UNIVERSITÄT KOBLENZ · LANDAU

Modulhandbuch

für den Studiengang

Master of Science (M.Sc.)

Applied Natural Sciences

Versionsnummer: 20193
Valid from WiSe 2020/21

am Campus

Koblenz

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UNIVERSITÄT KOBLENZ · LANDAU

Studiengangsbeschreibung:

Master Program "Applied Natural Sciences”

1. Contact persons for individual sections of the Master program

Applied Natural Sciences: Prof. Dr. S. Rathgeber

Chemistry: Prof. Dr. J. Scholz

Biology: Prof. Dr. E. Fischer

Physics: Prof. Dr. S. Rathgeber

2. Modules of the Master program

Compulsory Modules: 03XX2403; 03XX2404

Optional Compulsory Section: all "Advanced Modules"

It is strongly recommended to inform oneself about the actual opportunities already in the firstsemester of the Master program.

Some optional compulsory modules are taught in German exclusively, while all compulsorymodules are taught in English.

In agreement with the subject-specific study counseling, students may choose up to three already accredited modules from other study programs. The participation and examination in these is done in accordance with the examination regulations of the other study programs.

An entitlement to an offer of a specific module or participation in a specific module outside of these examination regulations does not exist.

3. Course Guide Master Program (M.Sc.) „Applied Natural Sciences” for students starting in the summer semester

The following course plan allows compliance with the standard period of study, as the compulsory modules planned for each semester are coordinated by the examination board

without any overlap. Variable are the times of the internship (possible in each semester break) and the elective modules.

Semester	Kennnummer	Modul	LP
1 (SS)	03XX2403	Recent topics in Applied Natural Sciences (Part 1)	3
1 (SS)		Advanced Modules	24-42
1 (SS)		Free elective modules up to 3 modules from other accredited degree programms	0-18
1 (SS)	03XX2404	Projektarbeit (Resarch Project) (Part 1)	
		total	**30**
2 (WS)	03XX2403	Recent topics in Applied Natural Sciences (Part 2)	3
2 (WS)		Advanced Modules	24-42
2 (WS)		Free elective modules up to 3 modules from other accredited degree programms	0-18
2 (WS)		Projektarbeit (Resarch Project) (Part 2)	12
		total	**30**
3 (SS)	03XX2490	Master thesis	25
3 (SS)	03XX2499	Final oral exam	5
		total	**30**
		Overall total	**90**

In the following sections all modules and the included courses are listed together with the maximum number of credit points attainable for each module of the master program.

The number of credit points per module sums up the students' workload, contact time and private studies following the formula 1 LP = 30 h.

Since the workload of the students varies in different teaching forms in terms of preparation and training/reworking, no fix factor between credit points (LP) and contact time (SWS) is possible. The listed contact time is converted in time following the estimate 1 SWS = 15 h.

In this master program a minimum workload of 33 SWS of pure contact time (thereby 5 SWS in compulsory modules and 28 SWS in elective modules) do provide 90 LP. In addition 30 LP are given for the master thesis.

Depending on the module, the certificates of achievement for the individual courses can be provided by final module examinations or partial module examinations in the form of written exams, oral examinations or study papers (for details see examination regulations). The type of module examination is defined in this module manual. The form of the module examination is described in the module manual and its date will be announced at the beginning of the first course of the module. Students are required to take their first attempt either directly after completing the course or before the start of the next semester. A failed examination can be repeated twice. If the second repetition is not rated at least as "adequate" (4.0), the academic performance is finally considered as not fulfilled; a renewed repetition of the same study performance is usually excluded. If this happens with a compulsory module, the degree can no longer be achieved.

The headers of the following module descriptions contain information on the type and title of the module, the credit points to be earned (LP), the number of semester hours per week (SWS), the workload in hours (hours) and the course duration. The courses are differentiated according to lectures (V), laboratory exercises (LÜ), internships (P) and seminars (S). Section 2 describes the expected learning outcomes as well as the subject-related competences that students should acquire by the end of their studies, each module contributing in a specific way to their acquisition. Section 3 "Contents" contains a brief description of the main subjects of the courses. Further details on frequency, prerequisites for participation, forms of examination, the language of instruction, literature, participating teaching units as well as those responsible for the module follow.

Participation in compulsory modules does not require any content-related prerequisites beyond the knowledge acquired in the bachelor's program, while some compulsory elective modules require the successful completion of other modules or the otherwise proven necessary knowledge.

The modules are abbreviated according to the following pattern into a module code:

- The first two characters are the numbers of the faculty: „03” Faculty 3: Mathematics / Science and „04” Faculty 4: Computational Science.
- The next two characters indicate the institute in charge for this Module: „MA” Mathematical Institute, „PH” Department of Physics, „BI” Department of Biology”, „CH” Department of Chemistry”; for soft skills as well as the thesis „XX” is used instead.
- The fifth character shows, if the module was initially built for a bachelor program („1”) or a master program („2”).

- The last three characters are given by the teaching unit in charge.

UNIVERSITÄT KOBLENZ · LANDAU

Modulbeschreibung Applied Natural Sciences

Inhaltsverzeichnis

Pflichtbereich (compulsory modules)

Masterstudiengang Applied Natural Sciences (90 LP)

Pflichtmodule (Compulsory modules) (48 LP inkl. Research Project, Master Thesis und Oral Final Exam)

<table>
<tr><td colspan="10">Modul 01 Recent topics in Applied Natural Sciences
03XX2403
6 Leistungspunkte
Pflichtmodul</td></tr>
<tr><td colspan="4">Workload
180 Std.</td><td colspan="3">Studiensemester
1. Semester (empfohlen)</td><td colspan="3">Dauer
2 Semester</td></tr>
<tr><td rowspan="2">1</td><td colspan="9">Lehrveranstaltungen</td></tr>
<tr><td>1.1</td><td>S</td><td colspan="2">Recent topics in Applied Natural Sciences</td><td>3924031</td><td>k.A.</td><td>4 SWS
60 Std.</td><td>120 Std.</td><td>30</td><td>6</td></tr>
<tr><td>2</td><td colspan="9">Lernergebnisse / Kompetenzen

3924031 - Recent topics in Applied Natural Sciences (S)

The students

• can collect, understand, assess and present information extracted from current publications in English
• are capable of participating in scientific discussions in English</td></tr>
<tr><td>3</td><td colspan="9">Inhalte

3924031 - Recent topics in Applied Natural Sciences (S)

Current topics from lecture and research eg:

• Metallic materials
• Ceramics
• Glass
• Plastic materials
• Surfaces</td></tr>
<tr><td>4</td><td colspan="9">Häufigkeit des Angebots
jedes Semester

3924031 - Recent topics in Applied Natural Sciences (S)
jedes Semester</td></tr>
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3924031 - Recent topics in Applied Natural Sciences (S)
Englisch</td></tr>
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Keine</td></tr>
<tr><td>7</td><td colspan="9">Prüfungsformen
Modulprüfung Recent topics in Applied Natural Sciences als

Coursework in the form of a presentation.</td></tr>
</table>

	(schriftlich - 2 Wo.) **3924031 - Recent topics in Applied Natural Sciences (S)** Studienleistung: Participation in at least 8 seminar lectures. (praktisch - 2 Sem.)
8	**Voraussetzungen für die Vergabe von Leistungspunkten** Passing the module examination. **3924031 - Recent topics in Applied Natural Sciences (S)** Proof of participation in at least 8 seminar lectures.
9	**Stellenwert der Endnote** 6/90 vom Studiengang
10	**Modulbeauftragte/r** Frau Prof. Dr. Silke Rathgeber
11	**Verantwortliche Einrichtung** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik **3924031 - Recent topics in Applied Natural Sciences (S)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik
12	**Literatur** Wird in den betreffenden Veranstaltungen bekannt gegeben
13	**Verwendung in Studiengang** M.Sc. Applied Natural Sciences (20193)
14	**Sonstige Informationen**

Modul 02 **Research Project** 12 Leistungspunkte
03XX2404 Pflichtmodul

Optional compulsory courses:
Two of the following compulsory courses have to be chosen. Ether the two courses 3324041 and 3324026 or the two courses 3524041 and 3524026.

