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Module description	**Solid State and Materials Chemistry**
Module code	**MatWiss-MG 01**
Faculty/Subject/ Department	Faculty 08/Chemistry
Associated degree course(s)/Semester taken	Chemistry MSc, Advanced Materials MSc
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	None
Learning outcomes	Students shall: • have advanced knowledge of concepts for the description of chemical and physical properties of modern materials; • have knowledge of relationships between structures and properties of solids; • have an overview of methods applied for materials characterisation; • have gathered experience with challenging preparation techniques for the modelling of modern materials; • have mastered aspects of occupational safety.
Module content	• Synthesis, structure and properties of selected cluster compounds • Introduction to chemistry of sol-gel ("soft chemistry"; chimie douce) • Selected chapters of solid-state chemistry and advanced materials • Laboratory in preparative inorganic materials chemistry
Form(s) of instruction	• Lecture (1 hour/week) • Seminar (0.7 hours/week) • Laboratory (2.7 hours/week)
Total workload in hours	Lecture: Contact hrs 15 weeks, 1 hr/week 15 hrs Preparation/revision 1 hr/contact hr 15 hrs Laboratory: Contact hrs 10 days, 4 hrs/day 40 hrs Preparation/revision 1 hr/day of laboratory work 10 hrs Reports 2 hrs/day of laboratory work 20 hrs Seminar: Contact hrs 10 days, 1hr/day 10 hrs Preparation/revision 1 h/contact hr 10 hrs Preparation of seminar presentation 38 hrs Written examination: 2 hrs Preparation 20 hrs Σ 180 hrs
Method(s) of assessment and contribution to final mark	• Written or oral examination (60%, Prerequisites for examination: completion of all Reports and seminar talk) • Oral presentation (40%)
Credit points	6 ECTS credits
Frequency, duration	Winter semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	40/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Solid State Physical Chemistry 1**
Module code	**MatWiss-MG 02**
Faculty/Subject/ Department	Faculty 08/Chemistry
Associated degree course(s)/Semester taken	Chemistry MSc, Advanced Materials MSc/ 1st or 2nd semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	None
Learning outcomes	Students shall: • be familiar with the most important concepts of physical solid-state chemistry of volume; • master the most important chemical methods for the regulation of materials properties; • be able to evaluate the chemical stability of the most common materials under different conditions; • be able to deal independently with the materials selection for a given problem.
Module content	• Phase diagrams and phase stability • Stoichiometric control • Control of properties through composition and microstructure • Solid state kinetics • Main fields of application of most important classes of materials
Form(s) of instruction	• Lecture (1 hour/week) • Seminar (2 hours/week) • Project (0.3 hours/week)
Total workload in hours	Lecture At the beginning 5 weeks, 3 hrs/week 15 hrs Preparation/revision 1 hr/contact hr 15 hrs Seminar Contact hrs 14 days, 2 hrs/day 28 hrs Preparation/revision 0.5 hr/contact hr 14 hrs Project "Materials Properties" Group work 6 weeks, 7hrs/week 42 hrs Discussions with lecturers 5 weeks, 1hr/week 5 hrs Preparation of written component 30 hrs Preparation of presentation 11 hrs Preparation for written examination 18 hrs Written examination (following the lecture) 2 hrs Σ 180 hrs
Method(s) of assessment and contribution to final mark	• Written examination (60%; 50% of problems given in examination must be solved in order to pass the examination) • Presentation of written component (seminar paper, 40%)
Credit points	6 ECTS credits
Frequency, duration	Winter semester and summer semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	40/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Physics of Semiconductors 1**
Module code	**MatWiss-MG 03**
Faculty/Subject/ Department	Faculty 07/Physics
Associated degree course(s)/Semester taken	Physics MSc, Advanced Materials MSc/ 1st semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	None
Learning outcomes	Students shall: • Have knowledge of fundamental physical properties of semiconductor materials and have necessary mathematical and technical understanding; • be acquainted with concepts of modern semiconductor physics; • be able to apply fundamental concepts of semiconductor physics; • have proven the acquired knowledge through independent exercises; • be able to plan and undertake a scientific project and to document and present the results in an appropriate manner.
Module content	• Fundamental properties of semiconductors, multi-element semiconductors • Concepts of energy band structures, defects and doping • Optical properties of semiconductors • Photoconductivity and creation of photons in semiconductors • Characteristics of surfaces and boundaries • Presentation techniques
Form(s) of instruction	• Lecture (1 hour/week) • Project work (4 hour/week) A theoretical transfer of knowledge is always followed by a concrete application of the knowledge by students.
