Karlsruhe Institute of Technology

Module Handbook

Meteorology

(MSc)

Winter Semester 2018/2019

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KIT-Department of Physics

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1. Study Guide

This module handbook is the relevant document describing the structure and the contents of the Master's degree program in *Meteorology*, and thus provides helpful information and guidance for the studies. The degree program and its subjects and modules are described in detail, thus providing the necessary information for planning an interdisciplinary course of studies tailored to each student's personal interests and needs.

The first section Study Guide specifies the organization of the degree program and further formalities in addition to the general examination regulations (ER/SPO). For example, the assignments of modules to the compulsory and elective subjects are specified. Another key function of the module handbook is the collection of module descriptions (Section 2), which provide information on the requirements and recommendations for the modules.

In addition to this module handbook, the university calendar and possibly announcements of the institutes inform about further details, for example, on times and places of lectures and classes.

Please note, that only the german version of the Study and Examination Regulation (SPO) is legally binding. The translated version is for the purpose of information only.

1.1. Objectives of the Degree Program

The masters degree program in Meteorology deepens and extends the essential scientific qualifications obtained in the Bachelor's program in a research-oriented way. Consolidation occurs in the areas of Theoretical Meteorology and Numerical Weather Prediction, Climatology, Remote Sensing and Data Analysis as well as in Atmospheric Chemistry and Aerosols, while extensions take place in the area of Applied Meteorology. A comprehensive practical course familiarizes the graduates with methods of modern atmospheric measurements in the laboratory and field. With the completion of the Master's thesis, the graduates have demonstrated that they are capable of applying scientific knowledge and methods to independently solve complex research problems. In addition, they acquired detailed skills in an elective from a wide range of other natural sciences.

The graduates possess practical skills to use concepts of theoretical meteorology to, respectively, describe and solve concrete meteorological or climatological problems. On the basis of the obtained knowledge they competently classify facts and thematic areas. They exhibit extensive knowledge in programming, have experience with numerical models and are capable of using modern measurement techniques. Applying statistical methods to observational data they are able to conclude relationships, to estimate uncertainty, to formulate hypotheses, and to derive and validate predictions.

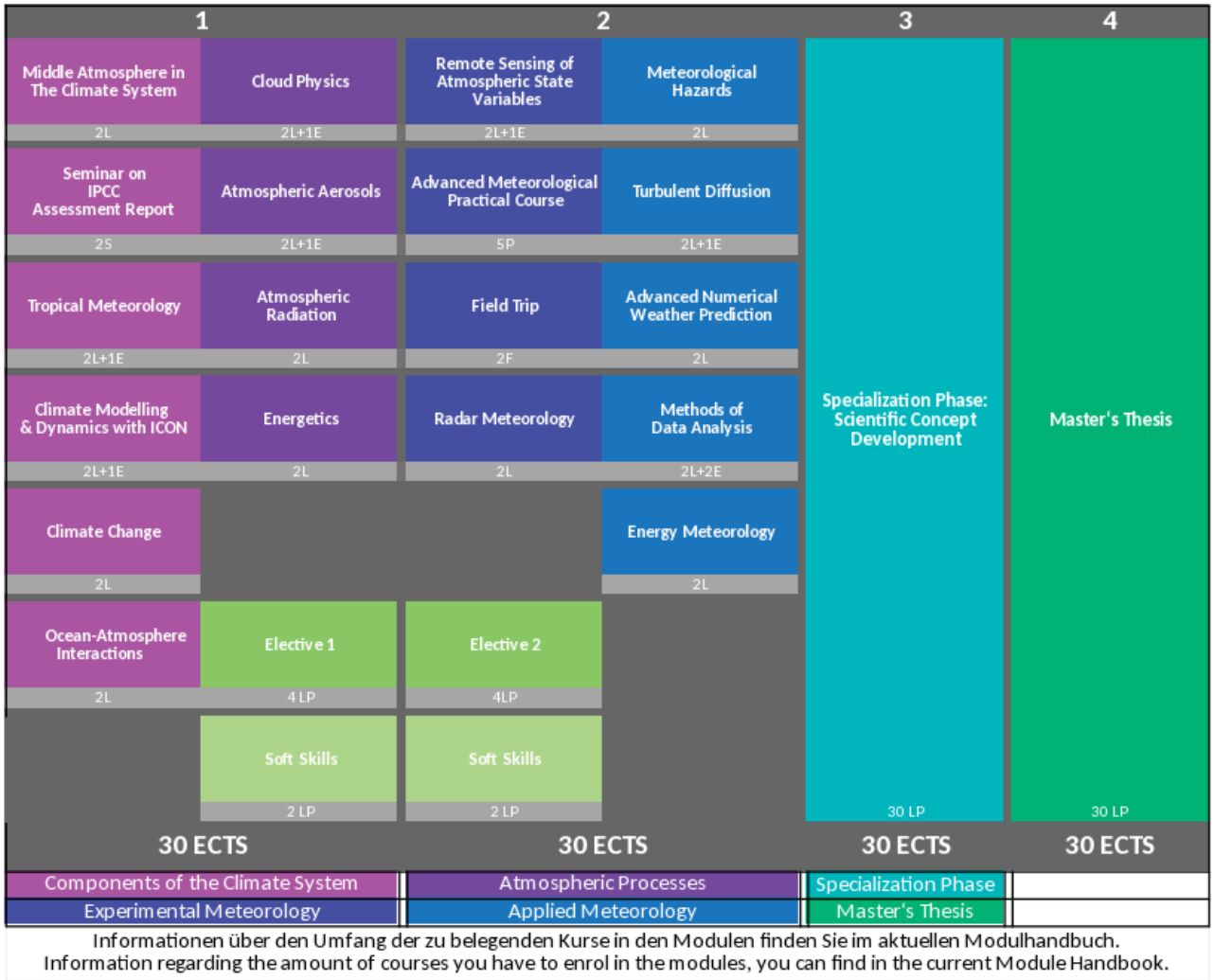
The graduates are proficient in the adequate written account of scientific results and in didactically appealing presentation techniques. They are able to reflect their actions and related scientific and societal ramifications, and to recognise and evaluate ethical aspects.

1.2. Subjects

The degree program in *Meteorology* comprises 120 credit points (CP) and is structured in the subjects

- Atmospheric and Climate Processes (24 CP)
- Applied and Experimental Meteorology (24 CP)
- Compulsory Electives (8 CP)
- Soft Skills (4 CP)
- Research Work: Specialization Phase (30 CP)
- Master's Thesis (30 CP)
- Additional Subjects (max. 30 CP)

Course Program M.Sc. (SPO 2015)



Informationen über den Umfang der zu belegenden Kurse in den Modulen finden Sie im aktuellen Modulhandbuch.
Information regarding the amount of courses you have to enrol in the modules, you can find in the current Module Handbook.

Atmospheric and Climate Processes

This is one of two core meteorological subjects comprising two large modules on *Components of the Climate System* (12 CP, see chapter 2.1.) and *Atmospheric Processes* (12 CP, see chapter 2.2.).

Applied and Experimental Meteorology

This is one of two core meteorological subjects comprising two large modules on *Experimental Meteorology* (14 CP, see chapter 2.3.) and *Applied Meteorology* (10 CP, see chapter 2.4.).

Supplementary Modules: Mandatory Electives

The individual specialization can be complemented by electives to individualize the profile studies. All subject-specific modules of the program, for which an examination has not already been taken, can be chosen as *Supplementary Modules*.

