Friedrich-Alexander-Universität
Erlangen-Nürnberg

Module description

for the degree programme

Master of Science Physical Geography: Climate & Environmental Sciences

(Version of examination regulation: 20202)

for the winter term 2026/2027

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1	**Module name** 46001	**Scientific Working I** Scientific working I	**5 ECTS**
2	Courses / lectures	PG Masterseminar: Scientific Writing and Communication (SW I) (2 SWS)	5 ECTS
3	Lecturers	Prof. Dr. Thomas Mölg Samuel Cook	

4	**Module coordinator**	Prof. Dr. Matthias Braun Prof. Dr. Thomas Mölg
5	**Contents**	Seminar: • Introduction and analysis of different publication standards • Introduction and analysis of different research processes • Scientific writing of papers and proposals • Transfer of knowledge and science communication. • Presentation techniques
6	**Learning objectives and skills**	The students • analyse different scientific designs of publications with a focus on structure, quality standards, and their placement within the academic system • learn the ethical principles of science and good scientific practice • analyse different forms and structures of proposals • learn different ways of transferring scientific knowledge to practice • learn standards of communicating scientific facts to the media and public
7	**Prerequisites**	n/s
8	**Integration in curriculum**	semester: 1;2
9	**Module compatibility**	Pflichtmodul Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Seminar achievement Three exercise tasks
11	**Grading procedure**	Seminar achievement (pass/fail) Pass/fail
12	**Module frequency**	Only in winter semester
13	**Workload in clock hours**	Contact hours: 30 h Independent study: 120 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	english
16	**Bibliography**	To be announced at the beginning of the term.

1	**Module name** 46003	**Scientific Working II**	**5 ECTS**
2	Courses / lectures	PG Masterseminar: Introduction to Climate & Environmental Sciences (SW II) (2 SWS)	5 ECTS
3	Lecturers	Prof. Dr. Rupert Bäumler Prof. Dr. Thomas Mölg Prof. Dr. Matthias Braun Prof. Dr. Achim Bräuning	

4	**Module coordinator**	Prof. Dr. Matthias Braun Prof. Dr. Thomas Mölg
5	**Contents**	Graduate seminar: • In-depth study of selected, research-oriented topics in climate and environmental science
6	**Learning objectives and skills**	The students • evaluate the importance of the selected topics in climate and environmental research • develop a practice-oriented awareness for processes which have the potential to change society and environment • independently prepare and present a topic from climate and environmental science at high level, considering the trained standards of scientific working
7	**Prerequisites**	n/s
8	**Integration in curriculum**	semester: 1;2
9	**Module compatibility**	Pflichtmodul Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Written examinationWritten examination (45 minutes)
11	**Grading procedure**	Written examination (100%)
12	**Module frequency**	Only in winter semester
13	**Workload in clock hours**	Contact hours: 30 h Independent study: 120 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	english
16	**Bibliography**	To be announced at the beginning of the term.

1	**Module name** 1700	**Inter-/Transdisciplinary Perspectives**	**10 ECTS**
2	Courses / lectures	No courses / lectures available for this module for this semester!	
3	Lecturers	No lecturers available since there are no courses / lectures for this module for this semester!	

4	**Module coordinator**	
5	**Contents**	Supplement and extension of geographical topics from the perspectives of neighbouring disciplines (modules offered by FAU Faculty of Sciences and Faculty of Engineering)
6	**Learning objectives and skills**	The students: • gain deepened knowledge of actual interdisciplinary questions within the selected key areas • know and reflect corresponding theoretical and methodical approaches and are able to apply these approaches • are able to embed such approaches within the academic system • understand, analyse and illustrate processes of climate and environment in the context of the key areas of research at the Institute of Geography
7	**Prerequisites**	None
8	**Integration in curriculum**	no Integration in curriculum available!
9	**Module compatibility**	Pflichtmodul Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Written examinationWritten examination (45 minutes) OralOral (30 minutes) Written Written examination Variable Short test Variable According to examination regulations of the elective modules
11	**Grading procedure**	Written examination (pass/fail) Oral (pass/fail) Written (pass/fail) Written examination (pass/fail) Variable (pass/fail) Short test (pass/fail) Variable (pass/fail) Non-graded examination (0%) Pass/fail
12	**Module frequency**	Every semester
13	**Workload in clock hours**	Contact hours: Compulsory course attendance and self-study in total 300 h; according to neighbouring disciplines