Total workload in hours	At the beginning: Lecture Contact hrs 5 weeks, 3 hrs/ week 15 hrs Preparation/revision 1 hr/contact hr 15 hrs Followed by: Project work "Materials Properties" Group work Contact hrs 6 weeks, 7hrs/week 42 hrs Discussions with lecturers 5 weeks, 1hr/week 5 hrs Preparation of written report 30 hrs Preparation of presentation 10 hrs Presentation 1 hr Accompanied by: Seminar Contact hrs 15 days, 2 hrs/day 30 hrs Preparation/revision 1 hr/day 15 hrs Written examination Preparation 15 hrs Written examination 2 hrs Σ 180 hrs
Method(s) of assessment and contribution to final mark	• Written examination (60%) • Presentation (Project work) (40%) (50% mark in both the written examination and presentation)
Credit points	6 ECTS credits
Frequency, duration	Winter semester and summer semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	40/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Electronic Components and Circuit Technology**
Module code	**MatWiss-MG 04**
Faculty/Subject/ Department	Faculty 07/Physics
Associated degree course(s)/Semester taken	Physics MSc, Physics L3, Advanced Materials MSc/ 1st semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	None
Learning outcomes	Students shall: • understand the mechanics and properties of electronic components; • master the fundamentals of analogue and digital circuit technology; • develop simple basic circuits and understand more complex circuit systems; • have gathered experience with circuit configuration and analysis in the field using practical examples.
Module content	• Passive and active components, construction forms • Analysis of linear networks • Analogue and digital circuit technology • Circuit design and layout • Microprocessors and concepts of memories • Practical tests for analogue and digital circuit design and simulation
Form(s) of instruction	Lecture (2 hours/week) Laboratory (3 hours/week)
Total workload in hours	Lecture: Contact hrs 15 weeks, 2 hrs/week 30 hrs Preparation/revision 1.5 hrs/contact hr 45 hrs Laboratory: Contact hrs 10 days, 4 hrs/day 40 hrs Preparation/revision 2 hrs/laboratory day 20 hrs Reports 4.5 hrs/laboratory day 45 hrs Σ 180 hrs
Method(s) of assessment and contribution to final mark	• Reports
Credit points	6 ECTS credits
Frequency, duration	Winter semester; 1 semester
Language of instruction	German
Intake capacity/Form of registration	30/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Modern Concepts of Inorganic Chemistry**
Module code	**MatWiss-MG 06**
Faculty/Subject/ Department	Faculty 08/Chemistry
Associated degree course(s)/Semester taken	Chemistry MSc, Advanced Materials MSc/ from 1st semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	None
Learning outcomes	Students shall: • have knowledge of the modern concepts of inorganic chemistry; • have knowledge of the interrelationships between synthesis, structure and properties of selected inorganic bonds; • have an overview of the methods necessary for characterisation.
Module content	• Modern concepts of inorganic chemistry (e.g. synthesis under extraordinary circumstances: microwave radiation, under high pressure, in supercritical fluids, sonochemistry) • Self-organisation of matter • Surface finishing • Hybrid materials
Form(s) of instruction	• Lecture (1 hour/week) • Seminar (1.3 hours/week)
Total workload in hours	Lecture: Contact hrs 15 weeks, 1hr/week 15 hrs Preparation/revision 1 h/contact hr 15 hrs Seminar: Contact hrs 10 days, 2 hrs/day 20 hrs Preparation/revision 1 hr/contact hr 20 hrs Preparation seminar presentation 88 hrs Written examination: Preparation 20 hrs Written examination 2 hrs Σ 180 hrs
Method(s) of assessment and contribution to final mark	• Written or oral examination (60%) (Prerequisites for examination: completion of seminar presentation) • Oral presentation (40%)
Credit points	6 ECTS credits
Frequency, duration	Winter semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	15/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Solid State Physical Chemistry 2**
Module code	**MatWiss-MG 07**
Faculty/Subject/Department	Faculty 08/Chemistry
Associated degree course(s)/Semester taken	Chemistry MSc, Advanced Materials MSc/ 1st or 2nd semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	MatWiss-MG 02
Learning outcomes	Students shall: • have knowledge of the most important concepts of physical chemistry of surfaces; • master the most important methods for controlling surface properties; • be able to evaluate the stability of the most common surfaces under different circumstances; • be able to work independently on issues related to surfaces within a given topic.