Workload	**Studiensemester**	**Dauer**
360 Std.	1. Semester (empfohlen)	2 Semester

1 **Lehrveranstaltungen**

				Pflicht/ Wahl-pflicht	**Kontakt-zeit**	**Selbst-studium**	**Geplante Gruppen-größe**	**LP**
2.1	Pro	Research Project Chemistry	3324041	Wahl-pflicht	0 SWS 0 Std.	330 Std.	1	11
2.2	S	Seminar	3324026	Wahl-pflicht	1 SWS 15 Std.	15 Std.	5	1
2.3	Pro	Research Project Physics	3524043	Wahl-pflicht	0 SWS 0 Std.	330 Std.	1	11
2.4	S	Seminar	3524026	Wahl-pflicht	1 SWS 15 Std.	15 Std.	5	1

2 **Lernergebnisse / Kompetenzen**

3324041 - Research Project Chemistry (Pro)

The students

- have the ability to work herself/himself into a scientific field in a given time under professional guidance;
- they are able to reflect and classify the results into the status of knowledge and can document the resultsin English;
- are able to achieve, adapt and apply scientific results;
- improve their communication abilities and other social competences by means of teamwork, groupdiscussions and presentations.

3324026 - Seminar (S)

The students

- vave the ability to work herself/himself into a scientific field in a given time under professional guidance.
- they are able to reflect and classify the results into the status of knowledge and can document the results in English.

3524043 - Research Project Physics (Pro)

The students

- have the ability to work herself/himself into a scientific field in a given time under professional guidance;
- they are able to reflect and classify the results into the status of knowledge and can document the resultsin English;
- are able to achieve, adapt and apply scientific results;
- improve their communication abilities and other social competences by means of teamwork, groupdiscussions and presentations.

	3524026 - Seminar (S) The students • vave the ability to work herself/himself into a scientific field in a given time under professional guidance. • they are able to reflect and classify the results into the status of knowledge and can document the results in English.
3	**Inhalte** **3324041 - Research Project Chemistry (Pro)** • Knowing about scientific methods for acquiring, assessing and presenting knowledge • The project seminar offers insight into scientific work • Awareness of relevant questions of the subject • Awareness of relevant publications of the subject **3324026 - Seminar (S)** • Knowing about scientific methods for acquiring, assessing and presenting knowledge • The project seminar offers insight into scientific work. • Awareness of relevant questions of the subject • Awareness of relevant publications of the subject **3524043 - Research Project Physics (Pro)** • Knowing about scientific methods for acquiring, assessing and presenting knowledge • The project seminar offers insight into scientific work • Awareness of relevant questions of the subject • Awareness of relevant publications of the subject **3524026 - Seminar (S)** • Knowing about scientific methods for acquiring, assessing and presenting knowledge • The project seminar offers insight into scientific work. • Awareness of relevant questions of the subject • Awareness of relevant publications of the subject
4	**Häufigkeit des Angebots** jedes Semester **3324041 - Research Project Chemistry (Pro)** jedes Semester **3324026 - Seminar (S)** jedes Semester **3524043 - Research Project Physics (Pro)** jedes Semester **3524026 - Seminar (S)** jedes Semester
5	**Lehrsprache** **3324041 - Research Project Chemistry (Pro)** Englisch **3324026 - Seminar (S)** Englisch

	3524043 - Research Project Physics (Pro) Englisch **3524026 - Seminar (S)** Englisch
6	**Teilnahmevoraussetzungen** Keine
7	**Prüfungsformen** Modulprüfung Research Project als Seminar lecture (mündlich - 20 Min.)
8	**Voraussetzungen für die Vergabe von Leistungspunkten** **3324041 - Research Project Chemistry (Pro)** Passing the module examamination.
9	**Stellenwert der Endnote** 12/90 vom Studiengang
10	**Modulbeauftragte/r** Frau Prof. Dr. Silke Rathgeber
11	**Verantwortliche Einrichtung** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik **3324041 - Research Project Chemistry (Pro)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie **3324026 - Seminar (S)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie **3524043 - Research Project Physics (Pro)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik **3524026 - Seminar (S)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik
12	**Literatur** Wird in den betreffenden Veranstaltungen bekannt gegeben
13	**Verwendung in Studiengang** M.Sc. Applied Natural Sciences (20193)
14	**Sonstige Informationen** The project work can be carried out in all areas of "Advanced Modules", but also in industry or external research institutes, as long as a supervisor or supervisor takes over the supervision.

Wahlpflichtbereich (elective modules)

Wahlpflichtbereich (elective modules) (42 LP, 28 SWS)

Hiervon müssen grundlegend Module im Umfang von mindestens 12 SWS aus den Bereichen Chemie und/ oder Physik gewählt werden. Ferner müssen Module im Umfang von mindestens 8 SWS aus den Bereichen Chemie, Physik und/oder BioGeoWissenschaften gewählt werden. Die Wahlpflichtmodule umfassen im Bereich BioGeo-Wissenschaften die Module 03BI2330, 03BI2337 und 03GE2331, im Bereich Chemie die Module 03CH2401,03CH2402 und 03CH2408 und im Bereich Physik die Module 03PH2403, 03PH2501, 03PH2503, 03PH2504 und 03PH2505. In den gewählten Wahlpflichtbereichen sind Module zu wählen, deren Inhalte nicht im Bachelorstudiengang „Angewandte Naturwissenschaften" bereits einmal eingebracht wurden. In Absprache mit der fachlichen Studienberatung können Module im Umfang von maximal 8 SWS durch bis zu vierakkreditierte Module aus anderen Studiengängen eingebracht werden. Die Teilnahme und Prüfung in diesen erfolgt nach Maßgabe der Prüfungsordnungen der anderen Studiengänge. Ein Anspruch auf ein Angebot eines bestimmten Moduls oder Teilnahme an einem bestimmten Modul außerhalb dieser Prüfungsordnung besteht nicht.