		Independent study: Compulsory course attendance and self-study in total 300 h; according to neighbouring disciplines
14	**Module duration**	1-2 semester
15	**Teaching and examination language**	german english
16	**Bibliography**	

1	**Module name** 46041	**Advanced Physical Geography I** Advanced physical geography I	**5 ECTS**
2	Courses / lectures	PG Masterseminar: Graduate Seminar Physical Geography II: Climate Change and Its Implications in Global Ecosystems (2 SWS) PG Masterseminar: Graduate Seminar Physical Geography I: Glacier Hydrology (2 SWS) Es besteht Anwesenheitspflicht.	5 ECTS 5 ECTS
3	Lecturers	Sugam Aryal Samuel Cook	

4	**Module coordinator**	Prof. Dr. Rupert Bäumler
5	**Contents**	In-depth study of selected, research-oriented topics in climate and environmental science.
6	**Learning objectives and skills**	The students • prepare the selected topics in climate and environmental research in written form according to the standards of scientific working by self-contained literature research focusing on primary literature • develop a practice-oriented awareness and critically reflect the contents of the selected topics • present and discuss the selected topic from climate and environmental science at high level, considering the trained standards of scientific working, and finally bring the different topics together to form an overall picture
7	**Prerequisites**	None
8	**Integration in curriculum**	semester: 1;2
9	**Module compatibility**	Pflichtmodul Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Seminar achievement Written paper (20-25 pages) with oral presentation (45 min.)
11	**Grading procedure**	Seminar achievement (100%) Written paper (50%), oral presentation (50%)
12	**Module frequency**	Every semester
13	**Workload in clock hours**	Contact hours: 30 h Independent study: 120 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	english
16	**Bibliography**	To be announced at the beginning of the term.

1	**Module name** 46042	**Advanced Physical Geography II** Advanced physical geography II	**5 ECTS**
2	Courses / lectures	PG Masterseminar: Graduate Seminar Physical Geography II: Climate Change and Its Implications in Global Ecosystems (2 SWS) PG Masterseminar: Graduate Seminar Physical Geography I: Glacier Hydrology (2 SWS)	5 ECTS 5 ECTS
3	Lecturers	Sugam Aryal Samuel Cook	

4	**Module coordinator**	Prof. Dr. Achim Bräuning
5	**Contents**	In-depth study of selected, research-oriented topics in climate and environmental science from scientific literature.
6	**Learning objectives and skills**	The students • evaluate the importance of the selected topics in climate and environmental research • develop a practice-oriented awareness for implementing science-based knowledge about climate and environment in society • independently prepare and present a topic from climate and environmental science at high level, considering the trained standards of scientific working, and finally bring the different topics together to form an overall picture
7	**Prerequisites**	None
8	**Integration in curriculum**	semester: 2;3
9	**Module compatibility**	Pflichtmodul Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Seminar achievement Written paper (20-25 pages) with oral presentation (45 min.)
11	**Grading procedure**	Seminar achievement (100%) Written paper (50%), oral presentation (50%)
12	**Module frequency**	Every semester
13	**Workload in clock hours**	Contact hours: 30 h Independent study: 120 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	english
16	**Bibliography**	To be announced at the beginning of the term.

1	**Module name** 46022	**RTC: Research Training Course** RTC: Research training course	**15 ECTS**
2	Courses / lectures	No courses / lectures available for this module for this semester! Es besteht Anwesenheitspflicht.	
3	Lecturers	No lecturers available since there are no courses / lectures for this module for this semester!	

