

# Modulhandbuch

*M.Sc. Sustainable Resource Management*

Wissenschaftszentrum Weihenstephan für Ernährung,

Landnutzung und Umwelt

Technische Universität München

[www.tum.de](http://www.tum.de)

[www.wzw.tum.de](http://www.wzw.tum.de)

## Allgemeine Informationen und Lesehinweise zum Modulhandbuch

### **Zu diesem Modulhandbuch:**

Ein zentraler Baustein des Bologna-Prozesses ist die Modularisierung der Studiengänge, das heißt die Umstellung des vormaligen Lehrveranstaltungssystems auf ein Modulsystem, in dem die Lehrveranstaltungen zu thematisch zusammenhängenden Veranstaltungsblöcken - also Modulen - gebündelt sind. Dieses Modulhandbuch enthält die Beschreibungen aller Module, die im Studiengang angeboten werden. Das Modulhandbuch dient der Transparenz und versorgt Studierende, Studieninteressierte und andere interne und externe Adressaten mit Informationen über die Inhalte der einzelnen Module, ihre Qualifikationsziele sowie qualitative und quantitative Anforderungen.

### **Wichtige Lesehinweise:**

#### **Aktualität**

Jedes Semester wird der aktuelle Stand des Modulhandbuchs veröffentlicht. Das Generierungsdatum (siehe Fußzeile) gibt Auskunft, an welchem Tag das vorliegende Modulhandbuch aus TUMonline generiert wurde.

#### **Rechtsverbindlichkeit**

Modulbeschreibungen dienen der Erhöhung der Transparenz und der besseren Orientierung über das Studienangebot, sind aber nicht rechtsverbindlich. Einzelne Abweichungen zur Umsetzung der Module im realen Lehrbetrieb sind möglich. Eine rechtsverbindliche Auskunft über alle studien- und prüfungsrelevanten Fragen sind den Fachprüfungs- und Studienordnungen (FPSOen) der Studiengänge sowie der allgemeinen Prüfungs- und Studienordnung der TUM (APSO) zu entnehmen.

#### **Wahlmodule**

Wenn im Rahmen des Studiengangs Wahlmodule aus einem offenen Katalog gewählt werden können, sind diese Wahlmodule in der Regel nicht oder nicht vollständig im Modulhandbuch gelistet.

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## Pflichtmodule | Required Modules

### Modulbeschreibung

## WZ1821: Natural Resources - Traits, Management and Theory of Sustainability | Natural Resources - Traits, Management and Theory of Sustainability

*Natural Resources - Traits, Management, Theory of Sustainability*

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2015

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 80	<b>Präsenzstunden:</b> 70

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

### Beschreibung der Studien-/ Prüfungsleistungen:

The intended learning outcomes as defined below require a differentiated way of examination. A written exam at the end of the semester will test whether the students sufficiently understand sustainability concepts and their connection to specific resources. As a midterm course achievement, external lecturer Dr. Savage offers the students topics for writing short reports about current global resource management problems as a homework, where they should show their ability to research and structure information and to identify crucial information gaps. Successful performance will improve the exam grade by 0.3.

### Wiederholungsmöglichkeit:

Folgesemester

### (Empfohlene) Voraussetzungen:

None

### Inhalt:

The module is intended to be a leitmotif during the first semester.

It consists of three basic units:



Unit 1 introduces the theory and the history of sustainability, supplemented by introducing interdisciplinary method knowledge.

Unit 2 introduces important natural resources, their specific traits in combination with sustainability challenges.

Unit 3 discusses case studies from interdisciplinary real-world-implementations.

Lecturers change during the semester. Each lecture is given by an expert in the specific field.

**Lernergebnisse:**

At the end of the module the students understand the most important theories and perceptions of sustainable resource management as well as traits and challenges connected with essential natural resources. Moreover, they are able to apply this knowledge for critically questioning given real-world situations. This comprises the ability to assess strengths and weaknesses of given problem solution approaches (as presented in the media or specialist literature), and to outline possible approaches if confronted with a resource management problem.

**Lehr- und Lernmethoden:**

Depending on each lecture's specific contents and due to the modules' interdisciplinary character, teaching methods combine classic presentations, blended learning and group work.

**Medienform:**

presentations, worksheets, simulation models

**Literatur:**

Recommended up-to-date readings are supplied by the specific lecturers

**Modulverantwortliche(r):**

: Dr. Peter Biber – Lehrstuhl für Waldwachstumskunde; Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/ 71- 4708; Peter.Biber@lrz.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Natural Resources - Traits, Management, Theory of Sustainability (Vorlesung, 5 SWS)

Biber P [L], Biber P, Fischer A, Grambow M, Häberle K, Kainz M, Kasperidus H, Knoke T, Kohlpaintner M, Menzel A, Müller J, Savage C, Schad P, Suda M

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ1824: System Analysis and Introduction to Ecology | System Analysis and Introduction to Ecology

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2016/17

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 4	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

In a written exam (duration 90 min), the students' understanding of important ecological concepts and ecosystem dynamics' patterns is assessed. Moreover, in the same exam, we test their understanding of system analysis methods and their ability to apply them in ecological and other contexts by correctly solving specific problems given in the questions.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

None

#### Inhalt:

This module combines an introduction to ecology with an introduction to analyzing and modelling dynamic systems. As ecosystems are intrinsically dynamic, i.e. governed by feedback structures, understanding dynamic systems is a key qualification for understanding ecological theory. By examples from ecology but also from other fields (in which cases, however, transfers to ecological applications are always highlighted) formal key methods in structuring system knowledge, building computer models, and learning from such models are taught. An important insight to convey is the interdisciplinarity of dynamic systems and the related methods: Feedback structures found in ecosystems can often as well be found in social science or engineering contexts and vice versa. Parallely, students get basic and advanced insights into fundamental elements of ecological concepts (e.g. modularity, unitarity, speciation, populations, metapopulations, competition,

mutualism, ecosystems and their functions) and theory from the level of organisms to populations to species interactions up to the ecosystem level.

**Lernergebnisse:**

At the end of the module students understand essential elements of ecological theory and concepts. They remember important dynamic patterns and the ecological concepts behind. Moreover, they are able to apply key methods of system analysis to small and intermediate problems in ecology but also in other fields. The latter abilities include using causal loop diagrams and stock-and-flow diagrams for structuring information, understanding the basic mathematics behind dynamic models, being able to build small and intermediate simulation models, and to develop an understanding of the potential and limitations of computer simulations in general.

**Lehr- und Lernmethoden:**

Lecture providing theoretical foundations in ecology. Interactive lecture in System Analysis, with an individual workstation being available for each student. In the beginning, the group is closely guided through simple problems in order to develop routine in the methodological and technical basics while understanding fundamental dynamic processes from exponential growth and decay up to nth order delays. Along with their increasing skills, students are given the opportunity to work more independently, with individual guidance upon request, about problems like different approaches to sustainable harvest or overshoot and collapse systems. This concept allows the lecturer to adjust the share of frontal teaching and independent work to the group's learning progress.