<table>
<tr><td colspan="10">Modul 03 03PH2501 Solid State Physics 6 Leistungspunkte Wahlpflichtmodul</td></tr>
<tr><td colspan="3">Workload
180 Std.</td><td colspan="4">Studiensemester
2. Semester (empfohlen)</td><td colspan="3">Dauer
1 Semester</td></tr>
<tr><td>1</td><td colspan="5">Lehrveranstaltungen</td><td>Pflicht/ Wahl-pflicht</td><td>Kontakt-zeit</td><td>Selbst-studium</td><td>Geplante Gruppen-größe</td><td>LP</td></tr>
<tr><td></td><td>3.1</td><td>V</td><td colspan="2">Solid State Physics</td><td>3525011</td><td>Pflicht</td><td>3 SWS 45 Std.</td><td>75 Std.</td><td>40</td><td>4</td></tr>
<tr><td></td><td>3.2</td><td>Ü</td><td colspan="2">Solid State Physics</td><td>3525012</td><td>Pflicht</td><td>1 SWS 15 Std.</td><td>45 Std.</td><td>40</td><td>2</td></tr>
<tr><td>2</td><td colspan="9">Lernergebnisse / Kompetenzen

3525011 - Solid State Physics (V)

The students

• know basic ideas, fundamental experiments and methods of solid state physics
• understand macroscopic material properties on the basis of microscopic interactions
• are able to describe different kinds of matter mathematically and can predict material properties, both electronic and thermal, in solids.
• become familiar with the language of condensed matter and key theories and concepts.

3525012 - Solid State Physics (Ü)

The students

• broaden their analytical and problem-solving skills.
• are able to acquire, adapt and apply current research results.</td></tr>
<tr><td>3</td><td colspan="9">Inhalte

3525011 - Solid State Physics (V)
• crystal structure
• binding mechanisms
• mechanical, thermal and electronic properties
• semi-conductors</td></tr>
</table>

	3525012 - Solid State Physics (Ü) • crystal structure • binding mechanisms • mechanical, thermal and electronic properties • semi-conductors
4	**Häufigkeit des Angebots** nur im Sommersemester **3525011 - Solid State Physics (V)** nur im Sommersemester **3525012 - Solid State Physics (Ü)** nur im Sommersemester
5	**Lehrsprache** **3525011 - Solid State Physics (V)** Englisch **3525012 - Solid State Physics (Ü)** Englisch
6	**Teilnahmevoraussetzungen** Keine
7	**Prüfungsformen** Modulprüfung Solid State Physics als Klausur (schriftlich - 90 Min.)
8	**Voraussetzungen für die Vergabe von Leistungspunkten** Bestehen der Modulprüfung
9	**Stellenwert der Endnote** 6/90 vom Studiengang
10	**Modulbeauftragte/r** Herr Dr. Christian Fischer
11	**Verantwortliche Einrichtung** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik **3525011 - Solid State Physics (V)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik **3525012 - Solid State Physics (Ü)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik
12	**Literatur** Wird in den betreffenden Veranstaltungen bekannt gegeben
13	**Verwendung in Studiengang** M.Sc. Mathematical Modeling of Complex Systems (20142) M.Sc. Mathematical Modeling of Complex Systems (20142) M.Sc. Chemie und Physik funktionaler Materialien / Chemistry and Physics of functional Materials (20145)

	M.Sc. Mathematical Modeling of Complex Systems (20142) M.Eng. Applied Physics (91) M.Sc. Mathematical Modeling of Complex Systems (20184) M.Sc. Chemie und Physik funktionaler Materialien / Chemistry and Physics of functional Materials (20183) M.Sc. Mathematical Modeling, Simulation and Optimization (20194) M.Sc. Applied Natural Sciences (20193)
14	**Sonstige Informationen**

Modul 04 03CH2401	**Modern concepts of Inorganic Chemistry**								6 Leistungspunkte Wahlpflichtmodul
Workload 180 Std.			**Studiensemester** 1. Semester (empfohlen)				**Dauer** 1 Semester		
1	**Lehrveranstaltungen**				**Pflicht/ Wahl-pflicht**	**Kontakt-zeit**	**Selbst-studium**	**Geplante Gruppen-größe**	**LP**
	4.1	V	Modern concepts of inorganic molecular chemistry (AC IV)	3324011	Pflicht	2 SWS 30 Std.	60 Std.	30	3
	4.2	LÜ	Experimental Exercises (AC IV)	3324012	Pflicht	2 SWS 30 Std.	60 Std.	30	3

2 **Lernergebnisse / Kompetenzen**

3324011 - Modern concepts of inorganic molecular chemistry (AC IV) (V)

The students

- are able to apply the achieved knowledge of modern concepts of inorganic and element organic molecular chemistry of main group- and transition elements as well as of perspectives of this area of chemistry in research and industry
- are able to understand the synthesis part of metal complexes for various chemical transformations and e.g. to choose the appropriate synthesis tools for the production of defined organic molecules or polymers and to use them target-oriented.
- understand the special advantages of complex catalyzed reactions during the synthesis of functional organic compounds or inorganic materials
- are able to handle the latest knowledge of the chemical literature and are capable of applying the scientific terminology actively

3324012 - Experimental Exercises (AC IV) (LÜ)

The students

- are able to handle the latest knowledge of the chemical literature and are capable of applying the scientific terminology actively
- have experimental abilities to apply demanding synthesis methods and modern laboratory techniques, know a wide range of chemical-analytical methods to characterize substances and to monitor reaction processes

3 **Inhalte**

3324011 - Modern concepts of inorganic molecular chemistry (AC IV) (V)

Focus is on modern inorganic and element organic chemistry of the main group- and transition elements, the coordination chemistry and metal organic catalysis, bio-inorganic chemistry as well as the homogenous catalysis. Basic questions of structure-activity relationships and reaction mechanisms will be treated as well as applications in modern chemical-technical processes.

3324012 - Experimental Exercises (AC IV) (LÜ)

Experimental exercises have a close relationship to the research topics of the research group Inorganic Chemistry whereby the focus is placed on preparative works.

4 **Häufigkeit des Angebots**

nur im Sommersemester

	3324011 - Modern concepts of inorganic molecular chemistry (AC IV) (V) nur im Sommersemester **3324012 - Experimental Exercises (AC IV) (LÜ)** nur im Sommersemester
5	**Lehrsprache** **3324011 - Modern concepts of inorganic molecular chemistry (AC IV) (V)** Englisch **3324012 - Experimental Exercises (AC IV) (LÜ)** Englisch
6	**Teilnahmevoraussetzungen** Keine
7	**Prüfungsformen** Modulprüfung Modern concepts of Inorganic Chemistry als Klausur oder Mündliche Prüfung (schriftlich oder mündlich - 90/30 Min.)
8	**Voraussetzungen für die Vergabe von Leistungspunkten** Bestehen der Modulprüfung
9	**Stellenwert der Endnote** 6/90 vom Studiengang
10	**Modulbeauftragte/r** Herr Prof. Dr. Joachim Scholz
11	**Verantwortliche Einrichtung** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie **3324011 - Modern concepts of inorganic molecular chemistry (AC IV) (V)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie **3324012 - Experimental Exercises (AC IV) (LÜ)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie
12	**Literatur** Wird in den betreffenden Veranstaltungen bekannt gegeben
13	**Verwendung in Studiengang** M.Sc. Chemie und Physik funktionaler Materialien / Chemistry and Physics of functional Materials (20145) M.Sc. Chemie und Physik funktionaler Materialien / Chemistry and Physics of functional Materials (20183) M.Sc. Applied Natural Sciences (20193)
14	**Sonstige Informationen**