4	**Module coordinator**	Prof. Dr. Rupert Bäumler Prof. Dr. Achim Bräuning
5	**Contents**	Design and implementation of a clearly defined research project of manageable size in time and content in accordance with and under guidance of the lecturers (course project); alternatively or in addition to it integration or participation in a current research project; herein taking over and independent processing of a defined scope.
6	**Learning objectives and skills**	The students • independently design and systematically transfer problem-oriented questions within clear targets • select suitable methods to empirically treat the selected set of themes • identify adequate theoretical approaches and place the own research topic within the theoretical approach • be aware of and organize the logical demands of research projects • present methods and results competent and understandable to experts and non-experts
7	**Prerequisites**	None
8	**Integration in curriculum**	semester: 2;3
9	**Module compatibility**	Pflichtmodul Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Presentation/written assignment Research report (20-50 pages) with oral presentation (30 min.)
11	**Grading procedure**	Presentation/written assignment (100%) Research report (70 %), oral presentation (30 %)
12	**Module frequency**	Every semester The module starts each summer term and continues in the following winter term. Summer term: 150 attendence, 150 self study Winter term: 30 attendence, 120 self study
13	**Workload in clock hours**	Contact hours: 180 h Independent study: 270 h
14	**Module duration**	2 semester

15	**Teaching and examination language**	english
16	**Bibliography**	To be introduced at the beginning of the course.

1	**Module name** 46150	**Field Course** Field course	**5 ECTS**
2	Courses / lectures	PG Masterseminar: Field Course (2 SWS) (SoSe 2027)	5 ECTS
3	Lecturers		

4	**Module coordinator**	Prof. Dr. Matthias Braun
5	**Contents**	• Students will learn to handle different environmental measuring devices • Measurements will be performed for different application fields including ground truthing for remote sensing, vegetation ecology, meteorological and hydrological as well as soil measurements • Student will work in small groups in turns with different measuring devices • For each device, certain measuring tasks have to be performed
6	**Learning objectives and skills**	Students • familiarize themselves with different measuring instruments • understand different measuring principles • use appropriate measurement instruments for the particular research question and critically evaluate the performance of measurements • are able to critically evaluate measurements and measured values
7	**Prerequisites**	• Scientific working I & II (recommended) • Advanced Physical Geography I (recommended)
8	**Integration in curriculum**	semester: 2
9	**Module compatibility**	Pflichtmodul Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Tutorial achievement • Practical application of various physical-geographical methods in the field (test measurements and other surveys) • Data processing and analysis • Presentation of results (5 pages)
11	**Grading procedure**	Tutorial achievement (100%)
12	**Module frequency**	Only in summer semester
13	**Workload in clock hours**	Contact hours: 28 h Independent study: 122 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	english
16	**Bibliography**	To be announced at the beginning of the term.

1	**Module name** 1999	**Master's thesis (M.Sc. Physical Geography: Climate & Environmental Sciences 20202)** Master's thesis	**30 ECTS**
2	Courses / lectures	No courses / lectures available for this module for this semester!	
3	Lecturers	No lecturers available since there are no courses / lectures for this module for this semester!	

4	**Module coordinator**	
5	**Contents**	Independent production of a substantial written scientific work within six months and its thesis defense
6	**Learning objectives and skills**	The students • design a relevant scientific scope and are in charge of independent elaboration within a defined period • develop independent ideas and concepts to solve the scientific questions • intensively and critically reflect concepts, models, theories, terminologies, characteristics, limitations and academically accepted views of the field of subject and science in general • are able to independently apply and develop appropriate methods – even for new or unknown and interdisciplinary contexts – and to present the results to experts • are able to clearly present subject-specific contents in written and oral form to target groups • extent their ability of planning and organization in order to realize subject-specific projects
7	**Prerequisites**	Successful graduation of modules of at least 60 ETCS credit points of the degree program
8	**Integration in curriculum**	semester: 4
9	**Module compatibility**	Pflichtmodul Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	WrittenWritten (6 Monate) OralOral (30 minutes) Master Thesis (ca. 80 pages) and oral defense (ca. 30 Min.) Please consider to enroll your master thesis on time, if you intend to successfully finish the master program at the end of the current semester (Winter term: 31.3.; summer term: 30.9.) Please consider as well, that • the defense of the thesis has to be passed within a limit of four weeks after submission of the thesis, and that • date of the defense corresponds to the date of the final performance. It is on your one responsibility to take care about the subject of the thesis and to sort out all dates and deadlines with the supervisor of your master thesis in time; please also consider possible periods of absence

		of your supervisor during the semester break. Submission deadline should be latest one month before end of the respective semester.
11	**Grading procedure**	Written (100%) Oral (pass/fail) Master Thesis (200 %), oral defense (0 %)
12	**Module frequency**	Every semester
13	**Resit examinations**	The exams of this moduls can only be resit once.
14	**Workload in clock hours**	Contact hours: Attendance and self-study in total 900 h Independent study: Attendance and self-study in total 900 h
15	**Module duration**	1 semester
16	**Teaching and examination language**	english
17	**Bibliography**	In agreement with the supervisor

Elective Modules: Advanced Methods A + B (graded)

Elective Modules: Advanced Methods C (ungraded)

1	**Module name** 46061	**Internship** Alternative External Expertise	**5 ECTS**
2	Courses / lectures	No courses / lectures available for this module for this semester! Es besteht Anwesenheitspflicht.	
3	Lecturers	No lecturers available since there are no courses / lectures for this module for this semester!	

