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For purpose of understanding only.

Study regulations for the English-speaking consecutive degree program Advanced Functional Materials leading to award of the degree Master of Science (M.Sc.) at Chemnitz University of Technology dated July 10, 2015

Based on Sect. 13(4) in conjunction with Sect. 36(1) of the Law on the Autonomy of Institutions of Higher Education in the Free State of Saxony (Sächsisches Hochschulfreiheitsgesetz - SächsHSFG) as promulgated on January 15, 2013 (SächsGVBl. p. 3), last amended by Article 11 of the law of April 29, 2015 (SächsGVBl. p. 349, 354), the faculty board of the Faculty of Natural Sciences at Chemnitz University of Technology enacts the following study regulations:

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In the following, the generic masculine will generally be used for reasons of better legibility. All personal designations apply naturally to all genders.

Part 1
General provisons

§ 1
Scope

Based on the respective examination regulations in effect, the study regulations at hand direct the aims, contents, structure, procedure, and realisation of the degree program Advanced Functional Materials leading to the Master of Science at the Faculty of Natural Sciences at Chemnitz University of Technology.

§ 2
Start and duration of the degree program

(1) The start of the program is generally possible in the winter semester.
(2) The program has a standard period of study of four semesters (two years). The program comprises modules with a total sum of 120 credit points (CP). This corresponds to an average work-load of 3600 working hours.

§ 3
Admission requirements

(1) The admission requirements for the master's degree program are fulfilled, if a degree of higher education with professional qualification has been acquired at the Chemnitz University of Technology in the bachelor's degree program Chemistry or in the bachelor's degree program Physics or in an equivalent study program concerning contents, and if knowledge of English at the level B2 of the Common European Framework of Reference for Languages is proven.
(2) The examining board decides about the equivalence as well as about the admission of other ap-plicants.

§ 4
Types of courses

(1) Types of courses may be: lecture (L), seminar (S), exercise (E), project (PR), colloquium (C), tuto-rial (T), practical course (P), or excursion (EC).
(2) Tutorials supporting the students are set down in the module descriptions.
(3) The courses are held in English. Additionally, modules with courses in German are offered in the elective area. It is set down in the module descriptions which courses are held in German.

§ 5
Objectives of the degree program

(1) In the study program Advanced Functional Materials, knowledge about synthesis and produc-tion methods of functional materials and about the characterisation of their specific properties are con-veyed. The students gain further experience in dealing with the typical chemical and physical methods of experimental and theoretical work in the interdisciplinary cross-sectional field.
(2) The study program Advanced Functional Materials is research-oriented. The handling of prima-ry literature about current research activities on functional materials is an integral part of the program Projects in form of practical courses offer the opportunity to work on research-related prob-lems.
(3) Modules for enhanced language training (English for students with German as first language, Ger-man as a Foreign Language for international students) broaden the technical communication skills in international work groups.
(4) In the master's thesis, students prove their ability to solve reasonably complex scientific tasks un-der supervision. This promotes the competence in scientific cooperation.

Part 2
Structure and contents of the degree program

§ 6
Structure of the degree program

(1) 120 CP are awarded during the program, which are composed as follows:
1. Basic modules:
CH1 - Synthetic Methods in Chemistry 5 CP (compulsory module)

CH2 - Analytical Methods 5 CP (compulsory module)
CH3 - Sustainable Production Technologies 5 CP (compulsory module)
PH1 - Advanced Surfaces, Thin Films and Interfaces PH2 - 5 CP (compulsory module)
Semiconductor physics - Nano structures PH3 - 5 CP (compulsory module)
Photovoltaics with Nanotechnology 5 CP (compulsory module)
AFM1 - Facets of Materials Science 10 CP (compulsory module)

2. Specialisation modules:
AFM2 - Research Project 20 CP (compulsory module)

From the following, modules amounting to a sum of 30 CP have to be chosen. To broaden the selec-tion range, up to 32 CP may be chosen. Those additional credit points will not be counted as credits towards the degree. Upon application and on an individual basis, the examining board can authorise the choice of other suitable modules.

Students whose first language is not German and who can't show proof the level A1 of the Common European Framework of Reference for Languages, are obligated to take the following module:
WS1 – German as a Foreign Language I (Level A1) 4 CP (elective module)

Students whose first language is not German and who can't show proof the level A2 of the Common European Framework of Reference for Languages, are obligated to take the following module:
WS2 – German as a Foreign Language II (Level A2) 4 CP (elective module)

WCH1- Colloids 5 CP (elective module)
WCH2 - Polymer Materials 5 CP (elective module)
WCH3 - Materials Technology 3 CP (elective module)
WCH4 - Processes and products of the chemical industry 5 CP (elective module)
WCH5 - Practice of electrochemical materials science 5 CP (elective module)
WCH6 - Functional Materials 5 CP (elective module)
WCH7 - Analytics of surfaces and colloids 3 CP (elective module)
WCH8 - Practical course for analytics of surfaces and colloids 3 CP (elective module)
WCH9 - Spectroelectrochemistry 3 CP (elective module)
WCH10 - Surface Spectroscopies 3 CP (elective module)
WCH11 - Heterogeneous Catalysis 5 CP (elective module)
WCH12 - Challenges for future energy concepts - Chemical energy conversion 5 CP (elective module)
WCH13 - Crystallography 5 CP (elective module)
WCH14 - The Energiewende 5 CP (elective module)
WPH1 - Nanophysics - Physics of mesoscopic systems 5 CP (elective module)
WPH2 - Microscopy and analysis on the nano scale 5 CP (elective module)
WPH3 - Polymer Physics 3 CP (elective module)
WPH4 - Modern Microscopy (AFM) 5 CP (elective module)
WPH5 - Theoretical Solid State Physics 5 CP (elective module)
WPH6 - Experimental Physics – Complex Materials 10 CP (elective module)
WMB1 - Surface and Interface Engineering 5 CP (elective module)
WET1 - Materials in micro and nano technologies 5 CP (elective module)
WMB2 - Printed Functionalities 5 CP (elective module)
WMB3 - Interface design for fibre-plastic composites 5 CP (elective module)
WMB4 - Electrochemical Coating 3 CP (elective module)
WMB5 - Innovative Materials Engineering 4 CP (elective module)
WMB6 - Rheology of Polymers 4 CP (elective module)
WMB7 - Biomaterials and materials for medical technology WMB8 - 4 CP (elective module)
Materials Engineering – Structure Formation Processes 3 CP (elective module)

Option only for students whose first language is not English and who haven't yet taken one of the modules German as a Foreign Language I (Level A1) or German as a Foreign Language II (Level A2). One of the following modules may be chosen:
WS3 - English in study-related and professional conversation I (Level B2) 4 CP (elective module)
WS4 - English in study-related and professional conversation III (Level C1) 4 CP (elective module)

Option only for students whose first language is not German and who haven't yet taken one of the modules German as a Foreign Language I (Level A1) or German as a Foreign Language II (Level A2). One of the following modules may be chosen:

WS5 - German as a Foreign Language III (Level B1)	4 CP (elective module)
WS6 - German as a Foreign Language IV (Level B2)	4 CP (elective module)
WS7 - German as a Foreign Language – Specialised Communication I (Level C1)	4 CP (elective module)

3. Module Master's Thesis:

AFM3 – Master's Thesis	30 CP (compulsory module)

(2) The recommended sequence of studies in the master's degree program Advanced Functional Materials at the Chemnitz University of Technology within the standard period of study results from the chronological outline in the schedule of studies (see appendix 1) and the modular structure of the program

§ 7
Contents of the degree program

(1) In the master's degree program Advanced Functional Materials, further knowledge, methods, and skills from the fields of Chemistry and Physics are conveyed to the students, qualifying them for interdisciplinary, research-oriented work in the area of materials science.
The master's degree program comprises:

1. basic modules for obtaining a broad methodical knowledge about synthesis, production, and ana-lytics of functional materials.
2. modules for obtaining experience in scientific practice by working on research-oriented problems in research and project practical courses, as well as by supervised work with primary literature about current research activities in the area of functional materials.
3. elective modules allowing for specialisation. This particularly includes choices illuminating the inter-face between scientific and technological approach to materials.
4. modules for enhanced language training (English or German as a Foreign Language).
5. completion of the master's thesis.

(3) Contents, aims, types of courses, credit points, examinations, as well as frequency and duration of the individual modules are displayed in the module descriptions (see annex 2).

Part 3
Conduct of the degree program

§ 8
Course guidance services

(1) There is a subject-specific course guidance besides the Central Course Guidance at Chemnitz University of Technology. The faculty board of the Faculty of Natural Sciences entrusts a member of the faculty with conducting this guidance.
(2) It is recommended to make use of the course guidance particularly in the following cases:
1. prior to starting the study program,
2. prior to a study visit abroad,
3. prior to a practical course,
4. in the event of a change of study program or university,
5. after failed examinations.

§ 9
Examinations

The regulations about examinations are enclosed in the examination regulations for the degree program Advanced Functional Materials leading to the Master of Science (M.Sc.) at Chemnitz University of Technology.

§ 10
Self-, distance-, and part time studies

(1) The students are expected to consolidate the contents of courses self-dependently and to prepare for the courses to be attended. The knowledge necessary for sucessfully completing the study program will not only be obtained by attending courses, but will have to be supplemented by additional studies.
(2) Distance studies or part time studies are not intended.

Part 4
Final provisions

§ 11
Entry into force and publication

The study regulations are applicable to those enrolled from winter term 2015/2016 onwards.

The study regulations take effect from the day after their publication in the Official Publications (Amtliche Bekanntmachungen) of Chemnitz University of Technology.

Issued on the basis of the decision of the Faculty Board of the Faculty of Natural Sciences on June 17, 2015 and the approval of the University Management of Chemnitz University of Technology on July 1, 2015.