Modul 05 03CH2402	**Thermochemistry**								6 Leistungspunkte Wahlpflichtmodul
Workload 180 Std.			**Studiensemester** 1. Semester (empfohlen)			**Dauer** 2 Semester			
1	**Lehrveranstaltungen**				**Pflicht/ Wahl-pflicht**	**Kontakt-zeit**	**Selbst-studium**	**Geplante Gruppen-größe**	**LP**
	5.1	V	Thermodynamics of condensed phases	3324021	Pflicht	2 SWS 30 Std.	60 Std.	30	3
	5.2	Ü	Thermochemistry	3329081	Pflicht	2 SWS 30 Std.	60 Std.	30	3

2 **Lernergebnisse / Kompetenzen**

3324021 - Thermodynamics of condensed phases (V)

The students

- are capable of transforming chemical reaction processes to processes and case-studies and to transfer energetic correlations to the conditions of real processing equipment in order to calculate and model the relations between chemical reactions and the correlations with the environment

3329081 - Thermochemistry (Ü)

The students

- shall be enabled to understand and handle by themselves the modeling tools from the sector of application of modern computer-aided processes (Computer Aided Thermochemistry CAT) as well as by using the software to learn about and present the necessary instruments to describe material changes depending on high temperatures

3 **Inhalte**

3324021 - Thermodynamics of condensed phases (V)
- basics of chemical thermodynamics and thermodynamics
- energetic consideration of heterogeneous chemical reactions

3329081 - Thermochemistry (Ü)
- Calculation of thermo-chemical correlations with the help of the Software FactSage 6.3
- Modeling of real engineering processes

4 **Häufigkeit des Angebots**

jedes Semester

3324021 - Thermodynamics of condensed phases (V)

nur im Wintersemester

3329081 - Thermochemistry (Ü)

nur im Sommersemester

5 **Lehrsprache**

3324021 - Thermodynamics of condensed phases (V)

Englisch

	3329081 - Thermochemistry (Ü) Englisch
6	**Teilnahmevoraussetzungen** Keine
7	**Prüfungsformen** Modulteilprüfung 3324021: Thermodynamics of condensed phases als Klausur (schriftlich - 45 Min.) Modulteilprüfung 3329081: Thermochemistry als Klausur (schriftlich - 45 Min.)
8	**Voraussetzungen für die Vergabe von Leistungspunkten** **3324021 - Thermodynamics of condensed phases (V)** Bestehen der Modulteilprüfung **3329081 - Thermochemistry (Ü)** Bestehen der Modulteilprüfung
9	**Stellenwert der Endnote** 6/90 vom Studiengang
10	**Modulbeauftragte/r** Herr Prof. Dr. Peter Quirmbach
11	**Verantwortliche Einrichtung** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie **3324021 - Thermodynamics of condensed phases (V)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie **3329081 - Thermochemistry (Ü)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie
12	**Literatur** Wird in den betreffenden Veranstaltungen bekannt gegeben
13	**Verwendung in Studiengang** M.Sc. Chemie und Physik funktionaler Materialien / Chemistry and Physics of functional Materials (20145) M.Sc. Chemie und Physik funktionaler Materialien / Chemistry and Physics of functional Materials (20183) M.Sc. Applied Natural Sciences (20193)
14	**Sonstige Informationen**

Modul 06 **03CH2408**	**Polymer Chemistry and Natural Products Chemistry**	6 Leistungspunkte Wahlpflichtmodul

Workload 180 Std.	**Studiensemester** 1. Semester (empfohlen)	**Dauer** 1 Semester

1 **Lehrveranstaltungen**

					Pflicht/ Wahl-pflicht	**Kontakt-zeit**	**Selbst-studium**	**Geplante Gruppen-größe**	**LP**
6.1	V	Polymer chemistry	3324031	Pflicht	2 SWS 30 Std.	60 Std.	30	3
6.2	V	Natural products chemistry	3324082	Pflicht	2 SWS 30 Std.	60 Std.	30	3

2 **Lernergebnisse / Kompetenzen**

3324031 - Polymer chemistry (V)

The students

- identify and distinguish between the most important classes of polymeric compounds.
- are able to present synthetic methods for specific polymers and explain their technological importance.
- know the most important analytical methods for the characterization of polymeric materials regarding their composition, their chemical structure and material properties.
- know about the techological use of polymers and know about actual trends in polymer chemistry.

3324082 - Natural products chemistry (V)

The students

- know the most important natural product classes and can present their occurrence and their physiological effects.
- know essential concepts for synthesis planning of complex molecules like e.g. retro-synthetic methods.
- Use their chemical basic knowledge from modules from bachelor courses to develop synthetic strategies for simple example molecules.

3 **Inhalte**

3324031 - Polymer chemistry (V)
- polymers in solution and in the solid state
- semi-crystalline and amorphous polymers
- polymer analytics
- polymers as materials
- step-growth and chain-growth polymerisation
- radical, ionic and catalytic polymerisation
- technical processes of polymerisation and polymer modification
- polymer degradation
- actual trends in polymer chemistry

3324082 - Natural products chemistry (V)
- Terpenes and steroids
- Biogenic amines and alkaloids
- Amino acids, peptides and proteins
- carbohydrates
- lipids
- nucleosides, nucleotides and nucleic acids

	• antibiotics and chemotherapeutics
4	**Häufigkeit des Angebots** nur im Wintersemester **3324031 - Polymer chemistry (V)** nur im Wintersemester **3324082 - Natural products chemistry (V)** nur im Wintersemester
5	**Lehrsprache** **3324031 - Polymer chemistry (V)** Englisch **3324082 - Natural products chemistry (V)** Englisch
6	**Teilnahmevoraussetzungen** **3324031 - Polymer chemistry (V)** The students possess sufficient knowledge of substance classes in organic chemistry and their typical reactivities.
7	**Prüfungsformen** Modulprüfung Polymer Chemistry and Natural Products Chemistry als Klausur (schriftlich - 90 Min.)
8	**Voraussetzungen für die Vergabe von Leistungspunkten** Bestehen der Modulprüfung
9	**Stellenwert der Endnote** 6/90 vom Studiengang
10	**Modulbeauftragte/r** Herr Prof. Dr. Wolfgang Imhof
11	**Verantwortliche Einrichtung** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie **3324031 - Polymer chemistry (V)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie **3324082 - Natural products chemistry (V)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie
12	**Literatur** Wird in den betreffenden Veranstaltungen bekannt gegeben
13	**Verwendung in Studiengang** M.Sc. Applied Natural Sciences (20193)
14	**Sonstige Informationen**

Modul 07 03PH2403	**Physics of Metals**								6 Leistungspunkte Wahlpflichtmodul
Workload 180 Std.			**Studiensemester** 1. Semester (empfohlen)				**Dauer** 2 Semester		
1	**Lehrveranstaltungen**				**Pflicht/ Wahl-pflicht**	**Kontakt-zeit**	**Selbst-studium**	**Geplante Gruppen-größe**	**LP**
	7.1	V	Physics of Metals 1	3524031	Pflicht	2 SWS 30 Std.	60 Std.	30	3
	7.2	V	Physics of Metals 2	3524032	Pflicht	2 SWS 30 Std.	60 Std.	30	3

2 **Lernergebnisse / Kompetenzen**

3524031 - Physics of Metals 1 (V)

The students

- know one-, two- and three-dimensional defects in metallic lattice structures
- are able to explain the physical properties of those defects
- understand and develop a model of the physical interaction between metallic defects and structural stresses
- can transfer their knowledge to technical behavior of different failure modes under static, cyclic and dynamic loads

3524032 - Physics of Metals 2 (V)