These could thus be further modules from related disciplines at KIT, such as Physics, Geoecology, Geophysics, Mechanical Engineering, or Applied Geosciences. Examples of possible *Supplementary Modules* from other disciplines are listed in section 2.5.

Interdisciplinary Qualification: Transferable Skills (Soft Skills) (§15a, SPO)

Apart from scientific qualifications, KIT attaches high importance to transferable skills. These skills of 4 credits shall be part of the Master's Program in Meteorology. *Soft Skills* may be imparted additively or integratively.

Research Work: Specialization Phase

Students carry out an interdisciplinary *Study Project*, for which 30 CP are credited. The project prepares students for independent scientific working and writing and introduces skills in project management. The *Study Project* focuses on the topic of the subsequent *Master's Thesis* and serves as a preparation for the scientific work. In addition to the competence in reading and understanding current scientific literature the students acquire abilities for independent work and critical evaluation of results in the context of the literature.

It is highly recommended to have acquired the necessary subject-specific and interdisciplinary competencies needed to work on the *Study Project* beforehand.

The assignment of a research topic, supervision and evaluation of the *Study Project* are carried out by a full-time faculty member of the KIT-Department of Civil Engineering, Geo and Environmental Sciences or of the KIT-Department of Chemical and Process Engineering, who offers courses in the Master's program. Students look for a supervisor from the field they are interested in. In exceptional cases and at request of the student, the spokesperson of the study program ensures that a topic is assigned within a four-week period.

Master's Thesis (§14, SPO)

The *Master's Thesis* is an independent scientific study and includes the theoretical and/or experimental work on a complex problem. Students deal with the current state of research and apply the expertise and scientific methods acquired during the studies. They can document, discuss and evaluate the obtained

results. Furthermore, they can present and defend the essential findings. The topic of the *Master's Thesis* depends on the subject area chosen for the thesis.

(1) For admission to the master's thesis module, the module examinations in the amount of 70 credits must have been passed successfully. In particular, module examination in the subject of "Wissenschaftliches Arbeiten" (scientific work) must have been passed successfully. At the request of the student, the examination committee shall decide on exceptions.

(1a) 30 credits are assigned to the master's thesis module. It consists of the master's thesis and a presentation. The presentation shall be made out four weeks upon submission of the master's thesis.

(2) The master's thesis can be assigned by university teachers, habilitated scientists, and executive scientists according to Article 14, par. 3, clause 1, KITG. In addition, the examination committee can authorize other examiners to assign the subject according to Article 17, pars. 2-4. The student shall be given the possibility of making proposals relating to the subject. If the master's thesis is to be written outside of the KIT Department of Physics, the approval of the examination committee shall be required. The master's thesis may also be accepted in the form of group work, if the contribution of the individual student to be evaluated in the examination can be distinguished clearly based on objective criteria and if the requirement outlined in par. 4 is fulfilled. In exceptional cases, the chairperson of the examination committee shall take care of the student receiving a subject for the master's thesis within four weeks upon her/his request. In this case, the subject is issued by the chairperson of the examination committee.

(3) The subject, task, and scope of the master's thesis shall be limited by the supervisor such that it can be handled with the expenditure outlined in par. 4.

(4) The master's thesis shall demonstrate that the student is able to deal with a problem of her/his subject area in an independent manner and within a limited period of time using scientific methods. The scope of the master's thesis shall correspond to 30 credits. The maximum duration of work on the thesis shall amount to six months. The subject and task shall be adapted to the scope envisaged. The examination committee shall specify in which languages the master's thesis can be written. At the request of the student, the examiner can permit the master's thesis to be written in a language other than German.

(5) When submitting the master's thesis, the student shall assure in writing that the thesis is original work by her/him alone and that she/he has used no sources and aids other than indicated, marked all citations in word and content, and observed the Rules of KIT for Safeguarding Good Scientific Practice, as amended. If this declaration is not contained, the thesis will not be accepted.

The wording of the declaration may be:

> *"Ich versichere wahrheitsgemäß, die Arbeit selbständig verfasst, alle benutzten Hilfsmittel vollständig und genau angegeben und alles kenntlich gemacht zu haben, was aus Arbeiten anderer unverändert oder mit Abänderungen entnommen wurde sowie die Satzung des KIT zur Sicherung guter wissenschaftlicher Praxis in der jeweils gültigen Fassung beachtet zu haben."*
> *(I herewith declare that the present thesis is original work written by me alone and that I have indicated completely and precisely all aids used as well as all citations, whether changed or unchanged, of other theses and publications, and that I have observed the Rules of KIT for Safeguarding Good Scientific Practice, as amended).*

If the declaration is not true, the master's thesis shall be evaluated "nicht ausreichend" (5.0, failed).

(6) The time of assignment of the subject of the master's thesis shall be recorded in the files of the examination committee by the supervisor and the student. The time of submission of the master's thesis shall be recorded in the files of the examination committee by the examiner. The student shall be allowed to return the subject of the master's thesis once only within the first month of the period of work on the thesis. At the justified request of the student, the examination committee may extend the time of work on the thesis given in par. 4 by three months at the maximum. If the master's thesis is not submitted in time, it shall be deemed to have been "nicht ausreichend" (failed, 5.0), unless the student is not responsible for this failure.

(7) The master's thesis shall be evaluated at least by a university teacher or an executive scientist according to Article 14, par. 3, clause 1, KITG and another examiner. As a rule, one of the examiners is the person who assigned the thesis according to par. 2. In case of deviating evaluations of both persons, the examination committee shall fix the grade of the master's thesis within the limits of the evaluations of both persons. It may also appoint another expert. The evaluation period shall not exceed eight weeks upon submission of the master's thesis.

Additional Achievements (§15, SPO)

(1) Further credits (additional achievements) in the amount of 30 credits at the maximum may be acquired in the courses offered by KIT. Articles 3 and 4 of the examination regulations shall remain unaffected. These additional achievements shall not be considered when calculating the total and module grades. The credits not considered when determining the module grade shall be listed as additional achievements in the transcript of records. At the student's request, additional achievements shall be indicated in the Master's certificate and marked as additional achievements. Additional achievements shall be listed with the grades outlined in Article 7.

(2) The student shall declare a module examination an additional achievement when registering for this examination already. At the student's request, allocation of the module can be changed later on.

1.3. Regular Period of Studies, Organization of Studies, Credits (§3, SPO)

(1) The regular period of studies shall be four semesters.

(2) The curriculum of the program is divided into subjects, the subjects into modules, and the modules are divided into courses. The subjects and their scopes are defined in Article 19. Details are outlined in the module manual.

(3) The work expenditure envisaged for passing courses and modules is expressed in credits. (credit points, CP) The criteria for assigning credits correspond to the European Credit Transfer System (ECTS). One credit corresponds to a work expenditure of about 30 hours. As a rule, the credits shall be distributed equally over the semesters.

(4) The coursework and examinations required for the successful completion of the studies are measured in credits and amount to a total of 120 credits.

(5) Upon prior announcement, the courses may also be offered in English.

1.4. Module Examinations, Coursework and Examinations (§4, SPO)

(1) The Master's examination shall consist of module examinations. Module examinations shall consist of one or several controls of success. Controls of success shall consist of coursework and examinations.

Examinations are:

- Written examinations,
- oral examinations, or
- examinations of another type.

(2) Coursework shall be written, oral, or practical work that is usually accomplished by students parallel to the courses. The Master's examination must not be completed by a coursework.

(3) At least 70% of the module examinations shall be graded.

(4) In case of complementary contents, module examinations of several modules may be replaced by a module-overlapping examination (par. 2, nos. 1-3).