Chemnitz, July 10, 2015

The President

of Chemnitz University of Technology

Prof. Dr. Arnold van Zyl

Annex 1: Consecutive degree program Advanced Functional Materials in English language leading to the Master of Science (M.Sc.) SCHEDULE OF STUDIES

Modules	**1st Semester**	**2 nd Semester**	**3rd Semester**	**4th Semester**	**Workload Sum of credit points**
1. Basic modules:					
CH1 - Synthetic Methods in Chemistry	150 WH 3 LH (S3) EX: oral exam				150 WH / 5 CP
CH2 - Analytical Methods	150 WH 3 LH (L2/S1) PEX: moderation EX: written exam				150 WH / 5 CP
CH3 - Sustainable Production Technologies		150 WH 4 LH (L2/S2) PEX: moderation EX: written exam			150 WH / 5 CP
PH1 - Advanced Surfaces, Thin Films and Interfaces	150 WH 4 LH (L2/T1/S1) PEX: presentation EX: oral exam				150 WH / 5 CP
PH2 - Semiconductor physics – Nano structures		150 WH 4 LH (L3/E1) EX: written exam			150 WH / 5 CP
PH3 - Photovoltaics with Nanotechnology			150 WH 3 LH (L2/E1) EX: oral exam		150 WH / 5 CP
AFM1 - Facets of Materials Science	50 WH 2 LH (S2) (Tutorial)	150 WH 3 LH (L2/S1) (Facets of Materials Science)	100 WH 2 LH (S2) (Sc. discussion of current areas of		300 WH / 10 CP

Annex 1: Consecutive degree program Advanced Functional Materials in English language leading to the Master of Science (M.Sc.) SCHEDULE OF STUDIES

		EX: written exam	research or Advanced Seminar) EX: presentation		
2. Specialisation modules:					
AFM2 - Research Project			600 WH 18 LH (L2/S2/P14) EX: written report about the research project		600 WH / 20 CP
From the following, modules amounting to a sum of 30 CP have to be chosen. To broaden the selection range, up to 32 CP may be chosen. Those additional credit points will not be counted as credits towards the degree. Upon application and on an individual basis, the examining board can authorise the choice of other suitable modules.					
Students whose first language is not German and who can't show proof the level A1 of the Common European Framework of Reference for Languages, are obligated to take the following module:					
WS1 – German s a Foreign Language I (Level A1)	120 WH 4 LH (E4) CCA: written exam				120 WH / 4 CP
Students whose first language is not German and who can't show proof the level A2 of the Common European Framework of Reference for Languages, are obligated to take the following module:					
WS2 - German s a Foreign Language II (Level A2)	120 WH 4 LH (E4) CCA: written exam	*or* 120 WH 4 LH (E4) CCA: written exam			120 WH / 4 CP
WCH1 - Colloids	150 WH 4 LH (L2/P2) 2 EX: written exam, report about practical course		*or* 150 WH 4 LH (L2/P2) 2 EX: written exam, report about practical course		150 WH / 5 CP

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WCH2 – Polymer Materials		150 WH 4 LH (L2/S1/P1) PEX: successfully audited practical course EX: written exam			150 WH / 5 CP
WCH3 – Materials Technology	90 WH 2 LH (L2) EX: written exam		*or:* 90 WH 2 LH (L2) EX: written exam		90 WH / 3 CP
WCH4 - Processes and products of the chemical industry	150 WH 4 LH (L2/S2) PEX: presentation EX: written exam		*or:* 150 WH 4 LH (L2/S2) PEX: presentation EX: written exam		150 WH / 5 CP
WCH5 – Practice of electrochemical materials science	150 WH 4 LH (L2/P2) PEX: successfully audited practical course EX: oral exam		*or:* 150 WH 4 LH (L2/P2) PEX: successfully audited practical course EX: oral exam		150 WH / 5 CP
WCH6 – Functional materials		150 WH 4 LH (L2/P2) PEX: successfully audited practical course EX: oral exam			150 WH / 5 CP
WCH7 – Analytics of surfaces and colloids	90 WH 2 LH (S2) EX: written exam		*or:* 90 WH 2 LH (S2)		90 WH / 3 CP

Annex 1: Consecutive degree program Advanced Functional Materials in English language leading to the Master of Science (M.Sc.) SCHEDULE OF STUDIES

			EX: written exam		
WCH8 – Practical course for analytics of surfaces and colloids	90 WH 2 LH (P2) EX: report about the practical course		*or:* 90 WH 2 LH (P2) EX: report about the practical course		90 WH / 3 CP
WCH9 - Spectroelectrochemistry	90 WH 2 LH (L2) EX: oral exam		*or:* 90 WH 2 LH (L2) EX: oral exam		90 WH / 3 CP
WCH10 - Surface Spectroscopies	90 WH 2 LH (L2) EX: oral exam		*or:* 90 WH 2 LH (L2) EX: oral exam		90 WH / 3 CP
WCH11 - Heterogeneous Catalysis		150 WH 4 LH (L2/P2) PEX: successfully audited practical course EX: oral exam			150 WH / 5 CP
WCH12 - Challenges for future energy concepts - Chemical energy conversion		150 WH 3 LH (L2/S1) PEX: presentation during the seminar EX: oral exam			150 WH / 5 CP
WCH13 - Crystallography	150 WH 4 LH (L2/E2) EX: written exam		*or:* 150 WH 4 LH (L2/E2) EX: written exam		150 WH / 5 CP

Annex 1: Consecutive degree program Advanced Functional Materials in English language leading to the Master of Science (M.Sc.) SCHEDULE OF STUDIES

WCH14 - The Energiewende 150 WH	4 LH (L1/S1/P2) EX: presentation		*or:* 150 WH 4 LH (L1/S1/P2) EX: presentation		150 WH / 5 CP
WPH1 - Nanophysics – Physics of mesoscopic systems	150 WH 3 LH (L2/E1) EX: written exam		*or:* 150 WH 3 LH (L2/E1) EX: written exam		150 WH / 5 CP
WPH2 - Microscopy and analysis on the nano scale		150 WH 3 LH (L2/E1) EX: written exam			150 WH / 5 CP
WPH3 – Polymer Physics		90 WH 2 LH (L2) EX: oral exam			90 WH / 3 CP
WPH4 - Modern Microscopy (AFM)	75 WH 3 LH (L2/S1)	75 WH 3 LH (L2/S1) EX: oral exam			150 WH / 5 CP
WPH5 - Theoretical Solid State Physics	75 WH 3 LH (L2/S1)	75 WH 3 LH (L2/S1) EX: oral exam			150 WH / 5 CP
WPH6 – Experimental Physics – Complex Materials	150 WH 5 LH (L2/S2/S1)	150 WH 5 LH (L3/S1/S1) PEX: presentation during seminar EX: oral exam			300 WH / 10 CP
WMB1 - Surface and Interface Engineering		150 WH 4 LH (L2/S1/P1)			150 WH / 5 CP

Annex 1: Consecutive degree program Advanced Functional Materials in English language leading to the Master of Science (M.Sc.) SCHEDULE OF STUDIES

		PEX: presentation EX: written exam			
WET1 - Materials in micro and nano technologies	150 WH 4 LH (L2/E2) PEX: proof of exercises EX: written exam		*oder:* 150 WH 4 LH (L2/E2) PEX: proof of exercises EX: written exam		150 WH / 5 CP
WMB2 - Printed Functionalities		150 3 LH (L2/P1) PEX: successfully audited practical course EX: written exam	WH		150 WH / 5 CP
WMB3 – Interface design for fibre-plastic composites		150 4 LH (L2/S1/P1) EX: written exam	WH		150 WH / 5 CP
WMB4 - Electrochemical Coating	90 WH 2 LH (L1/E1) EX: oral exam		*or:* 90 WH 2 LH (L1/E1) EX: oral exam		90 WH / 3 CP
WMB5 - Innovative Materials Engineering		120 3 LH (L2/P1) EX: written exam	WH		120 WH / 4 CP
WMB6 – Rheology of Polymers	120 WH 2 LH (L2) EX: written exam		*or:* 120 WH 2 LH (L2) EX: written exam		120 WH / 4 CP

Annex 1: Consecutive degree program Advanced Functional Materials in English language leading to the Master of Science (M.Sc.) SCHEDULE OF STUDIES

WMB7 - Biomaterials and materials for medical technology		120 3 LH (L2/E1) EX: written exam	WH		120 WH / 4 CP
WMB8 – Materials Engineering – Structure Formation Processes		90 2 LH (L2) EX: written exam	WH		90 WH / 3 CP
Option only for students whose first language is not English and who haven't yet taken one of the modules German as a Foreign Language I (Level A1) or German as a Foreign Language II (Level A2). One of the following modules may be chosen:					
WS3 - English in study-related and professional conversation I (Level B2)	120 WH 4 LH (E4) CCA: written exam	*or:* 120 WH 4 LH (E4) CCA: written exam	*or:* 120 WH 4 LH (E4) CCA: written exam		120 WH / 4 CP
WS4 - English in study-related and professional conversation III (Level C1)	120 WH 4 LH (E4) 2 CCA: written exam, oral exam	*or*: 120 WH 4 LH (E4) 2 CCA: written exam, oral exam	*or*: 120 WH 4 LH (E4) 2 CCA: written exam, oral exam		120 WH / 4 CP
Option only for students whose first language is not German and who haven't yet taken one of the modules German as a Foreign Language I (Level A1) or German as a Foreign Language II (Level A2). One of the following modules may be chosen:					
WS5 - German as a Foreign Language III (Level B1)	120 WH 4 LH (E4) CCA: written exam	*or*: 120 WH 4 LH (E4) CCA: written exam	*or*: 120 WH 4 LH (E4) CCA: written exam		120 WH / 4 CP
WS6 - German as a Foreign Language IV (Level B2)	120 WH 4 LH (E4) CCA: written exam	*or*: 120 WH 4 LH (E4) CCA: written exam	*or*: 120 WH 4 LH (E4) CCA: written exam		120 WH / 4 CP

Annex 1: Consecutive degree program Advanced Functional Materials in English language leading to the Master of Science (M.Sc.) SCHEDULE OF STUDIES

WS7 - German as a Foreign Language – Specialised Communication I (Level C1)	120 WH 4 LH (E4) CCA: written exam	*or*: 120 WH 4 LH (E4) CCA: written exam	*or*: 120 WH 4 LH (E4) CCA: written exam		120 WH / 4 CP
3. Module Master's Thesis:					
AFM3 – Master's Thesis:				900 WH 900 WH / 30 CP 30 LH (PR 30) 2 EX: master's thesis, presentation with discussion (colloquium)	

Total LH (exemplary for choice of WCH9, WCH14 and WPH1 in the 1st semester of studies, WCH12, WPH2 and WS3 in the 2nd semester of studies, and WCH10 in the 3rd semester of studies)	21 LH	21 LH	25 LH	30 LH	97 LH
Total WH (exemplary for choice of WCH9, WCH14 and WPH1 in the 1st semester of studies, WCH12, WPH2 and WS3 in the 2nd semester of studies, and WCH10 in the 3rd semester of studies)	890 WH	870 WH	940 WH	900 WH	3600 WH / 120 CP

EX	exam	S	seminar
PEX	pre-exam	E	exercise course
T	tutorial		
WH	working hours	P	practical cours
CP	credit points	EC	excursion
LH	lesson hours	C	colloquium
L	lecture	PR	project
CCA	creditable course achievement		

Annex 2: Module descriptions for the consecutive degree program Advanced Functional Materials in English language leading to the Master of Science (M.Sc.)