Module content	• Surface structure • Reactive surfaces • Production processes • Main fields of application of *Surface Science*
Form(s) of instruction	• Lecture (1 hour/week) • Seminar (2 hour/week) • Project work (0.3 hours/week)
Total workload in hours	Lecture: Contact hrs 5 weeks, 3 hrs/week 15 hrs Preparation/revision 1 hr/contact hr 15 hrs Seminar: Contact hrs 14 days, 2 hrs/day 28 hrs Preparation/revision 0.5 hr/contact hr 14 hrs Project work “Materials Properties” Group work 6 weeks, 7 hrs/week 42 hrs Discussions with lecturers 5 weeks, 1hr/week 5 hrs Preparation of written component 30 hrs Preparation of presentation 11 hrs Written examination Preparation 18 hrs Written examination (following the lecture) 2 hrs Σ 180 hrs
Method(s) of assessment and contribution to final mark	• Written examination (60%; 50% of examination questions must be successfully solved in order to pass the written examination) • Written and oral presentation (40%)
Credit points	6 ECTS credits
Frequency, duration	Winter semester and summer semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	40/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Physics of Semiconductors 2**
Module code	**MatWiss-MG 08**
Faculty/Subject/Department	Faculty 07/Physics
Associated degree course(s)/Semester taken	Physics MSc, Advanced Materials MSc/ 2nd semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	MatWiss-MG 03
Learning outcomes	Students shall: • have in-depth knowledge of the concepts of modern semiconductor physics; • understand the particularities of low-dimensional semiconductors and can determine their influence on materials properties; • apply concepts of semiconductor physics; • plan and undertake an extensive scientific project, document the results in a report and present the results in an appropriate manner.
Module content	• Semiconductor statistics • Charge and energy transport, diffusion of charge carriers, scattering processes • Quantum effects within charge carrier transports, Quantum Hall effect • Unipolar and bipolar components • Light emitters and solar cells • Materials preparation and realisation of components
Form(s) of instruction	• Lecture (1 hour/week) • Project (4 hours/week) • Lessons in theory are followed by practical applications.
Total workload in hours	At the beginning: Lecture Contact hrs 5 weeks, 3 hrs/week 15 hrs Preparation/revision 1 hr/contact hr 15 hrs Followed by: Project on “Materials Properties” Group work Contact hrs 6 weeks, 7 hrs/week 42 hrs Discussions with lecturers 5 weeks, 1 hr/week 5 hrs Preparation of written component 30 hrs Preparation of presentation 10 hrs Presentation 1 hr Accompanied by : Seminar Contact hrs 15 days, 2 hrs/day 30 hrs Preparation/revision 1 hr/contact hr 15 hrs Written examination Preparation 15 hrs Written examination 2 hrs Σ 180 hrs
Method(s) of assessment and contribution to final mark	• Written examination (60%) • Presentation (Project) (40%) (50% mark in both the written examination and presentation)
Credit points	6 ECTS credits
Frequency, duration	Winter semester and summer semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	40/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Solid State and Molecular Electronics**
Module code	**MatWiss-MG 09**
Faculty/Subject/Department	Faculty 07/Physics
Associated degree course(s)/Semester taken	Physics MSc, Physics L3, Advanced Materials MSc/ 2nd semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	MatWiss-MG 04
Learning outcomes	Students shall: • understand the physical fundamentals and operating principles of essential semiconductor components; • be able to identify differences in the characteristics of solids and of molecular materials; • discuss the effects of smaller components in highly integrated circuits; • be familiar with innovative components and their practical applications; • have a theoretical understanding of the fundamental characteristics of components.
