodul	Fachnote	10/115

Teilnahmevoraussetzungen:

Obligatorisch:

keine

Wünschenswert:

module Polymer Physics

Dauer:

1 Semester

Angebotsturnus:

jedes Wintersemester

Studentischer Arbeitsaufwand:

300 Stunden

Leistungspunkte:

10 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Lecture Concepts of Theoretical Polymer Physics	2	30	Wintersemester
Lecture Modern Polymer Physics	2	30	Wintersemester
Seminar on Concepts of Theoretical Polymer Physics	2	30	Wintersemester
Seminar on Modern Polymer Physics	1	15	Wintersemester
Excursion Polymer Industry	0	10	Wintersemester
Private Study	0	185	Wintersemester

Studienleistungen:

- seminar problem set solutions

Modulvorleistungen:

- keine

Modulleistung:

Modulleistung	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
oral or written examination	oral or written examination	oral or written examination	100 %

Termine für die Modulleistung:

1.Termin: examination period B

1.Wiederholungstermin: up to 6 months after the end of the semester

2.Wiederholungstermin: up to the examination of the same module in the next year

Modul: Basic Chemistry and Polymerization Lab

Identifikationsnummer:

CHE.03138.02

Lernziele:

- learning to safely handle chemicals, solvents and samples
- learning basic techniques of sample preparation, purification, and synthesis
- applying basic concepts of organic polymer synthesis
- writing of scientific reports

Inhalte:

- basic operations (distillation, recrystallization, precipitation)
- esterification
- amidation
- free radical polymerization
- suspension/emulsion polymerization
- resin preparation (amino-, epoxy resins)

Verantwortlichkeiten (Stand 20.07.2009):

Fakultät	Institut	Verantwortliche/r
Naturwissenschaftliche Fakultät II - Chemie, Physik und Mathematik	Chemie	Prof. Dr. Wolfgang Binder

Studienprogrammverwendbarkeit (Stand 22.04.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Applied Polymer Science 120 LP 1. Version 2007	1.	Wahlpflichtmodul	Fachnote	5/102
Master	Polymer Materials Science 120 LP 1. Version 2009	1.	Wahlpflichtmodul	Fachnote	5/115

Teilnahmevoraussetzungen:

Obligatorisch:

keine

Wünschenswert:

keine

Dauer:

1 Semester

Angebotsturnus:

jedes Wintersemester

Studentischer Arbeitsaufwand:

150 Stunden

Leistungspunkte:

5 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Lab Course Basic Chemistry and Polymerization	4	60	Wintersemester
Private Study	0	90	Wintersemester

Studienleistungen:

- completion of lab course protocols

Modulvorleistungen:

- keine

Modulleistung:

Modulleistung	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
graded lab protocols	graded lab protocols	graded lab protocols	100 %

Termine für die Modulleistung:

1.Termin: examination period A

1.Wiederholungstermin: up to the beginning of the lecture period of the following semester

2.Wiederholungstermin: up to the examination of the same module in the next year

Modul: Basic Physics and Measurement Methods

Identifikationsnummer:

PHY.03135.02

Lernziele:

- acquisition of practical skills in working with elementary modern measurement instrumentation
- planning, performing and evaluating scientific experiments
- identification and estimation of errors in physical measurements; error analysis
- recording measurement data and writing a scientific protocol
- graphical presentation of scientific data
- acquisition of knowledge on related, selected physical topics

Inhalte:

Lecture:

Physics of Materials

- atoms and bonds
- crystal lattices
- determination of crystal structures
- lattice defects
- mechanical properties of solids
- lattice vibrations and thermal properties
- dielectric properties
- optical properties
- magnetic properties

Lab Course:

Basic Measurement Methods

9 experiments are performed. Each experiment consists of 4 hours lab time, private study of physical basics, and evaluating the experiment and writing the protocol.
The list of experiments is subject to changes. Current experiments are:

- falling ball viscometer
- ultrasonic pulse-echo methods
- dew point hygrometer
- oscilloscope
- transistor amplifier
- diffraction spectrometer
- polarimeter and refractometer
- radioactivity
- x-ray methods

Verantwortlichkeiten (Stand 08.11.2012):

Fakultät	Institut	Verantwortliche/r
Naturwissenschaftliche Fakultät II - Chemie, Physik und Mathematik	Physik	Dr. Hartmut Leipner