4	**Module coordinator**	Prof. Dr. Rupert Bäumler
5	**Contents**	Work in non-university institutions such as public institutions, planning/ consulting offices, commercial enterprises, non-governmental organisations, etc. with a link to the content of the geography programme.
6	**Learning objectives and skills**	Students - Learn about potential professional fields in geography. - Apply theoretical knowledge gained during studies to practical questions in professional settings. - Develop important skills in self-organization and teamwork.
7	**Prerequisites**	The suitability of an internship position should be evaluated based on its proximity to the content of the degree programme. If there is any uncertainty, it is recommended to contact the internship coordinator in a timely manner. Additional information can be found on the institute's homepage.
8	**Integration in curriculum**	semester: 2;3
9	**Module compatibility**	Elective Modules: Advanced Methods C (ungraded) Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Written 1. Internship certificate from the employer. 2. Internship report (3-5 pages) to be submitted to the internship supervisor no later than 8 weeks after the end of the internship. Additionally, the report should detail the intern's learning successes. The report should include a description of the activities carried out by the intern, as well as a brief presentation of any projects they worked on and how they were completed. - The report must include the full address of the internship organisation, the name of the contact person, and the signature of a representative of the organisation. Additionally, a certification stamp or similar must be included. - A declaration in lieu of an oath is also required.
11	**Grading procedure**	Written (pass/fail) Successful participation
12	**Module frequency**	Every semester
13	**Workload in clock hours**	Contact hours: 120 h

		Independent study: 30 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	german or english
16	**Bibliography**	

Consolidation Modules - Emphasis on Climate Research

1	**Module name** 46080	**Advanced Methods: Advanced Climate Data Analysis** Advanced methods: Advanced climate data analysis	**5 ECTS**
2	Courses / lectures	PG Masterseminar: Advanced Methods MSc: Advanced Climate Data Analysis (2 SWS)	5 ECTS
3	Lecturers	Nadja Landshuter	

4	**Module coordinator**	Prof. Dr. Thomas Mölg
5	**Contents**	Selected methods related to the analysis of climate data & meteorological data
6	**Learning objectives and skills**	The students • understand the major principles of data availability and production; • practice different statistical methods for the problems at hand; • understand the importance of different space/time scales for the analysis and interpretation of climate data; • and are aware of the pitfalls of different types of climate data, which puts them in the position to make correct interpretations; A series of practical exercises builds on each other throughout the course. Results of these exercises will develop from individual contributions and small-group work, and from a discussion with the whole group. Course attendance is therefore compulsory.
7	**Prerequisites**	None
8	**Integration in curriculum**	semester: 2;3
9	**Module compatibility**	Consolidation Modules - Emphasis on Climate Research Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods A + B (graded) Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods C (ungraded) Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Written Weekly assignment (Problem-solving issues within the broader context of Climate Data Analysis, max. 3 pages) or written paper (max. 15 pages)
11	**Grading procedure**	Written (100%) Weekly assignments (100 %)
12	**Module frequency**	Only in winter semester
13	**Workload in clock hours**	Contact hours: 30 h Independent study: 120 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	german
16	**Bibliography**	Will be provided at the beginning of the course

1	**Module name** 46085	**Advanced Methods: Modeling Physical Systems in the Climate** Advanced methods: Modeling physical systems in the climate	**5 ECTS**
2	Courses / lectures	PG Masterseminar: Advanced Methods: Modeling Physical Systems in the Climate (2 SWS) (SoSe 2027) PG Masterseminar: Advanced Methods: Microwave Remote Sensing (2 SWS) (SoSe 2027) PG Masterseminar: Advanced Methods: Scripting for Remote Sensing of the Environment (2 SWS) (SoSe 2027) PG Masterseminar: Advanced Methods: Stable Isotope Analysis (2 SWS) (SoSe 2027) PG Masterseminar: Advanced Methods: Deep Learning for Physical Geography (2 SWS) (SoSe 2027)	5 ECTS 5 ECTS 5 ECTS 5 ECTS 5 ECTS
3	Lecturers		