**Medienform:**

Reading material provided by lecturers, power point presentations, modelling software VENSIM PLE, example models

**Literatur:**

Begon, M., C. R. Townsend and J. L. Harper. 2006. Ecology: From Individuals to Ecosystems. Blackwell Publishing, Malden, MA.  
Ford, A. Modeling the Environment. Island Press, 1999.  
Sterman, J.D., Business Dynamics. McGraw-Hill Education, 2000.

**Modulverantwortliche(r):**

Dr. Peter Biber – Lehrstuhl für Waldwachstumskunde Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/ 71- 4708; Peter.Biber@lrz.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

System Analysis (Vorlesung, 2 SWS)  
Biber P

Introduction into Ecology (Vorlesung, 2 SWS)  
Hof C, Meyer S, Seibold S, Weißer W

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2713: Methods of Scientific Communication | Methods of Scientific Communication

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2019/20

<b>Modulniveau:</b>	<b>Sprache:</b>	<b>Semesterdauer:</b>	<b>Häufigkeit:</b>
<b>Credits:*</b> 4	<b>Gesamtstunden:</b>	<b>Eigenstudiums- stunden:</b>	<b>Präsenzstunden:</b>

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

#### Wiederholungsmöglichkeit:

#### (Empfohlene) Voraussetzungen:

#### Inhalt:

#### Lernergebnisse:

#### Lehr- und Lernmethoden:

#### Medienform:

#### Literatur:

**Modulverantwortliche(r):**

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Presenting (Seminar, 3 SWS)

Howe T

Scientific Writing (Seminar, 2 SWS)

Weber-Blaschke G, Hijazi O

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## Modulbeschreibung

### WZ1823: Inventory Methods, Statistics and GIS | Inventory Methods, Statistics and GIS

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2015

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 6	<b>Gesamtstunden:</b> 180	<b>Eigenstudiums- stunden:</b> 110	<b>Präsenzstunden:</b> 70

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The learning success will be assessed by a written examination (duration 120 min) covering the knowledge and competence achieved in the three main branches of the module, namely GIS, Terrestrial Inventory Methods, Remote Sensing (RS), and Statistics. In GIS, a basic understanding of various GIS concepts and problem solution strategies is referred to.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

None

#### Inhalt:

Implementation of basic concepts for acquisition, management, visualization of spatial data, and data evaluation as well as their inter-connection with tabular data from different source.

1. GIS: the focus is on the use of vector based GIS; the potentials of raster based GIS are demonstrated.
2. Terrestrial Inventory Methods: Introduction to sampling theory and application.
3. Remote Sensing (RS): Introduction to RS Principles: basic understanding of the physical background, on sensor concepts, evaluation strategies and spatial information extraction are elucidated.

4. Statistics in Resource Management: Justification of statistics, descriptive statistics and exploration: Frequencies and their graphical representation, distributions and their moments, testing hypotheses, regression analysis, post hoc tests, a priori contrasts, analysis of variance.

**Lernergebnisse:**

At the end of the courses on Inventory methods, GIS and Statistics the students are able to:

- select an appropriate GIS/Image Analysis program with respect to its intended field of application;
- apply a Geoinformatics tool (GIS and RS) to solve individual problems dealing with spatial information.
- understand the principles of sampling and how to assure the quality of a sample.
- understand the basic principles of remote sensing
- identify a geospatial problem and to decide on the appropriate RS system as well as on the data analysis strategy for the task to be supported.
- understand data analysis as a support for their Master's Thesis, understanding the formulation of hypotheses, the connection of statistics to epistemology, their preconditions for proper application and interpretation of the results, applying important statistical techniques.

**Lehr- und Lernmethoden:**

The module includes lectures, exercises and accompanying examples.

**Medienform:**

Online material available at [www.elearning.tum.de](http://www.elearning.tum.de); Slides with lectures downloadable from a platform to be announced.

**Literatur:**

Environmental Systems Research Institute Inc.: Map Projections. Georeferencing spatial data, ESRI Press \* Zeiler, M.: Modelling Our World. The ESRI Guide to Geodatabase Design, ESRI Press \* Vienneau, A.: Using ArcCatalog, ESRI Press \* Minami, M.; Sakala, M.; Wrightsell, J.: Using ArcMap, ESRI Press \* Terrestrial Inventory Methods: Gregoire TG and Valentine HT (2008) Sampling strategies for natural resources and the environment. Boca Raton, Fla.; London, Chapman & Hall/CRC \* Mandallaz D (2008) Sampling techniques for forest inventories. Applied Environmental Statistics. Chapman and Hall. 276 p \* Introduction to Remote Sensing Principles: Richards, J.A., Jia, X.: Remote Sensing Digital Image Analysis - an introduction; Springer Press, Principles of Remote Sensing - an introductory textbook; Ed. L.L.F. Janssen, G.C. Huurneman, ITC educational textbook series; internet tutorials from ESA, DLR, NASA, CCRS, etc. \* Statistics with Microsoft Excel (4th Edition) by Beverly Jean Dretzke (Paperback - June 20, 2008) \*Discovering statistics using SPSS Field, Andy P. 2009

**Modulverantwortliche(r):**

Prof. Dr. Thomas Knoke – Professur für Waldinventur und nachhaltige Nutzung Hans-Carl-von-Carlowitz Platz 2, 85354 Freising,; 08161/71-4701; [knoke@forst.wzw.tum.de](mailto:knoke@forst.wzw.tum.de)



**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Introduction to GIS (Vorlesung, 2 SWS)

Döllerer M

Statistics (Vorlesung, 1 SWS)

Knoke T

Inventory Methods (Vorlesung, 2 SWS)

Knoke T, Schneider T

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Management Aspects | Management Aspects

### Modulbeschreibung

## WZ1822: Introduction to Economics and Business Ethics | Introduction to Economics and Business Ethics

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2015

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b>	<b>Präsenzstunden:</b>

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

### Beschreibung der Studien-/ Prüfungsleistungen:

The written examination (duration 90 min) assesses the students' understanding of the basic concepts of microeconomic theory (module part introduction to economics) and major business ethical concepts and issues. Furthermore, the examination tests students' ability to precisely describe solutions, achieve certain results and reproduce standard arguments within a limited amount of time.

A Mid-Term assignment (presentation) assesses the students' ability to present a new topic in a comprehensible manner. It will serve for grade improvement by 0.3 according to §6 (5) APSO.

### Wiederholungsmöglichkeit:

Folgesemester

### (Empfohlene) Voraussetzungen:

### Inhalt:

The module is an introduction to Business Ethics and Economics. Business ethics introduces the student to classical concepts of duty, consequentialism and virtues, in particular modern management virtues. The classical concepts are applied to corporate social responsibility and corporate governance. CSR and corporate governance will be discussed in the light of globalization, the financial crisis of 2008 and major corporate scandals.

The module part “Introduction to Economics” provides an introduction into microeconomic theory and the interaction between economics and the environment. Based on consumer and producer theory, we analyze the interactions of demand and supply on markets. We analyze economic reasons for market failure and use welfare economic concepts to evaluate market interventions. In the final part, we look at principles of intertemporal efficiency and an economic perspective of sustainability.

**Lernergebnisse:**

The major theoretical positions are reflected in public as well as private debates. Thus, understanding the structure of standard arguments contributes to the development of solution-oriented approach to ethical dilemmas and to the students’ rhetorical skills.

