

Master of Science "Crystalline Materials"

General Structure of Curriculum

Semester 4	Masters Thesis, incl. Seminar (30)				
Semester 3	Field Trips and Seminars (6)	Technical and Applied Mineralogy (6)	Analytical X-Ray Methods (6)	Applied Materials II (6)	Electives III (6)
Semester 2	Advanced Analytical Methods (6)	Defects (6)	Crystal Growth II (6)	Applied Materials I (6)	Electives II (6)
Semester 1	Analytical Methods (6)	Computer Methods (6)	Crystal Growth I (6)	Advanced Crystallography (6)	Electives I (6)

Annotations:

Compulsory = Module unique to M.Sc. "Crystalline Materials"

Elective = Choice of entire module or of various elective courses (must add up to 6 ECTS-Points)

Compulsory = Entire module joint with M.Sc. "Geology"

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Modules and Courses

Module #	Module Name	Course #	Course Name	Key Words for Course Content	h/wk	d	Type	ECTS Points WS1	ECTS Points SS2	ECTS Points WS3	ECTS Points Total	Exam Mode	Instructors
CRYS 41	Crystal Growth I	CRYS 411	Crystal Growth Technology	Melt, Solution, and Vapor Phase Growth	2		L	3			3	Written Exam	Cröll
		CRYS 412	Crystal Growth Methods I	Float-Zone, Solution Growth; Vapor phase	2		P	3			3	Marked Report	Cröll, Danilewsky, Fiederle
CRYS 42	Advanced Crystallography	CRYS 421	Crystallographic Methodology	Symmetry; Color Groups; Quasi Crystals	2		L+P	3			3	Written Exam	Cröll, Keller, Danilewsky
		CRYS 422	Space Groups and Crystal Structures	Space Groups 2D and 3D; Crystal Chemistry	2		L+P	3			3	Written Exam	Cröll, Keller
GEOL 42	Computer Methods	GEOL 421	Computer Methods	Computer-Based Data Analysis and Visualization; Methods for Modeling Geological Systems; Case Studies	4		L+P	6		6	6	Marked Report	Henk, Tipper, Ulmer
GEOL 43	Analytical Methods	GEOL 431	Physical Analytical Procedures	X-Ray Fluorescence; X-Ray Diffraction; Scanning Electron Microscopy; Electron Probe Microanalysis	2		L+P	3		3	3	Marked Report	Majzlan, Müller-Sigmund, Danilewsky, Lab Personnel
		GEOL 432	Chemical Analytical Procedures	Atomic Absorption Spectroscopy; Ion Chromatography; Infrared Spectroscopy; Wet Chemistry	2		L+P	3		3	3	Marked Report	Majzlan, NN, Lab Personnel
CRYS 51	Advanced Analytical Methods	CRYS 511	High-Resolution Spectroscopy	XPS; SIMS; AGS; XAS; EXAFS; XANES; Mössbauer	2		L+P		3		3	Written Exam	Keller, Cröll, Danilewsky, Fiederle
		CRYS 512	X-Ray Diffraction by Crystals	Structure Determination	2		L+P		3		3	Written Exam	Keller
CRYS 52	Crystal Growth II	CRYS 521	Growth Kinetics	Facets; Type-II Striations	1		L		1.5		1.5	Written Exam	Danilewsky
		CRYS 522	Crystal Growth Methods II	Bridgman Growth; HT-Solution Growth	1		P		1.5		1.5	Marked Report	Cröll, Fiederle, Danilewsky
		CRYS 523	Crystal Preparation	Orienting; Cutting; Etching; NDIC	1		P		1.5		1.5	Marked Report	Cröll, Fiederle, Danilewsky
		CRYS 524	Epitaxy	Methods of Epitaxial Deposition	1		L		1.5		1.5	Written Exam	Fiederle