Basic module

Module number	CH1
Module title	Synthetic Methods in Chemistry
Responsible for the module	Professorships of Coordination Chemistry (for S1), Inorganic Chemistry (for S2), Polymer Chemistry (for S3)
Contents and qualification aims	Contents: Basic principles of modern methods for chemical synthesis of materials will be treated and discussed by means of examples in current literature. These may include, e.g.: a) inorganic materials by procedures like solid state synthesis, chemical vapour deposition, sol-gel process, nanoparticle synthesis, or hydrothermal synthesis b) polymers by procedures like addition polymerisation (radical, anionic, cationic) or polycondensation c) organic-inorganic hybrid materials by procedures like twin polymerisation Qualification aims: The students will be familiar with various modern meth-ods of synthesis for different classes of materials and can assess the pros and cons of synthesis strategies as well as identify fields of application for the methods.
Types of courses	The module's type of course is the seminar. • S (S1): Synthetic Methods in Chemistry (1 LH) • S (S2): Synthetic Methods in Chemistry (1 LH) • S (S3): Synthetic Methods in Chemistry (1 LH)
Requirements for participa-tion	Proficiency in the areas of general, inorganic, and organic chemistry
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 30-minute oral exam about Synthetic Methods in Chemistry
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

Annex 2: Module descriptions for the consecutive degree program Advanced Functional Materials in English language leading to the Master of Science (M.Sc.)

Basic module

Module number	CH2
Module title	Analytical Methods
Responsible for the module	Professorship of Materials for Innovative Energy Concepts
Contents and qualification aims	Contents: During the lecture, important analytical methods including the underlying physical processes will be conveyed. The treated methods com-prise volume methods, e.g. powder X-ray diffraction, as well as surface sensitive methods like photoelectron spectroscopy. For teaching the meth-ods, the interactions of matter with electromagnetic radiation and particle radiation will initially be treated, in order to then systematically demonstrate the possibilities for characterisation derivable therefrom. On the one hand, the focus is on the different depths of information of the methods. On the other hand, the significance of a consistent model of the material to be characterised will we conveyed by various analytical methods. Qualification aims: The students acquire a wide range of charactarisation methods for solids, and a well-founded judgement of the respective results, taking the physical processes into account. During the accompanying semi-nar, the conveyed knowledge will be deepened and applied through case-studies of material characterisation in prepared and moderated discussions.
Types of courses	The module's types of courses are lecture and seminar. • L: Analytical methods (2 LH) • S: Analytical methods (1 LH)
Requirements for participa-tion	none
Applicability of the module	---
Requirements for credit points to be awarded	Meeting the prerequisite for admission to the exam and successfully pass-ing the module exam are the requirements for earning credit points. The prerequisite for admission is the following pre-exam (may be repeated several times): • moderating a 30-minute discussion during the seminar under the guid-ance of the seminar leader
Module exam	The module exam comprises: • a 60-minute written exam about Analytical Methods
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the winter semester of every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

Annex 2: Module descriptions for the consecutive degree program Advanced Functional Materials in English language leading to the Master of Science (M.Sc.)

Basic module

Module number	CH3
Module title	Sustainable Production Technologies
Responsible for the module	Professorship of Chemical Technology
Contents and qualification aims	Contents: The module conveys an understanding of the conception of pro-cesses in the chemical industry that are modern, economically feasible, and sustainable. Initially, the principles of "green" or "sustainable chemistry" will be introduced and the possibilities and chances for chemistry presented. Based on that, the methods and tools of sustainable industrial chemistry are treated with the extended goal of process intensification. The demonstrated principles will be deepened by means of the detailed inspection of exam-ples (use of membrane technologies, synthesis of certain basic chemicals by the chemical industry via sustainable processes, e.g. propylene oxide, phenol, biodiesel, etc.). Qualification aims: The students learn to regard knowledge about the pro-duction of basic chemicals under the aspect of a sustainable and resource-friendly interpretation of the processes. During the seminar included in the module, those skills will be applied and enhanced using selected examples in prepared and moderated discussions.
Types of courses	The module's types of courses are lecture and seminar. • L: Sustainable Production Technologies (2 LH) • S: Sustainable Production Technologies (2 LH)
Requirements for participa-tion	none
Applicability of the module	---
Requirements for credit points to be awarded	Meeting the prerequisite for admission to the exam and successfully pass-ing the module exam are the requirements for earning credit points. The prerequisite for admission is the following pre-exam (may be repeated several times): • moderating a 30-minute discussion during the seminar under the guid-ance of the seminar leader
Module exam	The module exam comprises: • a 90-minute written exam about Sustainable Production Technologies
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the summer semester of every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

Annex 2: Module descriptions for the consecutive degree program Advanced Functional Materials in English language leading to the Master of Science (M.Sc.)

Basic module

Module number	PH1
Module title	Advanced Surfaces, Thin Films and Interfaces
Responsible for the module	Professorship of Technical Physics
Contents and qualification aims	Contents: • vacuum technology • methods for the preparation of films • basics of crystallography in two dimensions, relaxation, reconstruc-tion • elementary processes on the surface (adsorption, desorption, diffu-sion) • electronic surface states, image states • surface analysis I: diffraction methods • surface analysis II: electron spectroscopy • surface analysis III: microscopy • characterisation of thin films with ions • interfaces, quantum well states Qualification aims: Introduction to modern surface physics, conveying the basic physical principles and concepts, interface effects, vacuum technology, and analytical methods.
Types of courses	The module's types of courses are lecture, tutorial, and seminar. • L: Surfaces, Thin Films and Interfaces (2 LH) • T: Surfaces, Thin Films and Interfaces (1 LH) • S: Advanced Surfaces, Thin Films and Interfaces (1 LH)
Requirements for participa-tion	none
Applicability of the module	---
Requirements for credit points to be awarded	Meeting the prerequisite for admission to the exam and successfully passing the module exam are the requirements for earning credit points. The prerequisite for admission is the following pre-exam (may be re-peated several times): • a 30-minute presentation during the seminar Advanced Surfaces, Thin Films and Interfaces
Module exam	The module exam comprises: • a 20-minute oral exam about the module contents
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one semester.

Annex 2: Module descriptions for the consecutive degree program Advanced Functional Materials in English language leading to the Master of Science (M.Sc.)

Basic module

Module number	PH2
Module title	Semiconductor physics - Nano structures
Responsible for the module	Professorship of Semiconductor Physics
Contents and qualification aims	Contents: Semiconductor physics / Nano structures: • survey of semiconductors • crystal structure, definition and terms • electronic band structure, calculations via pseudopotential meth-ods • vibrational properties of semiconductors and electron-phonon in-teraction • electronic properties of defects, classification of defects, effective mass, doping • electrical transport phenomena, charge carrier mobility and scat-tering, temperature dependence, relaxation time • optical properties, dielectric function, phonon-polariton and lattice absorption, absorption by free charge carriers and shallow donors and acceptors • surface effects, -states and -reconstructions • quantum confinement effect on electrons and phonons in semi-conductors • quantum wells, -wires, -dots, superlattice, applications • magnetic nano structures, spintronics Qualification aims: Understanding of the basic principles and methods of semiconductor physics and the confinement effects in nano struc-tures
Types of courses	The module's types of courses are lecture and exercise. • L: Semiconductor physics / Nano structures (3 LH) • E: Semiconductor physics / Nano structures (1 LH)
Requirements for participa-tion	none
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 90-minute written exam about Semiconductor physics / Nano structures
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one semester.

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Basic module

Module number	PH3
Module title	Photovoltaics with Nanotechnology
Responsible for the module	Professorship of Optics and Photonics of Condensed Matter, in particular Sensor Systems and Analytics
Contents and qualification aims	Contents: • absorption and emission of radiation in semiconductors • generation and recombination of charge carriers in semiconductors • electrical and optical parameters of solar cells • understanding of theoretical and practical limits of energy conversion efficiency • concepts for the increase in energy conversion efficiency of photovolta-ic cells Qualification aims: This module conveys knowledge about the basic work-ing principles of photovoltaic cells to the engineers-to-be, including general and practical limitations, as well as concepts for the increase in energy con-version efficiency.
Types of courses	The module's types of courses are lecture and seminar. • L: Photovoltaics with Nanotechnology (2 LH) • S: Photovoltaics with Nanotechnology (1 LH)
Requirements for participa-tion	none
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 30-minute oral exam about Photovoltaics with Nanotechnology
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the winter semester of every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Basic module

Module number	AFM1
Module title	Facets of Materials Science
Responsible for the module	Professorship of Materials for Innovative Energy Concepts
Contents and qualification aims	Contents: To allow for the rapid development within the broad range of ma-terials science, this module will be organised as a series of lectures by ex-perts with an up-to-date topic of research in the area of modern functional materials. The lectures will comprise an introduction to the respective topic, the underlying chemical and physical processes in or on the material, its synthesis and characterisation. The main focus will be on the relationship between structure and properties as well as on strategies for material opti-misation. Attention will finally be paid to existent challenges in the applica-tion. Following the lecture, there will be a discussion with the expert, re-sponding to the students' questions and suggestions. Furthermore, the students will practise working with primary literature in materials science and presenting a complex scientific topic. Depending on their preferences, the students may choose between the more chemically oriented seminar "Scientific discussion of current areas of research" or the "Advanced Seminar" focussing on physical aspects. Alongside the technical training, the tutorial enables discussing aspects of good scientific practice and of the presentation of scientific results. In order to guard against difficulties in technical understanding and communication between students from various disciplines, well-known cases arising from the respective faculty cultures, e.g. different use of technical terms or dis-similarly coined prior knowledge, will be addressed. Tutorials will alternately be held by the Institute of Physics and the Institute of Chemistry to convey broad understanding for the respective other department to the students. Qualification aims: Thanks to the experts' lectures in varying areas of re-search, the students receive a broad education concerning different classes of materials as well as applications. The subsequent opportunity for discus-sion with the lecturer enables to apply and deepen prior knowledge. Addi-tionally, the discussion contributes significantly to learning about the com-plex structure of professional discussions. The students obtain solid knowledge about the elaboration and presentation of scientific topics. They learn to become quickly and thoroughly acquainted with unfamiliar subject areas and gain insight into advanced topics in Chemistry and Physics. The tutorial sensitises the students to cultural differences between the dis-ciplines and teaches them to handle those constructively. Proficiency in processing and presenting complex contexts in limited time is deepened.
Types of courses	The module's types of courses are lecture and seminar: • S: Tutorial Chemistry meets Physics - Physics meets Chemistry (CPPC) (2 LH) • L: Facets of Materials Science (2 LH) • S: Facets of Materials Science (1 LH) One of the following courses has to be chosen: • S: Scientific discussion of current areas of research (2 LH) • S: Advanced Seminar (2 LH)
Requirements for participa-tion	none

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Applicability of the module ---	
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises two parts. In detail, the following exams have to be taken: • a 60-minute written exam about the lecture Facets of Materials Science • a 20-minute presentation during the seminar Scientific discussion of current areas of research or the Advanced Seminar
Credit points and grades	10 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations. Examinations: • written exam about the lecture Facets of Materials Science, weighting 1, passing required. • presentation during the seminar Scientific discussion of current areas of research or the Advanced Seminar, weighting 1, passing required.
Frequency of the module	The module will be offered in every academic year.
Workload	The module comprises a student's total workload of 300 WH.
Duration of the module	Presuming a proper course of studies, the module extends over three se-mesters.