The students

- know binary systems of metals and can explain their thermodynamic derivation
- students know ternary systems
- develop a model for hardening effects in metallic structures
- can transfer their knowledge to real alloys and impurities

3 **Inhalte**

3524031 - Physics of Metals 1 (V)
- Basics of metallic lattice structures
- Point defects and crystal dislocations
- Work hardening
- Fracture mechanics

3524032 - Physics of Metals 2 (V)
- Binary systems in metallurgy
- Ternary systems in metallurgy
- Solid solution hardening
- Precipitation hardening
- Time-Temperature-Transition Diagram and dilatrometric measurements

4 **Häufigkeit des Angebots**

jedes Semester

3524031 - Physics of Metals 1 (V)

nur im Sommersemester

	3524032 - Physics of Metals 2 (V) nur im Wintersemester
5	**Lehrsprache** **3524031 - Physics of Metals 1 (V)** Englisch **3524032 - Physics of Metals 2 (V)** Englisch
6	**Teilnahmevoraussetzungen** Keine
7	**Prüfungsformen** Modulteilprüfung 3524031: Physics of Metals 1 als Klausur (schriftlich - 45 Min.) Modulteilprüfung 3524032: Physics of Metals 2 als Klausur (schriftlich - 45 Min.)
8	**Voraussetzungen für die Vergabe von Leistungspunkten** Bestehen der Modulteilprüfungen **3524031 - Physics of Metals 1 (V)** Bestehen der Modulteilprüfung **3524032 - Physics of Metals 2 (V)** Bestehen der Modulteilprüfung
9	**Stellenwert der Endnote** 6/90 vom Studiengang
10	**Modulbeauftragte/r** Herr Dr. Christian Fischer
11	**Verantwortliche Einrichtung** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik **3524031 - Physics of Metals 1 (V)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik **3524032 - Physics of Metals 2 (V)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik
12	**Literatur** Wird in den betreffenden Veranstaltungen bekannt gegeben
13	**Verwendung in Studiengang** M.Sc. Chemie und Physik funktionaler Materialien / Chemistry and Physics of functional Materials (20145) M.Sc. Chemie und Physik funktionaler Materialien / Chemistry and Physics of functional Materials (20183) M.Sc. Applied Natural Sciences (20193)
14	**Sonstige Informationen**

Modul 08 03PH2503	**Surface Science**							6 Leistungspunkte Pflichtmodul	
Workload 180 Std.			**Studiensemester** 1. Semester (empfohlen)			**Dauer** 1 Semester			
1	**Lehrveranstaltungen**				**Pflicht/ Wahl-pflicht**	**Kontakt-zeit**	**Selbst-studium**	**Geplante Gruppen-größe**	**LP**
	8.1	V	Vacuum Technology	3525031	Pflicht	2 SWS 30 Std.	60 Std.	30	3
	8.2	V	Fundamentals of Surface Science	3525032	Pflicht	2 SWS 30 Std.	60 Std.	30	3

2 **Lernergebnisse / Kompetenzen**

3525031 - Vacuum Technology (V)

The students

- know the physical basis of vacuum technology,
- can explain the basic concepts and ideas of vacuum,
- develop an understanding of the countervailing effects relevant in the realization of vacuum andare able to evaluate technical problems on the basis of the resulting limitations,
- can transfer their knowledge to technical solutions and develop own experimental schemes.

3525032 - Fundamentals of Surface Science (V)

The students

- know the basics of reaction kinetics and other phenomena on surfaces
- can explain the particular characteristics of surfaces and discuss related problems
- are able to describe and analyze common detection techniques and evaluate their limitations
- can evaluate existing experimental setups
- are able to transfer their knowledge to experiments for specific tasks and develop their own experimental schemes.

3 **Inhalte**

3525031 - Vacuum Technology (V)

- equations of state
- motion in diluted gases
- transport
- flow
- conductance and pumping speed
- calculating conductance
- design of vacuum systems
- pumps
- measuring pressure
- materials for HV and UHV
- flange systems and components

3525032 - Fundamentals of Surface Science (V)

- surface structure
- diffraction on surfaces
- microscopy on surfaces
- scattering methods

	• chemical surface analysis • electronic states on surfaces • vibrations on surfaces • gas adsorption on surfaces • surface reactions
4	**Häufigkeit des Angebots** nur im Wintersemester **3525031 - Vacuum Technology (V)** nur im Wintersemester **3525032 - Fundamentals of Surface Science (V)** nur im Wintersemester
5	**Lehrsprache** **3525031 - Vacuum Technology (V)** Englisch **3525032 - Fundamentals of Surface Science (V)** Englisch
6	**Teilnahmevoraussetzungen** Keine
7	**Prüfungsformen** Modulprüfung Surface Science als Klausur (schriftlich - 90 Min.)
8	**Voraussetzungen für die Vergabe von Leistungspunkten** Bestehen der Modulprüfung
9	**Stellenwert der Endnote** 6/90 vom Studiengang
10	**Modulbeauftragte/r** Herr Dr. Christian Fischer
11	**Verantwortliche Einrichtung** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik **3525031 - Vacuum Technology (V)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik **3525032 - Fundamentals of Surface Science (V)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik
12	**Literatur** Wird in den betreffenden Veranstaltungen bekannt gegeben
13	**Verwendung in Studiengang** M.Sc. Mathematical Modeling of Complex Systems (20142) M.Sc. Chemie und Physik funktionaler Materialien / Chemistry and Physics of functional Materials (20145) M.Sc. Mathematical Modeling of Complex Systems (20142)

	M.Eng. Applied Physics (91) M.Sc. Mathematical Modeling of Complex Systems (20184) M.Sc. Chemie und Physik funktionaler Materialien / Chemistry and Physics of functional Materials (20183) M.Sc. Mathematical Modeling, Simulation and Optimization (20194) M.Sc. Applied Natural Sciences (20193)
14	**Sonstige Informationen**

Modul 09 **03PH2504**	**Applied Theoretical Physics**								6 Leistungspunkte Pflichtmodul
Workload 180 Std.			**Studiensemester** 1. Semester (empfohlen)				**Dauer** 2 Semester		
1	**Lehrveranstaltungen**				**Pflicht/ Wahl-pflicht**	**Kontakt-zeit**	**Selbst-studium**	**Geplante Gruppen-größe**	**LP**
	9.1	V	Applied Theoretical Physics 1	3525041	Pflicht	2 SWS 30 Std.	60 Std.	30	3
	9.2	V	Applied Theoretical Physics 2	3525042	Pflicht	2 SWS 30 Std.	60 Std.	30	3

2 **Lernergebnisse / Kompetenzen**

3525041 - Applied Theoretical Physics 1 (V)

The students:

- can name various fields, where modern concepts of theoretical physics are important for the description of real world problems in nature and technology
- know the fundamental definitions, theorems and methods related to the application of theoretical physics
- can analyze the relation between parameters in given systems
- can apply mathematical methods to solve problems in these fields
- can evaluate suggested solutions and develop own solving schemes

3525042 - Applied Theoretical Physics 2 (V)

The students:

- can name various fields, where modern concepts of theoretical physics are important for the description of real world problems in nature and technology
- know the fundamental definitions, theorems and methods related to the application of theoretical physics
- can analyze the relation between parameters in given systems
- can apply mathematical methods to solve problems in these fields
- can evaluate suggested solutions and develop own solving schemes