Module content	• Fundamentals of semiconductor electronics: conduction mechanisms in metals and semiconductors • P-n transition, diode and transistor characteristics • Fundamentals and applications of magneto-electronic components • Microelectronics: miniaturisation and integration • Molecular electronics: properties and functionality of nanoscale components
Form(s) of instruction	• Lecture (2 hours/week) • Seminar (2 hours/week)
Total workload in hours	Lecture Contact hrs 15 weeks, 2 hrs/week 30 hrs Preparation/revision 1.5 hrs/contact hr 45 hrs Seminar Contact hrs 15 weeks, 2 hrs/week 30 hrs Preparation/revision 2 hrs/contact hr 60 hrs Preparation seminar presentation 15 hrs Σ 180 hrs
Method(s) of assessment and contribution to final mark	Seminar presentation
Credit points	6 ECTS credits
Frequency, duration	Summer semester; 1 semester
Language of instruction	German
Intake capacity/Form of registration	30/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Fundamentals of Solid State Theory**
Module code	**MatWiss-MG 11**
Faculty/Subject/Department	Faculty 07/Physics
Associated degree course(s)/Semester taken	Physics MSc, Advanced Materials MSc/ 1st semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	None
Learning outcomes	The students shall master the theoretical fundamentals necessary for the treatment of solids from a quantum-mechanical point of view.
Module content	• Properties of the Schrödinger equation • 1D Problems • Wave packets • 2nd quantisation • Fermions and bosons • Pauli equation • Scattering theory • Critical behaviour
Form(s) of instruction	• Lecture (4 hours/week) • Tutorials (1 hour/week) • Computer practice (2 hours/week)
Total workload in hours	Lecture Contact hrs 15 weeks, 4 hrs/week 60 hrs Revision 0.5 hrs/contact hr 30 hrs Tutorials Contact hrs 15 weeks, 1 hr/week 15 hrs Homework 15 weeks, 3 hrs/week 45 hrs Computer practice 15 weeks, 2 hrs/week 30 hrs Σ 180 hrs
Method(s) of assessment and contribution to final mark	Tutorial problem sets (30%), Written examination or oral examination (70%; 50% of examination problems must be successfully solved)
Credit points	6 ECTS credits
Frequency, duration	Winter semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	20/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Solid State Theory**
Module code	**MatWiss-MG 12**
Faculty/Subject/Department	Faculty 07/Physics
Associated degree course(s)/Semester taken	Physics MSc, Advanced Materials MSc
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	None
Learning outcomes	Students shall master the theories and models necessary for an understanding of solids.
Module content	• Crystal structures and symmetries • Reciprocal lattice • Phonons • Heat conduction • Electron structure • Band structure methods (tight-binding, fast free electrons, density functional theory) • Magnetisation • Electronic transport (ballistic, diffuse)
Form(s) of instruction	• Lecture (4 hours/week) • Tutorials (1 hour/week) • Computer practice (2 hours/week)
Total workload in hours	Lecture Contact hrs 15 weeks, 4 hrs/week 60 hrs Revision 0.5 hrs/contact hr 30 hrs Tutorials Contact hrs 15 weeks, 1 hr/week 15 hrs Homework 15 weeks, 3 hrs/week 45 hrs Computer practice 15 weeks, 2 hrs/week 30 hrs Σ 180 hrs
Method(s) of assessment and contribution to final mark	Tutorial problem sets (30%), Written examination or oral examination (70%) 50% of examination problems must be successfully solved
Credit points	6 ECTS credits
Frequency, duration	Winter semester and summer semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	20/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Inorganic Chemistry, Advanced Synthesis, and Characterisation**
Module code	**MatWiss-MV 01**
Faculty/Subject/Department	Faculty 08/Chemistry
Associated degree course(s)/Semester taken	Chemistry MSc, Advanced Materials MSc/ from 3rd semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	MatWiss-MG 01, MatWiss-MG 06
Learning outcomes	• The course presents different aspects of synthesis, characterisation and reactivity of bonds in inorganic chemistry. • Students shall gather practical experience in dealing with such substances and be able to apply the acquired knowledge to the synthesis of new bonds.
Module content	• Synthesis and characterisation of metal-organic and simple Werner complexes, as well as model substances for metalloproteins • Introduction to the chemistry and synthesis of nanomaterials • In-depth knowledge of chemistry of sol-gels (“soft chemistry”; chimie douce) • Working techniques under inert conditions (Schlenk technique, "glovebags") • Methods of characterisation: Spectroscopy, diffractometry, electrochemistry, electron microscopy, “stopped-flow” measurement
Form(s) of instruction	• Laboratory (6.4 hours/week) • Seminar (1.3 hours/week)
Total workload in hours	Laboratory: Contact hrs 2 * 12 days, 4 hrs/day 96 hrs Preparation/revision 2 hrs/laboratory day 48 hrs Reports 2 hrs/laboratory day 48 hrs Seminar Contact hrs 2 * 10 days, 1 hr/day 20 hrs Preparation/revision 2 hrs/contact hr 40 hrs Preparation seminar presentation 48 hrs Σ 300 hrs
Method(s) of assessment and contribution to final mark	• Oral presentation (50%) • Reports (50%)
Credit points	10 ECTS credits
Frequency, duration	Winter semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	18/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Physical Chemistry of Nanosystems**
Module code	**MatWiss-MV 02**
Faculty/Subject/Department	Faculty 08/Chemistry
Associated degree course(s)/Semester taken	Chemistry BSc, Advanced Materials BSc/ from 3rd semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	MatWiss-MG 02, MatWiss-MG 07
Learning outcomes	Students shall: • have knowledge of the essential aspects of synthesis, characterisation and properties of nanosystems important in materials technology; • be able to apply common methods of characterisation and analysis of new nanoscale materials.