CRYS 53	Applied Materials I	CRYS 531	Crystal Physics	Tensors; NL Optics; Piezo-, Pyro-, Ferroelectric Effects	2		L+P		3		3	Written Exam	Cröll, Danilewsky
		CRYS 532	Semiconductors	Band Structures; Impurities and Dopants	2		L+P		3		3	Written Exam	Fiederle
CRYS 54	Defects	CRYS 541	Crystal Defects	Point Defects; Dislocations; Stacking Faults etc.	2		L+P		3		3	Written Exam	Cröll, Danilewsky
		CRYS 542	Electrical and Optical Characterization	Resistivity; Photoluminescence; DLTS; etc.	2		L+P		3		3	Written Exam	Fiederle
CRYS 61	Applied Materials II	CRYS 611	Semiconductor Technology	Ion Implantation; Diffusion; Epitaxy	2		L+P		3		3	Written Exam	Fiederle
		CRYS 612	Electrical Characterization of Crystals and Devices	Resistivity; Piezo-, Ferroelectricity; PL Measurements	2		P		3		3	Marked Report	Fiederle, Cröll
CRYS 62	Analytical X-Ray Methods	CRYS 621	Structure Analysis by X-Ray Diffraction	Structure Solution and Structure Refinement from Single Crystal and Powder Diffraction Data (Rietveldt)	3		L+P		4.5		4.5	Written Exam	Keller, Fiederle
		CRYS 622	Defect Analysis by Diffraction	Rocking Curves; X-Ray Topography	1		L+P		1.5		1.5	Written Exam	Danilewsky
CRYS 63	Technical and Applied Mineralogy	CRYS 631	Modern Ceramics, Cements, and Glasses	Ceramics; Cements; Glasses	3		L+P		4.5		4.5	Written Exam	Vogt, Cröll
		CRYS 632	Thermal Analysis	Laboratory Course on Differential Thermal Analysis and Differential Thermal Gravimetric Analysis	1		P		1.5		1.5	Marked Report	Keller
CRYS 64	Field Trips and Seminars	CRYS 641	Seminar: Recent publications	Crystal Growth and Characterization	2		L		3		3	Marked Presentation	Cröll, Fiederle
		CRYS 642	Advanced Seminar on In-House Research		1		L		1.5		1.5	Passed/Failed	Cröll
		CRYS 643	Field Trips to Industrial Facilities			3		F		1.5		1.5	Marked Report

Elective Courses

		CRYS 551 ??525???	Purification and Doping Methods	Vacuum; Clean Room Technology; Rectification; Sublimation; Doping	2		L		3		3	Written Exam	Cröll
		CRYS 552 ??533??	Semiconductor Devices	Diodes; Transistors; Detectors	2		L		3		3	Written Exam	Fiederle
		GEOL 433	Special Analytical Procedures in Mineralogy	Fluid Inclusions Analysis; Cathodoluminescence; Mineral Separation Techniques; Size Distribution Analysis	2		L+P		3		3	Marked Report	All Staff and Lab Personnel
		GEOL 441	Aqueous Geochemistry	Chemical Composition of Natural Waters; Dissolution and Precipitation; Concept of Saturation; Carbonate System and pH Control; Weathering and Rock Alteration; Al and Fe Reactions; Redox Systems; Phase Diagrams in Aqueous Geochemistry	2		L+P	3		3	3	Written Exam	Bucher
		GEOL 442	Chemical Modeling of Natural Waters	Modeling Concepts; Equations of State; Software; PT-Functions of Solubility; Titration Models; Redox Models; Distribution of Species; Saturation and Reaction Modeling; Transport and Reaction; Data Bases	2		L+P	3		3	3	Written Exam	Bucher
		GEOL 551	Energy, Waste, and the Environment	Nuclear Waste; Coal Combustion Products; CO ₂ Sequestration; Waste Incineration Slags; Landfills and Landfill Gases; Waste as Resource	2		L+P		3		3	Written Exam	Gieré
		GEOL 612	Geomechanical Modeling	Rock Mechanics; Numerical Methods; Stress and Fracture Prediction	2		L+P		3		3	Written Exam	Henk
			Geoscience Courses from B.Sc. Curriculum	BSc Courses to Make up for Deficiencies for External Students or Non-Geoscience Students								According to B.Sc. Curriculum	All Staff

Special Topics in Natural Science (Elective Courses)

			Special Topics in										Various
			Special Topics in Physics										Import (Math&Physics)

Other Elective Courses

			Special Topics in Microsystems Engineering										Import (11 th Faculty)
			Languages										Import