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Specialisation module

Module number	AFM2
Module title	Research Project
Responsible for the module	Dean of Studies Advanced Functional Materials of the Faculty of Natural Sciences
Contents and qualification aims	Contents: Scientific assignment focussed on materials science in the work group of a professor / junior professor of the Faculty of Natural Sciences, a professor / junior professor of the TU Chemnitz or another university, a non-university research institution or a research and development department of an industrial company inland or abroad. Qualification aims: The students show the ability to work on preset scientific questions concerning materials science. The scientific work will be con-ducted, evaluated, documented, and presented self-dependently. The stu-dents gain the ability to become acquainted with new topics and learn to handle modern scientific equipment. Regular attendance at the work group's seminar promotes the skills in scientific discourse.
Types of courses	The module's types of courses are lecture, seminar, and practical course: • P: practical research (14 LH) • S: work group seminar alongside the practical research (2 LH) One of the following lectures has to be chosen: • L: Physical Colloquium (2 LH) • L: Chemical Colloquium (2 LH)
Requirements for participation	There will be safety instructions by the respective work group's person re-sponsible prior to the start of laboratory work. Attendance at these instruc-tions is obligatory. Basic knowledge about the working methods of the work group chosen for the practical course is a precondition.
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a written report about the research project (approx. 30 pages long). The report may be submitted in either German or English.
Credit points and grades	20 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in every academic year.
Workload	The module comprises a student's total workload of 600 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WS1
Module title	German as a Foreign Language I (Level A1)
Responsible for the module	Head of Department German as a Foreign Language at the Foreign Lan-guage Centre
Contents and qualifica-tion aims	Contents: • teaching basic knowledge of German (vocabulary, grammar, phonet-ics) • introduction and practising of vocabulary about simple topics, e.g. family, shopping, living • acquiring first grammatical structures and rules, e.g. articles and de-clension of nouns, modal verbs, negation, verb forms in present and perfect tense • phonetic exercises The training follows the language competence level A1 of the Common European Framework of Reference for Languages (CEFR). Qualification aims: • understanding familiar, everyday expressions and grasping basic sen-tences • communicating simple phrases and sentences • answering easy questions about family, education, and studies The completion of the module corresponds to the language competence level A1 of the Common European Framework of Reference for Lan-guages (CEFR).
Types of courses	The module's type of course is the exercise. • E: Course 1 (4 LH)
Requirements for par-ticipation	none
Applicability of the module	---
Requirements for cred-it points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: Creditable course achievement: • a 90-minute written exam about Course 1 The exam needs to be graded with at least "sufficient" in order to be cred-ited.
Credit points and grades	4 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the mod-ule	The module will be offered in every semester.
Workload	The module comprises a student's total workload of 120 WH. (60 hours of contact and 60 hours of self-study).

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Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WS2
Module title	German as a Foreign Language II (Level A2)
Responsible for the module	Head of Department German as a Foreign Language at the Foreign Lan-guage Centre
Contents and qualifica-tion aims	Contents: • broadening and solidifying the vocabulary, e.g. about topics like edu-cation, activities, hobbies, recreation, and job • discovery and practice of new grammatical structures, e.g. separable and non-separable verbs, reflexive verbs, consolidation of the tenses, exercises about word order in different sentence constructions • exercises of German phonetics The training follows the language competence level A2 of the Common European Framework of Reference for Languages (CEFR). Qualification aims: • understanding of commonly used expressions related to areas of im-mediate significance • communication about familiar and common topics through simple and direct exchange of information The completion of the module corresponds to the language competence level A2 of the Common European Framework of Reference for Lan-guages (CEFR).
Types of courses	The module's type of course is the exercise. • E: Course 2 (4 LH)
Requirements for par-ticipation	Completed previous Course 1 or placement test (recommendation of quali-fication)
Applicability of the module	---
Requirements for cred-it points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: Creditable course achievement: • a 90-minute written exam about Course 2 The exam needs to be graded with at least "sufficient" in order to be credited.
Credit points and grades	4 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the mod-ule	The module will be offered in every semester.
Workload	The module comprises a student's total workload of 120 WH. (60 hours of contact and 60 hours of self-study).
Duration of the module	Presuming a proper course of studies, the module extends over one se-

	mester.

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Specialisation module

Module number	WCH1
Module title	Colloids
Responsible for the module	Professorship of Physical Chemistry
Contents and qualification aims	Contents: • colloids and dispersions • preparation of dispersions by fragmentation • preparation of dispersions by controlled precipitation • Aggregations of defined size in thermodynamic equilibrium with a bulk phase • nucleation & growth • Smoluchowski's aggregation kinetics • spherulitic growth • mechanisms of the collapse of dispersions: creaming/sedimenting, coalescence, aggregation, Ostwald ripening • measures for the stabilisation of dispersions • characterisation of dispersions • particle size measurements • preparation and characterisation of porous compounds • practical experiments in colloid chemistry Qualification aims: Students have the ability to • systematically explain natural phenomena, technical processes, and chemical reactions featuring dispersions • identify dispersions and classify them • prepare dispersions using different methods, recognise the strengths and weaknesses of each method and choose the respective best method for the preparation of a dispersion under given conditions • stabilise dispersions using different methods, recognise the strengths and weaknesses of each method and choose the respective best method or combination of methods for the stabilisation of a dispersion under given conditions • characterise dispersions using different methods • determine particle size and particle size distribution and choose the respective best method • independently derive further physical-chemical principles from basic mathematically describable knowledge
Types of courses	The module's types of courses are lecture and practical course. • L: Colloids (2 LH) • P: Colloids (2 LH) The courses will be held in German.
Requirements for participa-tion	There will be safety instructions / an introduction to the practical course prior to the practical course itself. Attendance is obligatory (see "Allgemeine Laborordnung" – general laboratory rules – of the Institute of Chemistry).
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.

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Module exam	The module exam comprises two parts. In detail, the following exams have to be taken: • a 120-minute written exam about the lecture Colloids • a report about the practical course Colloids (approx. 20 pages long)
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations. Examinations: • written exam about the lecture Colloids, weighting 1 – passing required • report about the practical course Colloids, weighting 1 – passing re-quired
Frequency of the module	The module will be offered in the winter semester of every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WCH2
Module title	Polymer Materials
Responsible for the module	Professorship of Polymer Chemistry
Contents and qualification aims	Contents: The module substantiates knowledge about synthesis, structure and material properties of macromolecular substances and polymer hybrid materials. This knowledge is deepened by information about ring-opening polymerisation, controlled polymer synthesis on interfaces and surfaces, sol-gel processes, specialty polymers like polyelectrolytes, conductive pol-ymers, branched or cross-linked polymer structures, block copolymers, and the application of polymers for nano structuring and synthesis of hybrid materials and composites. Qualification aims: The students learn about the application of different synthesis types and methods of macromolecular chemistry for the prepara-tion of polymers with well-defined properties for specific uses. They will self-dependently be able to theoretically devise synthetics and polymer sub-stances for assimilated solutions and design pathways for their experi-mental realisation and analytics.
Types of courses	The module's types of courses are lecture, seminar, and practical course. • L: Polymer Materials (2 LH) • S: Polymer Materials (1 LH) • P: Polymer Materials (1 LH) The courses will be held in German.
Requirements for participa-tion	There will be safety instructions / an introduction to the practical course prior to the practical course itself. Attendance is obligatory (see "Allgemeine Laborordnung" – general laboratory rules – of the Institute of Chemistry).
Applicability of the module	---
Requirements for credit points to be awarded	Meeting the prerequisite for admission to the exam and successfully pass-ing the module exam are the requirements for earning credit points. The prerequisite for admission is the following pre-exam (may be repeated several times): • successfully audited practical course Polymer Materials
Module exam	The module exam comprises: • a 90-minute written exam about Polymer Materials
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the summer semester of every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WCH3
Module title	Materials Technology
Responsible for the module	Professorship of Chemical Technology
Contents and qualifica-tion aims	Contents: • basic knowledge about understanding technological materials and their surfaces • nomenclature of materials in technology • structure and property correlation • characterisation and testing of materials • survey / fields of application / stresses and strains / operating condi-tions • applications / use in laboratories, technical centres, chemical indus-try, apparatus construction, process technology Qualification aims: In this elective module, the students gain basic knowledge about metallic and non-metallic materials, about the corre-lation between structure and material properties, selection and applica-tion of materials, limitations of use, and about the influence of various treatments on the material properties and material surfaces.
Types of courses	The module's type of course is the lecture. • L: Materials Technology (2 LH) The course will be held in German.
Requirements for partic-ipation	none
Applicability of the module	The module will be offered for students without profound knowledge in chemistry.
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 90-minute written exam about Materials Technology
Credit points and grades	3 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the winter semester of every academic year.
Workload	The module comprises a student's total workload of 90 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one semester.