1.5. Registration for and Admission to Module Examinations and Courses (§5, SPO)

(1) To participate in module examinations, students shall register online on the Students Portal for the corresponding controls of success. In exceptional cases, registration can be made in writing with the Students Office or another institution authorized by the latter. For controls of success, registration deadlines may be specified by the examiners. Registration of the master's thesis is outlined in the module manual. The registration period is opened Nov. 13th for the winter semester 2018.

To get help with the Campus System visit https://www.sle.kit.edu/imstudium/videotutorials-campus.php (currently available only in German language) or ask the *student counselling* via Mail.

(2) For admission to an examination in a certain module of choice, students, prior to the first examination in this module, shall submit together with their registration for the examination a binding declaration relating to their choice of the module and its assignment to a subject. At the request of the student to the examination committee, the choice or assignment can be changed later on. If an examination procedure in a module started already, the choice or assignment can be changed after its completion only.

(3) Admission to a control of success shall be granted to students, who

- are enrolled in the Master's Program of Meteorology at KIT; with the admission of students on leave being limited to examinations, and to students, who
- can prove that they meet the requirements for admission to a control of success outlined in the module manual and
- can prove that their entitlement to an examination in the Master's Program of Meteorology has not been lost.

(4) According to Article 30, par. 5, LHG, admission to individual mandatory courses may be restricted. The examiner shall decide on the selection of students, who have registered in due time before the deadline given by the examiner, taking into account the study progress made by these students and taking into consideration Article 13, par. 1, clauses 1 and 2, if the surplus of registrations cannot be reduced by other or additional courses. In the case of identical study progress, further criteria shall be specified by the KIT departments. The result shall be announced to the students in due time.

(5) Admission shall be refused, if the conditions outlined in pars. 3 and 4 are not fulfilled. Admission may be refused, if the corresponding control of success was already passed in a KIT bachelor's program, that was required for admission to this Master's Program. This shall not apply to premature Master's examinations. Admission to these shall be approved explicitly according to clause 1.

1.6. Execution of Controls of Success

(1) Controls of success shall be performed parallel to the studies, usually while imparting the contents of the individual modules or shortly afterwards.

(2) The type of control of success (Article 4, par. 2, nos. 1 – 3, par. 3) shall be specified by the examiner of the respective course depending on the contents of the course and teaching objectives of the module. The type of controls of success, their frequency, sequence, weighting, and the determination of the module grade, if applicable, shall be announced in the module manual six weeks prior to the start of the lecturing period at the latest. The examiner and student may change the type of examination and the examination language later on. In the former case, Article 4, par. 4 has to be observed. When organizing examinations, the needs of students with a disability or chronic disease shall be considered according to Article 13, par. 1. Article 13, par. 1, clauses 3 and 4 shall apply accordingly.

(3) In case of an unreasonably high examination expenditure, a written examination may also be passed orally or an oral examination may also be passed in writing. This modification shall be announced six weeks prior to the examination at the latest.

(4) In case of courses in the English language (Article 3, par. 5), the corresponding controls of success can be executed in this language. Article 6, par. 2 shall apply accordingly.

(5) *Written examinations* (Article 4, par. 2, no. 1) shall usually be evaluated by an examiner according to Article 17, pars. 2-4 or par. 3. If an evaluation is made by several examiners, the grade shall be the arithmetic mean of the individual evaluations. If the arithmetic mean does not correspond to any of the grade levels defined in Article 7, par. 2, clause 2, the grade shall be rounded to the next higher or lower grade level. In case of equal distance to the next higher and lower levels, the grade shall be rounded to the next higher grade level. The evaluation procedure shall not exceed six weeks. Written examinations shall last at least 60 and not more than 300 minutes.

(6) *Oral examinations* (Article 4, par. 2, no. 2) shall be performed and evaluated as group or individual examinations by several examiners (examining board) or by one examiner in the presence of an associate. Prior to determining the grade, the examiner shall consult the other examiners of the examining board. Oral examinations shall usually last at least 15 minutes and not more than 60 minutes per student.

Major details and results of the *oral examination* shall be documented in the minutes. The result of the examination shall be announced to the student directly after the oral examination.

Students who intend to take the same examination in a later semester shall be admitted to oral examinations as an audience depending on the space available and upon approval of the examinee. They shall not be admitted to the consultation of the examining board and announcement of the examination results.

(7) For *examinations of another type*, (Article 4, par. 2, no. 3), appropriate deadlines and submission dates shall be specified. Proper description of the task and adequate documentation shall ensure that the examination passed can be credited to the student. Major details and results of the control of success shall be recorded in the minutes.

During *oral examinations of another type*, an associate shall be present in addition to the examiner, who shall also sign the minutes together with the examiner.

Theses or papers to be written for *an examination of another type* shall be provided with the following declaration:

> *"Ich versichere wahrheitsgemäß, die Arbeit selbstständig angefertigt, alle benutzten Hilfsmittel vollständig und genau angegeben und alles kenntlich gemacht zu haben, was aus Arbeiten anderer unverändert oder mit Abänderungen entnommen wurde." (I herewith declare that the present thesis/paper is original work written by me alone and that I have indicated completely and precisely all aids used as well as all citations, whether changed or unchanged, of other theses and publications).*

If the thesis/paper does not contain this declaration, it shall not be accepted. Major details and results of such a control of success shall be recorded in the minutes.

1.7. Deregistration, Absence, Withdrawal (§10, SPO)

(1) Students can revoke their registration for *written examinations* until the issue of the examination tasks without having to indicate any reasons (deregistration). Deregistration can be made online on the Students Portal by 12 pm on the day before the examination or in justified exceptional cases with the Students Office during office hours. If the deregistration is addressed to the examiner, the latter shall ensure that the deregistration is documented in the Campus Management System.

(2) In case of *oral examinations*, deregistration shall be declared to the examiner at least three working days before the date of examination. Withdrawal from an oral examination less than three working days before the date of examination shall be possible under the conditions outlined in par. 5 only. In principle, withdrawal from oral reexaminations in the sense of Article 9, par. 1 shall be possible under the conditions of par. 5 only.

(3) Withdrawal from *examinations of another type* and from *coursework* shall be subject to the provisions given in the module manual.

(4) An examination shall be deemed to have been “nicht ausreichend” (5.0, failed), if the student fails to be present at the examination without a good reason or if she/he withdraws from the examination after its start without a good reason. The same shall apply, if the Master's thesis is not submitted within the period envisaged, unless the student is not responsible for having exceeded the deadline.

(5) The reason given for withdrawal after the start of the examination or absence shall be notified immediately, credibly, and in writing to the examination committee. In case of sickness of the student or of a child maintained by the student alone or of a relative in need of care, submission of a medical certificate may be required.

1.8. Repetition of Examinations, Ultimate Failure (§8, SPO)

(1) Students may repeat once a written examination that has not been passed (Article 4, par. 2, no. 1). In case a repeated written examination is given the grade of “nicht ausreichend” (5.0, failed), an oral reexamination shall take place soon after the date of the failed examination. In this case, the grade of this examination may not be better than “ausreichend” (4.0, sufficient).

(2) Students may repeat once an oral examination that has not been passed (Article 4, par. 2, no. 2).

(3) Repeated examinations according to paragraphs 1 and 2 shall correspond to the first examination in terms of contents, scope, and type (oral or written). At request, exceptions may be approved by the responsible examination committee.

(4) Examinations of another type (Article 4, par. 2, no. 3) can be repeated once.

(5) Coursework can be repeated several times.