We will take hands on approach to CSR, focusing on Un Global Compact and specific CSR policies. This approach will prepare the student for practical challenges of implementing CSR policies. We will approach Corporate Governance in a similar manner, looking at cases of bad corporate governance, at codes of corporate governance and at the practical challenges of implementing stricter procedures in the organizations.

The lectures on power will introduce the students to a significant aspect of organizational interaction. We look at different ways to obtain power in an organizational context and we will investigate the opportunity for ethical action in a professional environment characterized by a more or less intensive power struggles. The analysis of consumer ethics will clarify why our environmentally damaging consumer habits are so difficult to change.

Students will learn about ways in which the economy and the environment are independent. They will understand the microeconomic theory of consumer and producer behaviour and reasons for market failure. They will be able to apply welfare economics to evaluate governmental market interventions. Furthermore, they will understand the temporal dimension of economic decisions and their implications for sustainability.

**Lehr- und Lernmethoden:**

2/3 lectures, 1/3 group work and student presentations

**Medienform:**

**Literatur:**

The texts will be provided on moodle

**Modulverantwortliche(r):**

PD. Dr. Thilo Glebe – Lehrstuhl für Volkswirtschaftslehre - Umweltökonomie und Agrarpolitik Alte Akademie 14; 85354 Freising; 08161-71-5965; glebe@wzw.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Introduction to Economics (WZ1822) (Vorlesung, 2 SWS)

Glebe T [L], Glebe T

Business Ethics (WZ1822) (Vorlesung, 2 SWS)

Thejls Ziegler M [L], Thejls Ziegler M

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WI000926: International Environmental Governance and Conflict Management | International Environmental Governance and Conflict Management

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2019

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The module grade is based on a research paper (20-22 pages) which will be elaborated in teams of students. By working in teams, students show their ability to manage resources within the team and to solve separate project tasks within a specified time limit. The single student's contribution to the group work will be clearly identifiable and gradable.

With the research paper students demonstrate that they are able to recall key issues of international environmental governance and relate those to pertinent conflicts about resource management. With this multi-level analysis students show their ability to carry out a distinct case study in groups, following a systematic and coherent methodology.

By preparing the case study, students demonstrate their ability to analyze processes of regime formation related to global environmental problems, explore underlying causes of environmental conflicts and to generate and discuss possible solution strategies for a concrete example of the field of natural resource conflicts and their dynamics.

Within the process students demonstrate that they are able to consider different theoretical perspectives and to reflect these perspectives in order to attain a joint result.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

none

### **Inhalt:**

Conflicts of interest have become common in resource management. Moreover, actors, discourses and instruments from international environmental policy may play a role in the emergence, escalation and/or management of these conflicts. The module embeds the local level of conflictive issues in resource management in the broader setting of international environmental policy. Therefore, the emergence and development of the international environmental regime from 1970 onwards is explored with reference to international conventions like, for example, the Montreal Protocol on ozone depleting substances, the UN's climate policies and initiatives to end the loss of biodiversity. Approaches ranging from traditional top-down instruments used by governments ("government") to less conventional instruments that presuppose active participation of non-state actors, including firms and NGOs ("governance") are analyzed. Conflict Management discusses the limits and possibilities of conflict analyses, addresses the diverse and manifold drivers of environmental conflicts and offers an insight into conflict management strategies. The module's bottom line is that developments in international environmental governance affect management decisions over the use and/or protection of natural resources, yet solutions for conflictive issues have to be found at the local level and with involvement of multiple actors. In doing so, an important trend in international environmental governance is addressed, namely that multi-stakeholder dialogues and arrangements are pertinent for successful conflict management.

### **Lernergebnisse:**

At the end of the module, students are able to: (a) describe the role of actors and discourses in environmental governance and their role in the formation of international regime related to global environmental problems; (b) differentiate between different types of international environmental policy instruments (regulatory, market- and information-based); (c) analyze the impact of actors, discourses and/or instruments of international environmental policy on the local level, using an exemplary case; (d) apply a multi-level analysis to pertinent conflicts dealing with resource management; (e) propose and discuss appropriate resolution strategies of conflict management based on that analysis of an exemplary case (f) organize, distribute and communicate workloads and tasks within a team of diverse backgrounds and work together towards a common goal; (g) utilize and apply competencies in scientific writing

### **Lehr- und Lernmethoden:**

The module consists of two lectures. Moreover, students are asked to actively participate and read the reading assignments. The lectures provide students with a basic grasp of International Environmental Governance and Conflict Management. International regimes and conflict cases will be analyzed and discussed. In the course of a research paper students work in teams to develop and analyze a case study. The research paper is therefore the result of a joint project work, which is conducted by students in teams and will be guided by the lecturers who will provide theoretical and methodological input through plenum sessions and group consultations.

### **Medienform:**

PowerPoint, chalk board, flip chart

**Literatur:**

Kanie, N., Biermann, F. (Eds.), 2017. Governing through goals: Sustainable development goals as governance innovation. Cambridge: MIT Press.

Dryzek, John S. (2013) The Politics of the Earth: Environmental Discourses, Third Edition: Oxford University Press

Falkner, R. (2013) Handbook of Global Climate and Environment Policy, Chichester: John Wiley & Sons Inc.

**Modulverantwortliche(r):**

Suda, Michael; Prof. Dr. rer. silv.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

International Environmental Policy (Vorlesung, 2 SWS)

Koch S

Conflict Resolution (Vorlesung, 2 SWS)

Kunkowski T

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

**WZ2714: General Education Subject | General Education Subject****Modulbeschreibung****MCTS0036: Moderation (RESET) | Moderation (RESET)***How to guarantee efficient group discussions and moderation*

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2017/18

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 3	<b>Gesamtstunden:</b> 90	<b>Eigenstudiums- stunden:</b> 60	<b>Präsenzstunden:</b> 30

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

**Beschreibung der Studien-/ Prüfungsleistungen:**

Students must submit a research paper (2000 to 3000 words) in which they demonstrate that they have gained a deeper understanding of successful moderation. They do so by analysing a case or reflecting their own and other's communication patterns and behaviour in group discussions and moderation situations. In the paper, students demonstrate that they have acquired a greater awareness for communication challenges and barriers with different stakeholders, as well as an empathic and also assertive communication attitude. Furthermore, they show that they are able to apply effective communication techniques for the creation and maintenance of respectful and results-oriented group discussions, and also to learn from experience and - if necessary or advisable - to modify critical group communication patterns.

**Wiederholungsmöglichkeit:**

Folgesemester

**(Empfohlene) Voraussetzungen:**

This Skills module is aimed at students currently enrolled in the M.A. program 'Responsibility in Science, Engineering and Technology'. Students from other English-language MA programs can apply to join the respective course provided there is sufficient space available.



**Inhalt:**

It is a major challenge to communicate effectively with and to different stakeholders within the STS/RRI context (in project meetings, planning processes or field activities), especially when targeting the change of paradigms and behaviour. Involving different stakeholders such as fellow researchers and partners but also decision makers, entrepreneurs, and civil society in productive, interactive inter- and transdisciplinary meetings is a challenge and requires an informed and skilled intervention of the moderator. Relevant concepts for these interventions will be discussed and necessary skills will be trained.