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Specialisation module

Module number	WCH4
Module title	Processes and Products of the Chemical Industry
Responsible for the module	Professorship of Chemical Technology
Contents and qualification aims	Contents: The module conveys an understanding of chemical, technical, economical, ecological, and social aspects in the chemical industry and follows production lines from raw material to product. The lecture's empha-sis will be on the chemical industry's raw material base and on basic chem-icals. During a seminar, the students will present selected applications and end-products whose pre-products are manufactured from basic chemicals by the chemical industry, e.g. superabsorbents (diapers), car finish, rubber (car tyres) or liquid crystals. Qualification aims: The students learn about economical correlations and aspects of application technology of the chemical industry. Innovative and creative thinking is promoted and puts the students in a position to apply themselves actively in future operating procedures and the development of new products.
Types of courses	The module's types of courses are lecture and seminar. • L: Processes and Products of the Chemical Industry (2 LH) • S: Processes and Products of the Chemical Industry (2 LH) The courses will be held in German.
Requirements for participa-tion	none
Applicability of the module	---
Requirements for credit points to be awarded	Meeting the prerequisite for admission to the exam and successfully pass-ing the module exam are the requirements for earning credit points. The prerequisite for admission is the following pre-exam (may be repeated several times): • a 20-minute presentation during the seminar Processes and Products of the Chemical Industry
Module exam	The module exam comprises: • a 90-minute written exam about Processes and Products of the Chemi-cal Industry
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the winter semester of every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WCH5
Module title	Practice of Electrochemical Materials Science
Responsible for the module	Professorship of Physical Chemistry/Electrochemistry
Contents and qualifica-tion aims	Contents: Lecture Electrochemical Materials Science • materials (basic materials, compounds, technological materials) in inorganic and organic chemistry and their electrochemical pro-cesses for synthesis and modification are introduced • electrochemical processes are compared with thermal and me-chanical processes Practical course Electrochemical Materials Science • synthesis and characterisation of conductive polymers • corrosion and protection against corrosion • galvanic surface modification Qualification aims: The students are enabled to properly assess and classify the economic significance and the potential for development of processes of electrochemical material production and treatment.
Types of courses	The module's types of courses are lecture and practical course. • L: Electrochemical Materials Science (2 LH) • P: Electrochemical Materials Science (2 LH) The courses will be held in German.
Requirements for partic-ipation	There will be safety instructions / an introduction to the practical course according to the Ordinance on Hazardous Substances prior to the practical course itself. Attendance is obligatory (see "Allgemeine Labo-rordnung" – general laboratory rules – of the Institute of Chemistry).
Applicability of the module	Master's and bachelor's programmes Mechanical Engineering, Phys-ics, Computational Science
Requirements for credit points to be awarded	Meeting the prerequisite for admission to the exam and successfully passing the module exam are the requirements for earning credit points. The prerequisite for admission is the following pre-exam (may be re-peated several times): • successfully audited practical course Electrochemical Materials Science
Module exam	The module exam comprises: • a 30-minute oral exam about Electrochemical Materials Science
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the winter semester of every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one semester.

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Specialisation module

Module number	WCH6
Module title	Functional Materials
Responsible for the module	Professorship of Coordination Chemistry
Contents and qualifica-tion aims	Contents: The module conveys knowledge about the synthesis, struc-ture, characterisation, and potential application of selected functional materials from various areas of inorganic chemistry and organic-inorganic hybrid materials. The materials discussed include, e.g., zeo-lites, coordination polymers and MOFs (Metal Organic Frameworks), inorganic polymers, porous metal oxides, SAMs (Self-assembled mon-olayers), metal-oxo clusters, and selected hybrid materials. Besides classic methods of synthesis like high-temperature synthesis of solids or synthesis via chemical transport reaction, production processes like, e.g., the hydrolytic and non-hydrolytic sol-gel process, the hydrother-mal process, the microwave assisted synthesis, and the MOCVD pro-cess (Metal Organic Vapor Deposition) will be treated. During the prac-tical work, selected methods of synthesis will be tested and the materi-als obtained will be characterised, using for example BET analysis, IR spectroscopy, DTA-TG, and X-ray diffraction. Qualification aims: The students are enabled to describe structural setup and function of inorganic materials and organic-inorganic hybrid materials. They command modern synthesis techniques and are able to apply these techniques to the preparation of new compounds. The students can interpret and evaluate the results of various methods for structural analysis of functional materials.
Types of courses	The module's types of courses are lecture and practical course. • L: Functional Materials (2 LH) • P: Functional Materials (2 LH) The courses will be held in German.
Requirements for partic-ipation	There will be safety instructions / an introduction to the practical course according to the Ordinance on Hazardous Substances prior to the practical course itself. Attendance is obligatory (see "Allgemeine Labo-rordnung" – general laboratory rules – of the Institute of Chemistry).
Applicability of the module	---
Requirements for credit points to be awarded	Meeting the prerequisite for admission to the exam and successfully passing the module exam are the requirements for earning credit points. The prerequisite for admission is the following pre-exam (may be re-peated several times): • successfully audited practical course Functional Materials
Module exam	The module exam comprises: • a 30-minute oral exam about Functional Materials

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Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the summer semester of every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one semester.

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Specialisation module

Module number	WCH7
Module title	Analytics of Surfaces and Colloids
Responsible for the module	Professorship of Physical Chemistry
Contents and qualifica-tion aims	Contents: • analytics of surfaces of condensed phases • analytics of interfaces between condensed phases • imaging interface analytics • colloid analytics Qualification aims: The students are enabled to answer to issues about analytics of surfaces and colloids by choosing and conducting appro-priate methods of analysis.
Types of courses	The module's type of course is the seminar. • S: Analytics of Surfaces and Colloids (2 LH) The course will be held in German.
Requirements for partic-ipation	none
Applicability of the module	for all master's programmes of the TU Chemnitz
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 90-minute written exam about Analytics of Surfaces and Colloids
Credit points and grades	3 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the winter semester of every other aca-demic year.
Workload	The module comprises a student's total workload of 90 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one semester.

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Specialisation module

Module number	WCH8
Module title	Practical Course Analytics of Surfaces and Colloids
Responsible for the module	Professorship of Physical Chemistry
Contents and qualifica-tion aims	Contents: • analytics of surfaces of condensed phases and of interfaces be-tween condensed phases • colloid analytics Qualification aims: The students are enabled to answer to issues about analytics of surfaces and colloids by choosing and conducting appro-priate methods of analysis.
Types of courses	The module's type of course is the practical course. • P: Analytics of Surfaces and Colloids (2 LH)
Requirements for partic-ipation	There will be safety instructions / an introduction to the practical course prior to the practical course itself. Attendance is obligatory (see "Allge-meine Laborordnung" – general laboratory rules – of the Institute of Chemistry).
Applicability of the module	for all master's programmes of the TU Chemnitz
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a report about the practical course Analytics of Surfaces and Col-loids (approx. 20 pages long)
Credit points and grades	3 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the winter semester of every other aca-demic year.
Workload	The module comprises a student's total workload of 90 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one semester.

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Specialisation module

Module number	WCH9
Module title	Spectroelectrochemistry
Responsible for the module	Professorship of Physical Chemistry/Electrochemistry
Contents and qualifica-tion aims	Contents: • possibilities and limitations of classic methods in electrochemistry • sensors and signals • ex situ techniques • in situ vibrational spectroscopies • optical spectroscopies • mass spectroscopy • Mössbauer spectroscopy Qualification aims: The students are enabled to choose and apply spectroscopic methods for electrochemical tasks and to critically eval-uate the obtained results.
Types of courses	The module's type of course is the lecture. • L: Spectroelectrochemistry (2 LH)
Requirements for partic-ipation	Basics of spectroscopic methods and structure determination (see, e.g. module BA-SS Spectroscopic Methods and Structure Determination of the bachelor's program Chemistry) are assumed to be known.
Applicability of the module	Bachelor's and master's programmes Mechanical Engineering, Phys-ics, Computational Science
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 30-minute oral exam about Spectroelectrochemistry
Credit points and grades	3 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the winter semester of every academic year.
Workload	The module comprises a student's total workload of 90 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one semester.

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Specialisation module

Module number	WCH10
Module title	Surface Spectroscopies
Responsible for the module	Professorship of Physical Chemistry/Electrochemistry
Contents and qualifica-tion aims	Contents: • on the borders of solid material: surface properties • terms and definitions • sensors and signals on surfaces • electron spectroscopies • vibrational spectroscopies • mass spectroscopy • Mössbauer spectroscopy Qualification aims: The students are enabled to choose and apply spectroscopic methods for tasks in surface science and to critically evaluate the obtained results.
Types of courses	The module's type of course is the lecture. • L: Surface Spectroscopies (2 LH)
Requirements for partic-ipation	Basics of spectroscopic methods and structure determination (see, e.g. module BA-SS Spectroscopic Methods and Structure Determination of the bachelor's program Chemistry) are assumed to be known.
Applicability of the module	Bachelor's and master's programmes Mechanical Engineering, Phys-ics, Computational Science
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 30-minute oral exam about Surface Spectroscopies
Credit points and grades	3 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the winter semester of every academic year.
Workload	The module comprises a student's total workload of 90 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one semester.

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Specialisation module

Module number	WCH11
Module title	Heterogeneous Catalysis
Responsible for the module	Professorship of Chemical Technology
Contents and qualifica-tion aims	Contents: During the lecture, heterogeneous catalysis in terms of a multiscale approach will be taught on all relevant scales: • energetic, steric, and electronic aspects of molecules' interaction with the surfaces of solids • microkinetics of heterogeneously catalysed reactions (Hougen-Watson rate equations) • heat and mass transport on the catalyst pellet (macrokinetics) • reactor modelling for heterogeneously catalysed processes • deactivation in heterogeneously catalysed processes • catalyst production The lecture's contents will be deepened and the theoretical basics ap-plied in the course of two practical experiments (ignition and quenching of catalysts, activity of heterogeneous catalysts). Qualification aims: The students acquire a basic understanding of het-erogeneous catalysis on all relevant scales (molecular scale, pellet, reactor). This basic understanding is a precondition for rational devel-opment of catalysts in the laboratory and the transfer of results to a technical reactor.
Types of courses	The module's types of courses are lecture and practical course. • L: Heterogeneous Catalysis (2 LH) • P: Heterogeneous Catalysis (2 LH) The courses will be held in German.
Requirements for partic-ipation	The contents of module WCH4 - Processes and Products of the Chem-ical Industry are assumed to be known. There will be safety instructions / an introduction to the practical course according to the Ordinance on Hazardous Substances prior to the practical course itself. Attendance is obligatory (see "Allgemeine Labo-rordnung" – general laboratory rules – of the Institute of Chemistry).
Applicability of the module	---
Requirements for credit points to be awarded	Meeting the prerequisite for admission to the exam and successfully passing the module exam are the requirements for earning credit points. The prerequisite for admission is the following pre-exam (may be re-peated several times): • successfully audited practical course Heterogeneous Catalysis
Module exam	The module exam comprises: • a 30-minute oral exam about Heterogeneous Catalysis
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the summer semester of every academic year.

Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one semester.

