EBERHARD KARLS
UNIVERSITÄT
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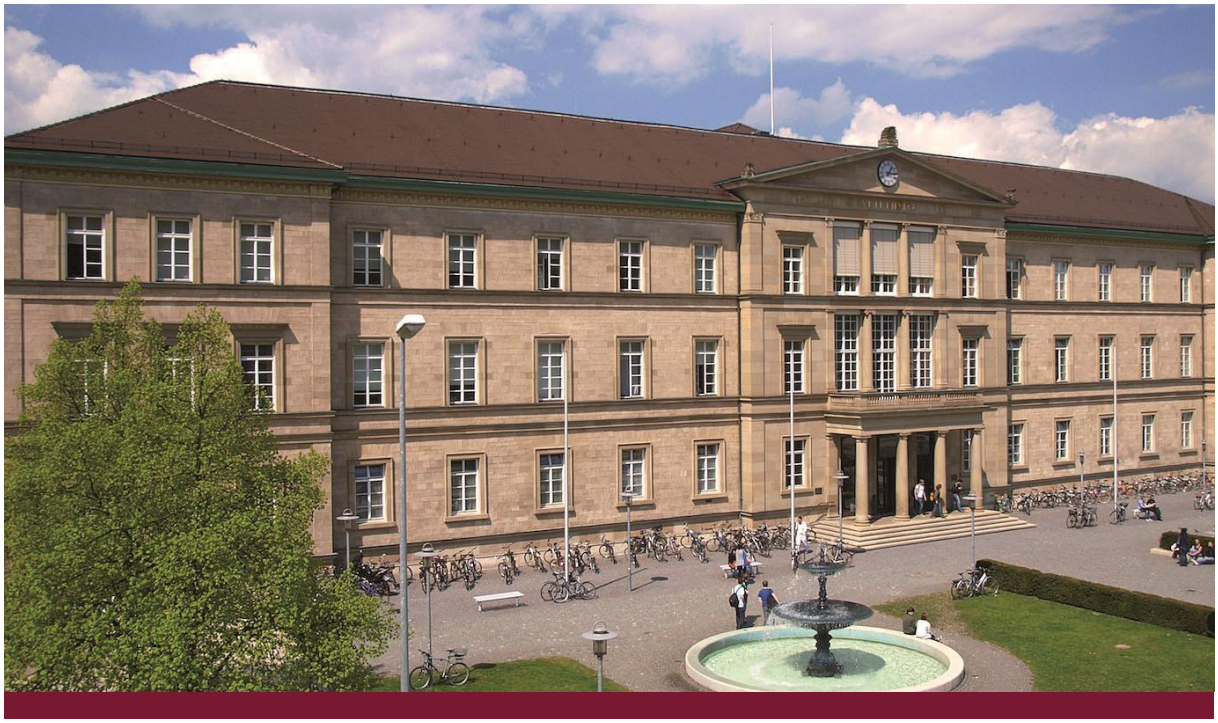

Module handbook

Nano-Science

Master of Science (M. Sc.)

Valid from

Winter semester 2025/2026

Status: March 1, 2025

Faculty of Mathematics and Natural Sciences
Depatrment of Physics

Content

1. General information on the degree program

The master’s degree course in Nano-Science is aimed at students who have already received a basic education in the natural sciences as part of their bachelor’s degree course. In addition to graduates of the basic bachelor’s degree course in Nano-Science at the University of Tübingen, this also includes students who have a bachelor’s degree in one of the three natural sciences involved - chemistry, biology and physics.

The master’s degree course in Nano-Science has a standard duration of four semesters and can be started in both the winter and summer semesters. As this is an international degree program, the courses are usually offered in English. The degree is the Master of Science (M. Sc.)

The Master's degree program comprises 120 credit points (CP). The three departments of Biology, Chemistry and Physics each provide 9 CP. A further 27 CP can be completed as elective modules from the modules offered by the departments. There are also interdisciplinary modules, such as “Nano-Science IV” or the large module “Independent Studies”, in which students can choose lectures and/or practical courses according to their individual interests and under the supervision of an internal specialist representative. This module can also be used for a stay abroad, whereby courses completed abroad can be recognized and a research stay is also possible. Industrial placements are also possible as part of this module. The degree program concludes with a six-month master’s thesis and a seminar presentation of the results of this thesis as part of the “Master Seminar” module.

You can find information about the degree program and contact persons on the homepage of the degree program https://www.uni-tuebingen.de/nano-science

2. Initial qualifications of the degree program

Admission to the Master's degree program in Nano-Science is open to anyone who has passed the bachelor’s examination in Nano-Science or in a related subject with a nanoscience focus or in the subjects of Physics or Chemistry or Biology with a grade of at least “3.0” or has an equivalent degree. Applicants from subjects related to nanoscience and the subjects of biology, chemistry and physics must also provide evidence of minimum knowledge and minimum performance in core nanoscience disciplines (quantum mechanics, soft matter physics, physical chemistry, biophysics, special microscopy, nanotechnology, nanostructure sciences) amounting to a total of at least 18 CP.

