Fakultät für Umwelt und natürliche Ressourcen
Faculty of Environment and Natural Ressources

Module handbook / Modulhandbuch

Kern- und Profillinienmodule / Core and major modules

Master of Science (M.Sc.)
Umweltwissenschaften / Environmental Sciences

Winter semester 2025/26

(Prüfungsordnung 2023 /
Examination regulations version 2023)

universität freiburg

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Prologue

This module handbook contains the modules and associated courses of the 1st and 3rd semester of the MSc Environmental Sciences. Before going into the individual modules, you will first find a general description of the degree program and an overview about the offered modules in the winter in this prologue.

Content Prologue

1. Short Overview

Subject	Environmental Sciences
Degree	Master of Science
Study duration	4 semesters / 2 years
Study format	Full-time
Scope	120 ECTS
Faculty	Faculty for Environment and Natural Resources
University	Albert-Ludwigs-University Freiburg
Website	https://www.msc-umwelt.uni-freiburg.de/en

Language(s)	German and English – or English only
Admission requirements	■ B.Sc. Graduation with a grade average of at least 2.5 (German grade) ■ Background in environmental sciences, forestry or related ■ Language English level B2 or C1 (depending on major) ■ Proof of academic requirements relevant for the major (Information on the website)
Start of study	Winter semester
Version examination regulation	Last version of the examination regulation: PO 2023
Special features	5 majors as main focus areas: ■ Landnutzung und Naturschutz (mostly German) ■ Climate Change Ecology ■ Environmental Modelling and Data Sciences ■ Sustainability Assessment and Transformation ■ Wildlife and Biodiversity

2. Objective of the study programme

The Master of Environmental Sciences provides an in-depth education in the field of environmental sciences. The spectrum of the course content ranges from basic ecosystem interrelationships and current issues of ecological change to technical and socio-economic strategies for the preservation, adaptation and restoration of an intact environment. Central importance is attached to the guiding principle of sustainability in dealing with the environment and natural resources.
The acquired and deepened knowledge can be applied and further developed within the framework of practice-oriented modules to solve environmental problems at regional, national and international level.
The aim is to familiarize students in this way with the theoretical knowledge and practical skills that are indispensable in the broad spectrum of possible fields of work of environmental scientists in science and practice.

3. Five Majors as focus areas

Students choose one of the five majors as their focus and can also individualize their studies with electives and a compulsory internship.

1) Landnutzung und Naturschutz (taught in German, partly English)
Students learn about different natural and social science approaches to understanding and evaluating the use and protection of nature and landscapes in their complexity.

2) Climate Change Ecology
Climate Change Ecology studies the impact of climate change on terrestrial ecosystems at local, regional and global scales. Both the meteorological and climatological causes of anthropogenic climate change and the impact on biogeochemical cycles are critically analysed. Hands-on laboratory and field-based approaches are used to quantify stress-induced changes in plants and ecosystems. The aim is to gain in-depth knowledge on alterations of important ecosystem processes, such as carbon or water cycles. Finally, an introduction to earth system modelling approaches addresses these processes at larger scales.

3) Environmental Modelling and Data Sciences
This major aims at equipping the students with a wide and relevant range of computer-based skills to address research and application challenges in environmental science. Ever-larger data sets from automatised data collections (remote sensing, omics) and large research and public data collections (weather stations, iNaturalist, ebird) require appropriate data science and modelling competences. As these methods are in constant flux, the profile Environmental Modelling and Data Science (EMDS) develops fundamental skills in statistics and programming and combines them with concrete studies and analyses.

4) Sustainability Assessment and Transformation
This major is a new interdisciplinary track for students who want to build a solid scientific basis for addressing topical sustainability questions. You will become an expert in cutting-edge sustainability assessment tools, including material and energy flow analysis, cost benefit analysis, life cycle assessment (LCA), and legal analysis! You will engage in world-class training in systems thinking, critical thinking, and analytical thinking on the above questions. You will learn how to apply models and develop indicators to evaluate innovative business, technical, infrastructural, regulatory, policy, and behavioural solutions for a sustainable future.

5. Wildlife and Biodiversity
Understanding the ecology and conservation biology of Wildlife and biodiversity with a focus on terrestrial ecosystem is the aim of this major. It's targeting on ecological research in a conservation context, but is also aiming at students interested in the interface between science and its application. Therefore, module contents range from theory and research methods to field work, data analysis and scientific writing.

4. Structure

A total of 120 ECTS must be earned in the MSc Environmental Sciences. These are divided into core modules (15 ECTS), major modules (50 ECTS), electives (15 ECTS), an internship (19 ECTS) and a Master's thesis (30 ECTS).

1) Core modules:
Three core modules (15 ECTS) are compulsory for all majors. They are offered in the first and third semesters. All modules here are taught in English language.

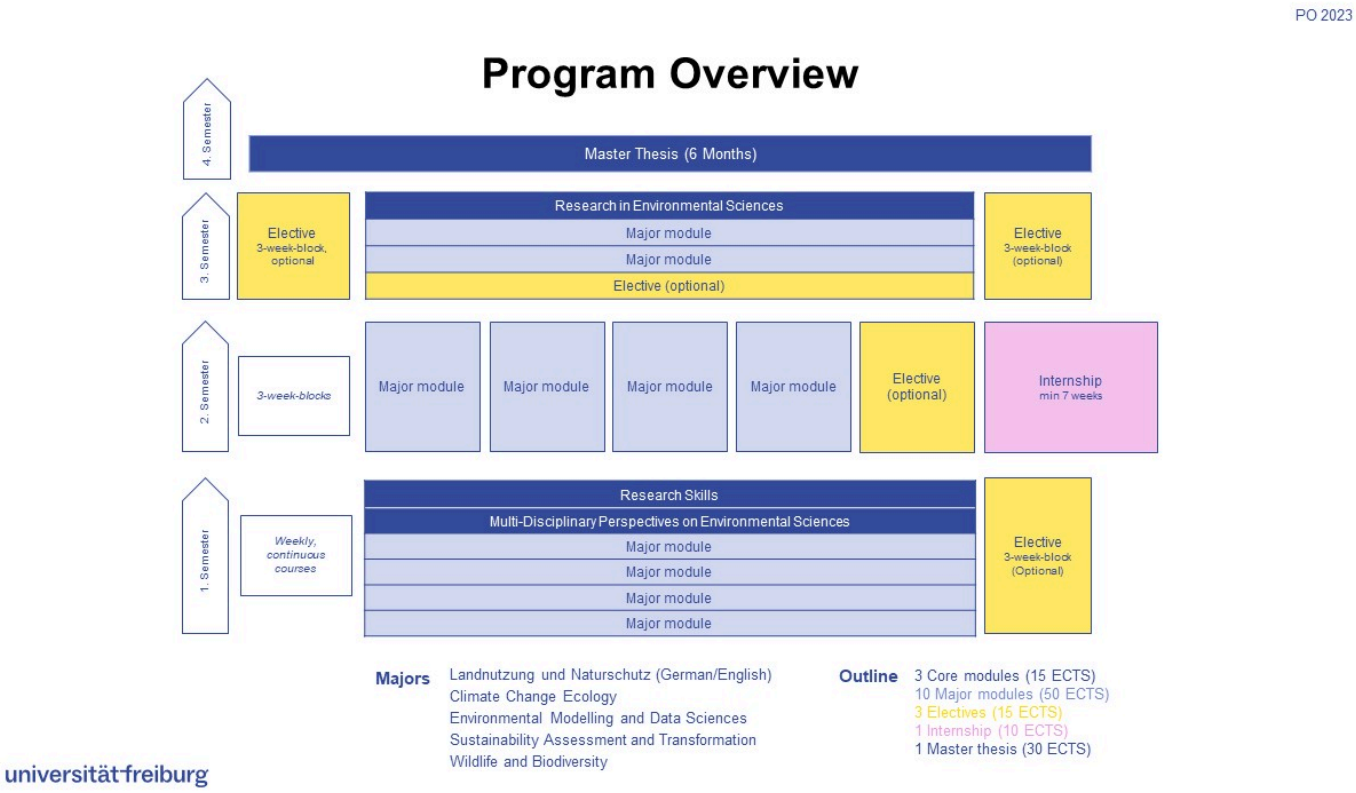
2) Major modules:
Major modules are mandatory for the major chosen. In total, 10 major modules accounting for 50 ECTS need to be taken, usually in the first, second and third semester. They form the focus and thus the specialization of the study programme. The modules may include excursions, trips and/or laboratory work in order to deepen the practical relevance.

3) Electives:
Three electives totalling 15 ECTS must be taken during the program. Students can choose from a variable offer of modules for the two Master's programs MSc Forest Sciences and MSc Environmental Sciences. It is also possible to choose modules from other Master's degree programs of the faculty, the university or outside the university, as long as there is a subject-related connection. The examination board decides on suitability in accordance with the respective major. Language courses are not considered as suitable courses.

4) Internship:
An internship (10 ECTS) of at least 7 weeks (275 working hours, full-time) is required for the successful completion of the M.Sc. in Environmental Sciences. It is usually completed during the lecture-free period between the second and third semester, but can also be completed flexibly at another time if required. The internship enables students to gain practical experience and is also a good opportunity to explore possible professional fields and career opportunities. It can be completed in Germany or abroad, either as a single placement or split into two practical phases of at least three weeks. Internships must be found and organized by the students themselves, but all lecturers are happy to provide tips and contacts from their networks on request. The programme coordinator also has a folder with addresses and evaluations from former students that you can look into.

5) Master thesis:
The Master thesis is worth 30 ECTS credits and is an individual examination paper. This thesis must be completed within 6 months and the topic must be chosen from the area of the chosen major.
The aim for the student is to be able to work on a topic in depth using scientific methods within the specified period and to present the results adequately. The topic and the supervisors are organized and agreed upon by the students themselves. Students with a minimum of 60 ECTS credits on their transcript of records can register for the Master thesis.

Study plan for full-time studies
Here you can see the study plan for a full-time MSc in Environmental Science programme. Please refer to the website for the programme overviews of the respective majors.



5. Examinations and Coursework

Examination
The type of examination is specified in the examination regulations of the degree program (=Prüfungsordnung 2023). These are either written or oral examinations. Written examinations are either written examinations (e.g. written work under supervision or an e-examination) or written assignments (e.g. report, portfolio, semester-long exercises, poster, review, minutes).
Oral examinations are oral examinations (examination discussions) and oral presentations (e.g. lecture, poster presentation).

The assessment of examinations is included in the final grade.
In addition to examinations, modules may also include coursework. The ECTS points for the respective module are awarded when all the required work has been completed.

Coursework
Coursework (=Studienleistung) is individual written, oral or practical work completed by students. They can, for example, consist of exercise sheets, protocols, written papers, posters or presentations. Coursework is ungraded and assessed as “passed” or “failed”. Coursework may also be graded for feedback reasons, but this grade will not be included in the final grade.

Registration for examinations and coursework
- Regardless of the course you are enrolled in, you must always register for examinations via the Campus Management System (HISinOne)!
- Instructions can be found in the WiKi of the Computer Center of the University of Freiburg.

- The valid dates for exam registration and the exam dates are listed there. The examination periods specified in HISinOne always apply.
- For courses in which coursework must be completed in addition to the examination, separate registration of examination and coursework must be made via HISInOne.

Attendance
Attendance is not mandatory in lectures. Specific practical-oriented courses, excursions and lab courses can require regular attendance as part of the coursework (pass/fail assessment) because it is essential for reaching the learning targets of these courses. Exercises may require regular attendance as well, in which case this fact will be stated in the description of the specific module.

6 Overview modules winter semester

This handbook describes all core and major modules of the MSc Environmental Sciences for the winter semester 2025/26 for the first semester or third semester of study (if completed within the standard length of study). If the modules are offered in English, the description is in English and for German-taught modules the description is in German.
During the winter, the major and core modules are taught in the format of weekly, continuous courses.

Overview Core modules for the winter term

Number	Name	Semester	Language
11102	Research Skills	1	ENG
11101	Multi-Disciplinary Perspectives on Environmental Sciences	1	ENG
11103	*Research in Environmental Sciences*	3	*ENG*

Overview Major modules for the winter term

Landnutzung und Naturschutz (German)

Number	Name	Semester	Language
12101	Landwende- und Forstrecht	1	DE
12102	Pol. Prozesse in Landnutzung und Naturschutz	1	DE
12103	Regionalentwicklung	1	DE
12104	Umwelt- und Landschaftsplanung	1	DE

12109	*Gen. Meth. in Naturschutz & Forstwirtschaft*	*3*	*DE*
12110	*Naturschutzkonzepte*	*3*	*DE*

Climate Change Ecology

Number	Name	Semester	Language
12203	Environmental Statistics	1	ENG
12204	Lab-Analysis of Climate Change Impact	1	ENG
12202	EcoFUN	1	ENG
12201	Climate Impact Research	1	ENG
12210	*Env. Monitoring, Data Analysis & Visualization*	*3*	*ENG*
12209	*Earth System Modelling*	*3*	*ENG*

Environmental Modelling and Data Sciences

Number	Name	Semester	Language
12304	Environmental Statistics	1	ENG
12303	Env. Monitoring, Data Analysis & Visualization	1	ENG
12302	EcoFUN	1	ENG
12301	Earth System Modelling	1	ENG
12310	*Capstone Project*	*3*	*ENG*
12309	*Advanced Statistics*	*3*	*ENG*

Sustainability Assessment and Transformation

Number	Name	Semester	Language
12402	Env. And Resource Economics	1	ENG
12403	Material and Energy Flow Analysis	1	ENG

12401	EcoFUN	1	ENG
12408	*Research Project*	*3*	*ENG*

Wildlife and Biodiversity

Number	Name	Semester	Language
12503	Environmental Statistics	1	ENG
12501	Analysis of Biodiversity Data	1	ENG
12502	Biodiversity and Conservation Biology	1	ENG
12504	Genetic & Genomic Methods in WL Conservation	1	ENG
12509	*Conservation of Forest Biodiversity*	3	ENG
12510	*Frontiers in Wildlife Ecology & Conservation Biology*	3	ENG

Terms used

This Module handbook is derived automatically from the online platform, which did not translate all terms into English. Here is a list for the terms to enable full comprehension.

DE	ENG
In jedem Sommersemester	Every summer semester
Lehrveranstaltung	Course
Pflicht (P)	Mandatory
Veranstaltung	Event
Prüfungsleistung (PL)	Examination achievement
Studienleistung (SL)	Course achievement

--- Deutsche Version ---

Prolog

Dieses Modulhandbuch umfasst die Module und zugehörigen Veranstaltungen des ersten und dritten Fachsemesters des MSc Umweltwissenschaften / Environmental Sciences. Bevor auf die einzelnen Module eingegangen wird, finden Sie zuerst eine allgemeine Beschreibung des Studiengangs in diesem Prolog und eine Übersicht der angebotenen Module im Wintersemester.

Inhaltsverzeichnis Prolog

1. Kurzbeschreibung des Studiengangs

Fach	Umweltwissenschaften / Environmental Sciences
Abschluss	Master of Science
Regelstudienzeit (Studiendauer)	4 Semester / 2 Jahre
Studienform	Vollzeitstudium
Studienumfang in ECTS-Punkten	120 ECTS
Fakultät	Fakultät für Umwelt und Natürliche Ressourcen
Institut	Albert-Ludwigs-Universität Freiburg

Homepage	https://www.msc-umwelt.uni-freiburg.de
Sprache(n)	Deutsch und Englisch - oder nur Englisch
Zugangs-voraussetzungen	■ B.Sc.-Abschluss mit Notendurchschnitt von mindestens 2,5 ■ Forst- oder umweltwissenschaftlicher Hintergrund ■ Sprachzertifikat Englisch B2 oder C1 (Je nach Profillinie) ■ Nachweis zu spezifische akademische Voraussetzungen je nach Profillinie (Informationen auf der Webseite)
Möglicher Studienbeginn	Wintersemester
Version Prüfungsordnung	Letzte Version der Prüfungsordnung: PO 2023
Besonderheiten des Studiengangs	5 Profillinien als Vertiefung: ■ Landnutzung und Naturschutz ■ Climate Change Ecology ■ Environmental Modelling and Data Sciences ■ Sustainability Assessment and Transformation ■ Wildlife and Biodiversity

2. Ziel des Studiengangs

Der Masterstudiengang MSc Umweltwissenschaften/Environmental Sciences vermittelt eine vertiefte Ausbildung im Bereich der Umweltwissenschaften. Das Spektrum der Lehrinhalte reicht dabei von grundlegenden Ökosystem-Zusammenhängen über aktuelle Fragen ökologischer Veränderungen bis hin zu technischen und sozio-ökonomischen Strategien zur Erhaltung, Adaptation und Wiederherstellung einer intakten Umwelt. Zentrale Bedeutung kommt dabei dem Leitbild der Nachhaltigkeit im Umgang mit der Umwelt und natürlichen Ressourcen zu.
Das erlangte und vertiefte Wissen kann im Rahmen von anwendungsorientierten Modulen zur Lösung von Umweltproblemen auf regionaler, nationaler und internationaler Ebene angewendet und weiterentwickelt werden.
Ziel ist es, die Studierenden auf diese Weise mit den theoretischen Kenntnissen und praktischen Fähigkeiten vertraut zu machen, die im breiten Spektrum möglicher Arbeitsbereiche von Umweltwissenschaftler*innen in Wissenschaft und Praxis unverzichtbar sind.

3. Fünf Profillinien als Vertiefungsschwerpunkte

Studierende wählen eine der fünf Profillinien als ihren Schwerpunkt und können zusätzlich durch Wahlpflichtmodule und ein Pflichtpraktikum ihr Studium individualisieren.

1) Landnutzung und Naturschutz
In dieser Profillinie werden unterschiedliche natur- und sozialwissenschaftliche Ansätze kennengelernt um die Nutzung und den Schutz von Natur und Landschaft in ihrer Komplexität zu erfassen und zu bewerten.

2) Climate Change Ecology
Diese Profillinie untersucht die Auswirkungen des Klimawandels auf terrestrische Ökosysteme im lokalen, regionalen und globalen Maßstab. Sowohl die meteorologischen und klimatologischen Ursachen des anthropogenen Klimawandels als auch die Auswirkungen auf biogeochemische Kreisläufe werden kritisch analysiert. In praktischen Labor- und Feldversuchen werden stressinduzierte Veränderungen in Pflanzen und Ökosystemen quantifiziert. Ziel ist es, vertiefte Kenntnisse über Veränderungen wichtiger Ökosystemprozesse, wie z.B. des Kohlenstoff- oder Wasserkreislaufs, zu gewinnen. Eine Einführung in die Modellierung von Erdsystemen befasst sich schließlich mit diesen Prozessen in größerem Maßstab.