3 **Inhalte**

3525041 - Applied Theoretical Physics 1 (V)
- modern concepts in theoretical physics
- reaction-diffusion-systems
- nonlinear physics
- non-equilibrium thermodynamics
- applications of theoretical physics in nature and technology

3525042 - Applied Theoretical Physics 2 (V)
- modern concepts in theoretical physics
- reaction-diffusion-systems
- nonlinear physics
- non-equilibrium thermodynamics
- applications of theoretical physics in nature and technology

4 **Häufigkeit des Angebots**

	ab Wintersemester **3525041 - Applied Theoretical Physics 1 (V)** nur im Wintersemester **3525042 - Applied Theoretical Physics 2 (V)** nur im Sommersemester
5	**Lehrsprache** **3525041 - Applied Theoretical Physics 1 (V)** Englisch **3525042 - Applied Theoretical Physics 2 (V)** Englisch
6	**Teilnahmevoraussetzungen** Keine
7	**Prüfungsformen** Modulprüfung Applied Theoretical Physics als Klausur (schriftlich - 90 Min.)
8	**Voraussetzungen für die Vergabe von Leistungspunkten** Bestehen der Modulprüfung
9	**Stellenwert der Endnote** 6/90 vom Studiengang
10	**Modulbeauftragte/r** Herr Dr. Christian Fischer
11	**Verantwortliche Einrichtung** FB 3 - Mathematik / Naturwissenschaften **->** Mathematisches Institut **3525041 - Applied Theoretical Physics 1 (V)** FB 3 - Mathematik / Naturwissenschaften **->** Mathematisches Institut **3525042 - Applied Theoretical Physics 2 (V)** FB 3 - Mathematik / Naturwissenschaften **->** Mathematisches Institut
12	**Literatur** Wird in den betreffenden Veranstaltungen bekannt gegeben
13	**Verwendung in Studiengang** M.Sc. Mathematical Modeling of Complex Systems (20142) M.Sc. Chemie und Physik funktionaler Materialien / Chemistry and Physics of functional Materials (20145) M.Sc. Mathematical Modeling of Complex Systems (20142) M.Eng. Applied Physics (91) M.Sc. Mathematical Modeling of Complex Systems (20184) M.Sc. Chemie und Physik funktionaler Materialien / Chemistry and Physics of functional Materials (20183) M.Sc. Mathematical Modeling, Simulation and Optimization (20194) M.Sc. Applied Natural Sciences (20193)

14	**Sonstige Informationen**

Modul 10 03PH2505	**Polymer Science**								6 Leistungspunkte Pflichtmodul
Workload 180 Std.			**Studiensemester** 2. Semester (empfohlen)				**Dauer** 1 Semester		
1	**Lehrveranstaltungen**				**Pflicht/ Wahl-pflicht**	**Kontakt-zeit**	**Selbst-studium**	**Geplante Gruppen-größe**	**LP**
	10.1	V	Polymer Physics	3525051	Pflicht	2 SWS 30 Std.	60 Std.	30	3
	10.2	V	Characterization methods in Polymer Science	3525052	Pflicht	2 SWS 30 Std.	60 Std.	30	3

2 **Lernergebnisse / Kompetenzen**

3525051 - Polymer Physics (V)

The students

- can independently explain basic models describing the properties of different types of polymers and in different states
- are able to understand how the peculiarities of the polymer structure such as connectivity affects their physical properties and of which relevance these are for applications
- develop on the basis of the covered basic concepts their own solving schemes
- are able to transfer the discussed basic concepts to actual, scientific topics in polymer science.

3525052 - Characterization methods in Polymer Science (V)

The students

- can independently explain the characterization method covered in this course
- can identify for the most important physical properties of polymer materials (Course 1) the correct characterization methods
- are aware of the technical realization and of the application potential of the different methods,
- they can give an overview over representative results for typical polymer systems
- develop strategies for data analysis, presentation and interpretation
- are able to transfer the discussed basic concepts to actual, scientific topics in polymer science

3 **Inhalte**

3525051 - Polymer Physics (V)

- Synthesis & molecular weight distributions
- Chain models
- Polymer solutions, polymer blends, block copolymers
- Semi-crystalline state
- Polymer dynamics & viscoelasticity
- Networks
- Glassy state

3525052 - Characterization methods in Polymer Science (V)

- Determination of molecular weights
- Thermal characterization
- Mechanical testing
- Dielectric spectroscopy & electrical characterization
- Scattering methods
- Microscopy

4	**Häufigkeit des Angebots** nur im Sommersemester **3525051 - Polymer Physics (V)** nur im Sommersemester **3525052 - Characterization methods in Polymer Science (V)** nur im Sommersemester
5	**Lehrsprache** **3525051 - Polymer Physics (V)** Englisch **3525052 - Characterization methods in Polymer Science (V)** Englisch
6	**Teilnahmevoraussetzungen** Keine
7	**Prüfungsformen** Modulprüfung Polymer Science als Klausur (schriftlich - 90 Min.)
8	**Voraussetzungen für die Vergabe von Leistungspunkten** Bestehen der Modulprüfung
9	**Stellenwert der Endnote** 6/90 vom Studiengang
10	**Modulbeauftragte/r** Frau Prof. Dr. Silke Rathgeber
11	**Verantwortliche Einrichtung** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik **3525051 - Polymer Physics (V)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik **3525052 - Characterization methods in Polymer Science (V)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik
12	**Literatur** Wird in den betreffenden Veranstaltungen bekannt gegeben
13	**Verwendung in Studiengang** M.Sc. Mathematical Modeling of Complex Systems (20142) M.Sc. Chemie und Physik funktionaler Materialien / Chemistry and Physics of functional Materials (20145) M.Sc. Mathematical Modeling of Complex Systems (20142) M.Eng. Applied Physics (91) M.Sc. Mathematical Modeling of Complex Systems (20184) M.Sc. Chemie und Physik funktionaler Materialien / Chemistry and Physics of functional Materials (20183) M.Sc. Mathematical Modeling, Simulation and Optimization (20194)

	M.Sc. Applied Natural Sciences (20193)
14	**Sonstige Informationen**

Modul 11 **03BI2330**	**Aquatic Ecology and Management**	6 Leistungspunkte Wahlpflichtmodul

Workload 180 Std.	**Studiensemester** 2. Semester (empfohlen)	**Dauer** 2 Semester

1	**Lehrveranstaltungen**				**Pflicht/ Wahl-pflicht**	**Kontakt-zeit**	**Selbst-studium**	**Geplante Gruppen-größe**	**LP**
	11.1	V	Aquatic Ecology	3223301	Pflicht	2 SWS 30 Std.	60 Std.	60	3
	11.2	V	Management of Inland Waters	3223302	Pflicht	2 SWS 30 Std.	60 Std.	60	3

2 **Lernergebnisse / Kompetenzen**

3223301 - Aquatic Ecology (V)

The students

- know the identity and capability of eukaryotic and prokaryotic key players in the aquatic food web
- have advanced knowledge about important functions and ecosystem services of aquatic ecosystems
- are able to assess the impact of anthropogenic stressors on the integrity of freshwater ecosystems
- are able to transfer their knowledge of mutualistic interactions in freshwater ecosystems for applied environmental issues

3223302 - Management of Inland Waters (V)