As this is an international degree program that can be studied entirely in English, all applicants must provide proof of English language proficiency at a level of at least B2 of the Common European Framework of Reference for Languages (CEFR). Furthermore, we recommend that all applicants have German language skills at B2 level (DSH) in order to be able to attend additional courses in German.

Further details on the entry qualifications are set out in the selection regulations for the Master's degree program in Nano-Science, which can be downloaded from the homepage of the degree program (https://www.uni-tuebingen.de/nano-science).

3. Qualification objectives of the degree program

The qualification objectives of the Master's degree program in Nano-Science are derived from the individual nano-science-relevant competencies that graduates have acquired in the modules they have chosen in the fields of biology, chemistry and physics and their sub-disciplines.

Although the program allows students to focus on one of the disciplines involved in the program (biology, chemistry, physics), its design and choice of content will ensure that graduates receive an exceptionally interdisciplinary education. Furthermore, graduates will have internalized the different scientific cultures of the participating disciplines and their scientific approaches, which is what makes interdisciplinary communication and successful work at nano-science-relevant interfaces possible in the first place.

Graduates will be in a unique position not only to explain, but also to evaluate and classify nano-science-relevant information and facts from the disciplines of biology, chemistry and physics. In addition, students will be able to systematically transfer and link the skills they have acquired to new nano-science-related problems and issues. A particular feature of this degree course is that its graduates are able to analyze nanoscientific and nanotechnological problems synthetically, interdisciplinarily and with a high synergistic potential and develop solutions that the individual disciplines of biology, chemistry and physics are not able to do.

Furthermore, the compulsory module “Independent Studies” will enable graduates to quickly adapt to new working environments, quickly analyze problems relevant to nanoscience and contribute to their solution in an interdisciplinary manner.

Graduates of the course are therefore, on the one hand, very well prepared for university and non-university basic scientific research in the field of nanosciences with high interdisciplinary scientific requirements. On the other hand, graduates will be able to work successfully at the interface of applied, molecular and cell-biologically oriented life sciences (nano-biology, nano-medical technology, personalized medicine, biophysics, nano-physics and nano-chemistry) in industrial and service companies, both analytically and application-oriented.

4. Module overviews

4.1 Overview by module

(according to the module overview of the study and examination regulations)

Module number	Mandatory/ Optional	Module title	Recommended semester	CP
M1	M	Basic Module Biology	1	9
M2	M	Basic Module Chemistry	1	9
M3	M	Basic Module Physics	2	9
M4	O	Focus Module 1	1-2	9
M5	O	Focus Module 2	1-2	9
M6	O	Focus Module 3	1-2	9
M7	M	Nano-Science IV	1-2	6
M8	M	Independent Studies	3	27
M9	M	Master Seminar	3-4	6
M10	M	Master Thesis	4	27

4.2 Module overview by course of study

Start in winter semester

Semester	CP				
1.	29	Basic Module Biology (M1)	Basic Module Chemistry (M2)	Focus Module 1 (M4)	Nano-Science IV (M7)
2.	31	Basic Module Physics (M3)	Focus Module 2 (M5)	Focus Module 3 (M6)	
3.	30	Independent Studies (M8)			Master Semi-nar (M9)
4.	30	Master Thesis (M10)			

Field of study	Nr.	Module title	Semester				Σ CP
			1	2	3	4	
Biology	M1	Basic Module Biology	9				**9**
Chemistry	M2	Basic Module Chemistry	9				**9**
Physics	M3	Basic Module Physics		9			**9**
Elective modules	M4	Focus Module 1	9				**9**
	M5	Focus Module 2		9			**9**
	M6	Focus Module 3		9			**9**
Interdisciplinary modules	M7	Nano-Science IV	2	4			**6**
	M8	Independent Studies			27		**27**
	M9	Master Seminar			3	3	**6**
Final thesis	M10	Master Thesis				27	**27**
			29	**31**	**30**	**30**	**120**

Start in the summer semester

Semester	CP				
1.	31	Basic Module Physics (M3)	Focus Module 1 (M4)	Focus Module 2 (M5)	Nano-Science IV (M7)
2.	29	Basic Module Biology (M1)	Basic Module Chemistry (M2)	Focus Module 3 (M6)	
3.	30	Independent Studies (M8)			Master Semi-nar (M9)
4.	30	Master Thesis (M10)			

Field of study	Nr.	Module title	Semester				Σ CP
			1	2	3	4	
Biology	M1	Basic Module Biology		9			**9**
Chemistry	M2	Basic Module Chemistry		9			**9**
Physics	M3	Basic Module Physics	9				**9**
Elective modules	M4	Focus Module 1	9				**9**
	M5	Focus Module 2	9				**9**
	M6	Focus Module 3		9			**9**
Interdisciplinary modules	M7	Nano-Science IV	4	2			**6**
	M8	Independent Studies			27		**27**
	M9	Master Seminar			3	3	**6**
Final thesis	M10	Master Thesis				27	**27**
			31	**29**	**30**	**30**	**120**