**Lernergebnisse:**

This module is dedicated to the challenges of successful communication in multi-stakeholder environments. Participants will acquire the following skills needed to support and moderate meetings and discussions (involving 3-20 participants) effectively and guarantee consistent outcomes:

- awareness for communication challenges and barriers with different stakeholders
- empathic and at the same time assertive communication attitude in moderation situations
- application of effective moderation techniques (e.g. active listening, rephrasing, question techniques, establishing rapport)
- ability to use these techniques for the creation and maintenance of respectful and result-oriented group discussions
- ability to learn from experience and - if necessary or advisable - to modify critical group communication patterns

**Lehr- und Lernmethoden:**

Lectures to transfer knowledge about moderation and mediation; interactive exercises and simulations (role plays) to train group communication and moderation techniques

**Medienform:**

Whiteboard, flip chart, exercise sheets, exercises, role plays, films

**Literatur:**

MOORE, Ch. (2014). The Negotiating Process - Practical Strategies for Resolving Conflict.- 4th revised Edition; Jossey-Bass Publishers. San Francisco, CA, USA.

FISHER, R. & Ury, W. (2012). Getting To Yes: Negotiating Agreement Without Giving In. 3rd revised Edition (1st Ed. 1983). Penguin Books. New York, NY, USA.

SCHULZ v. THUN, F. (2004) Seven Tools for Clear Communication: The Hamburg Approach in English Language; Arbeitsgruppe Beratung und Training, Fachbereich Psychologie; 69 p.

**Modulverantwortliche(r):**

Crail, Tina; M.A.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Moderation - How to Guarantee Efficient Communication within Groups (Workshop, 2 SWS)  
Caser U

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Wahlmodule | Elective Courses

### Science Topics | Science Topics

## Management and Protection of Forest Ecosystems | Management and Protection of Forest Ecosystems

### Modulbeschreibung

## WZ4161: Forest Management | Forest Management

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

### Beschreibung der Studien-/ Prüfungsleistungen:

The module integrates different scientific and management methods with the objective to develop concepts for the sustainable management of forest. Forest managers must understand complex content and be able to explain it to a critical audience. The learning outcome will be assessed by an oral exam covering the whole outcomes of the module.

### Wiederholungsmöglichkeit:

Folgesemester

### (Empfohlene) Voraussetzungen:

None

### Inhalt:

1. Definition of forest and forest ecosystem;
2. Overview of forestry on global, regional and local scales;
3. Introduction into objectives and methods of forest ecosystem management and forest management planning;
4. Demonstration of forest decision support systems and multiple-objective optimization;

5. Overview of silvicultural techniques;
6. Basic Knowledge of Forest economics;
7. Demonstration of examples in lowland and mountain forest management.

**Lernergebnisse:**

At the end of the module the students are able to:

- understand different concepts of Forest Management;
- understand different demands in forest management;
- apply means of linear programming to harmonize different measures;
- apply decision support systems;
- evaluate different forest management measures.

**Lehr- und Lernmethoden:**

The module is separated into lectures and exercises. Lectures providing the theoretical foundations and concepts in Forest Management. Exercises are done in supervised groups in the field.

**Medienform:**

PowerPoint presentation, additional reading material, software application

**Literatur:**

FAO (2009): State of the World's Forests; FAO (2006): Global Forest Resources Assessment 2005.

**Modulverantwortliche(r):**

Dr. Bernhard Felbermeier, felbermeier@lrz.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Forest Ecosystem Management (Vorlesung, 2 SWS)  
Annighöfer P, Aramayo Schenk V, Felbermeier B

Forest Management Planning (Übung, 3,5 SWS)

Knoke T, Döllerer M, Gosling E, Kienlein S

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2716: Forest Growth and Forest Operations | Forest Growth and Forest Operations

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The learning success of the module Forest Growth and Forest Operations will be assessed by a written examination of 90 minutes. This is due to the fact that biometric topics, growth processes and analyses as well as the forest growth modelling part of the lecture can be presented best in a written form by drawings, figures, calculation schemes, etc. For example the description of biological processes and growth cycles in forest growth simulators can best be explained and depicted by graphical representations.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in biology and forest science.

#### Inhalt:

The part Forest Growth deals with objectives and methods of forest growth and yield science. First, as fundamental topic, principal factors of the organic production of forest stands based on the driving forces (climate, water, nutrients) are shown and explained. In a next step growth and yield is analyzed more closely as part of the total production of plant communities. This leads to principles of tree shape development, tree growth and carbon dynamics in general. From individual tree growth the course proceeds to structure and development of whole forest stands. Both previous subjects provide the basic knowledge for understanding the effect of silvicultural treatment on quantitatively measured growth and yield characteristics. Growth trends, productivity

and carbon dynamics of the main tree species in Central Europe are presented. Analyses of stand structure, growth and yield in the view of climate change are discussed. Different types of forest growth models on tree, stand and forest enterprise levels are introduced. The part Forest Operations can be divided in 5 topics: (1) Overview of mechanized harvesting (methods and most common systems), (2) Environmentally sound resource road planning and construction, (3) Assessing the environmental impacts of forest operations on forest stands and soils, (4) Means of eco-efficient wood transportation from the forest to the mill and (5) Current developments in small-scale forest operations.

### **Lernergebnisse:**

On successful completion of the module, students are able to

- Understand the environmental factors influencing the forest stand production
- Describe the effects of silvicultural treatment on quantitatively measured growth and yield characteristics
- Understand the principles of growth models
- Analyze and evaluate the impact of environmental changes on tree and stand growth
- Create possible silvicultural measures to mitigate negative effects of environmental changes on forest stand growth
- Understand and evaluate the impact of biotic and abiotic factors on growth, vitality and stability of individual trees and forest stands
- Understand the fundamentals of sound resource road planning and construction
- Describe the links between mechanized harvesting and potential stand and soil damages
- Evaluate the productivity and carbon footprint of different harvesting systems.

### **Lehr- und Lernmethoden:**

Lectures and presentations, field trip (optional).

### **Medienform:**

Lectures and presentations (pdfs).

### **Literatur:**

FOREST GROWTH: Pretzsch, H., (2009): Forest Dynamics, Growth and Yield. Springer Verlag, Berlin, 664 S. 2009 published as Hardcover (ISBN 978-3-540-88306-7) 2010 published as paperback (ISBN 978-3-642-14861-3)

FOREST OPERATIONS: Bowers, S. 2012. Designing woodland roads. Oregon State University. EC 1137. 21 pp. Dykstra, D. P. and Heinrich, R. 1996. FAO Model code of forest harvesting practice. 85 pp. Enters, D., Applegate, G.B., Kho, P. C.S., and Man, G. (Eds.) 2002. Applying reduced impact logging to advance sustainable forest management. FAO. Heinrich, R. Recent developments on environmentally friendly forest road construction and wood transportation in mountainous forests. Rummer, B. 2009. New technology in forest operations. [www.forestlandowners.com](http://www.forestlandowners.com). 3 pp. Sutherland, B.J. 2003. Preventing soil compaction and rutting in the boreal forest of western Canada. FERIC. 53 pp.