Studienprogrammverwendbarkeit (Stand 22.04.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Applied Polymer Science 120 LP 1. Version 2007	1.	Wahlpflichtmodul	keine Benotung	
Master	Polymer Materials Science 120 LP 1. Version 2009	1.	Wahlpflichtmodul	keine Benotung	

Teilnahmevoraussetzungen:

Obligatorisch:

keine

Wünschenswert:

keine

Dauer:

1 Semester

Angebotsturnus:

jedes Wintersemester

Studentischer Arbeitsaufwand:

150 Stunden

Leistungspunkte:

5 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Basic Measurement Methods Lab Course	3	40	Wintersemester
Lecture Basic Concepts of Condensed Matter Physics	1	15	Wintersemester
private Study	0	95	Wintersemester

Studienleistungen:

- attestations to the individual experiments; completion of lab course protocols

Modulvorleistungen:

- keine

Modulleistung:

Modulleistung	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
lab protocols	lab protocols	lab protocols	100 %

Termine für die Modulleistung:

1.Termin: examination period A

1.Wiederholungstermin: up to the beginning of the lecture period of the following semester

2.Wiederholungstermin: up to the examination of the same module in the next year

Modul: Introduction to Polymer Research

Identifikationsnummer:

CHE.03144.02

Lernziele:

- students will be prepared to carry out independent research
- different lecturers will introduce the students to modern research topics in the field of polymers
- students will be introduced to giving scientific presentations and give a presentation based on literature work
- students will participate in different colloquiums at the university
- a project work as the first independent research experience for the students

Inhalte:

Lectures:

1. Current Topics in Polymer Research
   - modern principles of polymer chemistry, physics, and characterization techniques
   - new material developments
   - interdisciplinary research fields
   - discussion on Nobel Prices in the field of polymer science
   - scientific presentation
2. Polymer Colloquium
   - presentation of latest research activities in the field of polymer science by leading guest lecturers
   - presentation of international research institutions
   - presentation of related research fields
3. Project Work (150 h)
   - participation in a research group
   - introduction to independent research of the students
   - combining literature and experimental research
   - independent preparation of the research report
   - oral presentation of the results using Power Point

Verantwortlichkeiten (Stand 21.07.2009):

Fakultät	Institut	Verantwortliche/r
Naturwissenschaftliche Fakultät II - Chemie, Physik und Mathematik	Chemie	Prof. Dr. Jörg Kreßler

Studienprogrammverwendbarkeit (Stand 21.07.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Applied Polymer Science 120 LP 1. Version 2007	3.	Pflichtmodul	Fachnote	0/102
Master	Polymer Materials Science 120 LP 1. Version 2009	3.	Pflichtmodul	Fachnote	15/115

Teilnahmevoraussetzungen:

Obligatorisch:

keine

Wünschenswert:

module Introduction to Polymer Science

Dauer:

1 Semester

Angebotsturnus:

jedes Wintersemester

Studentischer Arbeitsaufwand:

450 Stunden

Leistungspunkte:

15 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Lecture Current Topics in Polymer Research	1	15	Wintersemester
Seminar on Current Topics in Polymer Research	1	15	Wintersemester
Polymer Colloquium	1	15	Wintersemester
Project Work	10	150	Wintersemester
Private Study	0	255	Wintersemester

Studienleistungen:

- seminar presentation; written and oral presentation of the project work

Modulvorleistungen:

- keine

Modulleistung:

Modulleistung	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
written report and oral presentation	written report and oral presentation	written report and oral presentation	100 %

Termine für die Modulleistung:

1.Termin: examination period B

1.Wiederholungstermin: up to 6 months after the end of the semester

2.Wiederholungstermin: up to the examination of the same module in the next year

Modul: Introduction to Polymer Science

Identifikationsnummer:

PHY.03132.02

Lernziele:

- knowledge of the basic concepts of polymer chemistry: terminology, synthesis, and characterization of chemical structure and molar mass
- application to the solution of synthetic problems and calculation of molar mass distributions
- foundations of the physical chemistry and physics of polymers, characterization methods
- application to calculating polymer dimensions, miscibility, and other properties
- basics of technical/industrial polymers, their processing, characterization, and applications
- learning computational applications in polymer science

Inhalte:

Lectures:

1. Introduction to Macromolecules
   - general introduction and history of polymer science
   - general principles of polymer synthesis
   - basics of polymer structure (conformation, constitution, tacticity, chain structure)
   - nomenclature
   - reactions with polymers: isomerization, grafting, crosslinking
   - basics of polymer characterization: end-group titration/NMR, osmometry, viscosity, chromatography, mass spectrometry
   - microphase-separated polymers: block copolymers, thin films, amphiphilic polymers in solvents, micelles
   - Flory-Huggins theory, polymer crystallization
   - natural polymers, additives
2. Fundamentals of Polymer Physics and Modeling
   - mathematical tools (complex numbers, Fourier transformation, delta function)
   - molecular weight distributions, averages and moments
   - diffusion, Brownian motion and random walks
   - single-chain structure (real chains, Gaussian coil, radius of gyration)
   - basic scattering (Bragg`s law, interference, Debye structure factor)
   - basic statistical thermodynamics (Boltzmann distribution and entropy, Flory-Huggins chain entropy, single-chain entropy and rubber elasticity)
   - forces within and between polymers
   - basics of viscoelasticity and rheology
3. Introduction to Polymer Engineering
   - industrial polymers and history, economical and ecological aspects
   - polymer materials testing: experimental tests of viscoelasticity, behavior under mechanical and thermal load
   - overview of polymer materials: thermoplastics, thermosets, elastomers, blends, composites
   - processing of polymers: basics of melt flow, extrusion, injection molding, spinning, foaming
   - elastomer processing, tires
   - photo resists, optical properties
   - recycling of polymers

   Lab Course:

   Polymer Computer Modeling
   - using Materials Studio software for modeling of polymers
   - polymer miscibility
   - interaction parameters, molecular diffusion in polymers
   - simulation of WAXS and IR spectra

- drawing of chemical structures, predicting of polymer properties

Verantwortlichkeiten (Stand 20.07.2009):

Fakultät	Institut	Verantwortliche/r
Naturwissenschaftliche Fakultät II - Chemie, Physik und Mathematik	Physik	Prof. Dr. Kay Saalwächter

Studienprogrammverwendbarkeit (Stand 07.07.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Applied Polymer Science 120 LP 1. Version 2007	1.	Pflichtmodul	Fachnote	8/102
Master	Polymer Materials Science 120 LP 1. Version 2009	1.	Pflichtmodul	Fachnote	8/115

Teilnahmevoraussetzungen:

Obligatorisch:

keine

Wünschenswert:

keine

Dauer:

1 Semester

Angebotsturnus:

jedes Wintersemester

Studentischer Arbeitsaufwand:

240 Stunden

Leistungspunkte:

8 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Lecture Introduction to Polymer Chemistry	2	30	Wintersemester
Lecture Fundamentals of Polymer Physics	1	15	Wintersemester
Lecture Introduction to Polymer Engineering	2	30	Wintersemester
Lab Course Polymer Computer Modeling	1	15	Wintersemester
Seminar Fundamentals of Polymer Physics	1	15	Wintersemester
Selbststudium	0	135	Wintersemester

Studienleistungen:

- lab course presentation; seminar problem set solutions; 3 written examinations

Modulvorleistungen:

- keine

Modulleistung:

Modulleistung	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
oral examination	oral examination	oral examination	100 %

Termine für die Modulleistung:

1.Termin: examination period B

1.Wiederholungstermin: up to 6 months after the end of the semester

2.Wiederholungstermin: up to the examination of the same module in the next year

Modul: Master Thesis (M.Sc.)

Identifikationsnummer:

CHE.04214.01

Lernziele:

- carrying out of independent research
- literature studies and experimental work
- writing of the thesis
- defense of the thesis

Inhalte:

- thesis related to polymer chemistry, physics, engineering, or biopolymers
- carrying out literature research
- collecting experimental data and doing of data evaluation
- oral presentation of the final thesis including defense

Verantwortlichkeiten (Stand 20.07.2009):

Fakultät	Institut	Verantwortliche/r
Naturwissenschaftliche Fakultät II - Chemie, Physik und Mathematik	Chemie	professors or lecturers of the university

Studienprogrammverwendbarkeit (Stand 20.07.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Polymer Materials Science 120 LP 1. Version 2009	4.	Pflichtmodul	Fachnote	30/115

Teilnahmevoraussetzungen:

Obligatorisch:

all modules of PolyMat

Wünschenswert:

keine

Dauer:

1 Semester

Angebotsturnus:

jedes Semester

Studentischer Arbeitsaufwand:

900 Stunden

Leistungspunkte:

30 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Master Thesis	30	900	Winter- und Sommersemester

Studienleistungen:

- keine

Modulvorleistungen:

- keine

Modulteilleistungen:

Modulteilleistungen	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
written Master Thesis	written Master Thesis	nicht möglich laut ABStPOBM §20 Abs.13	75 %
oral defence	oral defence	nicht möglich laut ABStPOBM §20 Abs.13	25 %

Termine für alle Modulteilleistungen:

1.Termin: within the running semester

1.Wiederholungstermin: within 6 months after the end of the semester

Modul: Polymer Chemistry

Identifikationsnummer:

CHE.03139.02

Lernziele:

- knowledge of advanced concepts of polymer synthesis and characterization
- details of free radical, ionic and catalytic polymerization, polycondensation
- characterization methods of polymers in solution, mass spectrometric methods
- principles of biopolymer synthesis and characterization
- basics of technical/industrial polymerization processes, instrumentation
- basic knowledge of polymerization kinetics, kinetic modeling approaches, design of polymerization reactors and industrial polymerization processes

Inhalte:

Lectures:

1. Polymer Synthesis
   - basic principles of organic chemistry
   - basics of solution state NMR, interpretation of spectra
   - free radical polymerization, initiator systems, controlled free radical polymerization, copolymerization
   - anionic/cationic polymerization
   - living and quasi-living polymerization techniques, sequential polymerization
   - preparation of block copolymers
   - catalytic polymerization, Ziegler-Natta, metallocene/MAO systems, supported catalysis, ROMP
   - polycondensation
   - network synthesis
2. Polymer Characterization
   - molecular masses and molecular mass distributions, thermodynamics of polymer solutions
   - colligative properties of polymer solutions and their utilization for characterization
   - light scattering and flowing behavior of polymer solutions including ultracentrifugation and field flow fractionation
   - principles of chromatography (SEC, HPLC)
   - characterization of non-linear polymers
   - NMR-spectroscopy in microstructure analysis of polymers (sequences analysis of random copolymers)
   - electrospray GC-MS, MALDI-ToF
   - end group determination (NMR, titration)
3. Biopolymer Synthesis
   - construction principles of biopolymers
   - enzymatic polymerization
   - polymer degradation in vivo and in vitro
   - polyamides (proteins), polysaccharides (e.g. starch, xantane), polyesters (e.g. PHB, PLA), etc.
   - analytical tools
4. Polymer Reaction Engineering
   - classification of polyreactions and polymerization processes
   - kinetics & kinetic modeling:

     kinetics of free radical polymerization in diluted systems

     molecular weight & molecular weight distribution, modeling methods

     kinetics of radical polymerization in concentrated systems

     kinetics of emulsion polymerization

     kinetics of coordinative polymerization

- rheological properties of reaction mixtures
- design of polymerization reactors:
  dimensioning of polymerization reactors
  heat removal in polymerization reactors
  mixing & selectivity effects
  non-ideal reactors
- industrial polymerization processes
  Lab Courses:
  Polymer Characterization
- size exclusion chromatography
- static and dynamic light scattering
- end-group titration
- intrinsic viscosity
- solubility of polymers
- vapor pressure osmometry

Verantwortlichkeiten (Stand 20.07.2009):

Fakultät	Institut	Verantwortliche/r
Naturwissenschaftliche Fakultät II - Chemie, Physik und Mathematik	Chemie	Prof. Dr. Jörg Kreßler

Studienprogrammverwendbarkeit (Stand 16.07.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Applied Polymer Science 120 LP 1. Version 2007	1.	Pflichtmodul	Fachnote	12/102
Master	Polymer Materials Science 120 LP 1. Version 2009	2.	Pflichtmodul	Fachnote	12/115

Teilnahmevoraussetzungen:

Obligatorisch:

keine

Wünschenswert:

keine

Dauer:

1 Semester

Angebotsturnus:

jedes Sommersemester

Studentischer Arbeitsaufwand:

360 Stunden

Leistungspunkte:

12 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Lecture Polymer Synthesis	2	30	Sommersemester
Seminar on Polymer Synthesis	1	15	Sommersemester
Lecture Polymer Characterization	2	30	Sommersemester
Lecture Biopolymer Synthesis	2	30	Sommersemester
Lecture Polymer Reaction Engineering	2	30	Sommersemester
Lab Course Polymer Characterization	2	30	Sommersemester
Private Study	0	195	Sommersemester

Studienleistungen:

- completion of lab course protocols

Modulvorleistungen:

- keine

Modulteilleistungen:

Modulteilleistungen	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
written examination Polymer Synthesis	written examination Polymer Synthesis	written examination Polymer Synthesis	25 %
written examination Polymer Characterization	written examination Polymer Characterization	written examination Polymer Characterization	25 %
written examination Biopolymer Synthesis	written examination Biopolymer Synthesis	written examination Biopolymer Synthesis	25 %
written examination Polymer Reaction Engineering	written examination Polymer Reaction Engineering	written examination Polymer Reaction Engineering	25 %

Termine für alle Modulteilleistungen:

1.Termin: examination period A

1.Wiederholungstermin: up to the beginning of the lecture period of the following semester

2.Wiederholungstermin: up to the examination of the same module in the next year

Modul: Polymer Physics

Identifikationsnummer:

PHY.03142.02

Lernziele:

- acquintance with the fundamental concepts of experimental polymer physics
- learning and applying the theoretical fundamentals and the experimental physical methods used to characterize and investigate polymer materials
- gaining practical experience with basic methods in experimental polymer physics
- understanding the properties of polymer surfaces
- knowledge of methods and technologies to modify and analyse polymer surfaces

Inhalte:

Lectures:

1. Introduction to Polymer Physics
   - chain molecules in solutions and melts (description of chain molecules, chain models, excluded volume interaction, semidilute solutions, screening, structure factor)
   - mechanical properties of polymer melts (viscoelasticity, Debye-relaxation, relaxation processes in polymer melts, flow behavior, dynamic and thermic glass transition, nonlinear effects)
   - microscopic models for polymer dynamics (diffusion, Rouse model, reptation)
   - solid polymers (rubber elasticity, semicrystalline polymers and crystallization)
   - blends and block copolymers (Flory-Huggins theory, spinodal decomposition, block copolymers and self assembly)
   - outlook: polymers in nature
2. Experimental Methods of Polymer Physics
   - scattering techniques (X-ray, light and neutron scattering)
   - relaxation spectroscopy (dynamic mechanical and dielectric spectroscopy)
   - calorimetry (DSC, TMDSC)
   - spectroscopy (IR, Raman, NMR)
   - microscopy (light-, electron- and scanning force microscopy)
3. Surface Science
   - surface vs. Bulk
   - surface composition and ordering
   - dynamic surface processes (adsorption, desorption, diffusion)
   - surface tension
   - surface analysis (XPS, SIMS, SEM, AFM)
   - surface modification by deposition (wet processes, dry processes, CVD, PE-CVD, PVD), polymer film growth
   - surface modification by ablation (wet and dry etching)
   - surface funtionalization (Grafting, plasma treatments)
   - polymer in lithography
   - technical applications for surface modification
4. Lab Course:

   Experimental Polymer Physics Lab

   (6 experiments, each consisting of 2x4 contact hours)
   - rheology/mechanical spectroscopy
   - dielectric spectroscopy
   - DSC
   - polarization microscopy/strain birefringence
   - infrared spectroscopy
   - low-field NMR

- wide-angle X-ray scattering

Verantwortlichkeiten (Stand 12.01.2010):

Fakultät	Institut	Verantwortliche/r
Naturwissenschaftliche Fakultät II - Chemie, Physik und Mathematik	Physik	Prof. Dr. Thomas Thurn-Albrecht

Studienprogrammverwendbarkeit (Stand 07.07.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Applied Polymer Science 120 LP 1. Version 2007	2.	Pflichtmodul	Fachnote	15/102
Master	Polymer Materials Science 120 LP 1. Version 2009	2.	Pflichtmodul	Fachnote	15/115

Teilnahmevoraussetzungen:

Obligatorisch:

keine

Wünschenswert:

module Basic Physics and Measurement Methods or module Advanced Physics Lab

Dauer:

1 Semester

Angebotsturnus:

jedes Sommersemester

Studentischer Arbeitsaufwand:

450 Stunden

Leistungspunkte:

15 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Lecture Introduction to Polymer Physics	3	45	Sommersemester
Lecture Experimental Methods of Polymer Physics	2	30	Sommersemester
Lecture Surface Science	2	30	Sommersemester
Seminars on Introduction to Polymer Physics and Experimental Methods of Polymer Physics	2	30	Sommersemester
Lab Course Experimental Polymer Physics	4	60	Sommersemester
Private Study	0	255	Sommersemester

Studienleistungen:

- completion of lab course protocols; seminar problem set solutions; 3 final written examinations

Modulvorleistungen:

- keine

Modulleistung:

Modulleistung	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
oral examination	oral examination	oral examination	100 %

Termine für die Modulleistung:

1.Termin: examination period B

1.Wiederholungstermin: up to 6 months after the end of the semester

2.Wiederholungstermin: up to the examination of the same module in the next year

Modul: Polymer Processing

Identifikationsnummer:

ZIW.03143.01

Lernziele:

learning the most important methods and technological equipment for the production of both semi- and final products based on polymer materials

understanding the working principles of polymer processing machines

performing lab experiments to get acquainted with modern polymer processing techniques

Inhalte:

Lecture:

Polymer Processing

- fundamentals of polymer processing
- extrusion
- injection molding
- rubber processing
- blow molding
- rapid prototyping technologies
- composite manufacturing

Lab Course:

Polymer Processing Lab

extrusion: operating diagram / residence time determination / melt mixing

cast film extrusion / coextrusion: incompatibility and interface disturbance

blown film extrusion: influence of blow-up ratio, take-off ratio and cooling rate on mechanical properties

injection molding: parameter influence / filling behavior / multi component injection molding

rubber processing: curemetry / rubber mixing (kneader) / compression molding / testing

Verantwortlichkeiten (Stand 17.12.2008):

Fakultät	Institut	Verantwortliche/r
Zentrum für Ingenieurwissenschaften - Zentrum für Ingenieurwissenschaften	Zentrum für Ingenieurwissenschaften	Prof. Dr. Hans-Joachim Radusch

Studienprogrammverwendbarkeit (Stand 10.02.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Applied Polymer Science 120 LP 1. Version 2007	3.	Pflichtmodul	Fachnote	5/102
Master	Polymer Materials Science 120 LP 1. Version 2009	3.	Pflichtmodul	Fachnote	5/115

Teilnahmevoraussetzungen:

Obligatorisch:

Modul/e:

- Introduction to Polymer Science

Wünschenswert:

keine

Dauer:

1 Semester

Angebotsturnus:

jedes Wintersemester

Studentischer Arbeitsaufwand:

150 Stunden

Leistungspunkte:

5 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Lecture Polymer Processing	2	30	Wintersemester
Lab Course Polymer Processing	2	30	Wintersemester
Private Study	0	90	Wintersemester

Studienleistungen:

- attestations to the individual experiments

Modulvorleistungen:

- keine

Modulleistung:

Modulleistung	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
written examination	written examination	written examination	100 %

Termine für die Modulleistung:

1.Termin: examination period A

1.Wiederholungstermin: up to the beginning of the lecture period of the following semester

2.Wiederholungstermin: up to the examination of the same module in the next year

Modul: Polymer Synthesis Lab

Identifikationsnummer:

CHE.03137.02

Lernziele:

- applying the different concepts of polymer synthesis
- training of practical abilities in chemical synthesis
- use of modern laboratory equipment, sample handling under inert gas atmosphere
- writing of scientific reports

Inhalte:

- free radical polymerization
- polycondensation of polyamides and/or polyesters
- ATRP synthesis
- suspension/emulsion polymerization
- copolymerization, determination of copolymerization parameters
- resin preparation (amino-, epoxy resins)
- polymer-analogous reaction
- Ziegler/Natta polymerization, ROMP

Verantwortlichkeiten (Stand 20.07.2009):

Fakultät	Institut	Verantwortliche/r
Naturwissenschaftliche Fakultät II - Chemie, Physik und Mathematik	Chemie	Prof. Dr. Wolfgang Binder

Studienprogrammverwendbarkeit (Stand 15.04.2009):

Studiengang	Studienprogramm (Leistungspunkte)	Studien-semester	Modulart	Benotung	Anteil der Modulnote an Abschlussnote
Master	Applied Polymer Science 120 LP 1. Version 2007	1.	Wahlpflichtmodul	Fachnote	5/102
Master	Polymer Materials Science 120 LP 1. Version 2009	1.	Wahlpflichtmodul	Fachnote	5/115