Legend	
Rating system:	g = graded; ng= not graded (pass/fail) ne = no examination
Examination form:	W = written exam; O = oral exam; TP = term paper; P = presentation, MT = Master's thesis, IR = internship report
Duration:	Duration of the exam in min, var: variable
Weighting:	For courses = weighting of the examination grade for the module grade For modules = weighting of the module grade for the final grade entered.
SWS:	Semester hours per week
Status:	m = mandatory; op = optional
Type of teaching:	L=Lecture; S=Seminar; E=Exercise; Practical courses/internships=PC
CP:	Credit points (ECTS points)

5. Module descriptions

5.1 Mandatory modules

<table>
<tr><td>Module number:
M1</td><td colspan="8">Modul title:
Basic Module Biology</td><td>Type of module:
Mandatory module</td></tr>
<tr><td>Credit points (CP)</td><td colspan="9">9 CP</td></tr>
<tr><td>Workload*
- Contact time
- Self-study</td><td colspan="3">Workload:
270 h</td><td colspan="3">Contact time:
90 h / 6 SWS</td><td colspan="3">Self-study:
180 h</td></tr>
<tr><td>Module duration*</td><td colspan="9">1 semester</td></tr>
<tr><td>Frequency of the offer*</td><td colspan="9">every academic year (winter semester)</td></tr>
<tr><td>Language of instruction</td><td colspan="9">English</td></tr>
<tr><td>Teaching/learning methods*</td><td colspan="9">Lecture and exercises</td></tr>
<tr><td>Module content*</td><td colspan="9">Bioanalytics - Lecture (Lecture 4 SWS):
Lecture on the basics of modern molecular biological, biochemical and analytical methods. Topics: Sampling, Genomics and Sequencing, Genetic Engineering, qPCR, Databases, Protein function and modeling, Cell Culture, Cytometry, Single Cell Analysis, Immunological Techniques, Model Organisms, Statistics, Electrophoresis, Liquid and Gas Chromatography, Mass Spectrometry, Metabolomics, Proteomics, Cryo EM, NMR, IR/CT/PET, Light and Electron Microscopy, Working in Regulated Environments, Inorganic Analysis

Bioanalytics – Advanced Excercises (Exercises 2 SWS)
Practical exercises on special applications of modern molecular biological, biochemical and analytical methods. Applications and topics: Database analysis of sequence data, RNAseq analysis, Basic Statistics (for all), Metabolomics, Proteomics, Physical Protein Analysis, CLSM, TEM, Metabolite Imaging, Cell Culture, Immunological Techniques, FACS (optional)</td></tr>
<tr><td>Qualification goals*</td><td colspan="9">The students
- have advanced knowledge of molecular analysis in modern biology
- are able to assess, classify and evaluate the advantages and disadvantages of the various methods used in modern biochemistry, molecular biology and microscopy
- are able to conceptually recombine and link molecular analysis methods for processing nanoscientific and nanotechnological problems in the life sciences</td></tr>
<tr><td>Coursework requirement</td><td colspan="9">Regular and active participation in the exercises</td></tr>
<tr><td>Prerequisite for the awarding of credit points/grading (weighting if applicable)*.</td><td>Title</td><td>Type of teaching</td><td>Status</td><td>SWS</td><td>CP</td><td>Form of examination</td><td>Exam duration</td><td>Grading system</td><td>Calculation of module grade</td></tr>
<tr><td></td><td>Bioanalytics</td><td>L</td><td>m</td><td>4</td><td>6</td><td rowspan="2">W</td><td rowspan="2">120</td><td rowspan="2">g</td><td rowspan="2">100</td></tr>
<tr><td></td><td>Bioanalytics – Advanced Excercises</td><td>E</td><td>m</td><td>2</td><td>3</td></tr>
<tr><td>Module coordinator</td><td colspan="9">Dr. Üner Kolukisaoglu und Dr. Mark Stahl</td></tr>
</table>

Lecturers	Dr. Üner Kolukisaoglu, Dr. Mark Stahl and other lecturers of the Faculty of Mathematics and Natural Sciences
Usability *	This module forms the basis for participation in various focus modules in the Department of Biology. It can also be credited in various Master's degree programs in the Department of Biology.
Participation requirements*	none