**Modulverantwortliche(r):**

Rötzer, Thomas; Apl. Prof. Dr. agr. habil.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Low Impact Forest Operations Technology (Exkursion, ,5 SWS)

Bauer E, Engler B

Low Impact Forest Operations (Vorlesung, 1,5 SWS)

Bauer E, Engler B

Forest Growth (Vorlesung, 2 SWS)

Pretzsch H, Rötzer T, Torano Caicoya A

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2717: Genetic Resources Management and Forest Protection | Genetic Resources Management and Forest Protection

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2020

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The learning outcome will be assessed by a written exam (duration 60 min) where the student have to analyze the risk of given pest and abiotic hazard-scenarios and to develop adequate management strategies. Furthermore they have to analyze a case study and interpret the genetic diversity situation presented there, including discussion of possible management strategies and problems. In this way, the students can demonstrate that they have obtained the ability to use their knowledge in real world management situations.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in biology and forest science

#### Inhalt:

Part I: Genetic Resource Management

1. introduction: DNA, genetic code, genes, alleles, genomes
2. speciation, hybridization, phylogenies
3. basics of population genetics
4. genetic variation in forest ecosystems
5. tree breeding, gene conservation & sampling strategies, certification of gene resources
6. genetics of plants and animals in the mountains
7. genetics of plants and animals in the Tropics



## 8. sustainable management strategies

Part II: Forest Protection- pathogens, insect pests, climatic and abiotic factors.

### a) fungal pathogens in forest ecosystems

1. fungal pathogens-woody plant interactions worldwide (incl. Phytophthora pathogens)
2. techniques to identify fungal pathogens in forest ecosystems
3. techniques to inhibit pathogen spread
4. management strategies for nurseries and forest ecosystems

### b) insect pests in forest ecosystems

1. insect morphology, anatomy and development
2. insect biology
3. herbivorous insects on trees
4. economically important herbivorous insects
5. pest control (monitoring and forecast)
7. insect pest management

### c) Abiotic hazards

This part addresses risks of non-biotic damages (wind, water in different aggregation states, fire, pollutants, extreme climate conditions) and its interactions with pests and diseases as well as preventive management activities.

### **Lernergebnisse:**

On successful completion of the module, students are able to

- assess genetic diversity patterns in natural populations of different groups of organisms (mammals, birds, plants)
- understand the importance of maximizing genetic diversity
- understand the impact of biotic and abiotic factors on vitality and stability of individual trees and forests;
- assess the impact of fungal pathogens and insects on tree health;
- apply their ecological knowledge to minimize and forecast the risk of damages by fungal pathogens and insect pests;
- characterize the impact of forest management on insect populations and crop loss.

### **Lehr- und Lernmethoden:**

lectures and presentations, field trip (optional)

### **Medienform:**

lectures and presentations (pdfs)

### **Literatur:**

Agrios, G.N. 2005, Plant Pathology, 5th edition. Elsevier Academic Press, Oxford \* Speight, M.R. & Wylie, F.R., 2001: Insect pests in tropical forestry. CABI publishing. \* Ruppert, E.E. & Barnes, R.D., 1993: Invertebrate Zoology 6th edition (Chapter 16 insects; p 825-862)

**Modulverantwortliche(r):**

Prof. Dr. Hanno Schäfer – Plant Biodiversity Research, Emil-Ramann-Str. 2, 85354 Freising, 08161/71-5884, [hanno.schaefer@tum.de](mailto:hanno.schaefer@tum.de)

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Biotic and Abiotic Forest Protection (Vorlesung, 2 SWS)  
Gruppe A, Seidl R

Genetic Resource Management (Vorlesung, 2 SWS)

Schäfer H

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ4082: Plantation Forestry and Agroforestry | Plantation Forestry and Agroforestry

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The learning outcomes are assessed by an oral examination. Based on specific problem statements the students have to demonstrate their ability to analyze and assess the situation, to understand the origin of the problem and to propose solutions adapted from the methodologies and techniques procured in the course.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

none

#### Inhalt:

Plantation forestry: Background, Definitions, Plantations in the Context of International Forest Policy, Plantation Forestry Purposes, Plantation Silviculture, Management and Economics;  
 Agroforestry (AF): Introduction (global land-use problems, definitions, terminology), Traditional AF Systems, Environmental, economic and socio-cultural aspects of AF, Interactions in AF systems, Important tree groups in AF (NFT's, MPT's, Palms), Planning in AF, Legal aspects  
 Forest Management for Carbon Sequestration: Role of forests in the global carbon cycle, Possible impacts of climate change on forests, International climate policy, Forest in the Kyoto Protocol (KP), Flexible mechanisms of the KP, REDD and REDD+, Forest management options, Modelling forest sequestration with CO2FIX, Case studies.

### **Lernergebnisse:**

Students will be able to

- understand and evaluate the major issues of plantations in the context of international forest policy,
- explain the fundamental purposes of Plantation Forestry,
- properly deploy the essential techniques of Plantation Silviculture, e.g. for establishment, tending and maintenance
- critically examine plantation projects (management, work volume, economic results).
- understand the fundamental principles and practices of agroforestry land use,
- analyze the interactions among different components of an AF system,
- assess the ecological and economic effects of AF-systems and develop adequate management options,
- address problems in the context of rural development and identify AF-based solutions
- understand the role of forests and forest management activities in the global C-cycle,
- assess forest management options for different purposes within the framework of the international climate policy,
- identify and develop concepts for mitigation projects.

### **Lehr- und Lernmethoden:**

Knowledge and skills are imparted by lectures, group discussions, presentation of case studies and small exercises; the learning methods are learning, reviewing scientific articles, and research reference articles. The lectures will provide theories and basic reference materials which will be deepened and proved by reviewing articles. The achieved skills will be used to develop and discuss solutions for specified problems.

### **Medienform:**

The module includes lectures - providing the theoretical foundations, discussions and small exercises.

### **Literatur:**

ABARE - JaakoPöyry (1999): Global Outlook for Plantations. Australian Bureau of Agricultural and Resource Economics (ABARE) Research Report 99.9, [www.abare.gov.au](http://www.abare.gov.au). Evans, J., Turnbull, J. W. (2004): Plantation forestry in the tropics. FAO, (1998): FRA 2000 - Terms and definitions. Forest Resources Assessment Programme, Working Paper 1. FAO (2001): Global Forest Resources Assessment 2000. FAO Forestry Paper 140. Pandey, D. and Ball, J. (1998): The role of industrial plantations in future global fibre supplies. *Unasylva* 193, Vol. 49, 37 - 43. Sawyer, J., (1993): Plantations in the Tropics. Smith, D.M., Larson, B.C., Kelty, M.J. and Ashton, P.M.S. (1997): The Practice of Silviculture: Applied Forest Ecology. Smith, J. (2002): Afforestation and reforestation in the clean development mechanism of the Kyoto protocol: implications for forests and forest people. *Int. J. Global Environmental Issues* 2 (3/4): 322-343. Shepherd, K.R. (1986): Plantation Silviculture. West, P. W. (2006): Growing Plantation Forests. Ashton, M.S. and Montagnini, F. (2000): The silvicultural Basis for Agroforestry Systems. *Agroforestry: Principles and Practice: Special issue of Forest Ecology and Management*, 45 (1991). Nair, P.K.R. (2012): Agroforestry, the future of global land use. Atangana et al. (2014): Tropical Agroforestry. Springer Verlag

**Modulverantwortliche(r):**

Dr. Bernhard Felbermeier; felbermeier@lrz.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Agroforestry and Forest Management for Carbon Sequestration (Vorlesung, 2 SWS)

Felbermeier B

Plantation Forestry (Vorlesung, 2 SWS)

Stimm B

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Wildlife and Protected Area Management | Wildlife and Protected Area Management

### Modulbeschreibung

#### WZ4197: Protected Areas Biodiversity and Management | Protected Areas Biodiversity and Management

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2020

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Final oral examination of 20 minutes in the field of protected areas biodiversity and its management to examine whether the students have understood the problematic of securing biodiversity in protected areas and are able to verify conservation measurements.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Successful completion of the 1st semester of the Master Program Sustainable Resource Management is recommended

#### Inhalt:

Biodiversity and protected areas: A worldwide survey on ecozones and altitudinal belts of the world as carriers of natural biodiversity; protection of biological units; IUCN protected areas classification, the European FFH Directive as an example of a continent-wide tool for nature protection.