Module content	• Physicochemical methods of preparation: self assembling, nanolithography etc. • Nanoparticles and clusters, multilayer systems, quantum wires, and dots • Nanomechanics and nanotribology, quantum size effect, thermodynamics of nanoscale systems
Form(s) of instruction	• Lecture (2 hours/week) • Seminar (2 hours/week) • Laboratory (2.7 hours/week)
Total workload in hours	Lecture Contact hrs 15 weeks, 2 hrs/week 30 hrs Preparation/revision 3 hrs/contact hr 45 hrs Seminar Contact hrs 15 weeks, 2 hrs/week 30 hrs Preparation/revision 1 hr/contact hr 30 hrs Laboratory Contact hrs 2 weeks, 20hrs/ week 40 hrs Report 40 hrs Seminar presentation and written component Discussion of written component with lecturers 5 hrs Writing of written component 48 hrs Preparation of seminar presentation 32 hrs Σ 300 hrs
Method(s) of assessment and contribution to final mark	• Oral presentation (50%) • Report (50%)
Credit points	10 ECTS credits
Frequency, duration	Winter semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	40/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Characterisation of Semiconductors**
Module code	**MatWiss-MV 03**
Faculty/Subject/Department	Faculty 07/Physics
Associated degree course(s)/Semester taken	Physics MSc, Advanced Materials MSc from 3rd semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	MatWiss-MG 03, MatWiss-MG 08
Learning outcomes	Students shall: • gain in-depth knowledge of the characterisation methods for semiconductor technology; • be able to produce new materials, modify them in a controlled manner, and develop concepts for technical applications.
Module content	• Spectroscopy with x-rays, positron annihilation • Trap spectroscopy, measurement methods using capacitance • Magnetic resonance technology • Optical characterisation from UV to IR • Luminescence spectroscopy
Form(s) of instruction	• Lecture (2 hours/week) • Seminar (2 hours/week) • Laboratory (3 hours/week)
Total workload in hours	Lecture Contact hrs 15 weeks, 2 hrs/week 30 hrs Preparation/revision 1 hr/contact hr 30 hrs Laboratory Contact hrs 15 weeks, 10hrs/week 150 hrs Preparation 0.2 hrs/contact hr 30 hrs Report 20 hrs Seminar Contact hrs 15 weeks 30 hrs Preparation of presentation 10 hrs Σ 300 hrs
Method(s) of assessment and contribution to final mark	• Oral presentation (50%) • Report (50%)
Credit points	10 ECTS credits
Frequency, duration	Winter semester and summer semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	40/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Modern Technologies of Conducting and Dielectric Materials**
Module code	**MatWiss-MV 04**
Faculty/Subject/Department	Faculty 07/Physics
Associated degree course(s)/Semester taken	Physics MSc, Physics L3, Advanced Materials MSc/ 3rd semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	MatWiss-MG 04, MatWiss-MG 09
Learning outcomes	Students shall: • master state-of-the-art methods of preparation, measurement, characterisation, structural composition, modelling and technical application of metallic, semiconducting, and insulating materials; • integrate technical development criteria into scientific problems; • document scientific experiments in a clear and comprehensible manner; • present a subject area related to a specific context logically and coherently and discuss it in front of a group.