Module number: M2	**Modul title:** Basic Module Chemistry		**Type of module:** Mandatory module
Credit points (CP)	9 CP		
Workload* **- Contact time** **- Self-study**	Workload: 270 h	Contact time: 90 h / 6 SWS	Self-study: 180 h
Module duration*	1 semester		
Frequency of the offer*	every academic year (winter semester)		
Language of instruction	englisch		
Teaching/learning methods*	Lecture		
Module content*	Sol-gel processes (ACM12; Lecture 1 SWS): Basics of the sol-gel process: sol, aerosol, gel, hydrolysis and condensation, gel formation, drying, ageing; synthesis strategies: control of parameters: pH, temperature, water value, growth models, template syntheses, non-, meso- and macroporous materials, options of the sol-gel process: aerogels, porous materials, xerogels, dense glasses and ceramics, ceramic films and silsesquioxanes. New carbon materials (OCM6; Lecture 1 SWS): Fullerenes, carbon nanotubes, graphene: Generation, properties (physical, spectroscopic, chemical), functionalization (covalent and non-covalent); small pi-conjugated molecules (acenes, coronenes, perylenediimides, phthalocyanines) and oligomers for OTFT, OLED and solar cells: Structure-property relationship, synthesis methods, characterization. Phenomenological materials science (MWM1; Lecture 2 SWS): Electrons: Overview of electronic structure, band structures and band shema, densities of states and charge carrier densities; Phonons: Dispersion and spectra, Thermal properties, heat capacity, thermal expansion, thermal conduction. Mechanical properties, stress and strain, Hooke's law, elastic and plastic deformation, hardness and hardening, electrical conductivity, metals and semiconductors, ionic conductors, mixed conductivity, temperature dependence, alternating current conductivity, frequency dependence Dielectric and optical properties, polarization, dispersion phenomena. Nanochemistry (Lecture 2 SWS): Historical nanotechnology, top-down and bottom-up methods, synthesis of gold and silver nanoparticles, metal clusters in the gas phase, jellium model, magic numbers, Wade rules, metalloid clusters, quantum dots, semiconductor nanoparticles (HNPs), size quantization effect, chemical and mechanistic aspects of colloid synthesis, chemistry and binding behavior of important ligands, chemical control of size, shape and phase of HNPs, Opto-electronic applications of HNPs, synthesis and characterization of nanoporous materials, template-assisted syntheses, metal-organic and covalent framework structures (MOFs and COFs), zeolites, zeolite-like materials (alumophosphates, gallophosphates), periodic mesoporous silica, mesoporous oxides, metal alkoxides, hybrid materials, synthesis of bottle ships, application of nanoporous materials.		
Qualification goals*	The students - have advanced knowledge in the fields of coordination chemistry, organometallic chemistry, biochemistry and solid-state chemistry - are able to assess and classify advanced techniques for the synthesis of nanoscale solids - can apply synthesis strategies, structure/property relationships and forms of nanoscale materials in order to develop and test the production and use of such materials in theory and practice		

Prerequisite for the awarding of credit points/grading (weighting if applicable)*	*Title*	*Type of teaching form*	*Status*	*SWS*	*CP*	*Form of examination*	*Exam duration*	*Grading system*	*Calculation of module grade*
	ACM12	*L*	*m*	*1*	*1,5*	*O*	*30*	*g*	*100*
	OCM6	*L*	*m*	*1*	*1,5*				
	MWM1	*L*	*m*	*2*	*3*				
	Nanochemie	*L*	*m*	*2*	*3*				
	The module examination is conducted as an oral examination with two examiners. One examiner is a lecturer of the lecture Nanochemistry, the second examiner is a lecturer of the lectures ACM12, OCM6 or MWM1.								
Module coordinator	Prof. Dr. Andreas Schnepf, Dr. Claudio Schrenk								
Lecturers	Prof. Dr. Reiner Anwander, Prof. Dr. Holger Bettinger, Prof. Dr. Marcus Scheele, Prof. Dr. Andreas Schnepf, Dr. Claudio Schrenk and other lecturers in the Department of Chemistry								
Usability *	This module forms the basis for participation in various focus modules in the Department of Chemistry. It can also be credited to various Master's degree programs in the Department of Chemistry.								
Participation requirements *	none								

Module number: M3	**Modul title:** Basic Module Physics		**Type of module:** Mandatory module
Credit points (CP)	9 CP		
Workload* **- Contact time** **- Self-study**	Workload: 270 h	Contact time: 90 h / 6 SWS	Self-study: 180 h
Module duration*	1 semester		
Frequency of the offer*	Every academic year (summer semester)		
Language of instruction	German and English		
Teaching/learning methods*	Lecture and exercises		
Module content*	Soft Matter Physics (Lecture 4 SWS + exercises 2 SWS): Experimental findings and theoretical concepts for systems with building blocks from nano to micrometer size. Systems: polymers, lipids, colloids, liquid crystals. Effective interactions: Electrostatics in solutions, entropic forces, chemical bonding vs. physical association. Equilibrium and non-equilibrium thermodynamics and statistics.		
Qualification goals*	The students - are able to present, classify and apply experimental findings and theoretical concepts of soft matter physics		
Coursework requirements	Regular participation in the exercises		