3) Environmental Modelling and Data Sciences
Diese Profillinie zielt darauf ab, die Studierenden mit einem breiten und relevanten Spektrum an computergestützten Fähigkeiten auszustatten, um Forschungs- und Anwendungsherausforderungen in der Umweltwissenschaft anzugehen. Immer größere Datensätze aus automatisierten Datensammlungen (Fernerkundung, Omics) und große Datensammlungen für die Forschung und die Öffentlichkeit (Wetterstationen, iNaturalist, ebird) erfordern angemessene Kompetenzen in den Bereichen Datenwissenschaft und Modellierung. Da sich diese Methoden ständig weiterentwickeln, werden im Profil Environmental Modelling and Data Science (EMDS) grundlegende Kenntnisse in Statistik und Programmierung vermittelt und mit konkreten Studien und Analysen kombiniert.

4) Sustainability Assessment and Transformation
Diese interdisziplinäre Profillinie richtet sich an Studierende, die eine solide wissenschaftliche Grundlage für die Beantwortung aktueller Nachhaltigkeitsfragen schaffen wollen. Sie erlangen Expertenwissen für modernste Instrumente zur Nachhaltigkeitsbewertung, darunter Material- und Energieflussanalysen, Kosten-Nutzen-Analysen, Lebenszyklusanalysen (LCA) und rechtliche Analysen! Sie werden eine erstklassige Ausbildung in Systemdenken, kritischem Denken und analytischem Denken zu den oben genannten Fragen erhalten. Darüber hinaus werden Modelle angewendet und Indikatoren entwickelt, um innovative geschäftliche, technische, infrastrukturelle, regulatorische, politische und verhaltensbezogene Lösungen für eine nachhaltige Zukunft zu bewerten.

5. Wildlife and Biodiversity
Ziel hier ist es, die Ökologie und Erhaltungsbiologie von Wildtieren und der biologischen Vielfalt zu verstehen, wobei der Schwerpunkt auf terrestrische Ökosysteme liegt. Die Profillinie zielt auf ökologische Forschung im Naturschutzkontext ab, richtet sich aber auch an Studierende, die sich für die Schnittstelle zwischen Wissenschaft und ihrer Anwendung interessieren. Daher reichen die Modulinhalte von Theorie und Forschungsmethoden bis hin zu Feldarbeit, Datenanalyse und wissenschaftlichem Schreiben.

4. Aufbau und Ablauf

Insgesamt sind im MSc Umweltwissenschaften / Environmental Sciences 120 ECTS zu erwerben. Diese sind in Kernmodule (15 ECTS), Profillinienmodule (50 ECTS), Wahlpflichtmodule (15 ECTS), Praktikum (19 ECTS) und Masterarbeit (30 ECTS) aufgeteilt.

1) Kernmodule / Grundlagenbereich:
Drei Kernmodule (15 ECTS) sind für alle Profillinien verpflichtend. Sie werden im ersten und dritten Semester, jeweils also in den Wintersemestern, angeboten und auf Englisch unterrichtet.

2) Profillinien-Module:
Diese Module sind für die gewählte Profillinie obligatorisch. Insgesamt sind 10 Profillinienmodule im Umfang von 50 ECTS zu belegen, in der Regel im ersten, zweiten und dritten Semester. Sie bilden den Schwerpunkt und damit die Vertiefung des Studiums ab. In den Modulen ist es möglich, dass Exkursionen, Ausflüge und / oder Laborarbeiten durchgeführt werden um den Praxisbezug zu vertiefen.

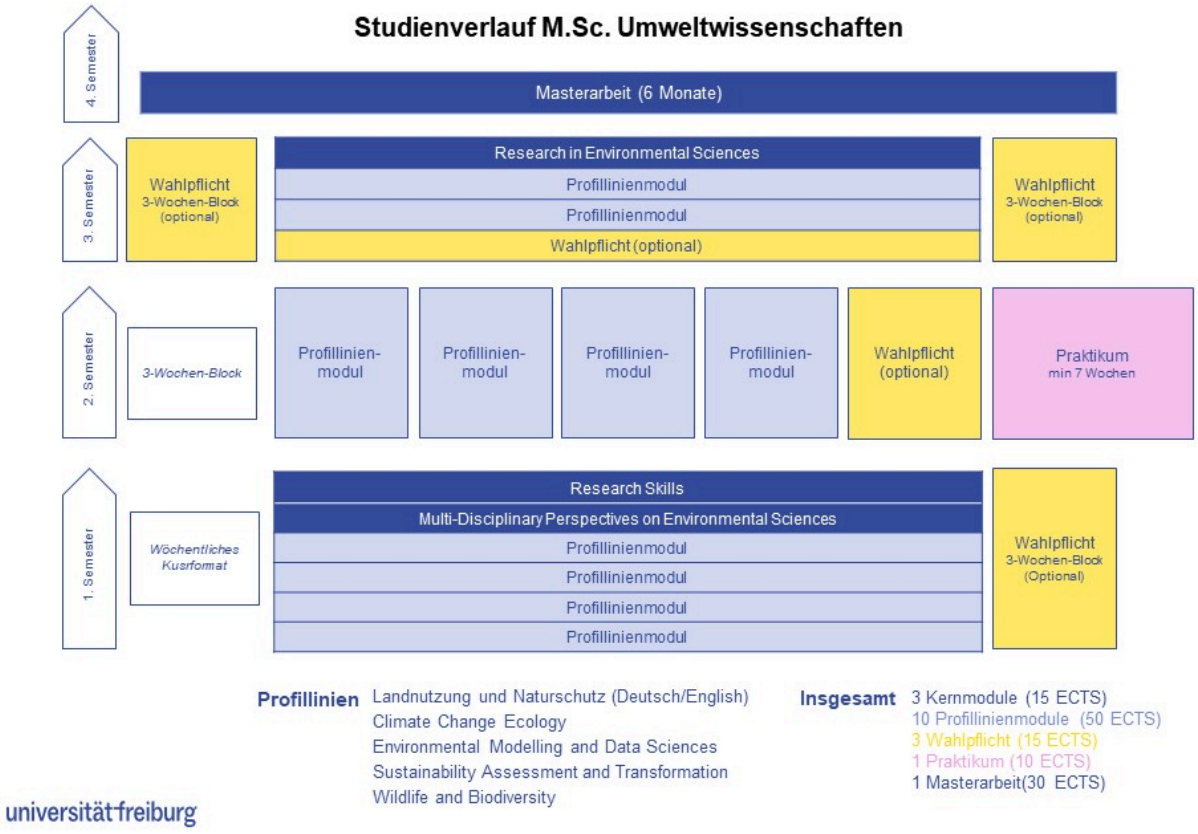
3) Wahlpflichtfächer:
Während des Studiums müssen drei Wahlpflichtfächer im Umfang von 15 ECTS belegt werden. Die Studierenden können aus einem variablen Angebot an Modulen für die beiden Masterstudiengänge MSc Forstwissenschaften / Forest Sciences und MSc Umweltwissenschaften / Environmental Sciences wählen. Es können auch Module aus anderen Masterstudiengängen der Fakultät, der Universität oder außerhalb der Universität gewählt werden, sofern ein fachlicher Bezug besteht. Über die Eignung entscheidet der Prüfungsausschuss nach Maßgabe des jeweiligen Studienschwerpunkts. Sprachkurse werden nicht als geeignete Lehrveranstaltungen anerkannt.

4) Praktikum:
Für den erfolgreichen Abschluss des M.Sc. Umweltwissenschaften ist ein Praktikum (10 ECTS) von mindestens 7 Wochen (275 Arbeitsstunden, Vollzeit) erforderlich. Es wird in der Regel in der vorlesungsfreien Zeit zwischen dem zweiten und dritten Fachsemester absolviert, kann aber bei Bedarf auch flexibel zu einem anderen Zeitpunkt durchgeführt werden. Das Praktikum ermöglicht den Studierenden Praxiserfahrung zu sammeln und ist außerdem eine gute Gelegenheit mögliche Berufsfelder und Karrieremöglichkeiten zu erkunden. Es kann in Deutschland oder im Ausland entweder zusammenhängend oder aufgeteilt, auf zwei mindestens dreiwöchige Praxisphasen, abgeleistet werden. Praktika müssen von den Studierenden selbstständig gesucht und organisiert werden, aber alle Lehrenden sind auf Anfrage gerne bereit, Tipps und Kontakte aus ihren Netzwerken zu geben.

5) Masterarbeit:
Die Masterarbeit hat einen Leistungsumfang von 30 ECTS-Punkten und ist eine individuelle Prüfungsarbeit. Innerhalb von 6 Monaten ist diese Arbeit anzufertigen und das Thema ist aus dem Bereich der gewählten Profillinie zu wählen.
Ziel ist, dass der Student oder die Studentin in der Lage ist, innerhalb der vorgegebenen Frist ein Thema aus seinem/ihrem Studienfach nach wissenschaftlichen Methoden vertiefend zu bearbeiten und die Ergebnisse adäquat darzustellen. Das Thema und die Betreuer werden hierbei durch die Studierenden selbst organisiert und abgesprochen. Ab einer Mindestanzahl von 60 verbuchten ECTS auf der Leistungsübersicht, kann die Masterarbeit angemeldet werden.

Studienplan bei einem Vollzeitstudium

Hier sehen Sie den Studienverlaufsplan bei einem Vollzeitstudium MSc Umweltwissenschaften / Environmental Sciences. Die Studienverläufe für die einzelnen Profillinien entnehmen Sie bitte der Webseite.



5. Prüfungs- und Studienleistungen

Prüfungsleistungen

Die Prüfungsart ist in der Prüfungsordnung des Studiengangs festgelegt. Hierbei handelt es sich entweder um schriftliche oder mündliche Prüfungsleistungen. Schriftliche Prüfungen sind entweder Klausuren (z.B. schriftliche Aufsichtsarbeiten oder E-Klausur) oder schriftliche Ausarbeitungen (wie z.B. Bericht, Portfolio, semesterbegleitende Übungsaufgaben, Poster, Review, Protokoll). Mündliche Prüfungsleistungen sind mündliche Prüfungen (Prüfungsgespräche) und mündliche Präsentationen (z.B. Vortrag, Posterpräsentation).

Die Bewertung von Prüfungsleistungen geht in die Abschlussnote ein.
In den Modulen können neben Prüfungsleistungen auch Studienleistungen zu erbringen sein. Die ECTS-Punkte des jeweiligen Moduls werden dann vergeben, wenn alle geforderten Leistungen erbracht wurden.

Studienleistungen

Studienleistungen (SL) sind individuelle schriftliche, mündliche oder praktische Leistungen, die von Studierenden erbracht werden. Sie können z.B. aus Übungsblättern, Protokollen, schriftlichen Ausarbeitungen, Postern oder Vorträgen bestehen. Studienleistungen werden mit „bestanden“

oder „nicht bestanden“ bewertet. Studienleistungen dürfen aus Feedbackgründen auch benotet werden, allerdings darf diese Note nicht in die Abschlussnote einfließen.

Anmeldung von Prüfungs- und Studienleistungen

- Unabhängig von der Belegung der Veranstaltung ist immer eine Anmeldung zur Prüfung über das Campus Management System (HISinOne) notwendig!
- Eine Anleitung finden Sie im WiKi des Rechenzentrums der Universität Freiburg.
- Die jeweils gültigen Termine zur Prüfungsanmeldung und die Prüfungstermine sind dort hinterlegt. Es gelten immer die in HISinOne angegebenen Prüfungszeiträume.
- Für Veranstaltungen bei denen neben der Prüfungsleistung eine Studienleistung zu erbringen ist, muss eine getrennte Anmeldung von Prüfungs- und Studienleistung über HISInOne erfolgen.

Anwesenheit

In den Vorlesungen besteht keine Anwesenheitspflicht. Bei bestimmten praxisorientierten Kursen, Exkursionen und Laborkursen kann die regelmäßige Anwesenheit als Teil der Studienleistung verlangt werden (Bewertung mit bestanden/nicht bestanden), da sie für das Erreichen der Lernziele dieser Kurse unerlässlich ist. Auch bei Übungen kann eine regelmäßige Anwesenheitspflicht bestehen; in diesem Fall wird dies in der Beschreibung des jeweiligen Moduls oder dem Kursverlauf (auf der Lernplattform Ilias) angegeben.

6. Übersicht Module Wintersemester

Dieses Modulhandbuch beschreibt alle Kern- und Profillinienmodule des MSc Umweltwissenschaften / Environmental Sciences für das Wintersemester 2025/26 im ersten und dritten Fachsemester (bei einem Absolvieren des Studiums in der Regelstudienzeit). Wenn die Module auf Englisch angeboten werden, steht die Beschreibung in englischer Sprache und bei deutsch-sprachigen Modulen ist die Beschreibung in deutscher Sprache.
Im Winter werden die Module im wöchentlichen Kursformat angeboten.

Übersicht Kernmodule Wintersemester

Nummer	Name	Semester	Sprache
11102	Research Skills	1	ENG
11101	Multi-Disciplinary Perspectives on Environmental Sciences	1	ENG
11103	*Research in Environmental Sciences*	3	*ENG*

Übersicht Profillinienmodule Wintersemester

Landnutzung und Naturschutz

Nummer	Name	Semester	Sprache
12101	Landwende- und Forstrecht	1	DE

12102	Pol. Prozesse in Landnutzung und Naturschutz	1	DE
12103	Regionalentwicklung	1	DE
12104	Umwelt- und Landschaftsplanung	1	DE
12109	*Gen. Meth. in Naturschutz & Forstwirtschaft*	*3*	*DE*
12110	*Naturschutzkonzepte*	*3*	*DE*

Climate Change Ecology

Nummer	Name	Semester	Sprache
12203	Environmental Statistics	1	ENG
12204	Lab-Analysis of Climate Change Impact	1	ENG
12202	EcoFUN	1	ENG
12201	Climate Impact Research	1	ENG
12210	*Env. Monitoring, Data Analysis & Visualization*	*3*	*ENG*
12209	*Earth System Modelling*	*3*	*ENG*

Environmental Modelling and Data Sciences

Nummer	Name	Semester	Sprache
12304	Environmental Statistics	1	ENG
12303	Env. Monitoring, Data Analysis & Visualization	1	ENG
12302	EcoFUN	1	ENG
12301	Earth System Modelling	1	ENG
12310	*Capstone Project*	*3*	*ENG*
12309	*Advanced Statistics*	*3*	*ENG*

Sustainability Assessment and Transformation

Nummer	Name	Semester	Sprache
12402	Env. And Resource Economics	1	ENG
12403	Material and Energy Flow Analysis	1	ENG
12401	EcoFUN	1	ENG
12408	*Research Project*	*3*	*ENG*

Wildlife and Biodiversity

Nummer	Name	Semester	Sprache
12503	Environmental Statistics	1	ENG
12501	Analysis of Biodiversity Data	1	ENG
12502	Biodiversity and Conservation Biology	1	ENG
12504	Genetic & Genomic Methods in WL Conservation	1	ENG
12509	*Conservation of Forest Biodiversity*	3	ENG
12510	*Frontiers in Wildlife Ecology & Conservation Biology*	3	ENG

Verwendete Begriffe

Dieses Modulhandbuch wurde automatisch von der Online-Plattform übernommen, die nicht alle Begriffe ins Englische übersetzt hat. Hier ist eine Liste der nicht-übersetzten Begriffe, um ein vollständiges Verständnis zu ermöglichen.

DE	ENG
In jedem Sommersemester	Every summer semester
Lehrveranstaltung	Course
Pflicht (P)	Mandatory
Veranstaltung	Event
Prüfungsleistung (PL)	Examination achievement
Studienleistung (SL)	Course achievement

Name of module	Number of module
Multi-Disciplinary Perspectives on Environmental Sciences	10LE07MO-M.11101
Responsible	
Prof. Ph.D. Stefan Pauliuk	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Attendance	50 h
Independent study	100 h
Recommended semester	1
Duration	1
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Multi-Disciplinary Perspectives on Environmental Sciences	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
This course provides students with a broad overview of the different scientific fields, methods, and modes of conducting science at the Faculty of Environment and Natural Resources in Freiburg. To navigate the fields of science and the knowledge generated in them, students will work with core concepts of the philosophy and ethics of science, as well as frameworks to describe the relation between science and society. Socio-ecological systems as complex adaptive systems will be introduced as integrative research paradigm.
Qualification
Students will be able to explain and apply the science theory concepts to the different disciplines of their expertise. This includes the following: the relation to socio-ecological systems (SES), the ontological, epistemological, and axiological foundations of the disciplines, the mode(s) of science followed, what constitutes valid research questions and methods, what type of evidence and knowledge are generated, and the relation of the disciplines and knowledge generated to society. Active participation in the class contributes to developing critical and analytical thinking in an interdisciplinary setting.
Examination achievement
Written assignment
Course achievement
none

Teaching method
Integrated lectures, exercises, and seminars
Literature
Latour, Bruno (1993). We have never been modern. Harvard University Press. ISBN 978-0-674-94839-6. More reading material will be provided on ILIAS.