Module content	• Preparation of layers, characterisation, composition, and technical application of functional structures • Modern methods of signal acquisition and processing, data evaluation, and numerical modelling
Form(s) of instruction	• Lecture (2 hours/week) • Seminar (1 hours/week) • Laboratory (8 hours/week)
Total workload in hours	Lecture Contact hrs 15 weeks, 2 hrs/week 30 hrs Preparation/revision 2 hrs/contact hr 60 hrs Seminar Contact hrs 10 weeks/1hr/week 10 hrs Preparation/revision 2 hrs/contact hr 20 hrs Preparation of presentation 24 hrs Laboratory Contact hrs 12 days, 5 hrs/day 60 hrs Preparation 3 hrs/laboratory day 36 hrs Reports 5 hrs/laboratory day 60 hrs Σ 300 hrs
Method(s) of assessment and contribution to final mark	• Oral presentation (20%) • Reports (80%)
Credit points	10 ECTS credits
Frequency, duration	Winter semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	30/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Laboratory: Inorganic Chemistry**
Module code	**MatWiss-MS01**
Faculty/Subject/Department	Faculty 08/Chemistry/Inorganic Chemistry
Associated degree course(s)/Semester taken	Chemistry MSc, Advanced Materials MSc/ 3rd semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Prerequisites	Basic science modules in inorganic molecular and solid state chemistry
Learning outcomes	Students shall: • be familiarised with the most important production and characterisation methods for new inorganic nanostructures or new complex chemical bonds; • develop their own solutions for problems within the subject area of inorganic chemistry.
Module content	Synthesis and characterisation of new inorganic nanostructures or new complex chemical or metal-organic bonds at a research level; Comparison of synthesis concepts and characterisation strategies
Form(s) of instruction	Practical tutorial (20 days, 3 hrs/day) Seminar (15 days, 1 hr/day)
Total workload in hours	Practical tutorial Contact hrs 60 hrs Preparation/revision 40 hrs Autonomous work 30 hrs Examination incl. preparation 30 hrs Seminar Contact hrs 15 hrs Preparation/revision 30 hrs Autonomous work 40 hrs Examination incl. preparation 55 hrs Σ 300 hrs
Method(s) of assessment and contribution to final mark **Exam prerequisites** **Form of module retake examination**	Oral presentation (50%) Written report (50%) None As original assessment method, if required each module-component can be retaken separately.
Credit points	10 ECTS credits
Frequency, duration	Annual, Winter semester; 1 semester
Language of instruction	German
Intake capacity/Form of registration	12/Internet
Date	See course catalogue
Reading list	See notice board

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Module description	**Physical Chemistry Project**
Module code	**MatWiss-MS 02**
Faculty/Subject/Department	Faculty 08/Chemistry
Associated degree course(s)/Semester taken	Chemistry MSc, Advanced Materials MSc/ from 3rd semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	MatWiss-MG 02, MatWiss-MG 07
Learning outcomes	Students shall master scientific methods and techniques in order to be in a position to solve modern problems in physical chemistry in a project-oriented manner.
Module content	• Changing research problems within physical chemistry • Development of experimental and theoretical concepts of physical chemistry • Preparation of a scientific work schedule • Evaluation of financial and personnel expenditures • Classification of research project within current literature • The written report shall be as complex and as of high a standard as a research proposal to the DFG (German Research Foundation)
Form(s) of instruction	• Tutorial (5.3 hours/week) • Project work (0.7 hours/week)
Total workload in hours	Tutorial Contact hrs 4 weeks, 20hrs/week 80 hrs Project work Discussions with lecturers 5 weeks, 2 hrs/week 10 hrs Literature review, provision of information 120 hrs Presentation/discussion (including preparation) 40 hrs Written report 50 hrs Σ 300 hrs
Method(s) of assessment and contribution to final mark	• Written presentation (50%) • Oral presentation (50%)
Credit points	10 ECTS credits
Frequency, duration	Winter semester and summer semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	10/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Multi-functional Semiconducting Thin Films**
Module code	**MatWiss-MS 03**
Faculty/Subject/Department	Faculty 07/Physics
Associated degree course(s)/Semester taken	Physics MSc, Advanced Materials MSc/ from 3rd semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	MatWiss-MG 03, MatWiss-MG 08
Learning outcomes	Students shall: • master the most important concepts for the production of functional, semiconducting thin films; • have knowledge of the fundamentals of plasmas and plasma-supported deposition methods; • have knowledge of physicochemical methods of epitaxy; • master the fundamental characterisation methods for thin films.