Prerequisite for the awarding of credit points/grading (weighting if applicable)*	*Title*	*Type of teaching form*	*Status*	*SWS*	*CP*	*Type of examination*	*Exam duration*	*Grading system*	*Calculation of module grade*
	Soft Matter Physics Lecture	*L*	*m*	*4*	*6*	*O*	*30*	*g*	*100*
	Soft Matter Physics Exercise	*E*	*m*	*2*	*3*				

Responsible for the module	Prof. Martin Oettel, apl. Prof. Dr. Hans-Joachim Schöpe
Lecturers	Prof. Martin Oettel, apl. Prof. Dr. Hans-Joachim Schöpe, Prof. Erik Schäffer
Usability*	This module forms the basis for participation in various Focus Modules in the Department of Physics.
Participation requirements*	none

Module number: M7	**Modul title:** Nano-Science IV		**Type of module:** Mandatory module
Credit points (CP)	6 CP		
Workload* **- Contact time** **- Self-study**	Workload: 180 h	Contact time: 90 h / 6 SWS	Self-study: 90 h
Module duration *	2 semesters		
Frequency of the offer*	every academic year (winter semester)		
Language of instruction	German and English		
Teaching/learning methods*	Lectures and seminars		
Module content*	Cellular Nanomachines (Lecture 2 SWS): This lecture introduces molecular machines that perform work in biological cells and explains their biophysical mechanisms. Among other things, molecular motors that interact with the cytoskeleton and DNA are presented in detail. Advanced Topics in Nanoscience (Seminar 2 SWS) Students will develop and present in-depth topics on the analysis and application of nanostructured materials. Advanced Topics in Nanochemistry (Seminar 2 SWS) Basic and advanced current topics in the field of synthesis and application of nanostructured materials should be developed and presented by the students themselves.		
Qualification goals*	The students - have advanced knowledge of biopolymers, molecular machines and their functional principles - are able to recognize and classify the limits of performance and efficiency of molecular processes and machines - have an understanding of molecular machines that enables them to transfer the physical concepts of their functioning to nanotechnological or biotechnological applications - can present, discuss and analyze research-related topics - have an understanding of advanced chemical aspects in the field of nanoscience and can develop, present and classify these independently		
Coursework requirements	Seminar presentation, active participation		

Prerequisite for the awarding of credit points/grading (weighting if applicable)*	*Title*	*Type of teaching form*	*Status*	*SWS*	*CP*	*Form of examination*	*Exam duration*	*Grading system*	*Calculation of module grade*
	Cellular Nanomachines	*L*	*m*	*2*	*2*	*O*	*20*	*g*	*67*
	Advanced Topics in Nanoscience	*S*	*m*	*2*	*2*				
	Advanced Topics in Nanochemistry	*S*	*m*	*2*	*2*	*P*	*20*	*g*	*33*

Responsible for the module	Prof. Erik Schäffer, Prof. Andreas Schnepf and Prof. Martin Oettel
Lecturers	Prof. Erik Schäffer, Prof. Andreas Schnepf, Prof. Martin Oettel and other lecturers of the Faculty of Mathematics and Natural Sciences

Usability	This module is designed to accompany modules M1, M2 and M3 in this Master's degree program. It can also be credited in various Master's degree programs in the Departments of Biology, Chemistry and Physics.
Participation requirements	none

Module number:M8	**Modul title:** Independent Studies		**Type of module:** Mandatory module
Credit points (CP)	27 CP		
Workload* - Contact time - Self-study	Workload: 810 h	Contact time: variable	Self-study: variable
Module duration *	1 semester		
Frequency of the offer*	every academic year		
Language of instruction	German and English		
Teaching/learning methods*	optional lectures, seminars, exercises, practicals		
Module content*	As part of this module, students should, in consultation with the module supervisor, intensively study and work on their specific areas of interest within the subject of nanoscience. These areas of interest should be developed and defined in dialog with the supervising lecturers, whereby the learning and qualification objectives are defined in study plans and target agreements. After consultation with the supervising lecturers, these studies can take place at the University of Tübingen as well as at other universities and research institutions in Germany and abroad and within the framework of internal internships.		
Qualification goals *	The students - have extended experience in sectors outside the Nano-Science degree program, e.g. in research institutions, industry, abroad - have combined their interdisciplinary and intercultural interests and skills - have developed and focused their study and research interests on a sub-area of nanoscience		
Coursework requirement	Depending on the course: participation, seminar presentations, written documentation. Further details will be agreed with the module coordinator at the beginning of the module.		