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Name of module	Number of module
Multi-Disciplinary Perspectives on Environmental Sciences	10LE07MO-M.11101
course	
Multi-Disciplinary Perspectives on Environmental Sciences	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.11101

ECTS-Points	5.0
Workload	150 h
Attendance	50 h
Independent study	100 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	100

Contents
This course provides students with a broad overview of the different scientific fields, methods, and modes of conducting science at the Faculty of Environment and Natural Resources in Freiburg. To navigate the fields of science and the knowledge generated in them, students will work with core concepts of the philosophy and ethics of science, as well as frameworks to describe the relation between science and society. Socio-ecological systems (SES) as complex adaptive systems (CAS) will be introduced as integrative research paradigm. Concepts will be illustrated using examples from a broad spectrum of disciplines, partly presented by invited experts from different fields.
Qualification
Students will be able to explain and apply the science theory concepts to the different disciplines of their expertise. This includes the following: the relation to socio-ecological systems (SES), the ontological, epistemological, and axiological foundations of the disciplines, the mode(s) of science followed, what constitutes valid research questions and methods, what type of evidence and knowledge are generated, and the relation of the disciplines and knowledge generated to society. Active participation in the class contributes to developing critical and analytical thinking in an interdisciplinary setting.
Examination achievement
Written assignment
Course achievement
none
Literature
Latour, Bruno (1993). We have never been modern. Harvard University Press. ISBN 978-0-674-94839-6. More reading material will be provided on ILIAS.
Compulsory requirement
None

Teaching method
Integrated lectures, exercises, and seminars

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Name of module	Number of module
Research Skills	10LE07MO-M.11102
Responsible	
Prof. Dr. Teja Kattenborn	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150 h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Research Skills	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
The aim of this module is acquiring the basic skills and concepts that are needed to conduct and communicate scientific research.
Qualification
Students will be able ■ to plan and perform a simple research project, applying the scientific method. ■ to interpret, critically reflect on and communicate scientific results. Students will have ■ a basic understanding of all important aspects of science, being able to describe concepts of good scientific practice, experimental design and structure of a research paper. Students will know ■ some tools for literature search and management, data analysis and scientific writing and they will be able to use them in a simple setting.
Examination achievement
none

Course achievement
Project paper (developed in series of assignments) (5-15 pages, 50%) Oral presentation (25%) Mid-term Report (25%)
Teaching method
Lectures, tutored exercises, group work
Literature
■ W.C. Booth, G.G. Colomb and J.M. Williams (2003) The craft of research. University of Chicago Press 2nd / 3rd edition. ■ Florian Hartig. Lecture Notes “Research Skills” (http://florianhartig.github.io/ResearchSkills/, https://www.dropbox.com/s/1otretqxn2o34e3/ResearchSkills.pdf)

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Name of module	Number of module
Research Skills	10LE07MO-M.11102
course	
Research Skills	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07S-M.11102

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	91

Contents

Research skills refer to a mixture of abilities that researchers need to acquire at some point in their career. Most of them are also useful beyond research and the scope of this module is thus a very wide one. The content falls broadly into the following categories:

- Generating ideas and hypotheses: sketching ideas, flowcharts, logical thinking, brainstorming, finding parallels/metaphors
- Planning and executing: experimental design, identifying a good hypothesis, simulation experiments, statistics basics
- Good scientific practice: reproducibility, validity, lab notebook, versioning, backups, plagiarism/fraud
- Knowing the state of the art: literature reviews, online searches, when to look (and when not to), judging quality of findings, track records and ratings, quick reading; social media and science, citing literature
- Scientific communication, writing and graphics: publication formats and their structure, free software for data analysis and writing (LibreOffice, LaTeX, JabRef, R); telling a story with scientific results and data, tables vs. figures; what to keep in/out; writing style, typical language issues; graphic quality
- Presentations and Posters (harmonizing audience, aim and own personality; the role of surprise; new/known-balance)

Qualification

Students

- will get a broader horizon of research practice and a better understanding of the scientific method
- understand how to formulate a research question and hypotheses
- understand the importance of communication of research results
- know some important tools and software for scientific activities

Examination achievement

none

Course achievement
Project paper (developed in series of assignments) (5-15 pages, 50%) Oral presentation (25%) Mid-term Report (25%)
Literature
■ W.C. Booth, G.G. Colomb and J.M. Williams (2003) The craft of research. University of Chicago Press 2nd / 3rd edition. ■ Florian Hartig. Lecture Notes “Research Skills” (http://florianhartig.github.io/ResearchSkills/, https://www.dropbox.com/s/1otretqxn2o34e3/ResearchSkills.pdf)
Compulsory requirement
none
Recommended requirement
Basic Knowledge of R
Teaching method
Lectures, tutored exercises, group work

↑

Name of module	Number of module
Research in Environmental Sciences	10LE07MO-M.11103
Responsible	
Prof. Dr. Andreas Christen	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150 h
Hours of week	4.0
Attendance	44 h
Independent study	106 h
Recommended semester	3
Duration	1
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None
Recommended requirement
Research Skills (10LE07MO-M.11102) Multi-Disciplinary Perspectives on Environmental Sciences (10LE07MO-M.11101)

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Research in Environmental Sciences	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
The goal of this course is to prepare you for your M.Sc. thesis. In this course you will be given strategic advice and you will explore approaches and tools on how to plan and manage thesis research and successfully draft a M.Sc. proposal.
Qualification
Students: ■ are able to formulate, conceptualize, and frame a thesis research project. ■ can manage logistics, resources, research data and time in a project. ■ can manage risks, overcome problems and consider safety in a thesis research project. ■ can responsibly use research exploration and writing tools and techniques including AI-tools. ■ can prepare, write and communicate a thesis proposal. ■ will have an overview on potential supervisors, ongoing research projects and topics within your minor, that allow thesis writing options in the faculty.

Examination achievement
none
Course achievement
Research proposal
Teaching method
Lectures, Exercises, Programming
Literature
Materials will be provided on the course website

↑

Name of module	Number of module
Research in Environmental Sciences	10LE07MO-M.11103
course	
Research in Environmental Sciences	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.11103

ECTS-Points	5.0
Workload	150 h
Attendance	44 h
Independent study	106 h
Hours of week	4.0
Recommended semester	3
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	91

Contents

This course integrates both practical research skills and theoretical foundations from the course „Multi-Disciplinary Perspectives in Environmental Sciences“ into strategic planning of your M.Sc. thesis research. It is designed to guide you through the process of preparing a comprehensive M.Sc. thesis proposal and to support you in selecting and managing a research project effectively. In the course you will develop and write a structured M.Sc. thesis proposal. You will also have special sessions to engage in networking with potential supervisors and be guided on the selection of thesis projects within your Major specialization.

In a broader sense the course will equip you with professional project management skills—including time management, effective communication, and problem-solving strategies—relevant not only to your thesis work but also to broader professional contexts. The course is structured in three parts: the first part focuses on overall management and strategic planning of a research project, while the second part delivers Major-specific guidance reflecting the distinct requirements and expectations across different fields of Environmental Sciences. In a third part, an iterative development of the proposal will occur in close collaboration with an individual faculty member / supervisor.

Qualification

Students:
- are able to formulate, conceptualize, and frame a thesis research project.
- can manage logistics, resources, research data and time in a project.
- can manage risks, overcome problems and consider safety in a thesis research project.
- can responsibly use research exploration and writing tools and techniques including AI-tools.
- can prepare, write and communicate a thesis proposal.
- will have an overview on potential supervisors, ongoing research projects and topics within your minor, that allow thesis writing options in the faculty.

Examination achievement

none

Course achievement
Research proposal
Literature
Materials will be provided on the course website
Compulsory requirement
None
Recommended requirement
Research Skills (10LE07MO-M.11102) Multi-Disciplinary Perspectives on Environmental Sciences (10LE07MO-M.11101)
Teaching method
Lectures, Exercises, Programming

↑

Name of node	Number of node
Landnutzung und Naturschutz (Land-Use and Conservation)	10LE07KT-PLU-2023-LuN-12100
Faculty	
Faculty of Environment and Natural Resources	

Compulsory/Elective (C/E)	Compulsory / Pflicht
ECTS-Points	50.0

↑

Name of module	Number of module
Landwende- und Forstrecht	10LE07MO-M.12101
Responsible	
Prof. Dr. Cathrin Zengerling	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	3
Duration	1 Semester
Compulsory/Elective (C/E)	Core elective
Frequency	takes place each winter term

Compulsory requirement
Keine / None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Landwende- und Forstrecht	andere (z.B. Kurse, Tutorien)	Core elective	5.0	4.0	150 h

Contents
■ Einführung in multiple Umweltkrisen mit Wurzeln in der Landnutzung, Notwendigkeit einer „Landwende“ (auch auf Waldflächen), Bezüge zum Rechtsrahmen ■ Landnutzungsformen und deren spezifische Herausforderungen ■ Wiederholung und Vertiefung: Grundlagen des Umweltrechts und deren Bedeutung für die Regulierung verschiedener Landnutzungsformen
Qualification
Die Studierenden ■ kennen zentrale rechtliche Grundlagen und Herausforderungen verschiedener Landnutzungsformen mit Relevanz für Klimawandel, Verlust an Biodiversität und Umweltverschmutzung. ■ sind mit wichtigen Zugängen und Methoden rechtswissenschaftlicher Analyse und Fallbearbeitung vertraut. ■ kennen beispielhaft konkrete Rechtstexte aus der Legislative, Exekutive und Judikative, die Landnutzungskonflikte adressieren. ■ können rechtliche Fragestellungen in diesen Kontexten rechtlich einordnen und in Ansätzen selbständig bearbeiten. ■ haben sich vertieft und kritisch mit denkenn rechtlichen Rahmenbedingungen eines konkreten Konfliktfalls oder eines Themengebiets im Bereich des Landwende- oder Forstrechts auseinandergesetzt.

Examination achievement
Schriftliche Ausarbeitung
Course achievement
Präsentation
Teaching method
Socratic teaching, aktives Lernen, Einzel- und Gruppenarbeiten
Literature
■ Koch, H.-J., Hoffmann, E., Reese M. (2023). Handbuch Umweltrecht, 6. Auflage, Beck. ■ Schlacke, S. (2023). Umweltrecht, 9. Auflage, Nomos. ■ Ausgewählte Textexzerpte via ILIAS

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Name of module	Number of module
Landwende- und Forstrecht	10LE07MO-M.12101
course	
Landwende- und Forstrecht	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12101

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	3
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Core elective
Language	german
Group size	30

Contents

- Einführung in multiple Umweltkrisen mit Wurzeln in der Landnutzung (insbesondere: Klimawandel, Verlust an Biodiversität, Umweltverschmutzung), Notwendigkeit einer „Landwende“ (auch auf Waldflächen), Bezüge zum Rechtsrahmen
- Landnutzungsformen und deren spezifische Herausforderungen in Bezug auf die drei genannten Krisen: Agrarflächen, Waldflächen, Siedlungs- und Verkehrsflächen, Wasserflächen; lokale und globale Bezüge, inkl. „environmental footprints“, also extraterritorialer Wirkungen lokaler Nutzung/telecoupling und Herausforderungen des Rechtsrahmens, diese zu adressieren
- Einführung in verschiedene Zugänge (rechtsphilosophisch, rechtstheoretisch, rechtssoziologisch) und Methoden rechtswissenschaftlicher Analyse und Fallbearbeitung
- Wiederholung und Vertiefung: Grundlagen des Umweltrechts (u.a. Verfassungsrecht, Einbettung in das Mehrebenensystem, Gewaltenteilung, Verwaltungsrecht, Prinzipien des Umweltrechts) und deren Bedeutung für die Regulierung verschiedener Landnutzungsformen
- Einführung in die Rechtsbereiche, die die genannten Landnutzungsformen primär regulieren (also insbesondere das Agrar(umwelt)-, Forst-, Naturschutz-, Klima-, Immissionsschutz-, Bau- und Planungs- sowie das Wasserrecht); grundsätzlich mit Blick auf das Mehrebenensystem und transnationale Bezüge, Arbeit mit konkreten Gesetzestexten und Beispielen aus Gesetzgebung, Verwaltung und Rechtsprechung
- Möglichkeit der Vertiefung in den einzelnen Teilbereichen je nach Interessenschwerpunkt in der Abschlussarbeit; Studierende wählen dazu einen konkreten Konfliktfall oder ein Themengebiet sowie die eingeführten Zugänge und Methoden rechtswissenschaftlicher Analyse und Fallbearbeitung; Vorstellung von Fragestellung, Analysezugang und ersten Ergebnissen der Abschlussarbeiten sowie deren Diskussion im letzten Drittel des Semesters.

Qualification

Die Studierenden

- kennen zentrale rechtliche Grundlagen und Herausforderungen verschiedener Landnutzungsformen mit Relevanz für Klimawandel, Verlust an Biodiversität und Umweltverschmutzung.
- sind mit wichtigen Zugängen und Methoden rechtswissenschaftlicher Analyse und Fallbearbeitung vertraut.

- kennen beispielhaft konkrete Rechtstexte aus der Legislative, Exekutive und Judikative, die Landnutzungskonflikte adressieren.
- können rechtliche Fragestellungen in diesen Kontexten rechtlich einordnen und in Ansätzen selbständig bearbeiten.
- haben sich vertieft und kritisch mit denkenn rechtlichen Rahmenbedingungen eines konkreten Konfliktfalls oder eines Themengebiets im Bereich des Landwende- oder Forstrechts auseinandergesetzt.

Examination achievement
Schriftliche Ausarbeitung
Course achievement
Präsentation
Literature

- Koch, H.-J., Hoffmann, E., Reese M. (2023). Handbuch Umweltrecht, 6. Auflage, Beck.
- Schlacke, S. (2023). Umweltrecht, 9. Auflage, Nomos.
- Ausgewählte Textexzerpte via ILIAS

Compulsory requirement
None
Recommended requirement
Idealerweise verfügen die Studierenden bereits über Grundkenntnisse in den Bereichen des Umwelt- und Planungsrechts, der Umweltplanung und/oder der Umweltpolitik, erforderlich ist dies jedoch nicht.
Teaching method
Socratic teaching, aktives Lernen, Einzel- und Gruppenarbeiten

↑

Name of module	Number of module
Politische Prozesse in Landnutzung und Naturschutz	10LE07MO-M.12102
Responsible	
Dr. Sylvia Isabelle Kruse	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150 h
Hours of week	4.0
Attendance	50 h
Independent study	100 h
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
Keine / None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Politische Prozesse in Landnutzung und Naturschutz	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
In diesem Modul lernen die Studierenden politische Prozesse in Landnutzung und Naturschutz kennen. Sie lernen anhand konkreter, aktueller Fälle, wie sie diese Prozesse analysieren und erklären können. Dafür lernen Sie zunächst Landnutzung und Naturschutz als Politikfelder kennen. Anschließend erarbeiten sie sich zentrale Ansätze der Politikanalyse und setzen diese schließlich selbst in Fallstudien aus den Bereichen Landnutzung und Naturschutz um. Dabei werden insbesondere folgende Dimensionen berücksichtigt: ■ der Prozess von der Problemformulierung, der Entwicklung von politischen Lösungen sowie deren Implementation, ■ Staatliche und nicht-staatliche Akteure und deren Interaktion in politischen Prozessen von der lokalen bis zur internationalen Ebene, ■ politische Instrumente und Mechanismen von politischer Steuerung und Governance. Für die Analyse politischer Prozesse in Landnutzung und Naturschutz werden verschiedene Theorien, Ansätze und Methoden berücksichtigt (z.B. Rational Choice, Institutionenanalyse, Diskursanalyse, Cultural Theory). Um die politischen Prozesse besser zu verstehen, werden Expert*innen aus Landnutzung und Naturschutz bzw. aus der Forschung eingebunden.

Qualification
Die Studierenden können politische Prozesse in Landnutzung und Naturschutz strukturiert analysieren, ihre Ergebnisse interpretieren und kritisch reflektieren und in Textform darlegen. Die Studierenden sind in der Lage, kritisch wissenschaftliche Literatur zu den oben genannten Themen zu lesen und zu diskutieren.
Examination achievement
Schriftliche Ausarbeitung
Course achievement
Präsentation
Teaching method
Inputs, Gruppenarbeit, praktische Übungen
Literature
Eine Liste mit relevanten Texten wird zu Beginn des Kurses verteilt.

↑

Name of module	Number of module
Politische Prozesse in Landnutzung und Naturschutz	10LE07MO-M.12102
course	
Politische Prozesse in Landnutzung und Naturschutz	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12102

ECTS-Points	5.0
Workload	150 h
Attendance	50 h
Independent study	100 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	german
Group size	30

Contents

In diesem Modul lernen die Studierenden politische Prozesse in Landnutzung und Naturschutz kennen. Sie lernen anhand konkreter, aktueller Fälle, wie sie diese Prozesse analysieren und erklären können.
Dafür lernen Sie zunächst Landnutzung und Naturschutz als Politikfelder kennen. Anschließend erarbeiten sie sich zentrale Ansätze der Politikanalyse und setzen diese schließlich selbst in Fallstudien aus den Bereichen Landnutzung und Naturschutz um. Dabei werden insbesondere folgende Dimensionen berücksichtigt:

- der Prozess von der Problemformulierung, der Entwicklung von politischen Lösungen sowie deren Implementation,
- Staatliche und nicht-staatliche Akteure und deren Interaktion in politischen Prozessen von der lokalen bis zur internationalen Ebene,
- politische Instrumente und Mechanismen von politischer Steuerung und Governance.

Für die Analyse politischer Prozesse in Landnutzung und Naturschutz werden verschiedene Theorien, Ansätze und Methoden berücksichtigt (z.B. Rational Choice, Institutionenanalyse, Diskursanalyse, Cultural Theory).
Um die politischen Prozesse besser zu verstehen, werden Expert*innen aus Landnutzung und Naturschutz bzw. aus der Forschung eingebunden.

Qualification

Die Studierenden können politische Prozesse in Landnutzung und Naturschutz strukturiert analysieren, ihre Ergebnisse interpretieren und kritisch reflektieren und in Textform darlegen. Die Studierenden sind in der Lage, kritisch wissenschaftliche Literatur zu den oben genannten Themen zu lesen und zu diskutieren.

Examination achievement

Schriftliche Ausarbeitung

Course achievement

Präsentation

Literature
Eine Liste mit relevanten Texten wird zu Beginn des Kurses verteilt.
Compulsory requirement
Keine
Recommended requirement
Grundkenntnisse der Umweltpolitik; Research Skills and Ethics
Teaching method
Inputs, Gruppenarbeit, praktische Übungen

↑

Name of module	Number of module
Regionalentwicklung	10LE07MO-M.12103
Responsible	
Prof. Dr. Heiner Schanz	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150 h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
Keine / None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Regionalentwicklung	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents

- Einführendes Seminar zu normativen Grundlagen der Zielbildung: Landschaft – Heimat – Wildnis – Nachhaltigkeit
- Einführung in die institutionellen und rechtlichen Grundlagen der Raumordnung und des Systems der Raum- und Landschaftsplanung in Deutschland
- Einführung in die Regionalplanung
- Einführung in die nachhaltige Regionalentwicklung (Konzepte, Instrumente) mit Schwerpunkt auf ländliche Räume
- Raumnutzungskonflikte und der Ausgleich von sozialen und wirtschaftlichen Ansprüchen an ländliche Räume in Einklang mit deren ökologischen Funktionen
- Praxis der Regionalentwicklung:
  - Bedeutung von Gebiets- (z.B. Nationalparke, Naturparke und Biosphärenreservate) und Förderkulissen (z.B. LEADER, PLENUM) für die integrierte Entwicklung ländlicher Räume
  - Regionalplanerische Rohstoffsicherung
  - Planung von (Groß)Infrastrukturprojekten im Rahmen der strategischen Planung auf Landesebene

Qualification

Die Studierenden können:

- die Grundlagen des Systems der Planung in Deutschland, mit Schwerpunkt nachhaltiger Regionalentwicklung ländlicher Räume erklären.

- die Herausforderung der politischen Steuerung und der Governance nachhaltiger Regionalentwicklung in Theorie und Praxis verdeutlichen.
- verschiedene Praktiken der nachhaltigen Regionalentwicklung auf unterschiedlichen Planungsebenen systematisch identifizieren.