Habitat analysis and management: Habitat types, tools for protecting habitats, design of management plans, visitor management, best practice examples in sustainable biodiversity and habitat protection.

**Lernergebnisse:**

On successful completion of the module students are able to:

- to put ecosystems and its utilisation options as well as its threats into a global perspective
- give clear options for further management, both regarding utilisation and protection

**Lehr- und Lernmethoden:**

Lecture, case studies, practical experiments / demonstrations, discussions.

**Medienform:**

PowerPoint Presentation.

**Literatur:**

Jürgen Schultz (2005): The Ecozones of the World: Ecological Divisions of the Geosphere. Springer, Berlin. 459p.

**Modulverantwortliche(r):**

Prof. Dr. Ralph Kühn; kuehn@wzw.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Biodiversity in Protected Areas (Vorlesung, 2 SWS)

Kühn R [L], Gula R, Rödl T

Protected Area Management (Vorlesung, 2 SWS)

Kühn R [L], Gula R, Rödl T

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ4198: Wildlife Management and Wildlife-Human Interactions | Wildlife Management and Wildlife-Human Interactions

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Written assignment (ca. 15 pages) requiring review of literature, synthesis and integration of key concepts and findings from the literature to develop a coherent research proposal that clearly demonstrates knowledge in the field of species management and conservation strategies and of human dimensions as a research and applied field of study. Expected to read in advance where possible assigned readings so to be prepared for course lectures.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

None

#### Inhalt:

This lecture combines contents of Wildlife Management and Wildlife Human Interactions. The key aspects are: 1) Principles of Wildlife Management & Wildlife Science, 2) Planning tools, 3) Case study: Strategic planning, 4) Conflicting views in WMT with case studies, 5) Basic Concepts in Ecology, 6) Reintroductions studies, 7) Global threats to Conservation, 8) Nature of human dimensions (HD) from a research perspective through various examples 9) Nature of various wildlife-human interactions from different perspectives, 10) Nature of public involvement and HD as an applied approach 11) Types of conflict, levels of planning and how to work with people toward solutions, 12) Understanding decision-making processes.



**Lernergebnisse:**

After the course students are able to: understand important ecological concepts in wildlife management; understand the importance of the human dimension in wildlife management; analyze a conservation strategy for a species; apply wildlife management plans; evaluate species and protected area management plans; understand the importance and nature of objectivity in conducting research and being a human dimension researcher; develop the ability to synthesize relevant literature pertinent to a research problem; organize ideas effectively and communicate these in a well-organized and developed written proposal.

**Lehr- und Lernmethoden:**

Lecture, video, group exercises, discussions

**Medienform:**

lecture notes, flip-chart/board, hand-outs, additional reading material

**Literatur:**

Sinclair et al. 2006, Wildlife Ecology, Conservation, and Management, ISBN 1-4051-0737-5 ;  
Krausman 2002, Wildlife Management, ISBN 0-1328-0850-1; Pullin 2002, Conservation Biology, ISBN 0-521-64482-8

**Modulverantwortliche(r):**

Kühn, Ralph; Apl. Prof. Dr. agr. habil.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Wildlife-Human Interactions (Seminar, 2 SWS)

Kühn R [L], Bath A

Wildlife Management (Vorlesung, 2 SWS)

Kühn R [L], Rödl T

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ4189: Fisheries and Aquatic Conservation | Fisheries and Aquatic Conservation

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2018/19

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Current information regarding the limited activities with physical presence due to the CoViD19-pandemic:

In case the framework requirements (hygiene, distance rules etc.) for examinations with physical presence are not met, the planned examination format can be changed to a digital (remote) examination according to §13a APSO. The decision on this change will be communicated as soon as possible, however latest 14 days before the actual examination date, by the responsible examiner in coordination with the examinations board.

The examination consists of a 60 min. written exam (Klausur). The examination means to measure the student's ability to assess anthropogenic influence on aquatic ecosystem functioning, evaluate the socioeconomic importance of fisheries and aquaculture, explain factors affecting susceptibility to and recovery from overexploitation and recall fisheries management tools for wild populations as well as of the underlying biological principles such as fish population dynamics. In the written examination students demonstrate by answering questions under time pressure and without helping material their theoretical and practical (e.g. application of methods) knowledge about fisheries management. For answering the questions, the students require their own wording. The regular examination consists of a 60 min. written exam (Klausur). The examination means to measure the student's ability to assess anthropogenic influence on aquatic ecosystem functioning, evaluate the socioeconomic importance of fisheries and aquaculture, explain factors affecting susceptibility to and recovery from overexploitation, create and apply sustainable aquatic conservation tools and recall fisheries management tools for wild populations as well as of the underlying biological principles such as fish population dynamics. In the written

examination students demonstrate by answering questions under time pressure and without helping material their theoretical and practical (e.g. application of methods) knowledge about fisheries management. For answering the questions, the students require their own wording. In the practical exercise the students prepare a brochure or poster to practice the knowledge transfer to specific target audiences in the context of fisheries and aquatic conservation.

### **Wiederholungsmöglichkeit:**

### **(Empfohlene) Voraussetzungen:**

Interest in aquatic biology, social sciences, conservation biology and management; this course can be selected

independently from other courses in the fields of Fish Biology and Limnology at TUM

### **Inhalt:**

The module combines the theoretical background and the practical implementation of fisheries management and aquatic conservation. The key aspects are:

1. Introduction to fish, shellfish and fisheries management,
2. The socioeconomic importance of fisheries and aquaculture,
3. The functioning of aquatic ecosystems and the impacts of fisheries on aquatic ecosystem health,
4. Factors affecting susceptibility to and recovery from overexploitation,
5. Fisheries Management Tools for wild populations,
6. Aquaculture,
7. Aquatic Biodiversity Conservation,
8. Case study and knowledge transfer/communication exercise

### **Lernergebnisse:**

At the end of the module students understand the importance of aquatic resources for mankind and the variables which influence ecosystem functions as well as the principles of aquatic biodiversity conservation. They are able to analyze the effects of natural and man-made disturbances in aquatic ecosystems (e.g. overexploitation) based upon an interdisciplinary understanding of methodological aquatic and fisheries biology, human dimensions, socioeconomic factors and management skills. In addition, students are able to objectively integrate knowledge from different disciplines (e.g. fish biology, conservation biology, commercial fishing techniques, aquatic habitat assessment and management) to evaluate sustainable resource management.