Prerequisite for the awarding of credit points/grading (weighting if applicable)*.	*Title*	*Type of teaching form*	*Status*	*SWS*	*CP*	*Form of examination*	*Exam duration*	*Grading system*	*Calculation of module grade*
	Lectures, seminars, internships (also outside the University of Tübingen)	*L, S, PC*	*op*	*variabel*	*27 in total*	*ne*	-	-	-

Module managers	Prof. Erik Schäffer, Prof. Andreas Schnepf, Prof. Martin Oettel, apl. Prof. Hans-Joachim Schöpe, Dr. Claudio Schrenk
Lecturers	Lecturers from the departments of biology, chemistry and physics
Usability	This module can be credited to various Master's degree programs in the Departments of Biology, Chemistry and Physics.
Participation requirements	Successful participation in modules M1-M5

Module number:M9	**Module title:** Master Seminar		**Type of module:** Mandatory module
Credit points (CP)	6 CP		
Workload* - Contact time - Self-study	Workload: 180 h	Contact time: 60 h / 4 SWS	Self-study: 120 h
Module duration*	2 semesters		
Frequency of the offer*	every semester		
Language of instruction	German and English		
Teaching/learning methods*	Lecture, seminar, exercise		
Module content*	Data Analysis with Statistics (Lecture 1 SWS + Exercises 1 SWS): Lecture on the basics of descriptive statistics and inferential statistics, as well as curve fitting and regression analysis with in-depth study in the exercise. Master seminar (2 SWS): In this seminar, students present their experiences and the results of their Master's thesis.		
Qualification goals*	The students - are able to apply common statistical methods - have the ability to exchange facts, arguments and perspectives across disciplines - can make decisions based on statistical data and assess the quality of these decisions - can apply specific presentation techniques and present and explain links between different disciplines		
Coursework requirement	Regular participation in the seminar events, seminar presentation (Master's seminar)		

Prerequisite for the awarding of credit points/grading (weighting if applicable)*.	*Title*	*Type of teaching form*	*Status*	*SWS*	*CP*	*Form of examination*	*Exam duration*	*Grading system*	*Calculation of module grade*
	Data Analysis with Statistics	*L*	*m*	*1*	*1,5*	*W*	*90*	*ng*	*-*
	Data Analysis with Statistics (Excercises)	*E*	*m*	*1*	*1,5*				
	Master seminar	*S*	*m*	*2*	*3*	*ne*	*-*	*-*	*-*

Responsible for the module	Prof. Frank Schreiber, Dr. Anita Jannasch, apl. Prof. Hans Joachim Schöpe, Dr. Claudio Schrenk
Lecturers	Dr. Anita Jannasch, apl. Prof. Hans Joachim Schöpe, Dr. Claudio Schrenk
Usability *	This module is designed to accompany modules M8 and M10 in this Master's degree program.
Participation requirements *	none

Module number: M10	**Modul title:** Master Thesis		**Type of module:** Mandatory module
Credit points (CP)	27 CP		
Workload* **- Contact time** **- Self-study**	Workload: 810 h	Contact time: 0 h	Self-study: 810 h
Module duration *	1 semester		
Frequency of the offer*	every academic year		
Language of instruction	German or English		
Teaching/learning methods*	Master thesis		
Module content *	After consultation with the academic supervisor of the thesis		
Qualification goals *	The students - are able to independently develop a research question - are able to work on scientific and technical questions and implement them in concrete research projects - are able to apply and combine methods from different disciplines - are able to present the results of their research project (duration six months including written documentation) both to a specialist audience and across disciplines - have the ability to document the results of their research activities in a reproducible and publication-ready form (in German or English)		

Prerequisite for the awarding of credit points/grading (weighting if applicable)*	*Title*	*Type of teaching form*	*Status*	*SWS*	*CP*	*Form of examination*	*Exam duration*	*Grading system*	*Calculation of module grade*
	Master Thesis	*MT*	*m*		*27*	*MT*	*-*	*g*	*100*

Responsible for the module	Lecturers from the departments of biology, chemistry and physics
Lecturers	Lecturers from the departments of biology, chemistry and physics
Usability*	
Participation requirements*	Successful participation in modules M1-M8

5.2 Optional modules

In the compulsory elective area, a total of three modules with a total of 27 CP must be selected from the following elective modules in the departments of Biology, Chemistry and Physics. Modules must be chosen from at least two of the three departments.

5.2.1 Optional modules in the Department of Biology

Module number: BWMA/B	**Module title Module title:** Focus Module Biology A/B								**Type of module:** Optional module
Credit points (CP)	9 CP								
Workload* - Contact time - Self-study	Total: 270 h	Contact time: Min. 90 h / 6 SWS							Self-study: Max. 180 h
Module duration *	1 semester								
Frequency of the offer*	every semester								
Language of instruction	German and English								
Teaching/learning methods*	Lectures, seminars, exercises, practicals								
Module content *	The module consists of courses from the Master's degree programs offered in the Department of Biology with links to nanoscience and nanotechnology. It also includes courses offered by the Department of Biology specifically for the Master's degree program in Nano-Science. It also includes selected courses from the Bioinformatics degree program with links to nanoscience and nanotechnology. The total number of courses successfully completed must add up to at least 6 SWS. The module coordinators decide whether individual courses can be credited to the module. A current overview of courses that can be credited across the board can be found on the homepage of the degree program (www.uni-tuebingen.de/nano-science).								
Qualification goals *	The students - are able to classify and analyze specific facts from the fields of microbiology, molecular cell biology & immunology, neurobiology and cellular & molecular biology of plants, depending on the selected courses, and to transfer them to nanoscientific issues								
Coursework requirement	Depending on the course: participation, presentation, scientific text, essay, preparation of minutes								
Prerequisite for the awarding of performance points/grading (weighting if applicable))*	*Title*	*Type of teaching form*	*Status*	*SWS*	*CP*	*Form of examination*	*Exam duration*	*Grading system*	*Calculation of module grade*