Examination achievement

Klausur

Course achievement

Teilnahme an mindestens einer der drei Exkursionen

Teaching method

Vorlesung, Seminar, Exkursionen

Literature

- Piechocki, R. (2010). Landschaft-Heimat-Wildnis: Schutz der Natur - aber welche und warum? : CH. Beck.
- Weiland, U., & Wohlleber-Feller, S. (2007). Einführung in die Raum- und Umweltplanung: UTB Schöningh. Elektronisch verfügbar über die UB unter: http://www.redi-bw.de/start/unifr/eBooks-utb/9783838583631
- Chilla, T., Kühne, O., & Neufeld, M. (2016). Regionalentwicklung (Vol. 4566): UTB. Elektronisch verfügbar über die UB unter: http://www.redi-bw.de/start/unifr/eBooks-utb/9783838545660

Weiteres Arbeitsmaterial wird auf ILIAS bereitgestellt

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Name of module	Number of module
Regionalentwicklung	10LE07MO-M.12103
course	
Regionalentwicklung	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12103

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	german
Group size	30

Contents

- Einführendes Seminar zu normativen Grundlagen der Zielbildung: Landschaft – Heimat – Wildnis – Nachhaltigkeit
- Einführung in die institutionellen und rechtlichen Grundlagen der Raumordnung und des Systems der Raum- und Landschaftsplanung in Deutschland
- Einführung in die Regionalplanung
- Einführung in die nachhaltige Regionalentwicklung (Konzepte, Instrumente) mit Schwerpunkt auf ländliche Räume
- Raumnutzungskonflikte und der Ausgleich von sozialen und wirtschaftlichen Ansprüchen an ländliche Räume in Einklang mit deren ökologischen Funktionen
- Praxis der Regionalentwicklung:
  - Bedeutung von Gebiets- (z.B. Nationalparke, Naturparke und Biosphärenreservate) und Förderkulissen (z.B. LEADER, PLENUM) für die integrierte Entwicklung ländlicher Räume
  - Regionalplanerische Rohstoffsicherung
  - Planung von (Groß)Infrastrukturprojekten im Rahmen der strategischen Planung auf Landesebene

Qualification

Die Studierenden können:

- die Grundlagen des Systems der Planung in Deutschland, mit Schwerpunkt nachhaltiger Regionalentwicklung ländlicher Räume erklären.
- die Herausforderung der politischen Steuerung und der Governance nachhaltiger Regionalentwicklung in Theorie und Praxis verdeutlichen.
- verschiedene Praktiken der nachhaltigen Regionalentwicklung auf unterschiedlichen Planungsebenen systematisch identifizieren.

Examination achievement

Klausur

Course achievement

Teilnahme an mindestens einer der drei Exkursionen

Literature
■ Piechocki, R. (2010). Landschaft-Heimat-Wildnis: Schutz der Natur - aber welche und warum? : CH. Beck. ■ Weiland, U., & Wohlleber-Feller, S. (2007). Einführung in die Raum- und Umweltplanung: UTB Schöningh. Elektronisch verfügbar über die UB unter: http://www.redi-bw.de/start/unifr/eBooks-utb/9783838583631 ■ Chilla, T., Kühne, O., & Neufeld, M. (2016). Regionalentwicklung (Vol. 4566): UTB. Elektronisch verfügbar über die UB unter: http://www.redi-bw.de/start/unifr/eBooks-utb/9783838545660 Weiteres Arbeitsmaterial wird auf ILIAS bereitgestellt
Compulsory requirement
Keine
Recommended requirement
Grundkenntnisse R
Teaching method
Vorlesung, Seminar, Exkursionen

↑

Name of module	Number of module
Umwelt- und Landschaftsplanung	10LE07MO-M.12104
Responsible	
Prof. Dr. Tanja Mölders	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150 h
Hours of week	4.0
Attendance	50 h
Independent study	100 h
Recommended semester	1
Duration	1
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
Keine / None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Umwelt- und Landschaftsplanung	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
■ System der räumlichen Planung in Deutschland (Landes-, Regional- und Bauleitplanung) ■ Instrumente und Methoden der Umwelt- und Landschaftsplanung (Umweltverträglichkeitsprüfung, Eingriffsregelung, FFH-Verträglichkeitsprüfung) ■ Ausgewählte Handlungsfelder sozial-ökologischer Transformation
Qualification
Die Studierenden ■ kennen das System der räumlichen Planung und das System der Umweltplanung in Deutschland, ■ sind in der Lage, Instrumente und Methoden der Umwelt- und Landschaftsplanung hinsichtlich ihrer Ziele, Einsatzbereiche, Verfahrensabläufe sowie Rechtwirksamkeit zu benennen, ■ können Entwicklungslinien im planungstheoretischen Denken unterscheiden und hinsichtlich der darin eingeschriebenen Rationalitäten reflektieren, ■ sind in der Lage, aktuelle Handlungsfelder sozial-ökologischer Transformation aus einer planungspraktischen und -theoretischen Perspektive einzuordnen, ■ erweitern ihr Reflexionsvermögen und ihre Kritikfähigkeit, ■ erweitern ihre Präsentationskompetenz, ■ erlernen Methoden des wissenschaftlichen Arbeitens und Schreibens.

Examination achievement
Schriftliche Ausarbeitung (100%)
Course achievement
Referat
Teaching method
Input der Lehrenden (Vorlesung), Inputs der Studierenden (Referate), Gruppenarbeit, Diskussionen, Gastvorträge
Literature

- Foliensätze der Veranstaltung
- Akademie für Raumforschung und Landesplanung (Hrsg.) (2018): Handwörterbuch der Stadt- und Raumentwicklung. Verlag der ARL: Hannover.
- Fürst, Dietrich/Scholles, Frank (Hrsg.) (2008): Handbuch Theorien und Methoden der Raum- und Umweltplanung. 3., vollständig überarbeitete Auflage. Verlag Dorothea Rohn: Dortmund.
- Haaren, von Christina (Hrsg.) (2004): Landschaftsplanung. Ulmer: Stuttgart.
- Jessel, Beate/Tobias, Kai (2002): Ökologisch orientierte Planung. Eine Einführung in Theorien, Daten und Methoden. Verlag Eugen Ulmer: Stuttgart.
- Wiechmann, Thorsten (Hrsg.) (2019): ARL Reader Planungstheorie. Band 1: Kommunikative Planung – Neoinstitutionalismus und Governance. Springer: Heidelberg.
- Wiechmann, Thorsten (Hrsg.) (2019): ARL Reader Planungstheorie. Band 2: Strategische Planung – Planungskultur. Springer: Heidelberg.

Eine Auswahl weiterer weiterführender Literatur wird im Rahmen der Veranstaltung bekannt gegeben.

↑

Name of module	Number of module
Umwelt- und Landschaftsplanung	10LE07MO-M.12104
course	
Umwelt- und Landschaftsplanung	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12104

ECTS-Points	5.0
Workload	150 h
Attendance	50 h
Independent study	100 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	german
Group size	30

Contents
Im Modul wird, ausgehend von einer Auseinandersetzung mit der räumlichen Planung in Deutschland, das System der Umweltplanung als integrativer und Sektor übergreifender Ansatz betrachtet. Gegenstand sind dabei sowohl raum- und umweltbezogene Fachplanungen als auch die Landschaftsplanung, die im System der Umweltplanung eine zentrale Rolle einnimmt: Sie ist Fachplanung des Naturschutzes und der Landschaftspflege (sektoral) und bündelt außerdem die Belange des raumbezogenen Umweltschutzes (querschnittsorientiert). Vor dem Hintergrund dieser Einordnungen werden Instrumente (z.B. Eingriffsregelung, Umweltverträglichkeitsprüfung, Strategische Umweltprüfung) und Methoden (insbesondere Methoden der Zielformulierung, Bewertung und Entscheidung) der Umwelt- und Landschaftsplanung eingeführt und exemplarisch vertieft. Im Rahmen von Referaten werden ausgewählte Handlungsfelder sozial-ökologischer Transformation (z.B. die Energie-, die Mobilitäts- und die Agrarwende) vorgestellt und hinsichtlich ihrer praktischen und theoretischen umweltplanerischen Implikationen diskutiert. Im Kontext der Profillinie ist dabei insbesondere die Frage nach dem Verhältnis von Naturschutz und Landnutzung relevant. Die umwelt- und landschaftsplanerischen Perspektiven werden durch Gastvorträge von Expert:innen aus Wissenschaft und Praxis erweitert.
Qualification
Die Studierenden ■ kennen das System der räumlichen Planung und das System der Umweltplanung in Deutschland, ■ sind in der Lage, Instrumente und Methoden der Umwelt- und Landschaftsplanung hinsichtlich ihrer Ziele, Einsatzbereiche, Verfahrensabläufe sowie Rechtwirksamkeit zu benennen, ■ können Entwicklungslinien im planungstheoretischen Denken unterscheiden und hinsichtlich der darin eingeschriebenen Rationalitäten reflektieren, ■ sind in der Lage, aktuelle Handlungsfelder sozial-ökologischer Transformation aus einer planungspraktischen und -theoretischen Perspektive einzuordnen, ■ erweitern ihr Reflexionsvermögen und ihre Kritikfähigkeit, ■ erweitern ihre Präsentationskompetenz, ■ erlernen Methoden des wissenschaftlichen Arbeitens und Schreibens.

Examination achievement
Schriftliche Ausarbeitung (100%)
Course achievement
Referat
Literature
Foliensätze der Veranstaltung ■ Akademie für Raumforschung und Landesplanung (Hrsg.) (2018): Handwörterbuch der Stadt- und Raumentwicklung. Verlag der ARL: Hannover. ■ Fürst, Dietrich/Scholles, Frank (Hrsg.) (2008): Handbuch Theorien und Methoden der Raum- und Umweltplanung. 3., vollständig überarbeitete Auflage. Verlag Dorothea Rohn: Dortmund. ■ Haaren, von Christina (Hrsg.) (2004): Landschaftsplanung. Ulmer: Stuttgart. ■ Jessel, Beate/Tobias, Kai (2002): Ökologisch orientierte Planung. Eine Einführung in Theorien, Daten und Methoden. Verlag Eugen Ulmer: Stuttgart. Eine Auswahl weiterer weiterführender Literatur wird im Rahmen der Veranstaltung bekannt gegeben.
Compulsory requirement
Keine
Teaching method
Inputs der Lehrenden (Vorlesung), Inputs der Studierenden (Referate), Gruppenarbeit, Diskussionen, Gastvorträge

↑

Name of module	Number of module
Genetische Methoden in Naturschutz und Forstwirtschaft	10LE07MO-M.12109
Responsible	
Prof. Dr. Katrin Heer Prof. Dr. Gernot Gunter Segelbacher	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150 h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	3
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
Keine

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Genetische Methoden in Naturschutz und Forstwirtschaft	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
Genetische und genomische Methoden verbessern unser Verständnis von genetischer Vielfalt, lokaler Anpassung und der genetischen Grundlage phänotypischer Merkmale und ermöglichen die Bewertung populationsrelevanter Eigenschaften wie effektive Populationsgröße, Genfluss und Hybridisierung. In diesem Modul werden aktuelle Methoden und Anwendungen vorgestellt, Fachliteratur diskutiert und in Kleingruppen ein Review verfasst.
Qualification
Die Studierenden verstehen, wie man auf der Grundlage genetischer Daten Parameter und Prozesse wie effektive Populationsgröße, genetische Vielfalt, Hybridisierung und lokale Anpassung bestimmen kann. Die Studierenden können wissenschaftliche Literatur zu den oben genannten Themen kritisch lesen und diskutieren. Die Studierenden sind in der Lage, Ergebnisse von wissenschaftlichen Studien zusammenzufassen, kritisch zu evaluieren und in wissenschaftlicher Sprache und mit adäquaten Abbildungen zu präsentieren.
Examination achievement
Schriftliche Ausarbeitung

Course achievement
Seminarvortrag
Literature
Wissenschaftliche Literatur wird während des Kurses bereitgestellt

↑

Name of module	Number of module
Genetische Methoden in Naturschutz und Forstwirtschaft	10LE07MO-M.12109
course	
Genetische Methoden in Naturschutz und Forstwirtschaft	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12109/22110

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	3
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	german
Group size	30

Contents
Die Anwendung genetischer und genomischer Methoden hat unser Verständnis über die genetischen Vielfalt innerhalb der Arten und ihrer räumlichen Verteilung, zur lokalen Anpassung und der genetischen Grundlage phänotypischer Merkmale erheblich verbessert. Außerdem ermöglichen genetische Methoden die Bewertung von Populationseigenschaften, die für das Management und die Erhaltung von Arten relevant sind, wie z. B. effektive Populationsgrößen, Muster des Genflusses und der Hybridisierung. In diesem Modul werden wir aktuelle Methoden und Anwendungen vorstellen, einschlägige Literatur lesen und diskutieren und die Vorteile und Grenzen genetischer Methoden kritisch erörtern. Die Studierenden werden sich intensiv mit der wissenschaftlichen Literatur zur relevanten Themen in Forst- und Naturschutzgenetik auseinandersetzen und in Kleingruppen einen Review verfassen.
Qualification
Die Studierenden verstehen, wie man auf der Grundlage genetischer Daten Parameter und Prozesse wie effektive Populationsgröße, genetische Vielfalt, Hybridisierung und lokale Anpassung bestimmen kann. Die Studierenden können wissenschaftliche Literatur zu den oben genannten Themen kritisch lesen und diskutieren. Die Studierenden sind in der Lage, Ergebnisse von wissenschaftlichen Studien zusammenzufassen, kritisch zu evaluieren und in wissenschaftlicher Sprache und mit adäquaten Abbildungen zu präsentieren.
Examination achievement
Schriftliche Ausarbeitung
Course achievement
Seminarvortrag
Literature
Wissenschaftliche Literatur wird während des Kurses bereitgestellt

Compulsory requirement
None / Keine
Teaching method
Vorlesungen, Seminarvorträge, Diskussion wissenschaftlicher Literatur

↑

Name of module	Number of module
Naturschutzkonzepte	10LE07MO-M.12110
Responsible	
Dr. Anna Saave	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150 h
Hours of week	4.0
Attendance	50 h
Independent study	100 h
Recommended semester	3
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
Keine / None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Naturschutzkonzepte	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
■ Naturschutzkonzepte verstehen und einordnen ■ Abwägen von Schutzstrategien angesichts gesellschaftlicher Ordnungen, Konfliktfelder sowie gesellschaftlicher Naturverhältnisse ■ Ausgewählte Themen und Handlungsfelder im Naturschutz
Qualification
Die Studierenden ■ erlangen ein fundiertes Verständnis der wesentlichen Naturschutzkonzepte, die in Deutschland angewendet werden. ■ sind befähigt, diese Konzepte im Kontext gesellschaftlicher Zielkonflikte kritisch zu reflektieren und abzuwägen. ■ sind durch die Anwendung von analytischen Fähigkeiten in der Lage, in konkreten Situationen verschiedene Naturschutzkonzepte gegeneinander abzuwägen und diesen Prozess sowohl in beruflichen als auch akademischen Kontexten transparent zu kommunizieren. ■ demonstrieren die Fähigkeit, komplexe gesellschaftliche Konflikte auf praxisnahe Anwendungsfälle herunterzubrechen und Lösungsansätze zu entwickeln. ■ erweitern ihr Reflexionsvermögen und ihre Kritikfähigkeit. ■ erweitern ihre Präsentationskompetenz und rhetorische Kompetenz.

- erweitern ihr Verständnis von und ihre Erfahrung in Führungskompetenzen angesichts komplexer Entscheidungssituationen.
- erlernen Methoden des wissenschaftlichen Arbeitens, Schreibens und Argumentierens.

Examination achievement

Mündliches Prüfungsgespräch 100%

Course achievement

Referat/Präsentation & Kurzinput

Teaching method

Inputs der Lehrenden (Vorlesung), Inputs der Studierenden (Referate), Reflexion zu Führungskompetenz (Übung), Gruppenarbeit, Diskussionen, Exkursion

Literature

Foliensätze der Veranstaltung

Literatur

- Eser, Uta (2016). Naturschutz. In: Handbuch Umweltethik, herausgegeben von Ott, Konrad; Dierks, Jan; Voget-Kleschin, Lieske. Stuttgart: J.B. Metzler, S. 44–48.
- Fischer, Ludwig (Hg.) (2004). Projektionsfläche Natur. Zum Zusammenhang von Naturbildern und gesellschaftlichen Verhältnissen. Hamburg: Hamburg University Press. (Veröffentlichungen des Forschungsprojekts "Natur im Konflikt. Naturschutz, Naturbegriff und Küstenbilder")
- Hofmeister, Sabine und Mölders, Tanja (2013). Caring for natures? Naturschutz aus der Perspektive Vorsorgenden Wirtschaftens. In: Wege Vorsorgenden Wirtschaftens, herausgegeben von Netzwerk Vorsorgendes Wirtschaften. Marburg: Metropolis-Verlag, S. 85–114.
- Büscher, Bram und Fletcher, Robert (2020). The Conservation Revolution. Radical Ideas for Saving Nature Beyond the Anthropocene. New York: Verso.
- Ott, Konrad (2018). Naturschutztheorie, bpb.de.
- Jax, Kurt (2024). Conservation Concepts. Rethinking Human–Nature Relationships. New York: Routledge.
- Haraway, Donna (2016). Staying with the trouble. Making Kin in the Chthulucene. Durham: Duke University Press.

Die Auswahl weiterführender Literatur wird im Rahmen der Veranstaltung bekannt gegeben.

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Name of module	Number of module
Naturschutzkonzepte	10LE07MO-M.12110
course	
Naturschutzkonzepte	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12110

ECTS-Points	5.0
Workload	150 h
Attendance	50 h
Independent study	100 h
Hours of week	4.0
Recommended semester	3
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	german
Group size	30

Contents

Das Modul „Naturschutzkonzepte“ bietet einen umfassenden Überblick über unterschiedliche Konzepte zu Schutz und Nutzung von Natur und stellt diese in den Kontext gesellschaftlicher Ordnungen, Konfliktfelder sowie gesellschaftlicher Naturverhältnisse. Das Modul erarbeitet sozialwissenschaftliche Grundlagen für die Analyse der Rolle des Naturschutzes in der heutigen Gesellschaft. Es berücksichtigt besonders das Zusammenspiel von naturschutzfachlichen Instrumenten und gesellschaftlichen Zielkonflikten. Die Studierenden werden schrittweise in die wichtigsten Konzepte des Naturschutzes und deren Anschlussstellen zu gesellschaftlichen Debatten eingeführt und durch Diskussionen, Präsentationen und Exkursionen zu einem vertieften Verständnis geführt. Um kritische Reflexionen des Verhältnisses von Schutz und Nutzen zu ermöglichen, wird ein Schwerpunkt auf feministische sozial-ökologische Forschungszugänge und Lösungsansätze zu gesellschaftlichen Naturverhältnissen gelegt.