### **Lehr- und Lernmethoden:**

The module combines a lecture "Fisheries Management" with an accompanying practical exercise "Applied Aquatic Conservation". The lecture contents will be presented using lectures based on power-point presentation, group work and interactive role plays in order to combine activating teaching methods with classic presentation techniques. In the accompanying practical exercise to the lecture the students will apply the gained theoretical knowledge by conducting case studies

or participating research experiments with various content in the field of freshwater ecology and aquatic conservation. The content of the practical work is incorporated into running research projects at the chair (e.g. habitat restoration, artificial breeding programmes, habitat assessment, conservation genetics). Additionally, the students learn to independently screen the respective literature in this field and learn methods in science communication.

**Medienform:**

Form of presentation: lecture, case study, movie segment and practical exercise  
material: lecture notes, flip-chart/board, plus different materials for methodological/technical training

**Literatur:**

1. King (2007) Fisheries Biology, Assessment and Management
2. Helfman (2007) Fish Conservation: A guide to understanding and restoring global aquatic biodiversity and fishery resources
3. Moyle & Cech (2004) Fishes An introduction to Ichthyology
4. Primack (2008) A primer of conservation biology

**Modulverantwortliche(r):**

Prof. Dr. Jürgen Geist, [geist@wzw.tum.de](mailto:geist@wzw.tum.de)

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Fisheries Management (Vorlesung, 2 SWS)  
Geist J

Applied Aquatic Conservation (Übung, 2 SWS)

Geist J [L], Bayerl H, Geist J, Pander J, Stoeckle B

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ6432: Wildlife and Conservation Biology | Wildlife and Conservation Biology

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2020

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 75	<b>Präsenzstunden:</b> 75

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The examination consists of an oral examination (30 min). The examination means to measure the student's ability to assess anthropogenic influence on Biodiversity, to explain factors affecting Wildlife, to recall methods in Conservation Biology and applied Genetics and to evaluate Conservation Biology concepts. In the written examination students demonstrate by answering questions under time pressure and without helping material their theoretical and practical knowledge about Wildlife and Conservation Biology. For answering the questions, the students require their own wording. In the practical exercise the students present a case study and design a own research project proposal to practice their scientific communication skills and to transfer the theoretical knowledge to practical projects.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Interest in Wildlife Conservation Biology and Nature Conservation. Basic background in Biology

#### Inhalt:

The module combines the theoretical background and the practical implementation of Wildlife Conservation Biology, Conservation Genetics and Nature Conservation. The key aspects are:

1. Scope and tasks of Conservation Biology and applied Genetics
2. Biodiversity, Ecosystems, Ecosystem Services and Green Banking
3. Factors affecting terrestrial and aquatic Biodiversity

4. Methods in Wildlife Conservation Biology and applied Genetics
5. Conservation Biology concepts and strategies for natural population using international examples
6. Case studies and applied Nature Conservation, from theory to praxis

### **Lernergebnisse:**

At the end of the module students understand the importance of Biodiversity of terrestrial resources and its interaction with human dimensions. They are able to apply and to evaluate Conservation Biology methods and strategies based upon an interdisciplinary understanding of species biology, conservation biology and applied genetics. In addition, students are able to integrate interdisciplinary knowledge into applied conservation management on a regional and international scale. They have an overview of applied interdisciplinary Nature Conservation management and are able to evaluate sustainable resource management strategies.

### **Lehr- und Lernmethoden:**

The module combines the lecture "Wildlife and Conservation Biology" with an accompanying practical exercise " Case Studies in Nature Conservation". The lecture contents will be presented using lectures based on power-point presentation and group work in order to combine activating teaching methods with classic presentation techniques. In the accompanying practical exercise, the students will apply the gained theoretical knowledge by conducting case studies (research programs), and presenting own concepts of research project in various content in the field of Wildlife Conservation Biology and Nature Conservation. Here the students learn to independently screen the respective literature in this field and learn methods in science communication.

### **Medienform:**

Form of presentation: lecture, case study, movie segment and practical exercise  
material: lecture notes, flip-chart/board, plus different materials for methodological/technical training

### **Literatur:**

1. Primack (2014) Essentials of Conservation Biology
2. Frankham (2010) Introduction to Conservation Genetics
3. Sutherland (2009) Conservation Science and Action

### **Modulverantwortliche(r):**

Prof. Dr. Ralph Kühn – Lehrstuhl für Zoologie Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising;  
08161/71-4608; kuehn@wzw.tum.de

### **Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Conservation Biology and Applied Genetics (Vorlesung, 2 SWS)  
Kühn R

Case Studies in Nature Conservation (Übung, 3 SWS)

Kühn R, Bässler C, Stoeckle B

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Landscape Management | Landscape Management

### Modulbeschreibung

## WZ4201: Vegetation Ecology and Geographical Information Systems | Vegetation Ecology and Geographical Information Systems

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

### Beschreibung der Studien-/ Prüfungsleistungen:

A written exam of 90 minutes assesses whether the students understand the basic concepts of spatial data analysis as well as vegetation ecology with respect to manage landscapes, the students' ability to apply these techniques to certain problems in landscape management as well as the students' ability to precisely describe solutions to achieve certain results within a limited amount of time.

A Mid-Term assignment (presentation) assesses the students' ability to communicate management plans based on vegetation and habitat data. It will serve for grade improvement by 0,3 according to §6 (5) APSO.

### Wiederholungsmöglichkeit:

Folgesemester

### (Empfohlene) Voraussetzungen:

Basic knowledge in GIS, remote sensing, for example learned by attending the module "Inventory Methods and GIS". Basic knowledge of plant species.

### Inhalt:

1. Advanced analysis and visualization of spatial data;
2. GIS based raster analysis;
3. GIS and satellite navigation;



3. Application of GIS in selected projects;
4. Introduction to the vegetation ecology, theory of plant distribution and of plantcommunities;
5. Methods of habitat mapping;
6. Habitat mapping in the field;
7. Field data analysis;
8. Management measures for management plans.

**Lernergebnisse:**

At the end of the module students are able to:

- manage, analyze and visualize spatial data to solve problems related to landscape management;
- break down general problems in landscape management to tasks which can be solved by using a GIS;
- develop and communicate management plans based on vegetation and habitat data;
- ascertain and classify habitats.

**Lehr- und Lernmethoden:**

Theoretical explanation of certain topics followed by practical exercises using GIS software supported by screen animations.

Transfer of theoretical knowledge in lectures (vegetation ecology, habitat mapping), practical field work and presentation of proposals for landscape management measures.

**Medienform:**

GIS Software, PowerPoint Presentation

**Literatur:**

To be announced

**Modulverantwortliche(r):**

Dr. Martin Döllerer – Professur für Waldinventur und nachhaltige Nutzung Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/71-4656, doellerer@tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

GIS (Landscape Management) (Übung, 2 SWS)

Döllerer M

Vegetation Ecology (Vorlesung, 2 SWS)

Teixeira Pinto L

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2719: Landscape Planning | Landscape Planning

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2016

<b>Modulniveau:</b>	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The attainment of learning outcomes for the module will be assessed in a piece of research paper in which students work independently on complex issues of contemporary landscape planning demonstrating their breadth of understanding in drawing out implications of their findings and putting them into a broader context. The written assignment is complemented by a presentation and/or a colloquium for the purpose of assessing the capacity of the students to communicate their findings orally to an audience. Depending on the number of participants, research paper and accompanying talk may be prepared either individually or in groups.