(6) An examination shall ultimately not be passed, if the oral reexamination according to par. 1 was evaluated with the grade of “nicht ausreichend” (5.0, failed). The examination also shall ultimately not be passed, if the oral examination according to par. 2 or the examination of another type according to par. 4 was evaluated twice with the grade of “nicht bestanden” (failed).

(8) The module shall ultimately not be passed, if an examination required for passing the module is ultimately not passed.

(9) A second repetition of the same examination according to Article 4, par. 2 shall be possible in exceptional cases at the request of the student only (“Antrag auf Zweitwiederholung” – application for a second repetition). As a rule, the application shall be submitted in writing to the examination committee within two months upon announcement of the grade.

The examination committee shall decide on the first application of a student for a second repetition. If the examination committee dismisses the application, a member of the Presidential Committee shall decide. Upon comment of the examination committee, a member of the Presidential Committee shall decide on further applications for a second repetition. If the application is accepted, the second repetition shall take place on the next but one examination date at the latest. Paragraph 1, clauses 2 and 3 shall apply accordingly.

(10) Repetition of a passed examination shall not be permitted.

(11) In case a Master's thesis has been granted the grade “nicht ausreichend” (5.0, failed), it can be repeated once. A second repetition of the Master's thesis shall be excluded.

1.9. Loss of the Entitlement to an Examination (§9, SPO)

In case coursework or an examination required according to the present Studies and Examination Regulations is ultimately not passed or the Master's examination, including potential repetitions, is not passed completely by the end of the examination period of the seventh semester, the entitlement to examination in the Master's Program of Meteorology shall expire, unless the student is not responsible for having exceeded the deadline. The decision on extending the deadline and on exceptions from the deadline regulations shall be made by the examination committee taking into account the activities listed in Article 32, par. 6, LHG at the request of the student. This request shall be made in writing usually six weeks prior to the expiry of the deadline.

1.10. Recognition of Accomplishments

Recognition of External Credits

The recognition of external accomplishments, for example credits obtained in other masters programs or at other universities, must be requested by the respective recognition form of the examination committee. The respective lecturers confirm if the accomplishments are equivalent to their modules in the curriculum. Accomplishments that are not equivalent to modules in the curriculum can be accredited if the acquired competences contribute to the qualification goals of the masters program. If necessary, an individual curriculum must be compiled and approved by the mentor.

The examination committee (§16, SPO) decides on which accomplishments are accredited and which parts of the curriculum may be replaced. The form for recognition must be submitted to the study advisor, who will transfer it to the examination committee and the "Studierendenservice".

Accomplishments obtained outside of the Higher Education System

Accomplishments made outside of the higher education system, as for example vocational training, can be accredited if the acquired competences contribute to the qualification goals of the Master's program. Recognition is requested with the respective form of the examination committee.

The examination committee verifies to which extent the acquired knowledge and capabilities can be recognized, and which parts of the program they can replace. At maximum, 50 % of the university education can be replaced. The form for recognition must be submitted to the study advisor, who will transfer it to the examination committee and the "Studierendenservice".

1.11. Special Circumstances

Students with a Disability or Chronic Disease (§13, SPO)

(1) When organizing studies and examinations, the needs of students with a disability or chronic disease shall be considered. In particular, students with a disability or chronic disease shall be granted preferred access to courses with a limited number of participants and the order for passing certain courses shall be adapted to their needs. According to the Federal Equality Act (Bundesgleichstellungsgesetz, BGG) and Vol. 9 of the Social Code (SGB IX), students are disabled, if their bodily function, mental capacity, or emotional health most probably deviates from the state typical of the age for a period longer than six months and, hence, their participation in social life is impaired. At the request of the student, the examination committee shall decide on the existence of conditions outlined in clauses 2 and 3. The student shall submit the required evidence for this purpose.

(2) If a student provides evidence of a disability or chronic disease, as a result of which she/he is not able to pass examinations completely or partly within the planned time or in the form envisaged, the examination committee may permit examinations within other time periods or in another form. In particular, disabled students shall be permitted to use the required aids.

(3) In case students provide evidence of a disability or chronic disease, as a result of which they are not able to attend courses regularly or to pass the required coursework or examinations as outlined in Article 19, the examination committee may permit at the student's request passing of certain coursework and examinations after the expiry of the deadlines given in the present Studies and Examination Regulations.

(4) Examples of possible compensations of disadvantages:

- Modified form of exams, for instance oral exams instead of written exams, and vice versa
- Conducting exams in a separate room
- Allowing necessary utilities and assistance, e.g. sign language interpreter
- Additional breaks during time-limited exams
- Extension of the periods between exams

Maternity Leave, Parental Leave, Assumption of Family Obligations (§12, SPO)

(1) At the student's request, the maternity protection periods as defined by the Act on the Protection of the Working Mother (Mutterschutzgesetz, MuSchG), as amended, shall be considered. The required evidence shall be enclosed with this request. The maternity protection periods suspend any deadline according to the present examination regulations. The duration of maternity protection shall not be included in the deadline given.

(2) At request, the deadlines of parental leave shall be considered according to the valid legislation (Bundeselterngeld- und Elternzeitgesetz (Parental Benefit and Parental Leave Act - BEEG)). Four weeks prior to the desired start of the parental leave period at the latest, the student shall inform the examination committee in writing about the time when she/he wishes to be on parental leave. The required evidence

shall be enclosed. The examination committee shall then check whether the legal prerequisites would justify an employee’s claim for parental leave and inform the student immediately of the result and the new times of examination. The period of work on the Master's thesis may not be interrupted by parental leave. In this case, the thesis shall be deemed to have not been assigned. Upon expiry of the parental leave period, the student shall receive a new subject that is to be dealt with within the period defined in Article 14.

(3) At request, the examination committee shall decide on the flexible handling of examination deadlines according to the provisions of the Act of Baden-Württemberg on Universities and Colleges (LHG), if students have to assume family obligations. Paragraph 2, clauses 4 to 6 shall apply accordingly.

1.12. Forthcoming Changes

2. Modules

2.1. Components of the Climate System

Module Code	**M-PHYS-100951**
Responsible Lecturer	Prof. Dr. Andreas Fink
Level	4
Components of the module: Mandatory Electives	1. T-PHYS-107692 Seminar on IPCC Assessment Report 2. T-PHYS-107693 Tropical Meteorology 3. T-PHYS-108928 Climate Modeling & Dynamics with ICON 4. T-PHYS-108931 Middle Atmosphere in the Climate System 5. T-PHYS-108932 Ocean-Atmosphere Interactions
ECTS Credits	12
Study Program	MSc *Meteorology*, compulsory module in the subject Atmospheric and Climate Processes'
Instruction Language	English
Duration	1 semester
Module Frequency	Each winter semester
Module Content	This module aims to give students an overview of important components of the climate system, their physical and chemical backgrounds and give their temporal and spatial changes. Particularly including: 1. Causes of climate change and paleoclimate (external and internal influency factors on the climate, results and structure of simple climate models with and without feedbacks, radiation effect and importance of greenhouse gases, results of model projections of the global climate, IPCC process structure and importance for the life on earth). 2. Dynamics and climate of the Tropics (tropical circulation, Hadley and Walker cells, monsoons, El Niño, equatorial waves, Madden-Julian Oscillation, easterly waves, tropical cyclones, tropical squall lines). 3. Climate Modeling and Climate Dynamics with ICON (introduction to the ICON model, baroclinic lifecycles, cloud impact on large-scale circulation of the atmosphere, climate change response of extratropical jet stream, aerosol impact on tropical rain belts). Numerical modeling and analysis of climate and climate change (climate system, conceptual models for processes and feedback, chaotic dynamic systems, numerical climate models (EMICS, Global