4	**Module coordinator**	Prof. Dr. Thomas Mölg
5	**Contents**	Selected methods related to the numerical modeling of the climate system
6	**Learning objectives and skills**	The students • understand the major principles of climate modeling; • put emphasis on model evaluation and uncertainty, and therefore appreciate the role of in-situ measurements; • know the strengths and weaknesses of models for a correct interpretation of model results; • and understand the importance of different space/time scales for model formulations and limitations; A series of practical exercises builds on each other throughout the course. Results of these exercises will develop from individual contributions and small-group work, and from a discussion with the whole group. Course attendance is therefore compulsory.
7	**Prerequisites**	None
8	**Integration in curriculum**	semester: 2;3
9	**Module compatibility**	Consolidation Modules - Emphasis on Climate Research Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods A + B (graded) Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods C (ungraded) Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Written Weekly assignment (Problem-solving issues within the broader context of Modeling Physical Systems in the Climate, max. 3 pages) or written paper (max. 15 pages)
11	**Grading procedure**	Written (100%)

		Weekly assigments (100 %)
12	**Module frequency**	Only in summer semester
13	**Workload in clock hours**	Contact hours: 30 h Independent study: 120 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	english
16	**Bibliography**	Will be provided at the beginning of the course

Consolidation Modules - Emphasis on Geoinformatics

1	**Module name** 46090	**Advanced Methods: Scripting for Remote Sensing of the Environment** Advanced methods: Scripting for remote sensing of the environment	**5 ECTS**
2	Courses / lectures	No courses / lectures available for this module for this semester!	
3	Lecturers	No lecturers available since there are no courses / lectures for this module for this semester!	

4	**Module coordinator**	Prof. Dr. Matthias Braun
5	**Contents**	Selected methods related to the processing of Earth observation data
6	**Learning objectives and skills**	The students • understand the major principles of data availability and processing chains; • are able to prepare scripts towards an automated processing of Earth observation data; • know to customize and adopt existing algorithms for data processing; • understand advanced methods of data processing. A series of practical exercises builds on each other throughout the course. Results of these exercises will develop from individual contributions and small-group work, and from a discussion with the whole group. Course attendance is therefore compulsory.
7	**Prerequisites**	None
8	**Integration in curriculum**	semester: 2;3
9	**Module compatibility**	Consolidation Modules - Emphasis on Climate Research Master of Science Physical Geography: Climate & Environmental Sciences 20202 Consolidation Modules - Emphasis on Geoinformatics Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods A + B (graded) Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods C (ungraded) Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Written Weekly assignment (Problem-solving issues within the broader context of Scripting for Remote Sensing of the Environment, max. 3 pages) or written paper (max. 15 pages)
11	**Grading procedure**	Written (100%) Weekly assignmemts (100 %)
12	**Module frequency**	Only in summer semester
13	**Workload in clock hours**	Contact hours: 30 h Independent study: 120 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	english

16	**Bibliography**	Will be provided at the beginning of the course

1	**Module name** 46110	**Advanced Methods: Microwave Remote Sensing** Advanced methods: Microwave remote sensing	**5 ECTS**
2	Courses / lectures	No courses / lectures available for this module for this semester!	
3	Lecturers	No lecturers available since there are no courses / lectures for this module for this semester!	