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Specialisation module

Module number	WCH12
Module title	Challenges for future energy concepts - Chemical energy conversion
Responsible for the module	Honorary Professorship of Computer Assisted Quantum Chemistry
Contents and qualification aims	Contents: During the lecture, the most important processes of chemical (and physical) energy conversion and storage will be treated: batteries, fuel cells, electrolysers, and solar cells. The topics of chemical basics of cataly-sis, electrocatalysis, and photocatalysis will also be considered. The focus is on the challenges concerning chemical aspects and materials science, but the economic and social context will also be referred to. Qualification aims: The students know fundamental principles and process-es of chemical energy conversion and storage. They understand the func-tionality and limitations of systems like fuel cells, batteries, or electrolysers, and have acquired an overview of economic and social aspects of energy conversion.
Types of courses	The module's types of courses are lecture and seminar. • L: Challenges for future energy concepts (2 LH) • S: Challenges for future energy concepts (1 LH)
Requirements for participa-tion	Basic knowledge of general, inorganic, and organic chemistry
Applicability of the module	---
Requirements for credit points to be awarded	Meeting the prerequisite for admission to the exam and successfully pass-ing the module exam are the requirements for earning credit points. The prerequisite for admission is the following pre-exam (may be repeated several times): • a 30-minute presentation during the seminar Challenges for future en-ergy concepts
Module exam	The module exam comprises: • a 15-minute oral exam about Challenges for future energy concepts
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WCH13
Module title	Crystallography
Responsible for the module	Professorship of Materials for Innovative Energy Concepts
Contents and qualification aims	Contents: Crystalline solids play an important role, in materials science as well as in application. This module imparts profound crystallographic knowledge to the students to enable them to work on materials-related is-sues. Furthermore, the crystallographic standard reference works and data bases will be introduced. The accompanying exercise course facilitates the consolidation of acquired knowledge using examples with practical rele-vance. Qualification aims: The students know how to use the standard reference works and can therefore work self-dependently on crystallographic issues. The exercise course instructs how to critically evaluate experimental re-sults, enabling the students to identify mistakes of their own.
Types of courses	The module's types of courses are lecture and exercise. • L: Crystallography (2 LH) • E: Crystallography (2 LH)
Requirements for participa-tion	none
Applicability of the module	**---**
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 90-minute written exam about Crystallography
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the winter semester of every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WCH14
Module title	The Energiewende
Responsible for the module	Professorship of Materials for Innovative Energy Concepts
Contents and qualification aims	Contents: The Energiewende, the transition from fossil fuels to renewable and sustainable energy sources, will present a central field of work for sci-entists and industry in the coming decades. The module demonstrates dif-ferent scenarios and evaluates them considering scientific, social, and eco-nomic aspects. The complexity of the transition is conveyed to the students and weak spots of the different scenarios are identified. In the accompany-ing seminar, the students develop new approaches for the various weak spots on the basis of current literature. By means of reproducing sustaina-ble energy economincs in the practical course, the complexity will be con-veyed in a practical way and new approaches can be directly put to the test. Qualification aims: Communicating the extensive facets of the Ener-giewende. Raising the students' awareness for existing weak spots to initi-ate a qualified discussion in society. Developing and testing new approach-es for the Energiewende by means of seminar and practical course.
Types of courses	The module's types of courses are lecture, seminar, and practical course. • L: The Energiewende (1 LH) • S: The Energiewende (1 LH) • P: The Energiewende (2 LH)
Requirements for participa-tion	none
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 30-minute presentation during the seminar The Energiewende
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the winter semester of every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WPH1
Module title	Nanophysics - Physics of mesoscopic systems
Responsible for the module	Professorship of Solid Surfaces Analysis
Contents and qualification aims	Contents: • introduction • preparation of nanostructures • some basics about physics of surfaces and interfaces • electronic states and charge transfer in nanostructures • optical effects on a nm-scale • magnetic effects on a nm-scale • outlook Qualification aims: Understanding the basic physical principles as well as fundamental effects on the nanoscale, i.e. in the transition zone between classical and quantum physics; acquisition of the ability for interdisciplinary communication in this area of expertise.
Types of courses	The module's types of courses are lecture and exercise. • L: Nanophysics - Physics of mesoscopic systems (2 LH) • E: Nanophysics - Physics of mesoscopic systems (1 LH)
Requirements for participa-tion	It is recommended to take the module in combination with the module Microscopy and analysis on the nano scale.
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 120-minute written exam about Nanophysics - Physics of mesoscopic systems
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WPH2
Module title	Microscopy and analysis on the nano scale
Responsible for the module	Professorship of Solid Surfaces Analysis
Contents and qualification aims	Contents: • introduction • microscopy in position space • diffraction techniques • spectroscopy of electronic and vibronic states • sample preparation • data and image processing • simulation processes • outlook Qualification aims: Understanding the functional principles and the physical background of modern microscopic and analytical methods and the corre-sponding pre- and post-processing techniques; based thereupon, develop-ing an understanding of the appropriate choice and combination of these methods.
Types of courses	The module's types of courses are lecture and exercise. • L: Microscopy and analysis on the nano scale (2 LH) • E: Microscopy and analysis on the nano scale (1 LH)
Requirements for participa-tion	none
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 120-minute written exam about Microscopy and analysis on the nano scale
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WPH3
Module title	Polymer Physics
Responsible for the module	Professorship of Chemical Physics
Contents and qualifica-tion aims	Contents: The lecture provides an introduction to the physics of poly-mers. The behaviour of single chains, collective behaviour (rubber elasticity, rheology), polymer solutions, polymer blends, block co-poymers, and semi-crystalline polymers will be treated. Experiments, characterisation methods, and theoretical models will be presented. Qualification aims: The students are enabled to describe the structural setup of polymers on different length scales and the resulting proper-ties. They command analytic methods and polymer models suitable for characterising and simulating macromolecules. The students obtain an understanding of structure formation in polymers.
Types of courses	The module's type of course is the lecture. • L: Polymer Physics (2 LH) The course will be held in German.
Requirements for partic-ipation	none
Applicability of the module	for all scientific-technological master's programmes
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 30-minute oral exam about Polymer Physics
Credit points and grades	3 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the summer semester of every other aca-demic year.
Workload	The module comprises a student's total workload of 90 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one semester.

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Specialisation module

Module number	WPH4
Module title	Modern Microscopy (AFM)
Responsible for the mod-ule	Professorship of Solid Surfaces Analysis
Contents and qualification aims	Contents: The module Modern Microscopy conveys a comprehensive and logically connected presentation of the module's topic. Qualification aims: • understanding of physical correlations • physical modelling • knowledge and understanding of characteristic approaches • ability for self-dependent work with scientific specialist literature
Types of courses	The module's types of courses are lecture and seminar. • L: Modern Microscopy (4 LH) • S: Modern Microscopy (2 LH) The courses will be held in German.
Requirements for partici-pation	The module may only be taken if module 5517 Modern Microscopy has not been taken during the bachelor's program Physics.
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 30-minute oral exam about the contents of the module Modern Microscopy
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will not be offered in every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over two semesters.

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Specialisation module

Module number	WPH5
Module title	Theoretical Solid State Physics
Responsible for the module	Dean of Studies Physics (BA, MA) of the Faculty of Natural Sciences
Contents and qualification aims	Contents: The module Theoretical Solid State Physics conveys a comprehensive and logically connected presentation of the module's topic. Qualification aims: • understanding of physical correlations • physical modelling • knowledge and understanding of characteristic approaches • ability for self-dependent work with scientific specialist literature
Types of courses	The module's types of courses are lecture and seminar. • L: Theoretical Solid State Physics I (2 LH) • S: Theoretical Solid State Physics I (1 LH) • L: Theoretical Solid State Physics II (2 LH) • S: Theoretical Solid State Physics II The (1 LH) courses will be held in German.
Requirements for participa-tion	none
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 15-minute oral exam about the contents of the module
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will not be offered in every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over two semesters.

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Specialisation module

Module number	WPH6
Module title	Experimental Physics – Complex Materials
Responsible for the mod-ule	Dean of Studies Physics (BA, MA) of the Faculty of Natural Sciences
Contents and qualification aims	Contents: Comprehensive and logically connected presentation of the basics of modern physics of complex materials. Based on experimental experience, physics of condensed matter will be broadened and applications concerning selected complex materials will be presented in an exemplary and comprehensible way from quali-tative observation to quantitative measurements to generalised math-ematical description. Qualification aims: • understanding of basic physical correlations in complex materials • ability to choose methods for the preparation, analysis, descrip-tion, and application of complex materials • ability for analytic, geometric, numeric abstraction and for model-ling
Types of courses	The module's types of courses are lecture and seminar. • L: Experimental physics – Complex Materials (5 LH) • S: Experimental physics – Complex Materials (3 LH) • S: Solution of experimental-physical problems (2 LH) The courses will be held in German.
Requirements for partici-pation	none
Applicability of the module	---
Requirements for credit points to be awarded	Meeting the prerequisite for admission to the exam and successfully passing the module exam are the requirements for earning credit points. The prerequisite for admission is the following pre-exam (may be re-peated several times): • a 30-minute presentation during the seminar about the contents of the module
Module exam	The module exam comprises: • a 30-minute oral exam about the contents of the module
Credit points and grades	10 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in every academic year.
Workload	The module comprises a student's total workload of 300 WH.
Duration of the module	Presuming a proper course of studies, the module extends over two semesters.