	Events of the Department of Biology or Bio-informatics with nanoscience relevance	*L, S, E, PC*	*op*	*mini-mum 6*	*9*	*variable*	*g*	*100*
Responsible for the module	Dr. Üner Kolukisaoglu							
Lecturers	Lecturers in the Department of Biology							
Usability *	This module can be credited to various Master's degree programs in the Department of Biology.							
Participation require-ments*	Depending on the course: In-depth knowledge of biology							

Module number: BWMC	**Module title:** Focus Module Biology C		**Type of module:** Optional module
Credit points (CP)	9 CP		
Workload* - Contact time - Self-study	Workload: 270 h	Contact time: 0 h	Self-study: 270 h
Module duration *	1 semester		
Frequency of the offer*	every academic year		
Language of instruction	German and English		
Teaching/learning methods*	Internship		
Module content *	Practical project work in a laboratory of the biology department		
Qualification goals *	The students - are able to use and apply molecular laboratory techniques - are able to carry out project work independently and to analyze and evaluate the results obtained - can apply qualified techniques for the presentation of research results		

Prerequisite for the awarding of credit points/grading (weighting, if applicable))*	*Title*	*Type of teaching form*	*Status*	*SWS*	*CP*	*Form of examination*	*Exam duration*	*Grading system*	*Calculation of module grade*
	Module internship	*PC*	*o*	*-*	*9*	*IR*	*-*	*g*	*100*

Responsible for the module	Prof. Erik Schäffer
Lecturers	Lecturers in the Department of Biology
Usability *	This module can be credited to various Master's degree programs in the Department of Biology.
Participation requirements *	none

5.2.2 Optional modules of the Department of Chemistry

Module number: CWMA/B	**Module title:** Focus Module Chemistry A/B							**Type of module:** Optional module	
Credit points (CP)	9 CP								
Workload* - Contact time - Self-study	Workload: 270 h	Contact time: min. 90 h / 6 SWS						Self-study: min. 180 h	
Module duration*	1 semester								
Frequency of the offer*	every academic year								
Language of instruction	German and English								
Teaching/learning methods*	Lecture								
Module content*	The module consists of courses offered by the institutes of Inorganic Chemistry (courses ACM...), Organic Chemistry (courses OCM...), Physical and Theoretical Chemistry (courses PCM.../TCM...), as well as Analytical Chemistry (courses ANM...) of the Master's degree program in Chemistry with references to nanoscience and nanotechnology. This also includes courses offered by the Department of Chemistry specifically for the Master's degree course in Nano-Science. The total number of courses chosen from one institute must add up to at least 4 SWS. Up to 2 SWS can be chosen from courses offered by other institutes. The same institute cannot be the main component of the Chemistry A and Chemistry B focus modules at the same time. The module coordinators decide whether individual courses can be credited to the module. A current overview of courses that can be credited across the board can be found on the homepage of the degree program (www.uni-tuebingen.de/nano-science).								
Qualification goals *	The students - have advanced knowledge in the fields of inorganic chemistry, organic chemistry, physical-theoretical chemistry and analytical chemistry, depending on the courses chosen - are able to compare and evaluate methods from the above-mentioned fields and combine them to develop new techniques - have the ability to describe, classify and apply advanced techniques for the analysis of nanoscale and crystalline solids.								
Coursework requirements	Regular participation								
Prerequisite for the awarding of credit points/grading (weighting if applicable))*	*Title*	*Type of teaching form*	*Status*	*SWS*	*CP*	*Form of examination*	*Exam duration*	*Grading system*	*Calculation of module grade*
	Event(s) of the Department of Chemistry with nano-scientific relevance	*L, S, E*	*op*	*minimum 6*	*9*	*W or O*	*var*	*g*	*100*
Responsible for the module	Prof. Dr. Andreas Schnepf, Dr. Claudio Schrenk								
Lecturers	Lecturers in the Department of Chemistry								

Usability	This module can be credited to various Master's degree programs in the Department of Chemistry.
Participation requirements	none