Im ersten Teil des Moduls werden die Konzepte des konservierenden, des integrativen Naturschutzes und des Prozessschutzes eingeführt und vor dem Hintergrund gesellschaftlicher Naturverhältnisse verglichen und eingeordnet. Die Studierenden haben Gelegenheit, innerhalb einer Exkursion die gewonnenen Erkenntnisse zur Abwägung verschiedener Naturschutzkonzepte auf ein Fallbeispiel anzuwenden. Im zweiten Teil werden gesellschaftliche Konfliktfelder mit Bezug zu Naturschutz und Naturnutzung aufgearbeitet und mit Naturschutzkonzepten und darauf basierenden möglichen Lösungen in Verbindung gebracht. Im dritten Teil schließt das Modul mit einem Ausblick auf aktuelle Diskussionen und im Entstehen begriffene Natur- und Naturschutzkonzepte ab. Die Modulinhalte werden ergänzt durch fortlaufende Reflexion und kleine praktische Übungen zu Führungskompetenzen in komplexen Entscheidungssituationen.

Qualification

Die Studierenden
- erlangen ein fundiertes Verständnis der wesentlichen Naturschutzkonzepte, die in Deutschland angewendet werden.
- sind befähigt, diese Konzepte im Kontext gesellschaftlicher Zielkonflikte kritisch zu reflektieren und abzuwägen.

- sind durch die Anwendung von analytischen Fähigkeiten in der Lage, in konkreten Situationen verschiedene Naturschutzkonzepte gegeneinander abzuwägen und diesen Prozess sowohl in beruflichen als auch akademischen Kontexten transparent zu kommunizieren.
- demonstrieren die Fähigkeit, komplexe gesellschaftliche Konflikte auf praxisnahe Anwendungsfälle herunterzubrechen und Lösungsansätze zu entwickeln.
- erweitern ihr Reflexionsvermögen und ihre Kritikfähigkeit.
- erweitern ihre Präsentationskompetenz und rhetorische Kompetenz.
- erweitern ihr Verständnis von und ihre Erfahrung in Führungskompetenzen angesichts komplexer Entscheidungssituationen.
- erlernen Methoden des wissenschaftlichen Arbeitens, Schreibens und Argumentierens.

Examination achievement

Mündliches Prüfungsgespräch 100%

Course achievement

Referat/Präsentation & Kurzinput

Literature

Foliensätze der Veranstaltung

Literatur

- Eser, Uta (2016). Naturschutz. In: Handbuch Umweltethik, herausgegeben von Ott, Konrad; Dierks, Jan; Voget-Kleschin, Lieske. Stuttgart: J.B. Metzler, S. 44–48.
- Fischer, Ludwig (Hg.) (2004). Projektionsfläche Natur. Zum Zusammenhang von Naturbildern und gesellschaftlichen Verhältnissen. Hamburg: Hamburg University Press. (Veröffentlichungen des Forschungsprojekts "Natur im Konflikt. Naturschutz, Naturbegriff und Küstenbilder")
- Hofmeister, Sabine und Mölders, Tanja (2013). Caring for natures? Naturschutz aus der Perspektive Vorsorgenden Wirtschaftens. In: Wege Vorsorgenden Wirtschaftens, herausgegeben von Netzwerk Vorsorgendes Wirtschaften. Marburg: Metropolis-Verlag, S. 85–114.
- Büscher, Bram und Fletcher, Robert (2020). The Conservation Revolution. Radical Ideas for Saving Nature Beyond the Anthropocene. New York: Verso.
- Ott, Konrad (2018). Naturschutztheorie, bpb.de.
- Jax, Kurt (2024). Conservation Concepts. Rethinking Human–Nature Relationships. New York: Routledge.
- Haraway, Donna (2016). Staying with the trouble. Making Kin in the Chthulucene. Durham: Duke University Press.

Die Auswahl weiterführender Literatur wird im Rahmen der Veranstaltung bekannt gegeben.

Compulsory requirement

none

Teaching method

Inputs der Lehrenden (Vorlesung), Inputs der Studierenden (Referate), Reflexion zu Führungskompetenz (Übung), Gruppenarbeit, Diskussionen, Exkursion

↑

Name of node	Number of node
Climate Change Ecology	10LE07KT-PLU-2023-CCE-12200
Faculty	
Faculty of Environment and Natural Resources	

Compulsory/Elective (C/E)	Compulsory
ECTS-Points	50.0

↑

Name of module	Number of module
Climate Impact Research	10LE07MO-M.12201
Responsible	
Prof. Dr. Christiane Werner Pinto	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Climate Impact Research	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
■ Overview on current approaches in climate change research ■ One-week excursion to Garmisch-Partenkirchen ■ Group work: Development and defense of a short research proposal on climate impact research on a selected topic
Qualification
Students will ■ gain an in-depth and overarching understanding of climate change on biogeochemical cycles, forest growth, and ecosystem physiology ■ gain insights into current research approaches and topics ■ be able to work with and critically analyze original English-language literature ■ be able to summarize and present original research.
Examination achievement
Written assignment and presentation
Course achievement
Attendance, Participiation in the excursion, Project proposal

Teaching method
Lectures, seminar, excursion
Literature
Will be handed out during the course

↑

Name of module	Number of module
Climate Impact Research	10LE07MO-M.12201
course	
Climate Impact Research	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07S-M.12201

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	18

Contents

The module provides an insight into current climate impact research. In particular, current experimental and methodological research approaches and concepts for analysing the consequences of climate change on various ecosystem processes will be taught. These include climate change manipulation experiments on the effects of elevated CO2 (FACE) or other climatic factors (drought, heat, etc.) carried out in a global network, as well as cross-scale research approaches to detect changes in biogeochemical processes (especially biomass production in forests). Additional emphasis is placed on analysing the effects of environmental change on past tree and forest growth (including dendroecology and dendroclimatology) and developing predictive models (including forest growth models and simulators). The three-week module includes a 5-day field trip to the KIT experimental plots in Garmisch-Partenkirchen in the second week. Students will work in small groups to develop their own ideas for a project proposal and defend their project ideas in a joint proposal evaluation at the end of the course.

Qualification

Students will
- gain an in-depth and overarching understanding of climate change on biogeochemical cycles, forest growth, and ecosystem physiology
- gain insights into current research approaches and topics
- be able to work with and critically analyze original English-language literature
- be able to develop a research idea, design a research study and defend the proposalmmarize and present original research.

Examination achievement

Written assignment and presentation

Course achievement

Attendance, Participiation in the excursion, Project proposal

Literature
Will be handed out during the course
Compulsory requirement
none
Recommended requirement
none
Teaching method
Lecture, lab visits, colloquium, group work, excursion

↑

Name of module	Number of module
Ecosystem Functioning	10LE07MO-M.12202
Responsible	
Prof. Dr. Christiane Werner Pinto	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Ecosystem Functioning (ECOFUN)	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
This module will cover different aspects of ecosystem processes across scales, providing insights into advanced knowledge of ecosystem functioning.
Qualification
Students will ■ get an overview on ecosystem processes and functioning at an advanced level from a scientific point of view. ■ be qualified to critically follow the scientific and public debates on the subject and give them background knowledge for careers in research, education and consultancy. ■ achieve an in depth understanding of the complexity and interactions of processes within ecosystems and their feedback on the environment. ■ study examples of case studies and additional literature, which will be provided to deepen their understanding of such processes.
Examination achievement
Written Exam (90 min)
Course achievement
none

Teaching method
Lecture, tutoria, group work
Literature
Will be provided during the course

↑

Name of module	Number of module
Ecosystem Functioning	10LE07MO-M.12202
course	
Ecosystem Functioning (ECOFUN)	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07S-M.12202/12302/12401/22202

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	100

Contents

This module will cover different aspects of ecosystem processes across scales, providing insights into advanced knowledge of ecosystem functioning.

It will cover the fundamental ecological processes of ecosystems, such as the carbon and water cycle, biogeochemical cycles, soil processes, and community dynamics. Lectures will showcase how ecosystem functioning is driven by changes in environmental factors, while in turn ecosystem processes feed-back to the environment. Lectures will cover how ecosystem functions relate to structural components of an ecosystem (e.g. vegetation, water, soil, atmosphere and biota) and how they interact with each other, within and across ecosystems. Further lecture material to deepen the knowledge will be provided. The lectures are accompanied by discussion groups on specific aspects and link the different thematic fields.

Qualification

Students will
- get an overview on ecosystem processes and functioning at an advanced level from a scientific point of view.
- be qualified to critically follow the scientific and public debates on the subject and give them background knowledge for careers in research, education and consultancy.
- achieve an in depth understanding of the complexity and interactions of processes within ecosystems and their feedback on the environment.
- study examples of case studies and additional literature, which will be provided to deepen their understanding of such processes.

Examination achievement

Written Exam (90 min)

Course achievement

none

Literature
Will be provided during the course
Compulsory requirement
none
Recommended requirement
none
Teaching method
Lecture, tutoria, group work

↑

Name of module	Number of module
Environmental Statistics	10LE07MO-M.12203
Responsible	
Prof. Dr. Carsten Dormann	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
none

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Environmental Statistics	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
This module builds on and extends statistical knowledge and its application: ■ Generalised Additive Models ■ Classification & Regression Trees (incl. randomForest and BRT) ■ non-parametric statistic (resampling approaches) ■ model selection incl. cross-validation ■ spatial statistics (correlogram, variogram) ■ extreme value statistics ■ time-series analysis (autocorrelation, decomposition) All topics will be taught in the free software R.
Qualification
Students will ■ extend their statistical knowledge ■ solve complex statistical tasks ■ advance the use of R
Examination achievement
Exam
Course achievement
10 out of 12 weekly homework assignments passed with over 60% of the points

Teaching method
Lectures, practical exercises, group work
Literature
■ Crawley (2007) The R Book. Wiley. ■ *Helsel & Hirsch (1992) Statistical Methods in Water Resources. (www.epa.gov/region9/qa/pdfs/statguide.pdf) ■ Schönwiese (2006) Praktische Statistik für Meteorologen und Geowissenschaftler, 4. Aufl., Bornträger ■ *R-documentation under http://cran.r-project.org/other-docs.html, like http://cran.r-project.org/doc/contrib/Dormann+Kuehn_AngewandteStatistik.pdf * indicates an open resource

↑

Name of module	Number of module
Environmental Statistics	10LE07MO-M.12203
course	
Environmental Statistics	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07S-M.12203/12304/12503/57140

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	150

Contents

This module builds on and extends statistical knowledge and its application:
- Generalised Additive Models
- Classification & Regression Trees (incl. randomForest and BRT)
- non-parametric statistic (resampling approaches)
- model selection incl. cross-validation
- spatial statistics (correlogram, variogram)
- extreme value statistics
- time-series analysis (autocorrelation, decomposition)

All topics will be taught in the free software R.

Qualification

Students will
- extend their statistical knowledge
- solve complex statistical tasks
- advance the use of R

Examination achievement

Exam

Course achievement

10 out of 12 weekly homework assignments passed with over 60% of the points

Literature

- Crawley (2007) The R Book. Wiley.
- *Helsel & Hirsch (1992) Statistical Methods in Water Resources. (www.epa.gov/region9/qa/pdfs/statguide.pdf)
- Schönwiese (2006) Praktische Statistik für Meteorologen und Geowissenschaftler, 4. Aufl., Bornträger

- *R-documentation under http://cran.r-project.org/other-docs.html, like http://cran.r-project.org/doc/contrib/Dormann+Kuehn_AngewandteStatistik.pdf

* indicates an open resource

Compulsory requirement
none
Recommended requirement
■ Basic statistical knowledge: distributions, maximum likelihood, regressions; ANOVA, GLM, PCA ■ Data import und simple statistical analyses in R (www.r-project.org) ■ Knowledge of all content of “R for Beginners” (https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf)
Teaching method
Lectures, practical exercises, group work

↑

Name of module	Number of module
Lab-Analysis of Climate Change Impact	10LE07MO-M.12204
Responsible	
Prof. Dr. Friederike Lang	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150 h
Hours of week	4.0
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Lab-Analysis of Climate Change Impact	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
Learning about and testing experimental approaches and analytical laboratory methods to quantify climate-dependent processes and determine climate-related changes in ecosystems, including plant physiological and dendroecological analyses or the analysis of the components of the carbon balance of soils.
Qualification
Students: ■ are familiar with currently used laboratory analyses to quantify the effects of climate change on carbon/nutrient/water-associated mechanisms and processes in plants, soils and microorganisms ■ are able to statistically evaluate analytical data, to interpret results obtained, and to discuss them in the context of international literature ■ can develop concepts for quality control and for quantifying the uncertainties of the methods used
Examination achievement
Report (55%) and presentation (45%)
Course achievement
Participation in experimental lectures
Teaching method
Lectures, analytical-experimental exercises, instructions for data analyses, interpretation and presentation of results.

Literature
A summary of method descriptions and data analyses are provided as well as annually changing primary literature
Recommendation
Students will need a basic understanding of scientific methods and interest in analytical work

↑

Name of module	Number of module
Lab-Analysis of Climate Change Impact	10LE07MO-M.12204
course	
Lab-Analysis of Climate Change Impact	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12204

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	18

Contents
The predicted and, in some cases, already occurring changes of the climate on a regional and global level influence the properties and functioning of ecosystems. It is to be expected that changing environmental conditions (e.g. higher temperatures, changes in the amount and frequency of precipitation, increased CO2 concentration) will affect the carbon and nutrient cycle, the water balance and the productivity of ecosystems, among other things. Identifying and quantifying these effects is essential for predicting climate impacts and developing adaptation strategies. A variety of experimental approaches and analytical methods are available in the various disciplines to quantify weather- and climate-dependent processes and to determine climate-induced changes in the state of ecosystems. In our module, selected laboratory methods from the various disciplines involved (soil ecology, ecosystem physiology, forest growth science/dendroecology) are presented and applied in supervised small groups in the respective laboratories. In addition to the methodological basics of of data analyses and interpretation, the limitations and sources of error of the methods are addressed. In addition, an introduction to laboratory work, experimental planning, quality assurance and laboratory safety is given.
Qualification
Students: ■ are familiar with currently used laboratory analyses to quantify the effects of climate change on carbon/nutrient/water-associated mechanisms and processes in plants, soils and microorganisms ■ are able to statistically evaluate analytical data, to interpret results obtained, and to discuss them in the context of international literature ■ can develop concepts for quality control and for quantifying the uncertainties of the methods used
Examination achievement
Report (55%) and presentation (45%)
Course achievement
Participation in experimental lectures

Literature
A summary of method descriptions and data analyses are provided as well as annually changing primary literature
Compulsory requirement
None
Recommended requirement
Foundation in natural sciences
Teaching method
Lectures, analytical-experimental exercises, instructions for evaluation, interpretation and presentation of results

↑

Name of module	Number of module
Earth System Modelling	10LE07MO-M.12209
Responsible	
Prof. Dr. René Orth	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150 h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Earth System Modelling	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
Lecture: The lectures in this module provide an overview of computational models and their origins and applications in Earth system science. Models of varying complexity are presented, from conceptual models to weather prediction models and Earth system models, including their areas of application. Specifically, it also addresses the incorporation of existing observational data into modeling (data assimilation), the handling of processes that cannot be spatially or temporally resolved (parameterizations), and the computation of climate projections. A conceptual hydrologic water balance model is presented in depth as a basis for practical modeling using programming. Modeling via Programming: Students implement a simple water balance model under guidance and test it with prepared data at selected sites. Seminar: In small groups, students select a research question to be investigated by modeling with the water balance model. Relevant scientific literature will be studied, and reference will be made to the knowledge gained in the lectures. The results will be summarized and visualized in a poster.

Qualification
Students will ■ Understand models of different complexity and their components ■ know the strengths, weaknesses, and areas of application of various models ■ understand the functioning and handling of a conceptual hydrological water balance model ■ develop a scientific problem and addressing it independently using the water balance model ■ learn to work efficiently in a team
Examination achievement
written assignment
Course achievement
none
Literature
Lecture slides will be provided.

↑

Name of module	Number of module
Earth System Modelling	10LE07MO-M.12209
course	
Earth System Modelling	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12209/12301

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	3
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	56

Contents
The lectures in this module provide an overview of computational models and their origins and applications in Earth system science. Models of varying complexity are presented, from conceptual models to weather prediction models and Earth system models, including their areas of application. Specifically, it also addresses the incorporation of existing observational data into modeling (data assimilation), the handling of processes that cannot be spatially or temporally resolved (parameterizations), and the computation of climate projections. A conceptual hydrologic water balance model is presented in depth as a basis for practical modeling using programming. Modeling via Programming: Students implement a simple water balance model under guidance and test it with prepared data at selected sites. Seminar: In small groups, students select a research question to be investigated by modeling with the water balance model. Relevant scientific literature will be studied, and reference will be made to the knowledge gained in the lectures. The results will be summarized and visualized in a poster.
Qualification
Students will ■ Understand models of different complexity and their components ■ know the strengths, weaknesses, and areas of application of various models ■ understand the functioning and handling of a conceptual hydrological water balance model ■ develop a scientific problem and addressing it independently using the water balance model ■ learn to work efficiently in a team
Examination achievement
written assignment

Course achievement
none
Literature
Lecture slides will be provided.
Compulsory requirement
none
Recommended requirement
Basic knowledge of climate modeling and first experience in programming
Teaching method
Lectures, modeling with programming, seminar (group work, development of poster)

↑

Name of module	Number of module
Environmental Monitoring, Data Analysis and Visualization	10LE07MO-M.12210
Responsible	
Prof. Dr. Markus Weiler	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150 h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
Basics in Statistics and GIS
Recommended requirement
Good knowledge in R

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Environmental Monitoring, Data Analysis and Visualization	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
The module teaches the **fundamentals of collecting, processing, and analyzing spatio-temporal environmental data**, with a focus on air temperature and how buildings and vegetation influence it. Key topics include: ■ Time series analysis (e.g., trend analysis, decomposition, extreme values) ■ Spatial and geostatistics (e.g., variograms, Kriging interpolation) Students: ■ Collect air temperature data using self-programmed data loggers ■ Compare it with online datasets ■ Use R to clean, fill gaps, and analyze time series data ■ Visualize data using R and GIS (maps, time series) ■ Work with climate indices for larger areas (e.g., Baden-Württemberg) Additionally, students: ■ Interpolate data spatially and relate it to urban features (e.g., building density) ■ Learn basics of SQL and spatial databases

- Store and analyze their data, comparing it with past years

The course emphasizes hands-on learning, group work, and the use of GitHub for collaboration.