	models, regional models), (statistical) analysis methods. 4. 5.
Workload	Presence time in lectures, exercises: 120 hours Preparation / follow-up: 120 hours Exam preparation: 120 hours
Learning Controls/Exams	The success check is carried out as part of an overall oral exam (60 minutes) in accordance with § 4 (2) No. 2 SPO Master's Meteorology
Special Features of the Exam	None
Grade	Grade of the oral exam
Exam Requirements	In the module "Components of the climate system" Lectures are offered with exercises (2V1Ü) and without exercises (2V). Registration for this part-performance is only possible if study achievements have been made in a sufficient amount. There are different ways to do this: - 3LV with 2V1Ü - 2LV with 2V1Ü and 2LV with 2V - 1LV with 2V1Ü and 4LV with 2V
Recommendations	Basic knowledge about the climate system is helpful.
Conditions	None
Learning Outcomes	The students are capable of essential components of the climate system and their physical properties to explain. They are capable of explaining causes of climate change expertly to present and critically discuss. Students can designate monitoring systems for climate monitoring and how they work of climate models. The students can designate essential processes in the atmosphere and ocean and explain with physical and chemical laws. They are able to analyse and interpret Climate and weather data on the basis of diagnostic methods. In addition, they can expertly present and discuss learned or self-developed scientific findings.

2.2. Atmospheric Processes

Module Code	M-PHYS-100952
Responsible Lecturer	Prof. Dr. Corinna Hoose
Level	4
Components of the module:	1. T-PHYS-107694 Cloud Physics 2. T-PHYS-107695 Energetics 3. T-PHYS-108938 Atmospheric Aerosols 4. T-PHYS-107696 Atmospheric Radiation
ECTS Credits	12
Study Program	MSc Meteorology, compulsory module in the subject Atmospheric and Climate Processes'
Instruction Language	English
Duration	1 semester
Module Frequency	Each winter semester
Module Contents	This module aims to give students an overview of important convey physical and chemical processes in the atmosphere. in the Special includes: 1. Cloud Physics (phenomenology, cloud dynamics of stratiform and convective clouds, microphysics of warm and cold clouds, collision and coalescence, primary and secondary ice formation, condesational and depositional growth) 2. Energetics (mean meridional circulation, stationary and transient eddies; basic forms, budget equations and transport processes of energy in the atmosphere; principle of available potential energy; Lorenz cycle: energy reservoirs and transformation processes, eddy and thermally driven jets (EP flux vectors)) 3. Atmospheric aerosols (Gas particle processes (kinetics, diffusion, condensation), Aerosol properties (diffusion, coagulation, sedimentation, impaction), Aerosol thermodynamics (chemical potential, solubility, Crystallization), aerosol cloud processes (Köhler theory, Einukleation)) 4. Atmospheric radiation (basic quantities of electromagnetic radiation, atmospheric radiative transfer, boundary conditions, reflection, emission, molecular spectroscopy, line broadening, scattering, optical phenomena, radiation parametrization in atmospheric models, radiation budget, climate change, remote sensing)
Workload	Presence time in lectures, exercises: 113 hours

	Preparation / follow-up: 87 hours Exam preparation: 160 hours
Learning Controls/Exams	**T-PHYS-108939 Atmosperic Processes (Module Exam)** The success check is carried out as part of an overall oral exam (60 minutes) in accordance with § 4 (2) No. 2 SPO Master's Meteorology
Special Features of the Exam	None
Grade	Grade of the oral exam
Requirements	All courses must be passed.
Recommendations	None
Conditions	None
Learning Outcomes	The students can name essential processes in the atmosphere and explain these using physical and chemical laws. In particular, they are capable of explaining structure and dynamics of different cloud systems and estimating the mikrophysical processes in clouds or calculating them directly for idealized conditions. In addition, the students are capable of mathematically evaluating the radiation transport in the atmosphere and describe the importance of radiation processes for the structure of the atmosphere, for climate change and for the measurement of different atmospheric variables. They can also explain the chemical structure and the composition of the aerosols in the troposphere and the stratosphere on the basis of the atmospheric physico-chemical processes and transformations. The students are able to understand the chemical and physical causes of stratospheric ozone hole and its future development, know the main aerosol-cloud processes and are familiar with the *Köhlertheorie* and the classical nucleation theory.

2.3. Experimental Meteorology

Module Code	M-PHYS-100953
Responsible Lecturer	Prof. Dr. Christoph Kottmeier
Level	4
Components of the module:	1. T-PHYS-109133 Remote Sensing of Atmospheric Trace Variables 2. T-PHYS-109134 Radar Meteorology 3. T-PHYS-109135 Advanced Practical Course 4. T-PHYS-109136 Field Trip
ECTS Credits	14
Study Program	MSc Meteorology, compulsory module in the subject *Experimental and Applied Meteorology*
Instruction Language	English
Duration	1 semester
Module Frequency	Each summer semester
Module Contents	This module is intended to convey students an overview of modern measurement methods in meteorology and practical aspects of application. In particular, this includes: 1. Remote sensing (physical Basics, radiation transfer, inverse methods, basics of Satellite remote sensing, techniques and applications) 2. Radar techniques (Scattering and absorption of electromagnetic waves, radar equation, Radar reflectivity factor and rain rate, technical aspects, Radar beams in a layered medium, wind information out of Doppler radar data) and laser techniques (properties and propagation of light, basics of the laser, operating principles of the Laser Remote Sensing, Technical Construction of Lidar Systems, Overview of common lidar measurement methods, space-based lidar systems). Moreover the module teaches the students through the internship and the Excursion a glimpse into experimental Meteorology and practical experience with modern day measurement methods as used in research at KIT and other Institutions .
Workload	Presence time in lectures, exercises: 57 hours Attendance time in excursion and internship: 100 hours Preparation / follow-up: 143 hours Exam preparation: 120 hours

Learning Controls/Exams	**T-PHYS-109137 Experimental Meteorology (Module Exam)** The success check is carried out as part of an overall oral exam (60 minutes) in accordance with § 4 (2) No. 2 SPO Master's Meteorology
Special Features of the Exam	None
Grade	Grade of the oral exam
Requirements	All courses must be passed.
Recommendations	None
Conditions	None
Learning Outcomes	The students can explain the functionality of modern meteorological measuring methods and measuring principles and name their possible uses. This is especially true for Remote sensing, advanced in-situ, trace gas and aerosol measurements. They are able to build and execute simple experiments in the lab or in the field according to instructions , to record and evaluate data scientifically founded and then Interpret and present the results.