Module number: CWMC	**Module title:** Focus Module Chemistry C		**Type of module:** Optional module
Credit points (CP)	9 CP		
Workload* - Contact time - Self-study	Workload: 270 h	Contact time: 0 h	Self-study: 270 h
Module duration*	1 semester		
Frequency of the offer*	every academic year		
Language of instruction	German and English		
Teaching/learning methods*	Internship		
Module content *	Practical project work in a laboratory of the Department of Chemistry		
Qualification goals *	The students - are able to use and apply modern chemical laboratory techniques - are able to carry out project work independently and to analyze and evaluate the results obtained - are able to apply qualified techniques for presenting research results		
Coursework requirements	Seminar presentation		

Prerequisite for the awarding of credit points/grading (weighting if applicable)*	*Title*	*Type of teaching form*	*Status*	*SWS*	*CP*	*Form of examination*	*Exam duration*	*Grading system*	*Calculation of module grade*
	Module internship	*PC*	*op*	*-*	*9*	*IR*	*-*	*g*	*100*

Responsible for the module	Prof. Dr. Andreas Schnepf, Dr. Claudio Schrenk
Lecturers	Lecturers in the Department of Chemistry
Usability *	This module can be credited to various Master's degree programs in the Department of Chemistry.
Participation requirements*	Successful participation in “Focus Module Chemistry A/B”

5.2.3 Optional modules of the Department of Physics

Module number: PWMA/B	**Module title:** Focus Module Physics A/B		**Type of module:** Optional module
Credit points (CP)	9 CP		
Workload* - Contact time - Self-study	Workload: 270 h	Contact time: min. 90 h / 6 SWS	Self-study: max. 180 h
Module duration *	1 semester		
Frequency of the offer*	every academic year (winter semester)		
Language of instruction	German and English		
Teaching/learning methods*	Lecture and exercises		
Module content *	The module consists of courses offered by the Department of Physics. These courses must be selected in such a way that at least 6 SWS are covered. The module coordinators decide whether individual courses can be credited to the module. A current overview of suitable courses can be found on the homepage of the degree program (www.uni-tuebingen.de/nano-science). Consultation with a module coordinator is strongly recommended.		
Qualification goals *	The students - have advanced knowledge of the physics of condensed matter - understand the physical principles of material properties and can establish connections between theory and application - are able to conceptually compile and link experimental analysis methods for processing problems in materials science and nanotechnology - are able to describe, classify and apply the basics of nanophysics or scanning and transmission electron microscopy, depending on the chosen courses - be able to record and numerically analyze the resulting data.		
Coursework requirements	depending on the chosen course: regular participation in the exercises		

Prerequisite for the awarding of credit points/grading (weighting if applicable)*.	*Title*	*Type of teaching form*	*Status*	*SWS*	*CP*	*Form of examination*	*Exam duration*	*Grading system*	*Calculation of module grade*
	Events of the Department of Physics	*V, E, S, PC*	*O*	*minimum 6*	*9*	*W or O*	*var*	*g*	*100*
	The examination form of the graded course depends on the respective lecturer of the course. Details on the examination form and duration will be announced at the beginning of the respective course. See also the list of creditable courses at www.uni-tuebingen.de/nano-science								
Module managers	Prof. Frank Schreiber, Prof. Martin Oettel, Prof. Hans Joachim Schöpe								
Lecturers	Prof. Frank Schreiber, Prof. Reinhold Kleiner, Prof. Monika Fleischer, Prof. Dieter Kölle and other lecturers in the Department of Physics								
Usability *	This module can be credited to the Bachelor's degree program in Physics.								
Participation requirements *	none								

Module number: PWMC	**Module title:** Focus Module Physics C		**Type of module:** Optional module
Credit points (CP)	9 CP		
Workload* - Contact time - Self-study	Workload: 270 h	Contact time: 0 h	Self-study: 270 h
Module duration *	1 semester		
Frequency of the offer*	every academic year		
Language of instruction	German and English		
Teaching/learning methods*	Internship		
Module content *	Practical project work in a laboratory of the Department of Physics		
Qualification goals *	The students - are able to apply and analyze physical laboratory techniques in the field of nanoscience and/or numerical methods from the field of soft matter theory/statistical physics - are able to carry out project work independently and to analyze and evaluate the results obtained - can apply qualified techniques for the presentation of research results		
Study achievements	Seminar presentation		

Prerequisite for the awarding of credit points/grading (possibly weighted)*.	*Title*	*Type of teaching form*	*Status*	*SWS*	*CP*	*Form of examination*	*Exam duration*	*Grading system*	*Calculation of module grade*
	Module internship	*PC*	*op*		*9*	*IR*	*-*	*g*	*100*

Responsible for the module	Prof. Dr. Martin Oettel, apl. Prof. Dr. Hans-Joachim Schöpe
Lecturers	Lecturers in the Department of Physics
Usability *	This module can be credited to various degree programs in the Department of Physics.
Participation requirements *	For this module, individual admission must be granted by a lecturer in the Department of Physics and agreed with the module coordinator.