Qualification
Students ■ can collect data in the field using both analogue and modern digital methods. ■ can distinguish between data sources, data types, and basic data formats. ■ can identify and critically use internet data sources. ■ can import collected data into data management software and control data quality. ■ can spatially interpolate time series data and assess their accuracy.
Examination achievement
2 written reports on timeseries data analysis and data management and data bases
Course achievement
none
Literature
Will be provided during the course.

↑

Name of module	Number of module
Environmental Monitoring, Data Analysis and Visualization	10LE07MO-M.12210
course	
Environmental Monitoring, Data Analysis and Visualization	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12210/12303

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	3
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english

Contents

In this module, the fundamentals for the collection, processing, and handling of spatio-temporal environmental data are taught, so that they are available in a suitable form for later modelling. The following topics will be the focus:

- Time series analyses (trend analysis, autocorrelation, decomposition, extreme value analysis)
- Spatial statistics (variogram); Geostatistics (spatial interpolation, e.g., Kriging)

The overarching theme is air temperature data in space and time, with a focus on the experimental description of the influence of building and vegetation on air temperature. The course also uses a GitHub environment to work in groups on two different topics and to complete exercises with their own data.

Time series data: Analogue and digital methods for data collection in the field are presented and discussed. This ranges from the basic elements of analogue field protocols (field book) to complex data collection. The students independently program their temperature data loggers, install them in the field, read the recorded data, and critically verify their accuracy. For comparison, time series data are downloaded from the internet. All time series are subjected to a comprehensive quality control procedure in R. Errors in the time series are deleted and the resulting data gaps are filled using various methods. This allows characteristic parameters for temperature behaviour to be determined.

An important component of the course is data visualization (e.g., using maps and time series). Students learn about different data types, the theory of data visualization, and effective ways to visualize in R and GIS (Best Practice Guide). They also work with climate data and climate indices on a larger scale (Baden-Württemberg) to combine temporal and spatial data analyses.

Databases with spatial data: Using R, the determined parameters are spatially interpolated and compared with existing city metadata (e.g., building density). This is followed by an introduction to SQL and common database systems. A simple storage solution is introduced and used to store data, conduct an analysis of the collected data, and compare it with the data from previous years.

Qualification

Students

- can collect data in the field using both analogue and modern digital methods.

■ can distinguish between data sources, data types, and basic data formats. ■ can identify and critically use internet data sources. ■ can import collected data into data management software and control data quality. ■ can spatially interpolate time series data and assess their accuracy.
Examination achievement
2 written reports on timeseries data analysis and data management and data bases
Course achievement
none
Literature
Will be provided during the course
Compulsory requirement
Basics in Statistics and GIS
Recommended requirement
Good knowledge in R

↑

Name of node	Number of node
Environmental Modelling and Data Sciences	10LE07KT-PLU-2023-EMDS-12300
Faculty	
Faculty of Environment and Natural Resources	

Compulsory/Elective (C/E)	Compulsory
ECTS-Points	50.0

↑

Name of module	Number of module
Earth System Modelling	10LE07MO-M.12301
Responsible	
Prof. Dr. René Orth	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Earth System Modelling	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
Lecture: The lectures in this module provide an overview of computational models and their origins and applications in Earth system science. Models of varying complexity are presented, from conceptual models to weather prediction models and Earth system models, including their areas of application. Modeling via Programming: Students implement a simple water balance model under guidance and test it with prepared data at selected sites. Seminar: In small groups, students select a research question to be investigated by modeling with the water balance model. Relevant scientific literature will be studied, and reference will be made to the knowledge gained in the lectures. The results will be summarized and visualized in a poster.
Qualification
Students will ■ Understand models of different complexity and their components ■ know the strengths, weaknesses, and areas of application of various models ■ understand the functioning and handling of a conceptual hydrological water balance model ■ develop a scientific problem and addressing it independently using the water balance model ■ learn to work efficiently in a team

Examination achievement
written assignment
Course achievement
none
Teaching method
Lectures, modeling with programming, seminar (group work, development of poster)
Literature
Lecture slides will be provided.

↑

Name of module	Number of module
Earth System Modelling	10LE07MO-M.12301
course	
Earth System Modelling	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12209/12301

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	3
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	56

Contents
The lectures in this module provide an overview of computational models and their origins and applications in Earth system science. Models of varying complexity are presented, from conceptual models to weather prediction models and Earth system models, including their areas of application. Specifically, it also addresses the incorporation of existing observational data into modeling (data assimilation), the handling of processes that cannot be spatially or temporally resolved (parameterizations), and the computation of climate projections. A conceptual hydrologic water balance model is presented in depth as a basis for practical modeling using programming. Modeling via Programming: Students implement a simple water balance model under guidance and test it with prepared data at selected sites. Seminar: In small groups, students select a research question to be investigated by modeling with the water balance model. Relevant scientific literature will be studied, and reference will be made to the knowledge gained in the lectures. The results will be summarized and visualized in a poster.
Qualification
Students will ■ Understand models of different complexity and their components ■ know the strengths, weaknesses, and areas of application of various models ■ understand the functioning and handling of a conceptual hydrological water balance model ■ develop a scientific problem and addressing it independently using the water balance model ■ learn to work efficiently in a team
Examination achievement
written assignment

Course achievement
none
Literature
Lecture slides will be provided.
Compulsory requirement
none
Recommended requirement
Basic knowledge of climate modeling and first experience in programming
Teaching method
Lectures, modeling with programming, seminar (group work, development of poster)

↑

Name of module	Number of module
Ecosystem Functioning	10LE07MO-M.12302
Responsible	
Prof. Dr. Christiane Werner Pinto	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Ecosystem Functioning (ECOFUN)	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
This module will cover different aspects of ecosystem processes across scales, providing insights into advanced knowledge of ecosystem functioning. It will cover the fundamental ecological processes of ecosystems, such as the carbon and water cycle, biogeochemical cycles, soil processes, and community dynamics. Lectures will showcase how ecosystem functioning is driven by changes in environmental factors, while in turn ecosystem processes feed-back to the environment. Lectures will cover how ecosystem functions relate to structural components of an ecosystem (e.g. vegetation, water, soil, atmosphere and biota) and how they interact with each other, within and across ecosystems. Further lecture material to deepen the knowledge will be provided. The lectures are accompanied by discussion groups on specific aspects and link the different thematic fields.
Qualification
Students will ■ get an overview on ecosystem processes and functioning at an advanced level from a scientific point of view. ■ be qualified to critically follow the scientific and public debates on the subject and give them background knowledge for careers in research, education and consultancy. ■ achieve an in depth understanding of the complexity and interactions of processes within ecosystems and their feedback on the environment.

■ study examples of case studies and additional literature, which will be provided to deepen their understanding of such processes.
Examination achievement
Written Exam (90 min)
Course achievement
none
Teaching method
Lecture, tutoria, group work
Literature
Will be provided during the course

↑

Name of module	Number of module
Ecosystem Functioning	10LE07MO-M.12302
course	
Ecosystem Functioning (ECOFUN)	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07S-M.12202/12302/12401/22202

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	100

Contents

This module will cover different aspects of ecosystem processes across scales, providing insights into advanced knowledge of ecosystem functioning.

It will cover the fundamental ecological processes of ecosystems, such as the carbon and water cycle, biogeochemical cycles, soil processes, and community dynamics. Lectures will showcase how ecosystem functioning is driven by changes in environmental factors, while in turn ecosystem processes feed-back to the environment. Lectures will cover how ecosystem functions relate to structural components of an ecosystem (e.g. vegetation, water, soil, atmosphere and biota) and how they interact with each other, within and across ecosystems. Further lecture material to deepen the knowledge will be provided. The lectures are accompanied by discussion groups on specific aspects and link the different thematic fields.

Qualification

Students will
- get an overview on ecosystem processes and functioning at an advanced level from a scientific point of view.
- be qualified to critically follow the scientific and public debates on the subject and give them background knowledge for careers in research, education and consultancy.
- achieve an in depth understanding of the complexity and interactions of processes within ecosystems and their feedback on the environment.
- study examples of case studies and additional literature, which will be provided to deepen their understanding of such processes.

Examination achievement

Written Exam (90 min)

Course achievement

none

Literature
Will be provided during the course
Compulsory requirement
none
Recommended requirement
none
Teaching method
Lecture, tutoria, group work

↑

Name of module	Number of module
Environmental Monitoring, Data Analysis and Visualization	10LE07MO-M.12303
Responsible	
Prof. Dr. Markus Weiler	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Environmental Monitoring, Data Analysis and Visualization	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
In diesem Modul werden Grundlagen für die Erfassung, Bearbeitung und Verarbeitung von Zeitreihen (mit räumlichen Aspekten) vermittelt, damit sie in einer geeigneten Form für eine spätere Modellierung vorliegen. Das Rahmenthema ist die experimentelle Beschreibung der „urbanen Wärmeinsel“ in der Stadt Freiburg. Der Kurs verwendete eine GitHub-Umgebung, um an zwei verschiedenen Themen zu arbeiten und mit eigenen Daten Übungen zu absolvieren.
Qualification
Studierende können ■ Daten im Gelände mit analogen und modernen digitalen Methoden erfassen. ■ Datenquellen, Datentypen und grundlegende Datenformate unterscheiden. ■ Internet-Datenquellen identifizieren und kritisch nutzen. ■ für gesammelte Daten die Datenqualität kontrollieren und kennen Datenbanken. ■ Zeitreihendaten räumlich interpolieren und deren Dyanmik bewerten.
Examination achievement
Schriftliche Ausarbeitung: zwei korrigierte Übungen (gleiche Gewichtung)
Course achievement
none

Literature
Zahumenský, I (2004): Guidelines on Quality Control Procedures for Data from Automatic Weather Stations, WMO, Geneva.

↑

Name of module	Number of module
Environmental Monitoring, Data Analysis and Visualization	10LE07MO-M.12303
course	
Environmental Monitoring, Data Analysis and Visualization	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12210/12303

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	3
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english

Contents

In this module, the fundamentals for the collection, processing, and handling of spatio-temporal environmental data are taught, so that they are available in a suitable form for later modelling. The following topics will be the focus:

- Time series analyses (trend analysis, autocorrelation, decomposition, extreme value analysis)
- Spatial statistics (variogram); Geostatistics (spatial interpolation, e.g., Kriging)

The overarching theme is air temperature data in space and time, with a focus on the experimental description of the influence of building and vegetation on air temperature. The course also uses a GitHub environment to work in groups on two different topics and to complete exercises with their own data.

Time series data: Analogue and digital methods for data collection in the field are presented and discussed. This ranges from the basic elements of analogue field protocols (field book) to complex data collection. The students independently program their temperature data loggers, install them in the field, read the recorded data, and critically verify their accuracy. For comparison, time series data are downloaded from the internet. All time series are subjected to a comprehensive quality control procedure in R. Errors in the time series are deleted and the resulting data gaps are filled using various methods. This allows characteristic parameters for temperature behaviour to be determined.

An important component of the course is data visualization (e.g., using maps and time series). Students learn about different data types, the theory of data visualization, and effective ways to visualize in R and GIS (Best Practice Guide). They also work with climate data and climate indices on a larger scale (Baden-Württemberg) to combine temporal and spatial data analyses.

Databases with spatial data: Using R, the determined parameters are spatially interpolated and compared with existing city metadata (e.g., building density). This is followed by an introduction to SQL and common database systems. A simple storage solution is introduced and used to store data, conduct an analysis of the collected data, and compare it with the data from previous years.

Qualification

Students

- can collect data in the field using both analogue and modern digital methods.

■ can distinguish between data sources, data types, and basic data formats. ■ can identify and critically use internet data sources. ■ can import collected data into data management software and control data quality. ■ can spatially interpolate time series data and assess their accuracy.
Examination achievement
2 written reports on timeseries data analysis and data management and data bases
Course achievement
none
Literature
Will be provided during the course
Compulsory requirement
Basics in Statistics and GIS
Recommended requirement
Good knowledge in R

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Name of module	Number of module
Environmental Statistics	10LE07MO-M.12304
Responsible	
Prof. Dr. Carsten Dormann	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Recommended semester	1
Duration	1
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
none

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Environmental Statistics	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
This module builds on and extends statistical knowledge and its application: ■ Generalised Additive Models ■ Classification & Regression Trees (incl. randomForest and BRT) ■ non-parametric statistic (resampling approaches) ■ model selection incl. cross-validation ■ spatial statistics (correlogram, variogram) ■ extreme value statistics ■ time-series analysis (autocorrelation, decomposition) All topics will be taught in the free software R.
Qualification
Students will ■ extend their statistical knowledge ■ solve complex statistical tasks ■ advance the use of R
Examination achievement
Exam
Course achievement
10 out of 12 weekly homework assignments passed with over 60% of the points

Teaching method
Lectures, practical exercises, group work
Literature
■ Crawley (2007) The R Book. Wiley. ■ *Helsel & Hirsch (1992) Statistical Methods in Water Resources. (www.epa.gov/region9/qa/pdfs/statguide.pdf) ■ Schönwiese (2006) Praktische Statistik für Meteorologen und Geowissenschaftler, 4. Aufl., Bornträger ■ *R-documentation under http://cran.r-project.org/other-docs.html, like http://cran.r-project.org/doc/contrib/Dormann+Kuehn_AngewandteStatistik.pdf * indicates an open resource

↑

Name of module	Number of module
Environmental Statistics	10LE07MO-M.12304
course	
Environmental Statistics	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07S-M.12203/12304/12503/57140

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	150

Contents

This module builds on and extends statistical knowledge and its application:
- Generalised Additive Models
- Classification & Regression Trees (incl. randomForest and BRT)
- non-parametric statistic (resampling approaches)
- model selection incl. cross-validation
- spatial statistics (correlogram, variogram)
- extreme value statistics
- time-series analysis (autocorrelation, decomposition)

All topics will be taught in the free software R.

Qualification

Students will
- extend their statistical knowledge
- solve complex statistical tasks
- advance the use of R

Examination achievement

Exam

Course achievement

10 out of 12 weekly homework assignments passed with over 60% of the points

Literature

- Crawley (2007) The R Book. Wiley.
- *Helsel & Hirsch (1992) Statistical Methods in Water Resources. (www.epa.gov/region9/qa/pdfs/statguide.pdf)
- Schönwiese (2006) Praktische Statistik für Meteorologen und Geowissenschaftler, 4. Aufl., Bornträger

- *R-documentation under http://cran.r-project.org/other-docs.html, like http://cran.r-project.org/doc/contrib/Dormann+Kuehn_AngewandteStatistik.pdf

* indicates an open resource

Compulsory requirement

none

Recommended requirement

- Basic statistical knowledge: distributions, maximum likelihood, regressions; ANOVA, GLM, PCA
- Data import und simple statistical analyses in R (www.r-project.org)
- Knowledge of all content of “R for Beginners” (https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf)

Teaching method

Lectures, practical exercises, group work

↑

Name of module	Number of module
Advanced Statistics	10LE07MO-M.12309
Responsible	
Dr. Manisha Bhardwaj	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150 h
Hours of week	4.0
Attendance	52 h
Independent study	98 h
Recommended semester	3
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None
Recommended requirement
Basic statistical knowledge in statistics (ANOVA, ANCOVA, GLMs, GAMs) and R

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Advanced Statistics	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
■ Analysis of temporally/spatially correlated data ■ Bayesian mixed-effect models ■ (generalized) mixed-effect models
Qualification
Students will ■ be able to apply and interprete mixed effects models ■ be able to solve complex statistical tasks independently using the software R and its relevant resources ■ get competences for the development (research) and application (practice) of advanced but important statistical models in the environmental sciences.
Examination achievement
Written assignment
Course achievement
none

Teaching method
Lecture, demonstration, tutored exercises
Literature
Scripts and reading material will be made available during the course on Github and on ILIAS. Some suggested literature is given here: ■ Paradis, E. R for Beginners (https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf) ■ Crawley M (2007) The R Book. Wiley ■ Zuur A et al. (2007) Mixed Effect Models and their Extensions in Ecology with R. Springer. ■ Bolker B et al. (2009) Generalized linear mixed models: a practical guide for ecology and evolution. Trends in Ecology and Evolution 24:127 – 135. ■ Documentation for the lme4 package: https://cran.r-project.org/web/packages/lme4/index.html

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Name of module	Number of module
Advanced Statistics	10LE07MO-M.12309
course	
Advanced Statistics	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12309

ECTS-Points	5.0
Workload	150 h
Attendance	52 h
Independent study	98 h
Hours of week	4.0
Recommended semester	3
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	20

Contents

The module teaches competences for the development (research) and application (practice) of advanced but important statistical models in the environmental sciences.

The module focuses on mixed effects models and their application in R. Mixed effects models are powerful tools to deal with structure and heterogeneity in environmental data arising from such common practices as multiple sampling of units, grouping units at various hierarchical levels, or spatial sampling. A rough estimation shows that 80-90 % of environmental studies require mixed effects models to analyse their data. However, mixed effects models are also complex and sometimes difficult to apply and interpret. More, they are developing fast and their possibilities expand continuously. The module´s goal is to teach students the basics of mixed effects models on which to build on when analysing their own data. The course thus extends statistical knowledge and its application as conveyed by other courses at the faculty. Topics covered will be repeated measurement ANOVA, generalised least squares (GLS), linear mixed models (LMMs), Generalised linear mixed models (GLMM), Bayesian mixed models, optimization methods and possibly Generalised additive mixed models (GAMM).

All topics will be taught in the free software R, mainly using the R-packages nlme, lme4, brms, gls, aov and their add-ons.

Qualification

Students will
- be able to apply and interprete mixed effects models
- be able to solve complex statistical tasks independently using the software R and its relevant resources
- get competences for the development (research) and application (practice) of advanced but important statistical models in the environmental sciences.

Examination achievement

Written assignment

Course achievement
None
Literature
Scripts and reading material will be made available during the course on Github and on ILIAS. Some suggested literature is given here: ■ Paradis, E. R for Beginners (https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf) ■ Crawley M (2007) The R Book. Wiley ■ Zuur A et al. (2007) Mixed Effect Models and their Extensions in Ecology with R. Springer. ■ Bolker B et al. (2009) Generalized linear mixed models: a practical guide for ecology and evolution. Trends in Ecology and Evolution 24:127 – 135. ■ Documentation for the lme4 package: https://cran.r-project.org/web/packages/lme4/index.html
Compulsory requirement
None
Recommended requirement
Basic statistical knowledge in statistics (ANOVA, ANCOVA, GLMs, GAMs) and R
Teaching method
Lecture, demonstration, tutored exercises

↑

Name of module	Number of module
Capstone Project	10LE07MO-M.12310
Responsible	
Prof. Dr. Carsten Dormann	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150 h
Hours of week	4.0
Recommended semester	3
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
none
Recommended requirement
Participants should have taken the majority of courses in the Major „Environmental Modelling and Data Science“, as this course builds on the skills acquired there.