2.4. Applied Meteorology

Module Code	M-PHYS-100954
Responsible Lecturer	Prof. Dr. Michael Kunz
Level	4
Components of the module:	1. T-PHYS-109142 Methods of Data Analysis 2. T-PHYS-109139 Advenced Numerical Weather Prediction 3. T-PHYS-109140 Meteorological Hazards 4. T-PHYS-109141 Energy Meteorology 5. T-PHYS-108610 Turbulent Diffusion
ECTS Credits	10
Study Program	MSc Meteorology, compulsory module in the subject *Experimental and Applied Meteorology*
Instruction Language	English
Duration	1 semester
Module Frequency	Each summer semester
Module Contents	This module aims to give students an overview of important applications of meteorology in areas such as weather forecasting and warning, Insurance and energy industry, air quality or data analysis. In particular, the module deals with the following aspects: 1. There will be methods of data analysis used in the geosciences and especially in meteorology / climate research frequent application presented (e.g. statistical methods, correlation analyzes, Least-squares methods (linear, multi-linear, and nonlinear Regression), principal component analysis, Fourier analysis) 2. Methods of numerical weather forecast (hydrodynamic Systems of equations, spectral approximation methods, Difference approximation on irregular lattices, statistical Data assimilation procedures, operational aspects of the Weather) 3. Meteorological natural hazards (extreme events, extratropical and tropical cyclones, convection, thunderstorms, supercells, tornadoes, convective storm gusts, derechos, hail, climate change and Extreme events) 4. Energy Meteorology (fundamentals of the energy system, application meteorological expertise in the energy industry, in particular for Integration of Renewable Energy Wind Power, Solar Energy and Hydropower; Deepening of individual meteorological aspects with special relevance) 5. Propagation of air bubbles (relevant trace gases, daily cycles of emissions and concentrations, temperature history and Movements in the lower at-

	mosphere, turbulent diffusion, Turbulence parameterization, chemical transformation processes, numerical models)
Workload	Presence time in lectures, exercises: 57 hours Attendance time in excursion and internship: 100 hours Preparation / follow-up: 143 hours Exam preparation: 120 hours
Learning Controls/Exams	**T-PHYS-109143 Applied Meteorology (Module Exam)** **T**he success check is carried out as part of an overall oral exam (60 minutes) in accordance with § 4 (2) No. 2 SPO Master's Meteorology
Special Features of the Exam	None
Grade	Grade of the oral exam
Requirements	In the module *Applied Meteorology* LVs are offered with exercises (2V1Ü) and without exercises (2V). Registration for this part-performance is only possible if study achievements have been made in a sufficient amount. There are different ways to do this: Methods of Data Analysis+ • 1LV with 2V1Ü and 1LV with 2V • 3LV with 2V
Recommendations	Basic knowledge in statistics are helpful.
Conditions	None
Learning Outcomes	The students can professionally explain essential aspects of the application aspects of meteorology and assign them to specific application areas. They are capable to describe the funcionality of a modern weather forecasting system in detail and are able to predict potential for extrem events and their impact on the population and the insurance industry depending on the region and the season. The students are capable to ederive the Impact on air pollution and generating regenerative energy from weather information. They are capable of analyzing meteorological data using computerized statistical and other processes.

2.5. Supplementary Modules: Mandatory Electives

Fluid Dynamics

Module Code	M-PHYS-102503
Responsible Lecturer	Prof. Dr. Bettina Frohnapfel (ISTM)
Level	4
Components of the module	T-MACH-105207 Ströhmungslehre I&II
ECTS Credits	8
Requirements	None
Instruction Language	German
Duration	2 semester
Module Frequency	Each summer semester
Learning Controls/ Exams	Prerequisite: optional variants from pre-calculation, exercise sheets Examination: written exam

Modern Theoretical Physics for Teacher Students

Module Code	M-PHYS-101664
Responsible Lecturer	Dr. Stefan Giesecke (ITP)
Level	4
Components of the module	T-PHYS-103203 - Moderne Theoretische Physik für Lehramt – Vorleistung T-PHYS-103204 - Moderne Theoretische Physik für Lehramt
ECTS Credits	8
Requirements	None
Instruction Language	German
Duration	1 semester
Module Frequency	Each winter semester
Learning Controls/Exams	Prerequisite: optional variants from pre-calculation, exercise sheets, written exam → successful completion of the exercises entitles to exam Examination: oral exam

Modern Theoretical Physics I, Quantum Mechanics I

Module Code	M-PHYS-101707
Responsible Lecturer	Prof. Dr. Frans Klinkhamer (ITP)
Level	4
Components of the module	T-PHYS-102317 - Moderne Theoretische Physik I, Quantenmechanik 1, Vorleistung 1 T-PHYS-105134 - Moderne Theoretische Physik I, Quantenmechanik 1
ECTS Credits	8
Requirements	None
Instruction Language	German
Duration	1 semester
Module Frequency	Each summer semester
Learning Controls/Exams	Prerequisite: exercises → successful completion of the exercises entitles to exam Examination: oral exam

Physics of Planetary Atmospheres

Module Code	M-PHYS-104488
Responsible Lecturer	Prof. Dr. Thomas Leisner (IMK)
Level	4
Components of the module	T-PHYS-109177 – Physics of Planetary Atmospheres, Prerequisite (8 CP) T-PHYS-109180 – Exam on Physics of Planetary Atmospheres (2 CP)
ECTS Credits	10
Study Program	Msc Meteorology, Mandatory Elective
Instruction Language	English
Duration	1 semester
Module Content	The module gives a broad introduction into the formation and properties of planets and their atmospheres and tries to constrain possible planetary atmospheres by applying fundamental principles of physics. In this respect, the module will focus on the planetary atmospheres in our solar system. Moreover, recently developed methods for the remote sensing of extrasolar planets are introduced and the current understanding of their atmospheres is presented. A focus is the energy budget of planetary atmospheres, where clouds play a central role. Their formation and growth will be covered in a generalized fashion.
Workload	Presence time in lectures, exercises: 45 hours (2L2E) Preparation / follow-up: 120 hours Exam preparation: 75 hours
Module Frequency	Each winter semester
Learning Controls/ Exams:	Prerequisite: 50% of points in exercises Overall oral exams in accordance with § 4 (2) No. 2 SPO Master's Meteorology
Grade	Grade of oral exam
Recommendations	Basic knowledge in Physics, Physical Chemistry and Fluid Dynamics at BSc level
Learning Outcomes	

Computer Vision and GIS

Module Code	M-BGU-102757
Responsible Lecturer	Prof. Dr. Stefan Hinz (IPF)
Level	4
Components of the module	T-BGU-103541 - Einführung in GIS für Studierende natur-, ingenieur- und geowissenschaftlicher Fachrichtungen, Vorleistung T-BGU-101681 - Einführung in GIS für Studierende natur-, ingenieur- und geowissenschaftlicher Fachrichtungen T-BGU-101732 - Image Processing and Computer Vision
ECTS Credits	10
Requirements	None
Instruction Language	German
Duration	1 semester
Module Frequency	Each winter semester
Learning Controls/Exams	Prerequisite: online test 'Introduction to GIS for Students of Natural, Engineering and Geo Sciences' (T-BGU-103541) → successful completion of the test entitles to exam Examination: written exam, 90 min

GIS and Remote Sensing

Module Code	M-BGU-102758
Responsible Lecturer	Prof. Dr. Stefan Hinz (IPF)
Level4	4
Components of the module	T-BGU-103541 - Einführung in GIS für Studierende natur-, ingenieur- und geowissenschaftlicher Fachrichtungen, Vorleistung T-BGU-101681 - Einführung in GIS für Studierende natur-, ingenieur- und geowissenschaftlicher Fachrichtungen T-BGU-105725 - Einführung in Klassifizierungsverfahren der Fernerkundung
ECTS Credits	10
Requirements	None
Instruction Language	German
Duration	1 semester
Module Frequency	Each winter semester
Learning Controls/Exams	Prerequisite: online test 'Introduction to GIS for Students of Natural, Engineering and Geo Sciences' (T-BGU-103541) → successful completion of the testentitles to exam Examination: written exam, 90 min