The students

- gain basic knowledge in data management and handling
- are able to document steps in data processing and to create metadata
- know general and statistical models and can apply general concepts in theoretical aquatic ecology
- know the basic regulatory concepts of water management in Germany and the EU

3 **Inhalte**

3223301 - Aquatic Ecology (V)

- Advanced concepts of structure and function of aquatic ecosystems (pelagic and benthic food webs, hydromorphology, environmental conditions) in freshwater systems
- Functions and ecosystem services of aquatic ecosystems (ecophysiology, species interactions, fluxes of matter and energy)
- Mutualistic interactions of organisms in freshwater ecosystems
- Impact of direct and indirect stressors in the aquatic environment
- Preservation of biodiversity in water bodies under anthropogenic stressors

3223302 - Management of Inland Waters (V)

- Basic concepts in acquisition, access, structuring, architecture, quality assurance, processing, and storage of data
- Introduction in basic concepts of data processing and modeling software
- Introduction in multivariate statistics and ecological modeling
- Concepts in theoretical aquatic ecology
- Regulatory concepts in environmental management

4 **Häufigkeit des Angebots**

ab Wintersemester

	3223301 - Aquatic Ecology (V) nur im Wintersemester **3223302 - Management of Inland Waters (V)** nur im Sommersemester
5	**Lehrsprache** **3223301 - Aquatic Ecology (V)** Englisch **3223302 - Management of Inland Waters (V)** Englisch
6	**Teilnahmevoraussetzungen** Keine
7	**Prüfungsformen** Modulteilprüfung 3223301: Aquatic Ecology als Klausur (schriftlich - 45 Min.) Modulteilprüfung 3223302: Management of Inland Waters als Klausur (schriftlich - 45 Min.)
8	**Voraussetzungen für die Vergabe von Leistungspunkten** **3223301 - Aquatic Ecology (V)** Bestehen der Modulteilprüfung **3223302 - Management of Inland Waters (V)** Bestehen der Modulteilprüfung
9	**Stellenwert der Endnote** 6/90 vom Studiengang
10	**Modulbeauftragte/r** Herr Prof. Dr. Werner Manz
11	**Verantwortliche Einrichtung** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Biologie **3223301 - Aquatic Ecology (V)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Biologie **3223302 - Management of Inland Waters (V)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Biologie
12	**Literatur** Angaben zur Literatur erfolgen aktualisiert jeweils zu Beginn der Lehrveranstaltungen.
13	**Verwendung in Studiengang** M.Sc. BioGeoWissenschaften (20187) M.Sc. Applied Natural Sciences (20193)
14	**Sonstige Informationen**

	3223301 - Aquatic Ecology (V) Diese Lehrveranstaltung kann eingebracht und angerechnet werden in Modul 13 des lehramtsbezogenen Master of Education Biologie Gymnasium. **3223302 - Management of Inland Waters (V)** Diese Lehrveranstaltung kann eingebracht und angerechnet werden in Modul 13 des lehramtsbezogenen Master of Education Biologie Gymnasium.

Modul 12 **03GE2331**	**Physical Geography**								6 Leistungspunkte Wahlpflichtmodul
Workload 180 Std.			**Studiensemester** 2. Semester (empfohlen)			**Dauer** 1 Semester			
1	**Lehrveranstaltungen**				**Pflicht/ Wahl-pflicht**	**Kontakt-zeit**	**Selbst-studium**	**Geplante Gruppen-größe**	**LP**
	12.1	S	Field Studies Soil, Water and Climate	3423311	Pflicht	1 SWS 15 Std.	45 Std.	30	2
	12.2	P	Field Studies Soil, Water and Climate	3423312	Pflicht	3 SWS 45 Std.	75 Std.	30	4

2 **Lernergebnisse / Kompetenzen**

3423311 - Field Studies Soil, Water and Climate (S)

The students

- gain a deeper understanding of the runoff processes in a low mountain range drainage basin
- can use the concept of waterbody structure quality mapping
- gain in-depth knowledge of processes that influence soil, water and climate properties
- can analyze processes of climate-change

3423312 - Field Studies Soil, Water and Climate (P)

The students

- can independently carry out and evaluate experiments on current scientific topics in soil, water and climate science (in the field and laboratory tests)
- acquire the ability to design, conduct, discuss and present a scientific paper on topics of soil, water and climate science
- are able to plan and carry out research work in the field
- acquire the ability to design, conduct, discuss and present a scientific work on hydrological, soil and climate topics

3 **Inhalte**

3423311 - Field Studies Soil, Water and Climate (S)

- Chemical, physical and biological processes in soils, water and climate
- Field and laboratory tests
- Planning and conception of soil sampling and laboratory tests
- runoff processes
- runoff-relevant parameters
- waterbody structure quality / mapping
- decentralized flood protection measures
- parameters of climate-change

3423312 - Field Studies Soil, Water and Climate (P)

- Planning, conception and implementation of an independent research project
- Operating and evaluation of soil, water and climate science experiments
- Statistical analysis of the results
- Data interpretation and presentation
- Synthesis and final presentation of an independent research project

4	**Häufigkeit des Angebots** nur im Wintersemester **3423311 - Field Studies Soil, Water and Climate (S)** nur im Wintersemester **3423312 - Field Studies Soil, Water and Climate (P)** nur im Wintersemester
5	**Lehrsprache** **3423311 - Field Studies Soil, Water and Climate (S)** Englisch **3423312 - Field Studies Soil, Water and Climate (P)** Englisch
6	**Teilnahmevoraussetzungen** Keine
7	**Prüfungsformen** Modulprüfung Physical Geography als Hausarbeit (schriftlich - 2 Wo.)
8	**Voraussetzungen für die Vergabe von Leistungspunkten** Bestehen der Modulprüfung
9	**Stellenwert der Endnote** 6/90 vom Studiengang
10	**Modulbeauftragte/r** Herr Dr. Michael Tempel
11	**Verantwortliche Einrichtung** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Geographie **3423311 - Field Studies Soil, Water and Climate (S)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Geographie **3423312 - Field Studies Soil, Water and Climate (P)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Geographie
12	**Literatur** Wird in den betreffenden Veranstaltungen bekannt gegeben.
13	**Verwendung in Studiengang** M.Sc. BioGeoWissenschaften (20187) M.Sc. Applied Natural Sciences (20193)
14	**Sonstige Informationen**

Modul 13 **03BI2337**	**Biodiversity and Assessment Methods for Insects**	6 Leistungspunkte Wahlpflichtmodul

Workload 180 Std.	**Studiensemester** 3. Semester (empfohlen)	**Dauer** 1 Semester

1	**Lehrveranstaltungen**				**Pflicht/ Wahl-pflicht**	**Kontakt-zeit**	**Selbst-studium**	**Geplante Gruppen-größe**	**LP**
	13.1	V	Insect Diversity Assessment	3223371	Pflicht	2 SWS 30 Std.	60 Std.	25	3
	13.2	LÜ	Insect Diversity Assessment	3223372	Pflicht	2 SWS 30 Std.	60 Std.	25	3

2 **Lernergebnisse / Kompetenzen**

3223371 - Insect Diversity Assessment (V)

The students

- gain an overview on diversity and phylogeny of insects

3223372 - Insect Diversity Assessment (LÜ)

The students

- know morphology and phylogeny of insects
- can allocate insects to taxa
- can determine insects with keys
- know and can use insects assessment methods