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Capstone Project	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
Lectures will cover scientific reproducibility (open data, open source, versioning, open science platforms); critical reading of papers including evaluation of claimed novelty; identifying sensitive assumptions or routines; and writing terse technical comments. This knowledge is then used, in group projects of 2-3 people, to (i) reproduce a published study; (ii) change the data or methods a bit to explore the consequences for the findings; and (iii) write a maximally 2-page comment accompanied by a full length documentation of steps (i) and (ii) in fully reproducible format.
Qualification
Students will be empowered to critically read, reproduce and re-analyse scientific studies. They will practice the use of versioning and literal programming software. Finally, they will learn to write with a focus on the key criticisms (or confirmation) of the study, by writing a terse, short and to-the-point comment on the original publication, reflecting their findings.

Examination achievement
written assignment Half-way through and at the end of the module, each group will briefly present their paper, the main target of re-analysis and findings with respect to consistency or discrepancy of the reproduction. Students will write a final written report, of maximally 2 pages of scientific writing plus many pages of documented and reproducible code as supplement.
Course achievement
none
Teaching method
Lectures, supervised group projects, student presentations
Literature
Dormann, C.F., Schneider, H., and Gorges, J. (2019) Neither global nor consistent: a technical comment on the tree diversity-productivity analysis of Liang et al. (2016). bioRxiv, https://doi.org/10.1101/524363

↑

Name of module	Number of module
Capstone Project	10LE07MO-M.12310
course	
Capstone Project	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12310

ECTS-Points	5.0
Workload	150 h
Attendance	50 h
Independent study	100 h
Hours of week	4.0
Recommended semester	3
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	20

Contents
Lectures will cover scientific reproducibility (open data, open source, versioning, open science platforms); critical reading of papers including evaluation of claimed novelty; identifying sensitive assumptions or routines; and writing terse technical comments. This knowledge is then used, in group projects of 2-3 people, to (i) reproduce a published study; (ii) change the data or methods a bit to explore the consequences for the findings; and (iii) write a maximally 2-page comment accompanied by a full length documentation of steps (i) and (ii) in fully reproducible format.
Qualification
Students will be empowered to critically read, reproduce and re-analyse scientific studies. They will practice the use of versioning and literal programming software. Finally, they will learn to write with a focus on the key criticisms (or confirmation) of the study, by writing a terse, short and to-the-point comment on the original publication, reflecting their findings.
Examination achievement
Written assignment: Half-way through and at the end of the module, each group will briefly present their paper, the main target of re-analysis and findings with respect to consistency or discrepancy of the reproduction. Students will write a final written report, of maximally 2 pages of scientific writing plus many pages of documented and reproducible code as supplement.
Course achievement
None
Literature
Dormann, C.F., Schneider, H., and Gorges, J. (2019) Neither global nor consistent: a technical comment on the tree diversity-productivity analysis of Liang et al. (2016). bioRxiv, https://doi.org/10.1101/524363

Compulsory requirement
Participants should have taken the majority of courses in the Major „Environmental Modelling and Data Science“, as this course builds on the skills acquired there.
Recommended requirement
R, Python, remote sensing techniques
Teaching method
Lectures, supervised group projects, student presentations

↑

Name of node	Number of node
Sustainability Assessment and Transformation	10LE07KT-PLU-2023-SAT-12400
Faculty	
Faculty of Environment and Natural Resources	

Compulsory/Elective (C/E)	Compulsory
ECTS-Points	50.0

↑

Name of module	Number of module
Ecosystem Functioning	10LE07MO-M.12401
Responsible	
Prof. Dr. Christiane Werner Pinto	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	1
Duration	1
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Ecosystem Functioning (ECOFUN)	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
This module will cover different aspects of ecosystem processes across scales, providing insights into advanced knowledge of ecosystem functioning. It will cover the fundamental ecological processes of ecosystems, such as the carbon and water cycle, biogeochemical cycles, soil processes, and community dynamics. Lectures will showcase how ecosystem functioning is driven by changes in environmental factors, while in turn ecosystem processes feed-back to the environment. Lectures will cover how ecosystem functions relate to structural components of an ecosystem (e.g. vegetation, water, soil, atmosphere and biota) and how they interact with each other, within and across ecosystems. Further lecture material to deepen the knowledge will be provided. The lectures are accompanied by discussion groups on specific aspects and link the different thematic fields.
Qualification
Students will ■ get an overview on ecosystem processes and functioning at an advanced level from a scientific point of view. ■ be qualified to critically follow the scientific and public debates on the subject and give them background knowledge for careers in research, education and consultancy. ■ achieve an in depth understanding of the complexity and interactions of processes within ecosystems and their feedback on the environment.

■ study examples of case studies and additional literature, which will be provided to deepen their understanding of such processes.
Examination achievement
Written Exam (90 min)
Course achievement
none
Teaching method
Lecture, tutoria, group work
Literature
Will be provided during the course

↑

Name of module	Number of module
Ecosystem Functioning	10LE07MO-M.12401
course	
Ecosystem Functioning (ECOFUN)	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07S-M.12202/12302/12401/22202

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	100

Contents

This module will cover different aspects of ecosystem processes across scales, providing insights into advanced knowledge of ecosystem functioning.

It will cover the fundamental ecological processes of ecosystems, such as the carbon and water cycle, biogeochemical cycles, soil processes, and community dynamics. Lectures will showcase how ecosystem functioning is driven by changes in environmental factors, while in turn ecosystem processes feed-back to the environment. Lectures will cover how ecosystem functions relate to structural components of an ecosystem (e.g. vegetation, water, soil, atmosphere and biota) and how they interact with each other, within and across ecosystems. Further lecture material to deepen the knowledge will be provided. The lectures are accompanied by discussion groups on specific aspects and link the different thematic fields.

Qualification

Students will
- get an overview on ecosystem processes and functioning at an advanced level from a scientific point of view.
- be qualified to critically follow the scientific and public debates on the subject and give them background knowledge for careers in research, education and consultancy.
- achieve an in depth understanding of the complexity and interactions of processes within ecosystems and their feedback on the environment.
- study examples of case studies and additional literature, which will be provided to deepen their understanding of such processes.

Examination achievement

Written Exam (90 min)

Course achievement

none

Literature
Will be provided during the course
Compulsory requirement
none
Recommended requirement
none
Teaching method
Lecture, tutoria, group work

↑

Name of module	Number of module
Environmental and Resource Economics	10LE07MO-M.12402
Responsible	
Prof. Dr. Stefan Baumgärtner	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	1
Duration	1
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None
Recommended requirement
Basic (environmental and resource) economics from a Bachelor program

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Environmental and Resource Economics	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
Part I Introduction 1. Environment and economy 2. Mathematics for environmental economics Part II Microeconomic foundations of environmental economics 1. Utility of the natural environment for humans 2. Scarcity and opportunity costs of natural resources 3. Optimization and optimality conditions Part III Welfare economics: markets, nature, and government 1. Market equilibrium 2. Markets and welfare 3. Public goods 4. Open access to natural resources 5. Externalities 6. Regulation of a heterogeneous polluting industry

7. Government failure
Qualification
In this module, students will learn how to analyze the (un)sustainable use of natural environment and natural resources from an economic perspective. To this end, students will learn intermediate and advanced concepts and methods from ecological, environmental and resource economics, and apply them to analyze (un)sustainable economy-environment systems.
Examination achievement
Written Exam (90 minutes)
Course achievement
none
Teaching method
Lecture, homework
Literature
There is no single textbook for this module. References for several chapters of the course include: ■ M. Common and S. Stagl: Ecological Economics. An Introduction, Cambridge University Press, 2005 ■ H.E. Daly and J. Farley: Ecological Economics. Principles and Applications, Washington DC: Island Press, 2004 ■ Endres and V. Radke: Economics for Environmental Studies. A Strategic Guide to Micro- and Macroeconomics, Springer, 2012 ■ N. Hanley, J.F. Shogren and B. White: Environmental Economics in Theory and Practice, 2nd edition, Palgrave Macmillan, 2007 ■ R. Perman, Y. Ma, J. McGilvray and M. Common: Natural Resource and Environmental Economics, 3rd edition, Pearson Education, 2003

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Name of module	Number of module
Environmental and Resource Economics	10LE07MO-M.12402
course	
Environmental and Resource Economics	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12402

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	25

Contents

Part I Introduction
1. Environment and economy
2. Mathematics for environmental economics

Part II Microeconomic foundations of environmental economics
1. Utility of the natural environment for humans
2. Scarcity and opportunity costs of natural resources
3. Optimization and optimality conditions

Part III Welfare economics: markets, nature, and government
1. Market equilibrium
2. Markets and welfare
3. Public goods
4. Open access to natural resources
5. Externalities
6. Regulation of a heterogeneous polluting industry
7. Government failure

Qualification

In this module, students will learn how to analyze the (un)sustainable use of natural environment and natural resources from an economic perspective. To this end, students will learn intermediate and advanced concepts and methods from ecological, environmental and resource economics, and apply them to analyze (un)sustainable economy-environment systems.

Examination achievement

Written Exam (90 minutes)

Course achievement

none

Literature
There is no single textbook for this module. References for several chapters of the course include: ■ M. Common and S. Stagl: Ecological Economics. An Introduction, Cambridge University Press, 2005 ■ H.E. Daly and J. Farley: Ecological Economics. Principles and Applications, Washington DC: Island Press, 2004 ■ Endres and V. Radke: Economics for Environmental Studies. A Strategic Guide to Micro- and Macroeconomics, Springer, 2012 ■ N. Hanley, J.F. Shogren and B. White: Environmental Economics in Theory and Practice, 2nd edition, Palgrave Macmillan, 2007 ■ R. Perman, Y. Ma, J. McGilvray and M. Common: Natural Resource and Environmental Economics, 3rd edition, Pearson Education, 2003
Compulsory requirement
None
Recommended requirement
Basic (environmental and resource) economics from a Bachelor program
Teaching method
Lecture, homework

↑

Name of module	Number of module
Material and Energy Flow Analysis	10LE07MO-M.12403
Responsible	
Prof. Ph.D. Stefan Pauliuk	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	10.0
Workload	300h
Hours of week	6.0
Attendance	80
Independent study	220
Recommended semester	1
Duration	1
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None
Recommended requirement
Familiarity with quantitative analysis

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Material and Energy Flow Analysis	andere (z.B. Kurse, Tutorien)	Compulsory	10.0	6.0	300 h

Contents
The module combines the theory of socioecological systems with the basics of quantitative analysis of systems and material and energy flow analysis, in particular. It also provides extensive factual knowledge of the material and energetic basis of our society and methodological skills for its analysis. The four areas are closely interlinked in the lectures and exercises.
Qualification
Students taking this module will: ■ acquire comprehensive factual knowledge on the material and energetic basis of human activities ■ learn to understand societal metabolism as a complex adaptive system ■ become familiar with the theory of socio-ecological systems and with contemporary concepts of sustainable development, such as the doughnut economy or the safe operating space for humanity and learn to discuss these concepts critically. ■ acquire basic competencies in quantitative systems analysis to address environmental and sustainability issues ■ become familiar with strategies to transform the biophysical basis of our societyCore technical skills acquired include:

- understand and apply the basics of energy and material flow analysisunderstand and learn to apply the basics of input-output analysis
- learn to deal with quantitative data, and in particular to use mass balance and error propagation
- be able to use common software (Excel and Python) to model concrete case studies of sustainable energy and material scenarios
- model concrete case studies of sustainable energy and material flow management
- develop an understanding of the possibilities and limitations of existing tools and methods, and gain experience in the selection and application of quantitative analytical methods

Examination achievement

Written exam *(2,5h, individual)*

Course achievement

none

Teaching method

Integratetd lectures, exercises, and seminars

Literature

- Practical Handbook of Material Flow Analysis. By Paul H Brunner, and Helmut Rechberger. CRC/Lewis, 2004. ISBN: 0203507207. Provided on ILIAS.
- Metabolism of the Anthroposphere, second edition. By Peter Baccini and Paul H. Brunner. MIT press, 2012, ISBN: 978-0262016650
- Input-Output Analysis Foundations and Extensions. By R.E. Miller and P.D. Blair. Cambridge University Press, 2009. ISBN: 978-0521739023
- The Economics of the Coming Spaceship Earth. Kenneth E Boulding. Buchkapitel in “Environmental Quality in a Growing Economy”, 1966. Johns Hopkins University Press. http://www.ub.edu/prometheus21/articulos/obsprometheus/BOULDING.pdf
- The role of in-use stocks in the social metabolism and in climate change mitigation. Stefan Pauliuk. Global Environmental Change 24, 2014, pp 132-142. DOI: 10.1016/j.gloenvcha.2013.11.006

Additional literature such as book chapters, journal articles and reports will be shared via ILIAS.

Recommendation

It is assumed that this mathematical knowledge is available and will be consolidated independently before and during the course. The mathematical methods themselves will not be re-introduced in detail during the course. This course includes an introduction to data analysis and material cycle modelling with Python.

↑

Name of module	Number of module
Material and Energy Flow Analysis	10LE07MO-M.12403
course	
Material and Energy Flow Analysis	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12403

ECTS-Points	10.0
Workload	300 h
Attendance	80
Independent study	220
Hours of week	6.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	25

Contents
The module combines the theory of socioecological systems (1) with the basics of quantitative analysis of systems (2). It also provides extensive factual knowledge of the material and energetic basis of our society (3) and methodological skills for its analysis (4). The four areas are closely interlinked in the lectures and exercises. 1) Theory of socioecological systems: Starting from the 'two sphere model', an interdisciplinary theory of socio-ecological systems (SES, from socioecological systems) is presented, which serves as the theoretical foundation of the entire course. Central concepts of the description and practical implementation of sustainability are introduced and classified with the help of the general theory. These concepts include socio-metabolic regimes, socio-metabolic transitions, 'Sustainable Development Goals', and energy and material service cascade, as well as the economic forms 'circular economy', 'Doughnut economy', bio-economy', and 'spaceman economy'. 2) Fundamentals of quantitative system analysis: system definition, system variables and parameters, balance equations, system equations and their analytical and numerical solution, error consideration and error propagation, data quality and measurement deviations, static, stationary and dynamic systems, material cycles. 3) The biophysical basis of human society and its sustainable transformation: In addition to the theory and methods of material flow management, extensive factual knowledge about the material and energetic basis of central human activities such as living, working, transport, communication, nutrition or cleaning is imparted in special background lectures, which then also forms the basis for the respective exercises. In addition to the facts, there is knowledge about the interrelationships in the system 'societal metabolism' and about the restructuring of the societal metabolism with regard to its sustainable development. 4) Methods of system analysis: Energy and material flow analysis of industrial systems is the basic method for quantifying the energy and material levels of human society (Baccini and Brunner 2012). It is used to capture the material and energy flows and stocks in technical processes in a system context, providing the basis for assessment and decision making. This method will be explained in detail and taught through several exercises.

The following mathematical methods will be applied during the course, partly in Python (an introduction is provided)
+ Basics of linear algebra: matrix multiplication and inversion, multiplication of matrices by vectors, rearrangement of matrix equations, systems of linear equations.
+ Performing simple and matrix calculations using MS Excel (e.g. row sum, multiplication, inverse) and Python.
+ Basic knowledge of differential calculus: partial derivative of simple functions.

Qualification

Students taking this module will:
- acquire comprehensive factual knowledge on the material and energetic basis of human activities
- learn to understand societal metabolism as a complex adaptive system
- become familiar with the theory of socio-ecological systems and with contemporary concepts of sustainable development, such as the doughnut economy or the safe operating space for humanity and learn to discuss these concepts critically.
- acquire basic competencies in quantitative systems analysis to address environmental and sustainability issues
- become familiar with strategies to transform the biophysical basis of our society

Core technical skills acquired include:
- understand and apply the basics of energy and material flow analysisunderstand and learn to apply the basics of input-output analysis
- learn to deal with quantitative data, and in particular to use mass balance and error propagation
- be able to use common software (Excel and Python) to model concrete case studies of sustainable energy and material scenarios
- model concrete case studies of sustainable energy and material flow management
- develop an understanding of the possibilities and limitations of existing tools and methods, and gain experience in the selection and application of quantitative analytical methods

Examination achievement

Written exam (2,5h, individual)

Course achievement

none

Literature

- Practical Handbook of Material Flow Analysis. By Paul H Brunner, and Helmut Rechberger. CRC/Lewis, 2004. ISBN: 0203507207. Provided on ILIAS.
- Metabolism of the Anthroposphere, second edition. By Peter Baccini and Paul H. Brunner. MIT press, 2012, ISBN: 978-0262016650
- Input-Output Analysis Foundations and Extensions. By R.E. Miller and P.D. Blair. Cambridge University Press, 2009. ISBN: 978-0521739023
- The Economics of the Coming Spaceship Earth. Kenneth E Boulding. Buchkapitel in “Environmental Quality in a Growing Economy”, 1966. Johns Hopkins University Press. http://www.ub.edu/prometheus21/articulos/obsprometheus/BOULDING.pdf
- The role of in-use stocks in the social metabolism and in climate change mitigation. Stefan Pauliuk. Global Environmental Change 24, 2014, pp 132-142. DOI: 10.1016/j.gloenvcha.2013.11.006

Additional literature such as book chapters, journal articles and reports will be shared via ILIAS.

Compulsory requirement

None

Recommended requirement

Familiarity with quantitative analysis

Teaching method
Integratetd lectures, exercises, and seminars

Name of module	**Number of module**
Research Project	10LE07MO-M.12408
Responsible	
Prof. Ph.D. Stefan Pauliuk	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	10.0
Workload	300 h
Hours of week	6.0
Attendance	80 h
Independent study	220 h
Recommended semester	3
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
none

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Research Project	andere (z.B. Kurse, Tutorien)	Compulsory	10.0	6.0	300 h

Contents
The scope of the work in the Project module is flexible, but a qualified scientific advisor from the SAT teachers team must be found. The work can be carried out individually or in groups. The following list shows potential projects that we could support, provided that the below-mentioned stakeholders are interested and have capacity: Circular Economy plan for city and region, targeting major material groups (link to the city) Climate protection plan for the Uni (link to the Uni) Scenarios for sustainable nutrition (link to the Innovation Campus / research group on sustainable nutrition systems) Scenarios for sustainable nitrogen and phosphorous management in the region Energy transition studies, covering solar PV in different constellations, hydrogen-based solution, consumer-driven solutions, etc. Plus topics in economics/market design, legal analysis, transformation science, etc. Also: Modelling activities (different sectors and scopes), life cycle analyses, footprint studies, … From the technical and scientific side, we will set some minimum standards (reg. scientific report/presentation/poster) with core features (literature overview, research gap + questions, discussion and classification of the results according to tbd. criteria, bibliography).