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Specialisation module

Module number	WMB1
Module title	Surface and Interface Engineering
Responsible for the module	Professorship of Surface Engineering/Functional Materials
Contents and qualification aims	Contents: The module's contents comprise surface- and coating technology and the formation of interfaces in hybrid composites, focussing on the un-derstanding of process-structure-property-relations. Knowledge about all relevant processes for the production of metallic, inor-ganic-nonmetallic, and organic layers or surface structures will be con-veyed. Strategies for a suitable formation of surfaces and interfaces are treated based on the complex profile of requirements regarding mechanical, tribo-logical, corrosive, and thermal exposure. Qualification aims: The students learn about the processes for the treat-ment and coating of surfaces and interfaces, as well as the necessary pre- and post-treatment processes. They are enabled to choose processes and coating systems according to the application.
Types of courses	The module's types of courses are lecture, seminar, and practical course. • L: Surface and Interface Engineering (2 LH) • S: Surface and Interface Engineering (1 LH) • P: Surface and Interface Engineering (1 LH)
Requirements for participa-tion	Basics of chemical bonding, atomic structure, periodic table of the ele-ments, structure of crystalline material, corrosion, and erosion
Applicability of the module	---
Requirements for credit points to be awarded	Meeting the prerequisite for admission to the exam and successfully pass-ing the module exam are the requirements for earning credit points. The prerequisite for admission is the following pre-exam (may be repeated several times): • a 20-minute presentation during the seminar
Module exam	The module exam comprises: • a 90-minute written exam about Surface and Interface Engineering
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the summer semester of every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WET1
Module title	Materials in micro and nano technologies
Responsible for the module	Professorship of Materials for Nanoelectronics
Contents and qualification aims	Contents: • general methodologies of nano technology: classification and produc-tion • general methodologies of nano technology: characterisation • inorganic nanostructures based on semi-conductors • nanomagnetic materials • preparation and properties of inorganic materials • electronic and electro-optic molecular materials • self-organising nanostructured materials • macromolecules on interfaces and structured organic layers • bio-nanotechnology Qualification aims: Understanding the basics and trends of modern meth-ods and technologies of micro- and nanomaterials.
Types of courses	The module's types of courses are lecture and exercise. • L: Materials in micro and nano technologies (2 LH) • E: Materials in micro and nano technologies (2 LH)
Requirements for participa-tion	none
Applicability of the module	---
Requirements for credit points to be awarded	Meeting the prerequisite for admission to the exam and successfully pass-ing the module exam are the requirements for earning credit points. The prerequisite for admission is the following pre-exam (may be repeated several times): • proof of exercises about Materials in micro and nano technologies Proof is provided if at least 50 percent of the exercises have been solved correctly.
Module exam	The module exam comprises: • a 120-minute written exam about Materials in micro and nano technologies
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the winter semester of every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WMB2
Module title	Printed Functionalities
Responsible for the module	Professorship of Digital Printing and Imaging Technology
Contents and qualification aims	Contents: The course is devised as a basics-oriented introduction to the technologies of printing and coating of flexible polymer films and selected fiber-based substrates. Starting with workflow and the basic technologies for the preparation of traditional printing products (depicting text and imag-es), specific further developments for future applications of printing beyond colour will be drafted and evolved. By means of exemplary printing applications in the areas of electronic cir-cuits, RF communication, flexible energy sources, microsystems technolo-gy, smart objects, leightweight engineering, and packaging technology, printing and imaging technology will be incorporated into the students' engi-neering toolbox as one of the key technologies for the development of the industry of printed, flexible, organic and large area electronics. Qualification aims: The students get to know printing technology as a ressource-friendly and therefore promising, additive manufacturing technol-ogy for applying liquid functional inks to flexible substrates in the electron-ics-, leightweight engineering-, and packaging industry.
Types of courses	The module's types of courses are lecture and practical course. • L: Printed Functionalities (2 LH) • P: Printed Functionalities (1 LH)
Requirements for participa-tion	none
Applicability of the module	---
Requirements for credit points to be awarded	Meeting the prerequisite for admission to the exam and successfully pass-ing the module exam are the requirements for earning credit points. The prerequisite for admission is the following pre-exam (may be repeated several times): • successfully audited practical course Printed Functionalities (amount 30 WH)
Module exam	The module exam comprises: • a 180-minute written exam about Printed Functionalities
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WMB3
Module title	Interface design for fibre-plastic composites
Responsible for the module	Professorship of Lightweight Structures / Polymer Technology
Contents and qualification aims	Contents: The module conveys basic knowledge about design of the fi-bre/ matrix interface which is crucial for quality and properties of the fibre-plastic composites. The students gain an overview of the physical and chemical properties of textile surfaces or matrix interfaces, of the possibili-ties for targeted activation, functionalisation, and modification of the outer material layer, and of material combinations and their compatibility. By means of examples, physical and chemical surface properties like surface energy and chemical structure will be experimentally determined. Qualification aims: In the module, the students will obtain basic knowledge from simple adhesion improvement up to the targeted interface design for fibre-plastic composites. The students are thus enabled to assess fi-bre/matrix adhesion and influence it specifically. Hence, the future gradu-ates can be employed in production processes as well as in research and development.
Types of courses	The module's types of courses are lecture, seminar, and practical course. • L: Interface design for fibre-plastic composites (2 LH) • S: Interface design for fibre-plastic composites (1 LH) • P: Interface design for fibre-plastic composites (1 LH) The courses will be held in German.
Requirements for participa-tion	none
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 60-minute written exam about Interface design for fibre-plastic com-posites
Credit points and grades	5 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the summer semester of every academic year.
Workload	The module comprises a student's total workload of 150 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WMB4
Module title	Electrochemical Coating
Responsible for the module	Professorship of Surface Engineering/Functional Materials
Contents and qualification aims	Contents: In this module, relevant topics of wet-chemical coating processes are addressed and comprehensively conveyed. Contents are: • Electrochemical basics • modelling of electrochemical processes • basics of the galvano technique • layer systems • coating technologies • electrochemical analytics • layer characterisation Qualification aims: The module's contents follow the one-semester lecture Surface- and Coating Technologies and go into more depth concerning industrially relevant coating processes. Involving company representatives from the coating industry during the exercise course creates a highly practi-cal relevance. The students learn about the most significant processes of pre- and post-treatment, as well as layer formation. They are thus enabled to choose layer systems considering the application and optimise process-es.
Types of courses	The module's types of courses are lecture and exercise. • L: Electrochemical Coating (1 LH) • E: Electrochemical Coating (1 LH) The courses will be held in German.
Requirements for participa-tion	Basic knowledge of materials engineering, surface/coating technology
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: a 30-minute oral exam about Electrochemical Coating
Credit points and grades	3 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the winter semester of every academic year.
Workload	The module comprises a student's total workload of 90 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WMB5
Module title	Innovative Materials Engineering
Responsible for the module	Professorship of Composite Materials
Contents and qualification aims	Contents: Multifaceted property profiles increasingly demand modern mate-rial composites and compounds including the rapid development of new manufacturing technologies, since a monolithic or single material cannot meet today's complex requirements anymore. Future material systems hold an economic key position and are of fundamental significance on growth markets. Tailor-made composites with adapted design are in demand. For this purpose, concepts for the ideal combination of components need to be developed. This asks for material-specific knowledge and the ability for correlation, as well as the organisation of complex technologies, not least with regard to continuous mass and line production (in-line, in-situ) and therefore to reducing the costs of to date expensive material composites and compounds. In the lecture, there will be a preliminary discussion of development and application of material composites and compounds and the relevance of these materials as tailor-made materials will be pointed out. The students will at first obtain an overview of the terminology. There will further be an introduction to production, properties, and application of reinforcing compo-nents in composite materials, like fibres, particles, CNTs, up to preforms. Materials engineering basics about particle and fibre reinforcement will be explained. Subsequently, the lecture will treat the properties and the appli-cation potential of polymer matrix, ceramic matrix, and metal matrix compo-sites and material compounds (composite constructions, hybrid com-pounds). The goal is the transfer of knowledge about the production of material com-posites and compounds for significant material combinations. Much empha-sis will be placed on the treatment of interfacial issues. Qualification aims: The module imparts the ability to handle the terminology of material composites and compounds. Furthermore, the students obtain knowledge to reliably evaluate properties and application potential of poly-mer matrix, ceramic matrix, and metal matrix composites, as well as com-posite constructions and hybrid compounds. The specific relevance of inter-face and structure-property correlation will be established. The students are equally able to assess and apply production processes and test procedures correctly regarding the possibilities and limitations of these materials.
Types of courses	The module's types of courses are lecture and practical course. • L: Innovative Materials Engineering (2 LH) • P: Innovative Materials Engineering (1 LH)
Requirements for participa-tion	Basics of materials engineering
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 120-minute written exam about Innovative Materials Engineering

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Credit points and grades	4 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the summer semester of every academic year.
Workload	The module comprises a student's total workload of 120 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one semester.

Specialisation module

Module number	WMB6
Module title	Rheology of Polymers
Responsible for the module	Professorship of Lightweight Structures / Polymer Technology
Contents and qualification aims	Contents: The lecture imparts basics about the rheological behaviour of thermoplastic and cross-linked polymers. To start with, rheological phe-nomena and physical parameters will be introduced. Building on that, the basic rheological bodies and the corresponding principles and flow rules will be treated. An integral part is the measuring of rheological parameters us-ing rotational, vibrational, capillary, and extensional rheometers. These will first be introduced concerning their set-up and measuring principle and the basis of calculation needed for determining the parameters will be devel-oped. It will be shown how the measured data are corrected and reasonably described for unknown flow rules. Finally, the material structure of poly-mers, emulsions, and suspensions will be addressed and their processing behaviour discussed. Qualification aims: Participants of this lecture will learn about the practical application of rheometry and the necessary rheological basics of polymers. They are then able to experimentally determine and apply the rheological parameters required for the processing of thermoplasts and thermosets. The students obtain methodological tools for analysing and controlling the flow and deformation behaviour of polymer melts in the application of measuring devices and plastics processing machines.
Types of courses	The module's type of course is the lecture. • L: Rheology of Polymers (2 LH) The course will be held in German.
Requirements for participa-tion	none
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 90-minute written exam about Rheology of Polymers
Credit points and grades	4 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the winter semester of every academic year.
Workload	The module comprises a student's total workload of 120 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WMB7
Module title	Biomaterials and materials for medical technology
Responsible for the module	Professorship of Materials Engineering
Contents and qualification aims	Contents: In this module, basics about materials with primary fields of appli-cation in medical technology – being of use as well in the human body as in apparatuses of medical technology – are systematically taught from a mate-rials engineering point of view. Metallic materials, polymers, glasses and ceramics, composite materials, and foams are considered according to their technical relevance. The complex hierarchic structure and the special prop-erties of biomaterials are compared with conventional materials. Qualification aims: The students obtain a comprehensive overview of the classes of materials applicable in medical technology, of surface aspects, and typical problematic practical areas like biocompatibility. They get to know test procedures and (structure) analysis methods. The students are enabled to choose materials for applications in medical technology and critically evaluate properties and fields of application.
Types of courses	The module's types of courses are lecture and exercise. • L: Biomaterials and materials for medical technology (2 LH) • E: Biomaterials and materials for medical technology (1 LH) The module will be offered as a block course. The courses will be held in German.
Requirements for participa-tion	Basics about chemical bonding, microstructure and material engineering, physics, chemistry
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 120-minute written exam about Biomaterials and materials for medi-cal technology
Credit points and grades	4 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the summer semester of every academic year.
Workload	The module comprises a student's total workload of 120 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WMB8
Module title	Materials Engineering – Structure Formation Processes
Responsible for the module	Professorship of Materials Engineering
Contents and qualification aims	Contents: The module Materials Engineering – Structure Formation Pro-cesses deals with the theoretical basics of processes in materials for engi-neering, which determine the formation of microstructures. Thermodynamic and kinetic processes that enable a theoretical understanding of phase dia-grams, diffusion processes, and lattice defects in crystalline materials will be decribed. Furthermore, solidification of melts, precipitation processes, phase transitions, and reactions on inner and outer interfaces will be discussed. The outlines of the complex correlations between processing, structure, and the resulting properties will be shown. A detailed treatment of these contents will take place in the additionally eligible module Materials Engineering –Mechanical Properties. Qualification aims: The module enables the students to understand the complex processes of structure formation in simple model systems up to the materials technological production of modern engineering materials and to put them into context with relevant properties. Fundamental skills for the scientific and technological analysis of materials-related problems and for the optimisation of materials for engineering will be conveyed.
Types of courses	The module's type of course is the lecture. • L: Materials Engineering – Structure Formation Processes (2 LH) The course will be held in German.
Requirements for participa-tion	Basic knowledge about material technologies, technical physics, higher mathematics I and II
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: • a 120-minute written exam about Materials Engineering – Structure Formation Processes
Credit points and grades	3 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in the summer semester of every academic year.
Workload	The module comprises a student's total workload of 90 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one semes-ter.