4	**Module coordinator**	Prof. Dr. Matthias Braun
5	**Contents**	Selected methods related to microwave remote sensing
6	**Learning objectives and skills**	The students • understand the principles of microwave remote sensing; • are able to process microwave remote sensing data; • know to customize and adopt scripts for data processing. A series of practical exercises builds on each other throughout the course. Results of these exercises will develop from individual contributions and small-group work, and from a discussion with the whole group. Course attendance is therefore compulsory.
7	**Prerequisites**	None
8	**Integration in curriculum**	semester: 2;3
9	**Module compatibility**	Consolidation Modules - Emphasis on Geoinformatics Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods A + B (graded) Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods C (ungraded) Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Written Weekly assignment (Problem-solving issues within the broader context of Microwave Remote Sensing, max. 3 pages) or written paper (max. 15 pages)
11	**Grading procedure**	Written (100%) Weekly assigments (100 %)
12	**Module frequency**	Only in summer semester
13	**Workload in clock hours**	Contact hours: 30 h Independent study: 120 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	english
16	**Bibliography**	Will be provided at the beginning of the course

1	**Module name** 46115	**Advanced Methods: Scripting for GIS analysis** Advanced methods: Scripting for GIS analysis	**5 ECTS**
2	Courses / lectures	PG Masterseminar: Advanced Methods MSc: Scripting for GIS Analysis (2 SWS)	5 ECTS
3	Lecturers	Dr. Sebastian Feick	

4	**Module coordinator**	Prof. Dr. Matthias Braun
5	**Contents**	Automating Geographic Information System (GIS) workflows using a script language.
6	**Learning objectives and skills**	The students • have a deeper insight into GI-Systems. • are familiar with a free & open source programming language. • are able to use a script language to automate GIS workflows. A series of practical exercises builds on each other throughout the course. Results of these exercises will develop from individual contributions and small-group work, and from a discussion with the whole group. Course attendance is therefore compulsory.
7	**Prerequisites**	n/s
8	**Integration in curriculum**	semester: 2;3
9	**Module compatibility**	Consolidation Modules - Emphasis on Geoinformatics Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods A + B (graded) Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods C (ungraded) Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Written Weekly assignment (Problem-solving issues within the broader context of Scripting for GIS, max. 3 pages) or written paper (max. 15 pages)
11	**Grading procedure**	Written (100%) Weekly assigments (100 %)
12	**Module frequency**	Only in winter semester
13	**Workload in clock hours**	Contact hours: 30 h Independent study: 120 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	english
16	**Bibliography**	Will be provided at the beginning of the course.

1	**Module name** 46099	**AI in Physical Geography**	**5 ECTS**
2	Courses / lectures	Currently no teaching units are offered for this module. For further information on teaching units please contact the module managers. Course attendance is compulsory.	
3	Lecturers		

4	**Module coordinator**	Samuel Cook
5	**Contents**	The principles and applications of machine-learning algorithms in the geosciences with a focus on practical use.
6	**Learning objectives and skills**	The students • understand the theoretical basis of machine-learning algorithms and when to apply them • know the existing uses of such algorithms within the geosciences • are able to develop and implement their own algorithms • are skilled in Python coding.
7	**Prerequisites**	Some pre-existing knowledge of Linux and Python will be an advantage.
8	**Integration in curriculum**	semester: 2;3
9	**Module compatibility**	Consolidation Modules - Emphasis on Climate Research Master of Science Physical Geography: Climate & Environmental Sciences 20202 Consolidation Modules - Emphasis on Geoinformatics Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods A + B (graded) Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Variable Weekly assignment (Problem-solving issues within the broader context of AI in Physical geography, max. 3 pages) or written paper (max. 15 pages)
11	**Grading procedure**	Variable (100%) Weekly assigments (100 %)
12	**Module frequency**	Irregular
13	**Workload in clock hours**	Contact hours: 30 h Independent study: 120 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	english
16	**Bibliography**	Will be provided at the beginning of the course.

Consolidation Modules - Environmental Analysis

1	**Module name** 46095	**Advanced Methods: Tree-Ring Analysis - Applied Dendroecology** Advanced methods: Tree-ring analysis - Applied dendroecology	**5 ECTS**
2	Courses / lectures	PG Masterseminar: Advanced Methods MSc: Tree Ring Analysis (2 SWS)	5 ECTS
3	Lecturers	Sugam Aryal	