Module content	• Fundamentals of synthesis and characterisation of functional, semiconducting thin films • Introduction to plasma processes and plasma diagnostics • Diagnostics of layer growth • Applications of semiconducting, functional materials
Form(s) of instruction	• Laboratory (6 hours/week) • Seminar (2 hours/week)
Total workload in hours	Laboratory Contact hrs 20 days, 3 hrs/day 60 hrs Preparation/revision 2 hrs/day of training 40 hrs Reports 3 hrs/day of training 60 hrs Literature review 40 hrs Final report 55 hrs Seminar Contact hrs 15 days, 1 hr/day 15 hrs Presentation 30 hrs Σ 300 hrs
Method(s) of assessment and contribution to final mark	• Oral presentation (50%) • Written presentation (final report, 50%) (All reports must be completed before the final report)
Credit points	10 ECTS credits
Frequency, duration	Winter semester and summer semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	40/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Applied Material Physics**
Module code	**MatWiss-MS 04**
Faculty/Subject/Department	Faculty 07/Physics
Associated degree course(s)/Semester taken	Physics MSc, Physics L3, Advanced Materials MSc/ 3rd semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	MatWiss-MG 04, MatWiss-MG 09
Learning outcomes	Students shall: • master advanced laboratory work in terms of good laboratory practice; • have knowledge of the modern methods for the preparation and characterisation of materials; • be able to determine and analyse physicochemical properties of materials; • discuss the significance of material properties for technical applications; • identify the interrelationships between practical work and the underlying theories; • document scientific experiments in a clear and comprehensible manner; • present their results, related to a specific context, in a clear and comprehensible manner and be able to discuss the results in front of a group.
Module content	• Preparation of layers, micro- and nanostructuring • Surface analysis, measuring probes and their physical operating principles • Influence of varied conditions (composition, pressure, temperature) on material properties • Composition of functional structures, technical applications of oxidic, molecular and hybrid materials
Form(s) of instruction	• Laboratory (16 hours/week) • Seminar (1 hours/week)
Total workload in hours	Laboratory Contact hrs 15 weeks, 4 days/4hrs/day 240 hrs Preparation/revision 2 hrs/ day 30 hrs Seminar Contact hrs 15 weeks, 1 hr/day 15 hrs Preparation of a seminar presentation 15 hrs Σ 300 hrs
Method(s) of assessment and contribution to final mark	• Report (80%) • Oral presentation (20%)
Credit points	10 ECTS credits
Frequency, duration	Winter semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	6/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Theoretical Materials Research Project**
Module code	**MatWiss-MS 05**
Faculty/Subject/Department	Faculty 07/Physics
Associated degree course(s)/Semester taken	Physics MSc, Advanced Materials MSc/ from 3rd semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	MatWiss-MG 11, MatWiss-MG 12
Learning outcomes	Students shall: • apply modern models and theories related to a specific materials system; • have worked on and competently given a presentation on a clearly defined area of theoretical solid-state physics.
Module content	• Changing research problems from theoretical Advanced Materials • Development of theoretical concepts • Classification of research project within current literature • Preparation of a scientific work schedule • Evaluation of financial and personnel expenditures • The written report shall be as complex and as of high a standard as a research proposal to the DFG (German Research Foundation)
Form(s) of instruction	• Laboratory (6 hours/week) • Seminar (2 hours/week)
Total workload in hours	Computer laboratory Contact hrs 20 days, 3 hrs/day 60 hrs Preparation/revision 2hrs/laboratory day 40 hrs Reports 3 hrs/laboratory day 60 hrs Literature review 40 hrs Final report 55 hrs Seminar Contact hrs 15 days, 1 hr/day 15 hrs Preparation of presentation 30 hrs Σ 300 hrs
Method(s) of assessment and contribution to final mark	• Oral presentation (50%) • Written presentation (final report, 50%) (All reports must be completed before the final report.)
Credit points	10 ECTS credits
Frequency, duration	Winter semester and summer semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	40/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Master's Dissertation**
Module code	**MatWiss-MS 06**
Faculty/Subject/Department	Faculty 07/Physics and Faculty 08/Chemistry
Associated degree course(s)/Semester taken	Advanced Materials MSc/ 4th semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	All remaining modules of the master's programme
Learning outcomes	Students shall: • have the competence to work on a concrete problem from an area of functional materials in Advanced Materials by applying scientific methods, and be able to present, discuss, and defend their results.