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Specialisation module

Module number	WS3
Module title	English in study-related and professional conversation I (Level B2)
Responsible for the module	Head of Department English at the Foreign Language Centre
Contents and qualification aims	Contents: Extension of linguistic knowledge and skills regarding study- and profession-related issues and situations, imparting significant differences of oral and written communication (text types, appropriate register), composi-tion of application documents; The training follows the language competence level C1 of the Common European Framework of Reference for Languages (CEFR) and contains a component of technical terminology. Qualification aims: Confidence in handling typical situations of academic everyday life (introducing persons and fields of work, naming and describ-ing academic structures, etc.) and further development of reading and lis-tening strategies; The completion of the module corresponds to the language competence level C1 of the Common European Framework of Reference for Languages (CEFR) with a focus on technical terminology.
Types of courses	The module's type of course is the exercise. • E: Course 1 Study-related standard situations (4 LH)
Requirements for participa-tion	• previous knowledge in English, generally A-level standard • placement test (recommendation of qualification)
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: Creditable course achievement: • a 120-minute written exam about Course 1 The exam needs to be graded with at least "sufficient" in order to be credit-ed.
Credit points and grades	4 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in every semester.
Workload	The module comprises a student's total workload of 120 WH. (60 hours of contact and 60 hours of self-study)
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WS4
Module title	English in study-related and professional conversation III (Level C1)
Responsible for the module	Head of Department English at the Foreign Language Centre
Contents and qualification aims	Contents: Consolidation of technical terminology in selected areas and systematic extension of general vocabulary regarding study- and profes-sion-related as well as intercultural issues, conduction of consultations and discussions, giving talks; The training follows the language competence level C1 of the Common European Framework of Reference for Languages (CEFR) and contains a component of technical terminology. Qualification aims: Confidence in the oral and written exchange of infor-mation and in the oral and written expression, confidence in presenta-tions, acquisition of intercultural skills; The completion of the module corresponds to the language competence level C1 of the Common European Framework of Reference for Lan-guages (CEFR) with a focus on technical terminology.
Types of courses	The module's type of course is the exercise. • E: Course 3 Advanced English in job-related situations (4 LH)
Requirements for participa-tion	• completed module English in study-related and professional conver-sation II (Level B2) or placement test (recommendation of qualifica-tion)
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises two parts. In detail, the following exams have to be taken: Creditable course achievements: • a 120-minute written exam about Course 3 • a 30-minute oral exam (presentation) about Course 3 The respective exams need to be graded with at least "sufficient" in or-der to be credited.
Credit points and grades	4 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations. Creditable course achievements: • Written exam about Course 3, weighting 4 (3 CP) • Oral exam about course 3, weighting 1 (1 CP)
Frequency of the module	The module will be offered in every semester.
Workload	The module comprises a student's total workload of 120 WH. (60 hours of contact and 60 hours of self-study).
Duration of the module	Presuming a proper course of studies, the module extends over one semester.

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Specialisation module

Module number	WS5
Module title	German as a Foreign Language III (Level B1)
Responsible for the module	Head of Department German as a Foreign Language at the Foreign Lan-guage Centre
Contents and qualifica-tion aims	Contents: • exercises for the extension of vocabulary and the improvement of speaking skills • communicative situations and assignments about topics like time and waste of time, free time, daily routine, studies, job and profession, modern media • repetition and consolidation of basic grammar and imparting of further grammatical structures, e.g. passive, subordinate clauses The training follows the language competence level B1 of the Common European Framework of Reference for Languages (CEFR). Qualification aims: • improvement of speaking skills, simple and coherent comments about familiar areas • relating experiences and incidences, describing goals and plans, stat-ing reasons and giving explanations • communication by simple linguistic means • understanding and composing texts about everyday topics The completion of the module corresponds to the language competence level B1 of the Common European Framework of Reference for Lan-guages (CEFR).
Types of courses	The module's type of course is the exercise. • E: Course 3 (4 LH)
Requirements for par-ticipation	Completed previous Course 2 or placement test (recommendation of quali-fication)
Applicability of the module	---
Requirements for cred-it points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: Creditable course achievement: • a 90-minute written exam about Course 3 The exam needs to be graded with at least "sufficient" in order to be cred-ited.
Credit points and grades	4 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the mod-ule	The module will be offered in every semester.
Workload	The module comprises a student's total workload of 120 WH. (60 hours of contact and 60 hours of self-study).

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Duration of the module	Presuming a proper course of studies, the module extends over one semester.

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Specialisation module

Module number	WS6
Module title	German as a Foreign Language IV (Level B2)
Responsible for the module	Head of Department German as a Foreign Language at the Foreign Lan-guage Centre
Contents and qualifica-tion aims	Contents: • practising all language skills, like listening, speaking, reading, writing, by means of numerous general-language topics, e.g. travel, holiday, living abroad, education, intercultural relations, as well as study- and profession-related issues and situations • consolidation and extension of grammatical structures with the help of exercises about nominal structures and subordinate clauses, passive constructions, present subjunctive and past subjunctive • composition of application documents The training follows the language competence level B2 of the Common European Framework of Reference for Languages (CEFR). Qualification aims: • understanding the main content of complex texts about concrete and abstract topics • spontaneous and fluent communication • precise and detailed comments over a broad spectrum of topics • defining one's position on current issues The completion of the module corresponds to the language competence level B2 of the Common European Framework of Reference for Lan-guages (CEFR).
Types of courses	The module's type of course is the exercise. • E: Course 4 (4 LH)
Requirements for par-ticipation	Completed previous Course 3 or placement test (recommendation of qualification)
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: Creditable course achievement: • a 90-minute written exam about Course 4 The exam needs to be graded with at least "sufficient" in order to be cred-ited.
Credit points and grades	4 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will be offered in every semester.
Workload	The module comprises a student's total workload of 120 WH. (60 hours of contact and 60 hours of self-study).

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Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Specialisation module

Module number	WS7
Module title	German as a Foreign Language – Specialised Communication I (Level C1)
Responsible for the module	Head of Department German as a Foreign Language at the Foreign Lan-guage Centre
Contents and qualification aims	Contents: • focus on conveying models of word formation and on extending and consolidating technical terminology in the context of selected interdisci-plinary topics • Overview of the morphology of the target language concerning study- and profession-related situations The training follows the language competence level C1 of the Common European Framework of Reference for Languages (CEFR) and contains a component of technical terminology. Qualification aims: • coping linguistically with study- and profession-related situations • confidence in the oral and written use of technical terminology • ability to analyse and interpret country- and culture-specific circum-stances The completion of the module corresponds to the language competence level C1 of the Common European Framework of Reference for Languages (CEFR) with a focus on technical terminology.
Types of courses	The module's type of course is the exercise. • E: Specialised Communication I (4 LH)•
Requirements for participa-tion	Proof of level B2 of the Common European Framework of Reference for Languages (CEFR) or placement test (recommendation of qualification)
Applicability of the module	---
Requirements for credit points to be awarded	Successfully passing the module exam is the requirement for earning credit points.
Module exam	The module exam comprises: Creditable course achievement: • a 90-minute written exam about Specialised Communication I The exam needs to be graded with at least "sufficient" in order to be credit-ed.
Credit points and grades	4 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations.
Frequency of the module	The module will in general be offered in every semester.
Workload	The module comprises a student's total workload of 120 WH. (60 hours of contact and 60 hours of self-study).
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.

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Module Master's Thesis

Module number	AFM3
Module title	Master's Thesis
Responsible for the module	Dean of Studies Advanced Functional Materials of the Faculty of Natural Sciences
Contents and qualifica-tion aims	Contents: • self-dependent work on a given topic from the area of "Advanced Functional Materials" • developing a strategic concept for organising a scientific project • literature research • critical discussion of experimental results • composition of a scientific report in written form (master's thesis) Qualification aims: The students learn to work self-dependently on a sci-entific topic taking into account the current state-of-the-art, to complete a scientific task in their area of specialisation within a given time, to develop and realise ideas of their own. They are enabled to communicate, dis-cuss, and publish the obtained results in accordance with scientific con-ventions.
Types of courses	The module's type of course is the project. • PR: (30 LH)
Requirements for partic-ipation	80 credit points from the curriculum of the master's degree program Advanced Functional Materials must have been earned. There will be safety instructions / an introduction course according to the Ordinance on Hazardous Substances prior to laboratory work. Attend-ance is obligatory.
Applicability of the module	---
Requirements for credit points to be awarded	Meeting the prerequisite for admission to the single exams and success-fully passing the module exams are the requirements for earning credit points. The prerequisite for admission is: • 80 credit points from the curriculum of the master's degree program Advanced Functional Materials must have been earned

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Module exam	The module exam comprises two parts. In detail, the following exams have to be taken: • master's thesis (approx. 80 pages long, duration 23 weeks) • a 20-minute presentation of the master's thesis with subsequent scientific discussion (colloquium)
Credit points and grades	30 credit points are awarded for the module. Evaluation of the exam and formation of the module grade are laid down in § 10 of the examination regulations. Examinations: • master's thesis, weighting 3 - passing required • presentation of the master's thesis with subsequent scientific discussion (colloquium), weighting 1 - passing required
Frequency of the module	The module will be offered in every semester.
Workload	The module comprises a student's total workload of 900 WH.
Duration of the module	Presuming a proper course of studies, the module extends over one se-mester.