3 **Inhalte**

3223371 - Insect Diversity Assessment (V)
- Introduction to insect diversity with overview on major taxa
- Morphology and phylogeny of insects
- Introduction on methods of insect assessment

3223372 - Insect Diversity Assessment (LÜ)
- Practical course in insect morphology
- Training of insect identification
- Assessment of insects in the field

4 **Häufigkeit des Angebots**

nur im Sommersemester

3223371 - Insect Diversity Assessment (V)
nur im Sommersemester

3223372 - Insect Diversity Assessment (LÜ)
nur im Sommersemester

5 **Lehrsprache**

3223371 - Insect Diversity Assessment (V)
Englisch

	3223372 - Insect Diversity Assessment (LÜ) Englisch
6	**Teilnahmevoraussetzungen** Keine
7	**Prüfungsformen** Modulprüfung Biodiversity and Assessment Methods for Insects als Hausarbeit (schriftlich - 2 Wo.)
8	**Voraussetzungen für die Vergabe von Leistungspunkten** Bestehen der Modulprüfung
9	**Stellenwert der Endnote** 6/90 vom Studiengang
10	**Modulbeauftragte/r** Herr apl. Prof. Thomas Wagner
11	**Verantwortliche Einrichtung** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Biologie **3223371 - Insect Diversity Assessment (V)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Biologie **3223372 - Insect Diversity Assessment (LÜ)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Biologie
12	**Literatur** **3223371 - Insect Diversity Assessment (V)** • McGavin, G. C. 2001. Essential Entomology. Pp. 323. Oxford University Press. • Schoonhoven, L. M., v. Loon, J. J. A. & Dicke, M. 2008. Insect-Plant Biology, 2nd. ed. Pp. 421. Oxford University Press. • Daly, H. V., Doyen, J. T. & Purcell, A. H. 2014. Introduction to insect Biology and Diversity. Oxford University Press. **3223372 - Insect Diversity Assessment (LÜ)** • McGavin, G. C. 2001. Essential Entomology. Pp. 323. Oxford University Press. • Schoonhoven, L. M., v. Loon, J. J. A. & Dicke, M. 2008. Insect-Plant Biology, 2nd. ed. Pp. 421. Oxford University Press. • Daly, H. V., Doyen, J. T. & Purcell, A. H. 2014. Introduction to insect Biology and Diversity. Oxford University Press.
13	**Verwendung in Studiengang** M.Sc. BioGeoWissenschaften (20187) M.Sc. Applied Natural Sciences (20193)
14	**Sonstige Informationen** This module is offered irregularly. Please ask the responsible module representative before assigning the module. **3223371 - Insect Diversity Assessment (V)**

	Diese Lehrveranstaltung kann eingebracht und angerechnet werden in Modul 13 des lehramtsbezogenen Master of Education Biologie Gymnasium.

Abschlussarbeit

ANW-MBV	**Masterarbeit**	30 Leistungspunkte Pflichtmodul

Workload 900 Std.	**Studiensemester** 3. Semester (empfohlen)	**Dauer** 1 Semester

1	**Lehrveranstaltungen**				**Pflicht/ Wahl-pflicht**	**Kontakt-zeit**	**Selbst-studium**	**Geplante Gruppen-größe**	**LP**
		A	Masterarbeit	03XX2490	Pflicht	0 SWS 0 Std.	750 Std.	1	25
		A	Mündliche Abschlussprüfung	03XX2499	Pflicht	0 SWS 0 Std.	150 Std.	1	5

2 **Lernergebnisse / Kompetenzen**

03XX2490 - Masterarbeit (A)

The students

- can independently handle a scientific question under expert guidance
- master the principles of scientific working and publishing
- can write a paper about the results obtained.

03XX2499 - Mündliche Abschlussprüfung (A)

The students

- present the knowledge gained in a form appropriate to the subject
- defend the master thesis in a discussion
- master the principles of scientific work and presentation

3 **Inhalte**

03XX2490 - Masterarbeit (A)

The aim of the master's thesis is to show that candidates are able to work on a defined physics or chemistry problem by scientific methods within a set deadline. Here the means of the solution as well as the solution itself are to be presented and interpreted in an understandable and correct way.

The master thesis can only be issued when the project work has been completed successfully. The Examining Board may allow exceptions in special cases. The candidate must complete a subject-related topic within a set time frame.

Candidates are expected to have the ability to largely independently deliver scientific results, to identify and solve any problems that arise, to critically evaluate and classify them according to their level of knowledge and in an appropriate manner appropriate to the subject Form to document and present the results in writing.

03XX2499 - Mündliche Abschlussprüfung (A)

The oral final exam completes the Master's program.

	The candidate must present and discuss the results of the Master's thesis in the oral final exam in an appropriate and appropriate manner.
4	**Häufigkeit des Angebots** jedes Semester **03XX2490 - Masterarbeit (A)** jedes Semester **03XX2499 - Mündliche Abschlussprüfung (A)** jedes Semester
5	**Lehrsprache** **03XX2490 - Masterarbeit (A)** Englisch **03XX2499 - Mündliche Abschlussprüfung (A)** Englisch
6	**Teilnahmevoraussetzungen** **03XX2490 - Masterarbeit (A)** Gemäß § 14 wird zur Masterarbeit wird zugelassen, wer 1. die Erbringung von gegebenenfalls wegen fehlender Vorkenntnisse oder fehlender Leistungspunkte aus dem vorangegangenen Studium zusätzlichen LP im Umfang von bis zu 30 gemäß § 2 Abs. 2 S. 2 nachweist, zusätzlich 2. mindestens 45 LP erworben hat und 3. das vorläufige Thema für eine Masterarbeit mit einer Betreuerin oder einem Betreuer vereinbart hat. **03XX2499 - Mündliche Abschlussprüfung (A)** Bestehen der Masterarbeit (03XX2490) gemäß § 16
7	**Prüfungsformen** Masterarbeit als Masterarbeitgemäß § 14 Prüfungsordnung (schriftlich - 20 Wo.) Mündliche Abschlussprüfung als Mündliche Abschlussprüfung gemäß § 15 Prüfungsordnung. (mündlich - 30 Min.)
8	**Voraussetzungen für die Vergabe von Leistungspunkten** **03XX2490 - Masterarbeit (A)** Submission of the Master's thesis to a reasonable extent in German or English after a processing period of 5 months. Passing the Master's Thesis in accordance with § 14 of the Examination Regulations. **03XX2499 - Mündliche Abschlussprüfung (A)**

	Passing the final exam in accordance with § 16 of the Examination Regulations.
9	**Stellenwert der Endnote** 30/90 vom Studiengang
10	**Modulbeauftragte/r** Frau Prof. Dr. Silke Rathgeber
11	**Verantwortliche Einrichtung** **03XX2490 - Masterarbeit (A)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik **03XX2499 - Mündliche Abschlussprüfung (A)** FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Chemie FB 3 - Mathematik / Naturwissenschaften **->** Institut für Integrierte Naturwissenschaften **->** Physik
12	**Literatur** Wird in den betreffenden Veranstaltungen bekannt gegeben
13	**Verwendung in Studiengang**
14	**Sonstige Informationen** **03XX2490 - Masterarbeit (A)** The processing time for the Master's thesis is five months. The Master's thesis can be carried out in all areas of "Advanced Modules", as well as in industry or external research institutes in Germany and abroad, as far as a supervisor or supervisor does the supervision according to § 14 examination regulations.