Teilnahmevoraussetzungen:

Obligatorisch:

keine

Wünschenswert:

keine

Dauer:

1 Semester

Angebotsturnus:

jedes Wintersemester

Studentischer Arbeitsaufwand:

150 Stunden

Leistungspunkte:

5 LP

Sprache:

Englisch

Modulbestandteile:

Lehr- und Lernformen	SWS	Studentische Arbeitszeit in Stunden	Semester
Polymer Synthesis Lab Course	4	60	Wintersemester
Private Study	0	90	Wintersemester

Studienleistungen:

- completion of lab course protocols

Modulvorleistungen:

- keine

Modulleistung:

Modulleistung	1. Wiederholung	2. Wiederholung	Anteil an Modulnote
graded lab protocols	graded lab protocols	graded lab protocols	100 %

Termine für die Modulleistung:

1.Termin: examination period A

1.Wiederholungstermin: up to the beginning of the lecture period of the following semester

2.Wiederholungstermin: up to the examination of the same module in the next year

Anhang

MARTIN-LUTHER-UNIVERSITÄT
HALLE-WITTENBERG

Studiengangübersicht: Master Polymer Materials Science - 120 LP

(FStPO: 1. Version 2009) vom 28.06.2013

Pflichtmodule

ID	Modultitel	Teilnahme-voraus-setzung	Kontakt-studium (in SWS)	LP	Studien-leistung	Modul-vorlei-stung	Modulleistung	Anteil an Abschluss-note	Empfehlung Anfangs-semester
CHE.03144.02	Introduction to Polymer Research	Nein	13	15	Ja	Nein	written report and oral presentation	15/115	3.
PHY.03132.02	Introduction to Polymer Science	Nein	7	8	Ja	Nein	oral examination	8/115	1.
CHE.04214.01	Master Thesis (M.Sc.)	Ja	30	30	Nein	Nein	written Master Thesis; oral defence	30/115	4.
CHE.03139.02	Polymer Chemistry	Nein	11	12	Ja	Nein	written examination Polymer Synthesis; written examination Polymer Characterization; written examination Biopolymer Synthesis; written examination Polymer Reaction Engineering	12/115	2.
PHY.03142.02	Polymer Physics	Nein	13	15	Ja	Nein	oral examination	15/115	2.
ZIW.03143.01	Polymer Processing	Ja	4	5	Ja	Nein	written examination	5/115	3.

ID	Modultitel	Teilnahme-voraus-setzung	Kontakt-studium (in SWS)	LP	Studien-leistung	Modul-vorlei-stung	Modulleistung	Anteil an Abschluss-note	Empfehlung Anfangs-semester
Wahlpflichtmodule									
Spezialisierung (alle Module aus einem Bereich, 25 LP)									
Polymer Chemistry									
CHE.03133.02	Advanced Chemistry	Nein	16	15	Ja	Nein	written examination Math. Tools in Chemistry; written examination Physical Chemistry; written examination Organic Chemistry	15/115	1.
PHY.03135.02	Basic Physics and Measurement Methods	Nein	4	5	Ja	Nein	lab protocols	-	1.
CHE.03137.02	Polymer Synthesis Lab	Nein	4	5	Ja	Nein	graded lab protocols	5/115	1.
Polymer Physics									
PHY.03134.02	Advanced Physics	Nein	14	15	Ja	Nein	oral or written examination	15/115	1.
PHY.03136.02	Advanced Physics Lab	Nein	4	5	Ja	Nein	seminar presentation	-	1.
CHE.03138.02	Basic Chemistry and Polymerization Lab	Nein	4	5	Ja	Nein	graded lab protocols	5/115	1.
Vertiefung (je nach Schwerpunktsetzung der Masterarbeit, 10 LP)									
CHE.03146.02	Advanced Polymer Chemistry	Nein	8	10	Ja	Nein	oral or written examination	10/115	3.
ZIW.03148.02	Advanced Polymer Engineering	Nein	7	10	Ja	Nein	oral or written examination	10/115	3.
PHY.03145.02	Advanced Polymer Physics	Nein	7	10	Ja	Nein	oral or written examination	10/115	3.