Computer Vision and Remote Sensing

Module Code	M-BGU-102759	
Responsible Lecturer	Dr. Jan Cermak (ASF), Dr. Uwe Weidner (IPF)	
Level	None	
Components of the module	T-BGU-105725 - Einführung in Klassifizierungsverfahren der Fernerkundung	4 CP
	Compulsory Elective Subject:	
	T-BGU-101732 - Image Processing and Computer Vision	4 CP
	T-BGU-106333 - Remote Sensing of a Changing Climate, Vorleistung	4 CP
	T-BGU-106334 - Remote Sensing of a Changing Climate, Prüfung	4 CP
	T-PHYS-108283 T-PHYS-108286- Platzhalter MA MET Computer Vision und Fernerkundung für Meteorologen	4 CP
ECTS Credits	8	
Requirements	None	
Instruction Language	German/English	
Duration	2 semester	
Module Frequency	Each summer semester	
Learning Controls/Exams	Depends on compulsory electives	

GIS and Geo Data Infrastructures

Module Code	M-BGU-102760
Responsible Lecturer	Prof. Dr. Stefan Hinz (IPF)
Level	4
Components of the module	T-BGU-103541 - Einführung in GIS für Studierende natur-, ingenieur- und geowissenschaftlicher Fachrichtungen, Vorleistung T-BGU-101681 - Einführung in GIS für Studierende natur-, ingenieur- und geowissenschaftlicher Fachrichtungen T-BGU-101757 - Geodateninfrastrukturen und Web-Dienste, Vorleistung T-BGU-101756 - Geodateninfrastrukturen und Web-Dienste
ECTS Credits	10
Requirements	None
Instruction Language	
Duration	1 semester
Module Frequency	Each summer semester
Learning Controls/Exams	Prerequisite: online test 'Introduction to GIS for Students of Natural, Engineering and Geo Sciences' (T-BGU-103541) → successful completion of the testentitles to exam (T-BGU-101681) Examination: written exam, 90 min Prerequisite: the accomplishment 'Geodata Infrastructures and Web-Services, Prerequisite' (T-BGU-101757) has to be passed to entitle to exam (T-BGU-101756) Examination: oral exam, 20 min

Fluid Mechanics and Turbulence

Module Code	M-BGU-101876		
Responsible Lecturer	Prof. Dr. Oliver Eiff(IfH)		
Level	None		
Components of the module	CE I:	T-BGU-106612 - Advanced Fluid Mechanics	6 CP
	1 of 2	T-BGU-103561 - Analysis of Turbulent Flows	
	CE II:	T-BGU-103562 – Strömungsmesstechnik	3 CP
	1 of 2	T-BGU-103563 - Gebäude- und Umweltaerodynamik	
ECTS Credits	9		
Requirements	One examination has to be taken in one of the *Teilleistungen* "Analysis of Turbulent Flows" or "Fluid Mechanics for Environmental Flows" and one other exmaination in one of the *Teilleistungen* "Flow Measuring Technique" oder "Building- and Environmental Aerodynamics". The learning controls depend on the selected *Teilleistungen* (s. *Teilleistungen)*.		
Instruction Language	English/German		
Duration	2 semester		
Module Frequency	Each semester		
Learning Controls/Exams	• *Teilleistung* T-BGU-106612 with written examination according to § 4 (2) no. 1 • *Teilleistung* T-BGU-103561 with oral examination according to § 4 (2) no. 2 • *Teilleistung* T-BGU-103562 with oral examination according to § 4 (2) no. 2 • *Teilleistung* T-BGU-103563 with oral examination according to § 4 (2) no. 2 For details on the individual success checks, see the respective *Teilleistung*		

Informatics for Meteorology Students

Module Code	**M-PHYS-102980**	
Responsible Lecturer	Bernhard Beckert	
Level	4	
Components of the module	**Compulsory Elective Subject:**	
	T-INFO-101345 - Parallelrechner und Parallelprogrammierung	4 CP
	T-INFO-101298 - Verteiltes Rechnen	4 CP
	T-INFO-102061 - Mobile Computing und Internet der Dinge	4 CP
	T-INFO-101305 - Analysetechniken für große Datenbestände	4 CP
	T-INFO-101497 – Datenbanksysteme	4 CP
	T-INFO-101275 – Visualisierung	4 CP
	T-PHYS-108279 - T-PHYS-108282 Platzhalter MA MET INF für Stud. benotet oder unbenotet	4 CP
ECTS Credits	8	
Requirements	The module: Introduction to Computer Networks is foreseen Knowledge of basics from the course computer structures are helpful	
Instruction Language	German	
Duration	1 or 2 semester	
Module Frequency	Each semester	
Learning Controls/Exams	The learning controls depend on the selected *Teilleistungen* (s. *Teilleistungen)*.	

Geophysical Analysis of Natural Hazards

Module Code	M-PHYS-103336
Responsible Lecturer	Prof. Dr. Ellen Gottschämmer (GPI)
Level	4
Components of the module	T-PHYS-103553 – Einführung in die Vulkanologie, Vorleistung T-PHYS-103644 – Einführung in die Vulkanologie, Prüfung T-PHYS-107673 – Seminar on recent topics of risk rcience
ECTS Credits	8
Requirements	None
Instruction Language	English
Duration	2 semester
Module Frequency	Each summer semester
Learning Controls/Exams	**Introduction to Vulcanology** Active and regular attendance of lecture and practicals, presentation of a volcano in a short (10 – 15 minute) talk with slides, submission of a scientific essay about their presentation, approx. 8-10 pages, which will be graded. **Seminar on recent topics of risk sclence** Preparation and presentation of a talk based on a scientific publication, critical discussion of the scientific results.

Information on **T-PHYS-107673**: Seminar on recent topics of risk rciance:

A seminar on Guatemalan volcanoes and their monitoring will be given as part of the Electives in winter term 18/19. The course will be held in English.

Who: Geophysics students in in their 3rd year (Bachelors), 1st & 2nd year (Masters), Meteorology students (Masters).

Where and when: Mondays, 11.45 am - 1.15 pm, seminar room, building 6.42

Start: 15 October 2018

Additional information regarding contents, workload, grading can be found here:

https://ilias.studium.kit.edu/goto.php?target=crs_876603_rcodet6CrhwagZB&client_id=produktiv

Geoecology

Module Code	M-PHYS-103398
Responsible Lecturer	Wolfgang Wilcke
Level	4
Components of the modul	T-BGU–107487 – Geomorphologie und Bodenkunde T-BGU-107486 – Field Course Soil Science
ECTS Credits	8
Requirements	
Instruction Language	Deutsch
Duration	1 semester
Module Frequency	Each summer semester
Learning Controls/Exams	**Geomorphologie und Bodenkunde:** Written examination according to § 4 Abs. 2 Nr. 1 SPO 2015 Master Meteorology **Field Course Soil Science:** Study achievement according to § 4 Abs. 3 SPO 2015 Master Meteorology For details on the individual success checks, see the respective partial services.