Qualification
This course qualifies students for interdisciplinary research in the SAT major. This includes the application of the central research skills, the formulation of research questions that require an interdisciplinary approach, the development of a research program to tackle these questions. Organisation of the research, either individually or as a team. Compilation of a report and a presentation, including a critical discussion of the results generated.
Examination achievement
none
Course achievement
Project report, can be individual or a group work AND a presentation in a final seminar.
Literature
■ Industrial Ecology Open Online Course: https://www.industrialecology.uni-freiburg.de/teaching ■ Good Scientific Practice in Industrial Ecology - A Factsheet. This document provides researchers and students with a condensed overview of three main aspects of good scientific practice in industrial ecology: research ethics, best practice for conducting and documenting research, and research tools. The following topics are covered: (1) Research ethics overview. Core scientific principles and good scientific conduct. (2) Best practice for carrying out, documenting, and publishing research: including recommendations for report structure and scientific writing as well as reproducible research. (3) Some state-of-the art tools and infrastructure for IE research: https://www.industrialecology.uni-freiburg.de/Content/IEooc_Methods_Good_Scientific_Practice.pdf Additional literature such as book chapters, journal articles and reports will be shared via ILIAS.

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Name of module	Number of module
Research Project	10LE07MO-M.12408
course	
Research Project	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12408

ECTS-Points	10.0
Workload	300 h
Attendance	80 h
Independent study	220 h
Hours of week	6.0
Recommended semester	3
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	18

Contents
The scope of the work in the Project module is flexible, but a qualified scientific advisor from the SAT teachers team must be found. The work can be carried out individually or in groups. The following list shows potential projects that we could support, provided that the below-mentioned stakeholders are interested and have capacity: Circular Economy plan for city and region, targeting major material groups (link to the city) Climate protection plan for the Uni (link to the Uni) Scenarios for sustainable nutrition (link to the Innovation Campus / research group on sustainable nutrition systems) Scenarios for sustainable nitrogen and phosphorous management in the region Energy transition studies, covering solar PV in different constellations, hydrogen-based solution, consumer-driven solutions, etc. Plus topics in economics/market design, legal analysis, transformation science, etc. Also: Modelling activities (different sectors and scopes), life cycle analyses, footprint studies, … From the technical and scientific side, we will set some minimum standards (reg. scientific report/presentation/poster) with core features (literature overview, research gap + questions, discussion and classification of the results according to tbd. criteria, bibliography).
Qualification
This course qualifies students for interdisciplinary research in the SAT major. This includes the application of the central research skills, the formulation of research questions that require an interdisciplinary approach, the development of a research program to tackle these questions. Organisation of the research, either individually or as a team. Compilation of a report and a presentation, including a critical discussion of the results generated.
Examination achievement
none
Course achievement
Project report, can be individual or a group work AND a presentation in a final seminar.

Literature
■ Industrial Ecology Open Online Course: https://www.industrialecology.uni-freiburg.de/teaching ■ Good Scientific Practice in Industrial Ecology - A Factsheet. This document provides researchers and students with a condensed overview of three main aspects of good scientific practice in industrial ecology: research ethics, best practice for conducting and documenting research, and research tools. The following topics are covered: (1) Research ethics overview. Core scientific principles and good scientific conduct. (2) Best practice for carrying out, documenting, and publishing research: including recommendations for report structure and scientific writing as well as reproducible research. (3) Some state-of-the art tools and infrastructure for IE research: https://www.industrialecology.uni-freiburg.de/Content/IEooc_Methods_Good_Scientific_Practice.pdf Additional literature such as book chapters, journal articles and reports will be shared via ILIAS.
Compulsory requirement
none
Teaching method
Integrated lectures and seminars, project work

↑

Name of node	Number of node
Wildlife and Biodiversity	10LE07KT-PLU-2023-WaB-12500
Faculty	
Faculty of Environment and Natural Resources	

Compulsory/Elective (C/E)	Compulsory
ECTS-Points	50.0

↑

Name of module	Number of module
Analysis of Biodiversity Data	10LE07MO-M.12501
Responsible	
Dr. Stefan Kaufmann	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Analysis of Biodiversity Data	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
Main focus of this module: ■ Measuring and comparing biological diversity (α-, β- and γ-Diversity) by using rarefaction/extrapolation and modelling approaches ■ Analysing community data with multivariate statistics (ordinations)
Qualification
Students will ■ receive a deeper understanding about how to measure biological diversity ■ learn widely applied methods, especially in plant ecology ■ increase R-knowledge
Examination achievement
Written report
Course achievement
Attendance
Teaching method
Lectures, practical exercises

↑

Name of module	Number of module
Analysis of Biodiversity Data	10LE07MO-M.12501
course	
Analysis of Biodiversity Data	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12501/22201

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	30

Contents
Main focus of this module: ■ Measuring and comparing biological diversity (α-, β- and γ-Diversity) by using rarefaction/extrapolation and modelling approaches ■ Analysing community data with multivariate statistics (ordinations)
Qualification
Students will ■ receive a deeper understanding about how to measure biological diversity ■ learn widely applied methods, especially in plant ecology ■ increase R-knowledge
Examination achievement
Written report
Course achievement
Attendance
Compulsory requirement
None
Recommended requirement
Basic statistical knowledge and familiar with R
Teaching method
Lectures, practical exercises

↑

Name of module	Number of module
Biodiversity and Conservation Biology	10LE07MO-M.12502
Responsible	
Prof. Dr. Ilse Storch	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
none

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Biodiversity and Conservation Biology	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
■ Biodiversity concept, measures and indicators ■ The biodiversity crisis and its causes ■ Biodiversity policy and instruments ■ Approaches to priority setting in conservation ■ Conservation approaches from species to landscapes ■ Animal population restauration ■ The scientific basis for conservation ■ International Conservation Case Examples
Qualification
Students understand the concept of "biodiversity" and its different aspects, and are able to understand, critically discuss and interpret conservation biology studies for application in conservation.
Examination achievement
written assignment
Course achievement
SL

Teaching method
Lectures, presentations, discussions

↑

Name of module	Number of module
Biodiversity and Conservation Biology	10LE07MO-M.12502
course	
Biodiversity and Conservation Biology	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12502

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	20

Contents
■ Biodiversity concept, measures and indicators ■ The biodiversity crisis and its causes ■ Biodiversity policy and instruments ■ Approaches to priority setting in conservation ■ Conservation approaches from species to landscapes ■ Animal population restauration ■ The scientific basis for conservation ■ International Conservation Case Examples
Qualification
Students understand the concept of "biodiversity" and its different aspects, and are able to understand, critically discuss and interpret conservation biology studies for application in conservation.
Examination achievement
written assignment
Course achievement
SL
Literature
Will be provided during the course.
Compulsory requirement
none
Recommended requirement
none

Teaching method
Vorlesung, Präsentationen, Diskussion

↑

Name of module	Number of module
Environmental Statistics	10LE07MO-M.12503
Responsible	
Prof. Dr. Carsten Dormann	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
none

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Environmental Statistics	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
This module builds on and extends statistical knowledge and its application: ■ Generalised Additive Models ■ Classification & Regression Trees (incl. randomForest and BRT) ■ non-parametric statistic (resampling approaches) ■ model selection incl. cross-validation ■ spatial statistics (correlogram, variogram) ■ extreme value statistics ■ time-series analysis (autocorrelation, decomposition) All topics will be taught in the free software R.
Qualification
Students will ■ extend their statistical knowledge ■ solve complex statistical tasks ■ advance the use of R
Examination achievement
Exam
Course achievement
10 out of 12 weekly homework assignments passed with over 60% of the points

Teaching method
Lectures, practical exercises, group work
Literature
■ Crawley (2007) The R Book. Wiley. ■ *Helsel & Hirsch (1992) Statistical Methods in Water Resources. (www.epa.gov/region9/qa/pdfs/statguide.pdf) ■ Schönwiese (2006) Praktische Statistik für Meteorologen und Geowissenschaftler, 4. Aufl., Bornträger ■ *R-documentation under http://cran.r-project.org/other-docs.html, like http://cran.r-project.org/doc/contrib/Dormann+Kuehn_AngewandteStatistik.pdf * indicates an open resource

↑

Name of module	Number of module
Environmental Statistics	10LE07MO-M.12503
course	
Environmental Statistics	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07S-M.12203/12304/12503/57140

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	150

Contents

This module builds on and extends statistical knowledge and its application:
- Generalised Additive Models
- Classification & Regression Trees (incl. randomForest and BRT)
- non-parametric statistic (resampling approaches)
- model selection incl. cross-validation
- spatial statistics (correlogram, variogram)
- extreme value statistics
- time-series analysis (autocorrelation, decomposition)

All topics will be taught in the free software R.

Qualification

Students will
- extend their statistical knowledge
- solve complex statistical tasks
- advance the use of R

Examination achievement

Exam

Course achievement

10 out of 12 weekly homework assignments passed with over 60% of the points

Literature

- Crawley (2007) The R Book. Wiley.
- *Helsel & Hirsch (1992) Statistical Methods in Water Resources. (www.epa.gov/region9/qa/pdfs/statguide.pdf)
- Schönwiese (2006) Praktische Statistik für Meteorologen und Geowissenschaftler, 4. Aufl., Bornträger

- *R-documentation under http://cran.r-project.org/other-docs.html, like http://cran.r-project.org/doc/contrib/Dormann+Kuehn_AngewandteStatistik.pdf

* indicates an open resource

Compulsory requirement

none

Recommended requirement

- Basic statistical knowledge: distributions, maximum likelihood, regressions; ANOVA, GLM, PCA
- Data import und simple statistical analyses in R (www.r-project.org)
- Knowledge of all content of “R for Beginners” (https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf)

Teaching method

Lectures, practical exercises, group work

↑

Name of module	Number of module
Genetic and Genomic Methods in Wildlife Management and Conservation	10LE07MO-M.12504
Responsible	
Prof. Dr. Katrin Heer Prof. Dr. Gernot Gunter Segelbacher	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	1
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Genetic and Genomic Methods in Wildlife Management and Conservation	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
The application of genetic and genomic methods has greatly enhanced our understanding of the extent and spatial distribution of genetic diversity within species, of patterns of local adaptation and the genetic basis underlying phenotypic traits. Also, genetic methods allow assessing population properties that are relevant for species management and conservation such as effective population sizes, patterns of gene flow and hybridization. In this module, we will present current methods and applications, read and discuss relevant literature and critically discuss the advantages and limitations of genetic methods. Students will learn how to design molecular studies in the lab, and acquire basic knowledge in analyzing genetic data and evaluate case studies.
Qualification
Student understand how to determine parameters and processes like effective population size, genetic diversity, hybridization and local adaptation based on genetic data. Students can critically read and discuss scientific literature on the above mention topics.
Examination achievement
Written assignment

Course achievement
Seminar presentation
Literature
Allendorf et al. 2022 Conservation and the Genomics of Populations.

↑

Name of module	Number of module
Genetic and Genomic Methods in Wildlife Management and Conservation	10LE07MO-M.12504
course	
Genetic and Genomic Methods in Wildlife Management and Conservation	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07S-M.12504

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	1
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	18

Contents
The application of genetic and genomic methods has greatly enhanced our understanding of the extent and spatial distribution of genetic diversity within species, of patterns of local adaptation and the genetic basis underlying phenotypic traits. Also, genetic methods allow assessing population properties that are relevant for species management and conservation such as effective population sizes, patterns of gene flow and hybridization. In this module, we will present current methods and applications, read and discuss relevant literature and critically discuss the advantages and limitations of genetic methods. Students will learn how to design molecular studies in the lab, and acquire basic knowledge in analyzing genetic data and evaluate case studies.
Qualification
Student understand how to determine parameters and processes like effective population size, genetic diversity, hybridization and local adaptation based on genetic data. Students can critically read and discuss scientific literature on the above mention topics.
Examination achievement
Written assignment
Course achievement
Seminar presentation
Literature
Allendorf et al. 2022 Conservation and the Genomics of Populations.
Compulsory requirement
None
Recommended requirement
Fundamentals of population genetics

↑

Name of module	Number of module
Conservation of Forest Biodiversity	10LE07MO-M.12509
Responsible	
Prof. Dr. Ilse Storch	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150 h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	3
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Conservation of Forest Biodiversity	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
The module will offer students insights into the approaches, study design, field methods and data anlysis of ConFoBi. ConFoBi researchers will present their projects, students will visit study plots and – as far as possible - participate in data collection and/or analysis. After a general introduction to forest biodiversity conservation issues, and the ConFoBi project, students will work on various aspects of ConFoBi (field work, lab, data analysis, written assignments).
Qualification
Students will ■ gain knowledge of major approaches and challenges in conservation of biodiversity in managed forests ■ will gnowledge of retention forestry approaches ■ understand the interdisciplinary study design and the translational approach of ConFoBi ■ be qualified for advanced education in conservation biological research (PhD programmes) and the scientific background for careers in forest conservation policy and management will be provided.
Examination achievement
Research paper (max 2.500 words)
Course achievement
none

Teaching method
Lectures, group assignments, field excursions
Literature
Lectures, group assignments, field excursions

↑

Name of module	Number of module
Conservation of Forest Biodiversity	10LE07MO-M.12509
course	
Conservation of Forest Biodiversity	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07S-M.12509/52180

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	3
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	18

Contents
The DFG-funded Research Training Group ConFoBi Conservation of Forest Biodiversity in Multiple-use Landscapes of Central Europe is a major research and qualification programme of Freiburg University. ConFoBi combines multi-scale ecological studies on forest biodiversity with social and economic studies of biodiversity conservation, and focuses on the effectiveness of structural retention measures, namely habitat trees and dead wood, for the conservation of biodiversity in managed forests. See also: http://confobi.uni-freiburg.de/ The module will offer students insights into the approaches, study design, field methods and data anlysis of ConFoBi. ConFoBi researchers will present their projects, students will visit study plots and – as far as possible - participate in data collection and/or analysis. After a general introduction to forest biodiversity conservation issues, and the ConFoBi project, students will work on various aspects of ConFoBi (field work, lab, data analysis, written assignments). Details will be specified each summer shortly before the module according to ConFoBi's research schedule. The module may also prepare students for MSc thesis work, and possibly later PhD research, within the ConFoBi project.
Qualification
Students will ■ gain knowledge of major approaches and challenges in conservation of biodiversity in managed forests ■ will gnowledge of retention forestry approaches ■ understand the interdisciplinary study design and the translational approach of ConFoBi ■ be qualified for advanced education in conservation biological research (PhD programmes) and the scientific background for careers in forest conservation policy and management will be provided.
Examination achievement
Research paper (max 2.500 words)
Course achievement
none

Literature
To be specified towards start of the module
Compulsory requirement
none
Recommended requirement
Basic knowledge of forest ecology and management
Teaching method
Lectures, group assignments, field excursions

↑

Name of module	Number of module
Frontiers in Wildlife Ecology and Conservation Biology	10LE07MO-M.12510
Responsible	
Dr. Catalina Munteanu	
Faculty	
Faculty of Environment and Natural Resources	

ECTS-Points	5.0
Workload	150 h
Hours of week	4.0
Attendance	60 h
Independent study	90 h
Recommended semester	3
Duration	1 Semester
Compulsory/Elective (C/E)	Compulsory
Frequency	takes place each winter term

Compulsory requirement
None
Recommended requirement
Basic knowledge/ course in Wildlife Ecology and/or Conservation Biology

Assigned Courses					
Name	Type	C/E	ECTS	HoW	Workload
Frontiers in Wildlife Ecology and Conservation Biology	andere (z.B. Kurse, Tutorien)	Compulsory	5.0	4.0	150 h

Contents
■ Overview of timely topics and recent advancements in the fields of ecology and conservation ■ Interpretation and discussion of research output and methodological advancements ■ Implications of research for conservation action
Qualification
■ Students can name and describe concepts and recent scientific advancements in the field wildlife ecology and conservation and are in the position to synthesize and critically analyze research output of selected research papers ■ Students can explain and communicate main research outputs to a peer audience, jointly weight costs and benefits of different conservation options and position themselves in relation to the discussed points ■ Students can participate in polarized discussion, accept and analyze opposing arguments, and consequently develop and clarify their own standpoint
Examination achievement
Oral presentation (100%)

Course achievement
■ Synthesize and present main research advancements on one selected research topic. ■ Develop critical arguments for/against implementation of a certain conservation strategy ■ Participate in weekly discussions and quizzes
Teaching method
Frontal teaching, Group work, Student presentations, Polarized discussion
Literature
2-3 readings will be assigned weekly. PDF documents will be posted online a week in advance.

↑

Name of module	Number of module
Frontiers in Wildlife Ecology and Conservation Biology	10LE07MO-M.12510
course	
Frontiers in Wildlife Ecology and Conservation Biology	
Event type	Number
andere (z.B. Kurse, Tutorien)	10LE07V-M.12510

ECTS-Points	5.0
Workload	150 h
Attendance	60 h
Independent study	90 h
Hours of week	4.0
Recommended semester	3
Frequency	takes place each winter term
Compulsory/Elective (C/E)	Compulsory
Language	english
Group size	18

Contents

The seminar discusses recent scientific concepts and advancements in the fields of wildlife ecology and conservation practice with special emphasis on providing the scientific background for critically assessing conservation management implications. Each week, we will read and critically discuss research papers that cover following topics such as:

- Extinction drivers and their interactions
- Species responses to global climate change
- Frontiers in habitat assessments and passive wildlife monitoring
- Connectivity, fragmentation and wildlife movement
- Conservation approaches: Land Sharing vs. Land sparing, Half Earth, SDGs
- Novel Ecosystems and invasive species
- Extinction debt and time-delayed biodiversity change
- Human interaction with nature: biophilia, biophobia, perception

Qualification

- Students can name and describe concepts and recent scientific advancements in the field wildlife ecology and conservation and are in the position to synthesize and critically analyze research output of selected research papers
- Students can explain and communicate main research outputs to a peer audience, jointly weight costs and benefits of different conservation options and position themselves in relation to the discussed points
- Students can participate in polarized discussion, accept and analyze opposing arguments, and consequently develop and clarify their own standpoint

Examination achievement

oral presentation (100%)

Course achievement

- Synthesize and present main research advancements on one selected research topic.
- Develop critical arguments for/against implementation of a certain conservation strategy
- Participate in weekly discussions and quizzes

Literature
2-3 readings will be assigned weekly. PDF documents will be posted online a week in advance.
Compulsory requirement
none
Recommended requirement
Basic knowledge/ course in Wildlife Ecology and/or Conservation Biology
Teaching method
Frontal teaching, Group work, Student presentations, Polarized discussion

↑