4	**Module coordinator**	Prof. Dr. Achim Bräuning
5	**Contents**	Selected methods related to the processing of tree-ring data
6	**Learning objectives and skills**	The students • understand the major principles of tree ring research, wood anatomy and wood formation; • are able to prepare wood samples for macroscopic and microscopic analyses; • know how to measure various wood parameters, to evaluate quality of measurements and to synchronize and date tree-ring data series; • learn how to relate tree-ring data to environmental variables • understand advanced methods of data processing. A series of practical exercises builds on each other throughout the course. Results of these exercises will develop from individual contributions and small-group work, and from a discussion with the whole group. Course attendance is therefore compulsory.
7	**Prerequisites**	None
8	**Integration in curriculum**	semester: 2;3
9	**Module compatibility**	Consolidation Modules - Emphasis on Climate Research Master of Science Physical Geography: Climate & Environmental Sciences 20202 Consolidation Modules - Environmental Analysis Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods A + B (graded) Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods C (ungraded) Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Written Weekly assignment (Problem-solving issues within the broader context of Tree-Ring Analysis, max. 3 pages) or written paper (max. 15 pages)
11	**Grading procedure**	Written (100%) Weekly assignments (100 %)
12	**Module frequency**	Only in winter semester
13	**Workload in clock hours**	Contact hours: 30 h Independent study: 120 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	english

16	**Bibliography**	Will be provided at the beginning of the course.

1	**Module name** 46120	**Advanced Methods: Remote Sensing: Spectroscopy and Analysis of Spectral Data** Advanced methods: Remote sensing: Spectroscopy and analysis of spectral data	**5 ECTS**
2	Courses / lectures	PG Masterseminar: Advanced Methods MSc: Remote Sensing: Spectroscopy and Analysis of Spectral Data (2 SWS)	5 ECTS
3	Lecturers	Dr. Thorsten Seehaus	

4	**Module coordinator**	Prof. Dr. Matthias Braun
5	**Contents**	Selected methods related to the advanced analysis of spectroscopy data
6	**Learning objectives and skills**	The students • understand the major principles of spectroscopy for remote sensing; • practice different state-of-the-art methods for an analysis of spectroscopy data; • understand the applicability, limitations, and pitfalls of these methods; • know potential applications of spectral analyses to topics in physical geography. A series of practical exercises builds on each other throughout the course. Results of these exercises will develop from individual contributions and small-group work, and from a discussion with the whole group. Course attendance is therefore compulsory.
7	**Prerequisites**	None
8	**Integration in curriculum**	semester: 2;3
9	**Module compatibility**	Consolidation Modules - Emphasis on Geoinformatics Master of Science Physical Geography: Climate & Environmental Sciences 20202 Consolidation Modules - Environmental Analysis Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods A + B (graded) Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods C (ungraded) Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Written Weekly assignment (Problem-solving issues within the broader context of Spectroscopy and Analysis of Spectral Data, max. 3 pages) or written paper (max. 15 pages)
11	**Grading procedure**	Written (100%) Weekly assigments (100 %)
12	**Module frequency**	Only in winter semester
13	**Workload in clock hours**	Contact hours: 30 h Independent study: 120 h
14	**Module duration**	1 semester

15	**Teaching and examination language**	english
16	**Bibliography**	Will be provided at the beginning of the course

1	**Module name** 46125	**Advanced Methods: Soil Science** Advanced methods: Soil science	**5 ECTS**
2	Courses / lectures	PG Masterseminar: Advanced Methods MSc: Soil Science (2 SWS)	5 ECTS
3	Lecturers	Prof. Dr. Rupert Bäumler	

4	**Module coordinator**	Prof. Dr. Rupert Bäumler
5	**Contents**	Application of sampling techniques, analytical methods and data interpretation in soil science
6	**Learning objectives and skills**	The students • understand the major principles of soil related questions in theory and practice (field methods and analytical techniques) • practice field sampling techniques, preparation of soil samples, and lab analyses of soil physical and chemical parameters • learn how to run quality controls of soil analytical data • learn how to interpret analytical data subject to research questions • learn how to relate soil data to environmental issues • understand applicability and limitations of the applied methods A series of practical exercises builds on each other throughout the course. Results of these exercises will develop from individual contributions and small-group work, and from a discussion with the whole group. Course attendance is therefore compulsory.
7	**Prerequisites**	n/s
8	**Integration in curriculum**	semester: 3;2
9	**Module compatibility**	Consolidation Modules - Environmental Analysis Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods A + B (graded) Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods C (ungraded) Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Written Weekly assignment (Problem-solving issues within the broader context of Soil Science, max. 3 pages) or written paper (max. 15 pages)
11	**Grading procedure**	Written (100%) Weekly assignments (100 %)
12	**Module frequency**	Only in winter semester
13	**Workload in clock hours**	Contact hours: 30 h Independent study: 120 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	english
16	**Bibliography**	Will be provided at the beginning of the course.