Basics of Estimation Theory and its Application in Geoscience Remote Sensing

Module Code	M-BGU-103422
Responsible Lecturer	Prof. Dr. Jan Cermak (IMK-ASF) Prof. Dr. Stefan Hinz (IPF)
Level	None
Components of the module	T-BGU-106821 – Grundlagen der Schätztheorie, Coursework T-BGU-106633 – Data Analysis in Geoscience Remote Sensing Projects, Coursework T-BGU – 106822 – Grundlagen der Schätztheorie und ihrer Anwendung in geowissenschaftlicher Fernerkundung, Oral Exam
ECTS Credits	8
Requirements	None
Instruction Language	German
Duration	1 semester
Module Frequency	Each summer semester
Learning Controls/Exams	

Geological Hazards and Risk

Module Code	M-PHYS-101833
Responsible Lecturer	Prof. Dr. Ellen Gottschämmer (GPI)
Level	4
Components of the module	T-PHYS-103525 - Geological Hazards and Risks
ECTS Credits	8
Requirements	None
Instruction Language	English
Duration	1 semester
Module Frequency	irregular

Module Content	• Earthquake Hazards
	  ◦ Short introduction to seismology and seismometry (occurrence of tectonic earthquakes, types of seismic waves, magnitude, intensity, source physics)
	  ◦ Induced seismicity
	  ◦ Engineering seismology, Recurrence intervals, Gutenberg-Richter, PGA, PGV, spectral acceleration → hazard maps
	  ◦ Earthquake statistics
	  ◦ Liquefaction
	• Tsunami Hazards
	• Landslide Hazards
	• Hazards from Sinkholes
	• Volcanic Hazards
	  ◦ Short introduction to physical volcanology
	  ◦ Types of volcanic hazards
	• The Concept of Risk, Damage and Loss
	• Data Analysis and the use of GIS in Risk analysis
	• Risk Modelling - Scenario Analysis
	• Risk Reduction and Risk Management
	• Analysis Feedback and Prospects in the Risk Modelling Industry

Learning Outcomes	The students understand basic concepts of hazards and risk. They can explain in detail different aspects of earthquake hazard, volcanic hazard as well as other geological hazards, can compare and evaluate those hazards. The have fundamental knowledge of risk reduction and risk management. They know methods of risk modelling and are able to apply them.

Learning Controls/Exams	The module grade is determined by the grade of the sExamination of other type:. To be evaluated: Exercise sheets, written project work.

Inormation on **M-PHYS-101833**:

Lectures and exercises on Geological Hazards and Risk will be given as part of the Electives in winter term 18/19 by James Daniell and myself. The course will be given in English.

Who: Geophysics students in in their 3rd year (Bachelors), 1st & 2nd year (Masters), Meteorology students (Masters), Physics students (Masters).

Where and when: Fridays, 9 - 10:30 am (lectures), 10:45 - 12:15 am (exercises), seminar room, building 6.42

Start: 19 October 2018

Additional information regarding contents, workload, grading etc. can be found here:

https://ilias.studium.kit.edu/goto.php?target=crs_876597_rcodeEuQ9MynDUR&client_id=produktiv

2.6. Interdisciplinary Qualifications: Soft Skills (§15a, SPO)

Apart from scientific qualifications, KIT attaches high importance to transferable skills. These skills of 4 credits shall be part of the Master's Program of Meteorology. Transferable skills may be imparted additively or integratively.

A wide range of interdisciplinary qualifications is offered by the House of Competence (HOC).

2.7. Research Work: Specialization Phase

Module Code	M-PHYS-100955
Responsible Lecturer	Prof. Dr. Peter Knippertz (Dean of Faculty)
Level	5
ECTS Credits	30
Study Program	*MSc Meteorology*
Language	English or German. On agreement with the examiner(s), the *Study Project* can also be written in other languages.
Duration	1 semester
Module Frequency	Each semester
Examinations/Partial Deliveries	Examination of other type: Final presentation (20-25 minutes) in the *Seminar on Specialization Phase*, followed by a short discussion with all listeners (15 minutes). Afterwards a short feedback meeting with the examiners and the supervisor about the previous progress and next steps will take place. Please notice that the seminar only occurs within the semester on Wednesday (15:45 – 17:15 pm) in Bldg. 20.23, Room 13-2. To get a seminar slot please enroll via Mail. Additionally, please register in the Campus Management System for the Specialization Phase! (This is possible, if three out of four meteorological modules have been passed).
Components of the module	T-PHYS-101563 Scientific Concept Development
Special Features of the Exam	None
Grade	Ungraded
Requirements	The Start of the *Specialization Phase* simultaneously establishes the deadline for the delivery of the Master's thesis (12 months). For registration, the students need to get the registration form at the examination office (Bldg. 20.12, Room 9-13, Ms. Müller).
Recommendations	The knowledge and technical and interdisciplinary skills needed to work on the selected topic and to prepare the 'Study Project' should have been acquired.
Conditions	Students have successfully completed all four module exams in the subjects A*tmospheric and Climate Processes* and *Applied and Experimental Meteorology*. *Soft skills* and *Supplementary Modules* can be in progress.
Learning Outcomes	Students can work on an interdisciplinary, meteorological project using scientific methods.

	They can, with guidance, plan, structure, prepare, conduct, and document a study. They can select appropriate methods for the solution of the given problem. Students can work self-organized and structured. They possess skills in the field of project management and presentation, both orally and in writing.
Content	Conducting a meteorological, interdisciplinary project work. This may be of a theoretical and/or experimental type. The focus is on the development of conclusions using scientific methods, project management and presentation of the results. Students are invited to make suggestions for topics. It is possible to conduct the project in cooperation with external partners.
Workload	6 months (900 h)
Literature/ Learning Materials	

2.8. Master's Thesis

Module Code	M-PHYS-100956
Responsible Lecturer	Prof. Dr. Peter Knippertz (Dean of Faculty)
Level	5
ECTS Credits	30
Study Program	MSc *Meteorology*
Language	English or German; On request, the Master's thesis can also be written in another language.
Duration	1 semester
Module Frequency	Each semester
Examinations	Written report (Master's thesis) and presentation (SPO §24) The assessment is based on § 14 SPO Master's Meteorology and consists of the evaluation of the actual Master's Thesis and the related presentation by at least one professor, one habilitated scientist of the KIT-Faculty of Physics or one leading scientist in accordance with § 14 Abs. 3 para. 1 KITG and another examiner. The overall assessment will be recorded in a written report. The evaluation period shall not exceed eight weeks upon submission of the Master's thesis.
Special Features of the Exam	None
Grade	The overall grade results from the evaluations of the thesis and the final presentation.
Requirements	Students have successfully completed modules with a minimum of 70 ECTS credits, especially the module *Specialization Phase* must be successfully completed. (SPO §14)
Recommendations	The knowledge and technical and interdisciplinary skills needed to work on the selected topic and to prepare the thesis should have been acquired. Visit of the Karlsruhe Meteorological Colloquium and the departmental seminars.
Conditions	Students have successfully completed modules with a minimum of 70 ECTS credits, especially the module *Specialization Phase* must be successfully completed. (SPO §14)
Learning Outcomes	Students can independently develop and carry out a scientific work. To this end, they deal with the latest state of research and apply the knowledge and the methods acquired during studies. They can discuss and evaluate the obtained results and present them in writing as well as defend the work in a presentation.

	The students are able to work on a continuing problem from their field of study independently and in a limited time according to scientific methods and then present the knowledge gained in a written paper and in a lecture in an understandable and precise manner and to discuss it competently.
Content	The Master's thesis is an original scientific study and includes the theoretical and/or the experimental work on a complex problem using scientific methods. Students may choose a subject area, which determines the topic of their thesis. Students are invited to make suggestions for topics. It is possible to conduct the project in cooperation with external partners, for example an external research institution or an institution from the professional background. This module is intended to provide students with in-depth aspects of scholarly writing, writing and presentation. The subject areas usually arise from current research priorities of the Institute of Meteorology and Climate Research. The written scientific work includes a summary of the state of the literature, presentation of the goals, methods used and the results obtained as well as a discussion of the knowledge gained and the remaining open questions.
Workload	6 months (900 h) (SPO§14 Abs. 1a)
Literature/ Learning materials	