Module content	• Draft of a work schedule • Familiarisation with literature • Acquisition of measuring and evaluation techniques, implementation and evaluation of these techniques, discussion of results • Writing of dissertation
Form(s) of instruction	• Full-day blocks of classes on scientific research in scientific teams
Total workload in hours	22.5 weeks full-day Instructions on scientific research 1 hr/day 113 hrs Literature review 1 h/ day 113 hrs Scientific work on subject 6 hrs/day 540 hrs Writing of dissertation 104 hrs Presentation of results 5 hrs Preparation for final examination 24 hrs Final oral examination 1 hr Σ 900 hrs
Method(s) of assessment and contribution to final mark	Written presentation of dissertation
Credit points	30 ECTS credits
Frequency, duration	Summer semester; 1 semester
Language of instruction	* see separate list of current semester
Intake capacity/Form of registration	30/Internet
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Business Formation and Management**
Module code	**MatWiss-MW 01**
Faculty/Subject/Department	FH Gießen-Friedberg
Associated degree course(s)/Semester taken	Physics MSc, Chemistry MSc, Advanced Materials MSc/ 1st semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	None
Learning outcomes	Students shall: • be acquainted with the prerequisites of successful business formation and management; • have specialist knowledge of the fundamentals of business studies in order to be able to assume responsible positions within a company; • have knowledge of fundamental management methods; • have fundamental knowledge of the prerequisites for successfully beginning a professional career in self-employment; • gain practical experience related to the previously acquired theoretical fundamentals.
Module content	• Business studies compendium (theoretical fundamentals for business formation and management) • Project; with possible alternative thematic priorities: -Innovation management -Planning of the formation of a company -Development of a company -Leadership of employees
Form(s) of instruction	• Lecture (1 hour/week) and supervised teamwork (5 hours/week) A lesson in theory is always followed by a concrete practical application by students of the theoretical principle(s) learned. In addition, students practice fundamental soft skills through teamwork and learning-by-doing (1 hour/week).
Total workload in hours	Lecture Contact hrs 4 days, 4 hrs/day 16 hrs Preparation/revision 1 hr/day of lecture 4 hrs Project work Group work 8 hrs, 10 weeks 80 hrs Discussions with lecturers 5 weeks, 2 hrs/week 10 hrs Composition of written component 45 hrs Preparation of presentation 20 hrs Presentations 5 hrs Σ 180 hrs
Method(s) of assessment and contribution to final mark	• Written presentation (60%) • Oral presentation (40%)
Credit points	6 ECTS credits
Frequency, duration	Winter semester; 1 semester
Language of instruction	German
Intake capacity/Form of registration	25 students per semester maximum
Date	* see separate list of current semester
Reading list	* see separate list of current semester

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Module description	**Learning by Teaching (MSc degree course)**
Module code	**MatWiss-MW 02**
Faculty/Subject/Department	Faculty 07 Physics, Faculty 08 Chemistry
Associated degree course(s)/Semester taken	Physics MSc, Advanced Materials MSc, Chemistry MSc/ 1st semester
Module coordinator	Cf. German Version
Module guidance	Cf. German Version
Lecturers	Cf. German Version
Prerequisites	None
Learning outcomes	Students shall, in a teaching project, be able to: • supervise younger students from the degree course "Bachelor Advanced Materials" in tutorials and laboratories under the guidance of and in consultation with the responsible professors; • explain chemical and physical interrelationships; • practically apply teaching methods; • apply simple methods of evaluation; • critically challenge the applied methods.
Module content	• Supervision, under the guidance of a professor, of students from the degree courses "Chemistry BSc", "Physics BSc", "Advanced Materials BSc" in tutorials or laboratories • Teaching of basic knowledge (autonomous revision and broadening of contents) • Didactical methods, analysis of students' success • Evaluation through questionnaires and their analysis, review of applied methods
Form(s) of instruction	• Teaching project
Total workload in hours	Tutorials of basic courses in chemistry or physics Contact hrs with professor 30 hrs Contact hrs with students 30 hrs Preparation of tutorials (laboratories) 30 hrs Correction of homework (reports) 60 hrs Composition of a questionnaire 10 hrs Evaluation and written report 20 hrs Σ 180 hrs
Method(s) of assessment and contribution to final mark	• Report • Evaluation by students
Credit points	6 ECTS credits
Frequency, duration	Winter semester; 1 semester
Language of instruction	German
Intake capacity/Form of registration	20 students per semester maximum
Date	* see separate list of current semester
Reading list	* see separate list of current semester