1	**Module name** 46130	**Advanced Methods: Stable Isotope Analysis** Advanced methods: Stable isotope analysis	**5 ECTS**
2	Courses / lectures	Currently no teaching units are offered for this module. For further information on teaching units please contact the module managers.	
3	Lecturers		

4	**Module coordinator**	Prof. Dr. Achim Bräuning
5	**Contents**	Applications of stable isotope methods related to environmental research
6	**Learning objectives and skills**	The students • understand the major principles of stable isotope theory and methodology; • practice sample preparation techniques for stable isotope analysis; • understand the applicability, limitations, and pitfalls of this technique; • know potential applications of stable isotope data to topics in physical geosciences. Practical exercises illustrate the applicability of the method. Results of these exercises will develop from individual contributions and small-group work, and from a discussion with the whole group. Course attendance is therefore compulsory.
7	**Prerequisites**	None
8	**Integration in curriculum**	semester: 2;3
9	**Module compatibility**	Consolidation Modules - Environmental Analysis Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods A + B (graded) Master of Science Physical Geography: Climate & Environmental Sciences 20202 Elective Modules: Advanced Methods C (ungraded) Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Written Weekly assignment (Problem-solving issues within the broader context of Stable Isotope Analysis, max. 3 pages) or written paper (max. 15 pages)
11	**Grading procedure**	Written (100%) Weekly assignments (100 %)
12	**Module frequency**	Only in winter semester
13	**Workload in clock hours**	Contact hours: 30 h Independent study: 120 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	english
16	**Bibliography**	Will be provided at the beginning of the course

1	**Module name** 46076	**Project Planning and Preparation** Project planning and preparation	**5 ECTS**
2	Courses / lectures	PG Masterseminar: Project Planning and Preparation: Emphasis on Environmental Analysis (Bäumler, Bräuning) (2 SWS) PG Masterseminar: Project Planning and Preparation: Emphasis on Geoinformatics or Climate Research (Braun, Mölg) (2 SWS)	5 ECTS 5 ECTS
3	Lecturers	Prof. Dr. Rupert Bäumler Prof. Dr. Thomas Mölg Prof. Dr. Matthias Braun Prof. Dr. Achim Bräuning	

4	**Module coordinator**	Prof. Dr. Thomas Mölg
5	**Contents**	The course is a guide to project planning in the context of specializing on a research field, which will lead to the topic of the Master's thesis. At leasr three visits of research colloquium talks complement the research-orientated nature of the course. Since the objectives rely on group discussions and coordination meetings, attendance is compulsory.
6	**Learning objectives and skills**	Students • identify their major field of interest in coordination with a lecturer of Physical Geography. • access the state of the art in this field from the peer-reviewed scientific literature. • engage in research discussions through participation in research colloquium talks. • apply the knowledge to design and plan their Master's thesis research project. • practice the scientific methods that will enable the implementation of the thesis project.
7	**Prerequisites**	• Scientific Working I & II (strongly recommended) • Advanced Physical Geography I & II (strongly recommended) • Inter-/Transdisciplinary Perspective (strongly recommended) • at least 10 ECTS credits in Advanced Methods (strongly recommended).
8	**Integration in curriculum**	semester: 2;3
9	**Module compatibility**	Consolidation Modules - Emphasis on Climate Research Master of Science Physical Geography: Climate & Environmental Sciences 20202 Consolidation Modules - Emphasis on Geoinformatics Master of Science Physical Geography: Climate & Environmental Sciences 20202 Consolidation Modules - Environmental Analysis Master of Science Physical Geography: Climate & Environmental Sciences 20202
10	**Method of examination**	Written or oral Research report, 20-50 pages (0%), and reflexive discussion, 15- 30 minutes (0%)
11	**Grading procedure**	Written or oral (pass/fail)

12	**Module frequency**	Only in winter semester
13	**Workload in clock hours**	Contact hours: 15 h Independent study: 135 h
14	**Module duration**	1 semester
15	**Teaching and examination language**	english
16	**Bibliography**	Accompanying reading will be decided at the beginning of the module with regard to the specific research topic of the student.