#### Wiederholungsmöglichkeit:

#### (Empfohlene) Voraussetzungen:

Basis understanding of environmental systems. Course 2: Class discussion is a core element of the seminar. Therefore, students are expected to take part and contribute to the discussions.

#### Inhalt:

Concerned with the stewardship and enhancement of environmental systems, Landscape Planning is the key planning instrument for nature conservation and landscape management in Germany. The module introduces Landscape Planning and reflects on its potential contribution to sustainable land use with a focus on non-urban areas.

Course 1: Lectures will address the guiding principles, formal instruments and procedural elements of Landscape Planning; present methodological approaches for the assessment of natural assets and landscape functions including methods and tools for data collection, analysis and evaluation;

illustrate target formulation and implementation strategies with examples from the planning practice.

Course 2: The seminar gives students the opportunity to deepen their knowledge by reflecting on readings and planning documents as well as by discussing in class such topics as: contemporary and emerging scientific theories and methodological approaches relevant for environmental planning; rationale of stakeholder involvement; context-dependency of spatial planning; comparison of current jurisdictional and institutional arrangements on landscape-related planning in the home countries of the students and their implications.

**Lernergebnisse:**

Upon completion of the module, students are able to:

- recognize the purpose and objectives of Landscape Planning;
- explain instruments and procedural elements of contemporary Landscape Planning;
- select appropriate methods and tools to assess natural assets and landscape functions;
- be aware of the role of Landscape Planning in the decision-making upon the use of land;
- retrieve and interpret information from different sources;
- communicate key concepts relevant for environmental planning (both written and oral).

**Lehr- und Lernmethoden:**

Lectures provide subject specific knowledge; class discussions of selected readings engage students in critical thinking; in group work activities students experience the application of selected methods and tools.

**Medienform:**

Lectures, presentations, class discussions, small group exercises, assigned readings.

**Literatur:**

Haaren, Chr. v., Galler, C. & S. Ott (2008): Landscape planning. The basis of sustainable landscape development. Ed. by Federal Agency for Nature. Additional material will be provided.

**Modulverantwortliche(r):**

Dr. Isabel Augenstein – Lehrstuhl für Strategie und Management der Landschaftsentwicklung Emil-Ramann-Str. 6, 85354 Freising; 08161/71- 4783; isabel.augenstein@lrz.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Landscape Planning - lecture (Vorlesung, 2 SWS)  
Augenstein I

Landscape Planning - seminar (Seminar, 2 SWS)  
Augenstein I

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2737: Remote Sensing and Image Processing | Remote Sensing and Image Processing

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 80	<b>Präsenzstunden:</b> 70

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Achievements will be assessed by exercises, a presentation and a final report. On behalf of home exercises the students get a first insight into concepts of image analysis. "Hands on" exercises with state of the art software packages are employed to train the main image processing steps and to assess the understanding of the students in implementing the basic concepts of remote sensing from data take to data analysis. Regular discussions with the tutor measure the student's ability to develop an idea from initial concepts to the complete picture within a given timeframe, delivering interim results at relevant milestones (35%). On behalf of a presentation of a topic related to remote sensing the student's ability to understand a technical/scientific subject, to analyze and evaluate facts and factors of influence, to summarize the subject and present it to an audience, and to conduct a discussion about the presented subject is assessed. With the final report the students demonstrate that they have gained deeper knowledge of the specific image analysis software packages and its components, of differing analysis concepts and that they are prepared to evaluate an existing situation as imaged by the respective remote sensing data set. They demonstrate further that they are able to create new geodata layers appropriated to be analyzed in an integrating GIS environment (65%). The grade weights of module examination components correspond to the weighting factors given in brackets.

#### Wiederholungsmöglichkeit:

Folgesemester

**(Empfohlene) Voraussetzungen:**

Module "Inventory Methods and GIS" of the 1st semester of the Master Program "Sustainable Resource Management" passed, computer skills at least at working level .

**Inhalt:**

The implementation of data interpretation and information extraction concepts and techniques is trained "hands on" with the help of advanced image processing and analysis programs. Topics: 1. Introduction to image processing concepts; 2. Implications of air- and space borne data takes; 3. Data types: Digital aerial photographs, high to very high resolution multispectral and hyperspectral scanner data, LIDAR data; 4. Development of interpretation keys; 5. Exercises on data pre-processing; 6. Unsupervised and supervised classification concepts, pixel-based, object based classification strategies; 7. Exercises on land use/land cover classification; 8. Basic verification concepts; 9. Exercises on the extraction of bio-geo-chemo-physical parameter from RS data; 10. Change detection concepts; 11. Interrelation of Remote Sensing with GIS; 12. Access and data download from geodata provider.

**Lernergebnisse:**

At the end of the Remote Sensing and Image Processing module (RSIP) the students are able to:

- decide which data set is most appropriated to solve his thematic task, - access data bases, download and open a data set for image processing, - geocode/georeference digital data sets,
- develop appropriated interpretation keys fitting the data set and the targeted thematic goal,- visualize and enhance the data set for interpretation, - extract spectral signatures, - calculate indices on behalf of the data,
- learn how to extract bio-geo-chemo-physical parameter from the data set, - perform unsupervised and supervised classifications, - proof the quality of the results by an accuracy assessment, - perform a change detection study, - export the results as GIS layer.

**Lehr- und Lernmethoden:**

By using advanced image processing software packages the theoretical explained concepts are exercised "hands on" and discussed on basis of different data types applying the "just in time teaching (JiTT)" technique; the practical courses are prepared by homework (presentation of specific related topics, exercises); the short presentations will be given during the courses, contents, layout and style discussed and narrated; the home exercises explained in close relation to the computer exercises just done. The definition of the problem to be solved by image analysis techniques and the development of appropriated solutions needs research of reference materials. The final outcome of the courses, the classification result, will be used as basis for the Module "Application Study" of the concentration field "Landscape Management".

**Medienform:**

Image processing software and tutorials, prepared exercises, different data types

**Literatur:**

The literature recommended within the Modules "Inventory Methods and GIS", "Remote Sensing and Image Processing", [www.wiau.man.ac.uk/courses/cvmsc/Terminol.htm#SplitMerge](http://www.wiau.man.ac.uk/courses/cvmsc/Terminol.htm#SplitMerge);

[www.pfc.cfs.nrcan.gc.ca/landscape/inventory/wulder/large\\_area\\_rs/index.html](http://www.pfc.cfs.nrcan.gc.ca/landscape/inventory/wulder/large_area_rs/index.html); <http://www.pfc.cfs.nrcan.gc.ca/landscape/inventory/wulder/hirespres.html>; Uni Zürich, RSL: <http://www.geo.unizh.ch/rsl2/>; EARSeL: <http://www-earsel.cma.fr/>; <http://www.ccrs.nrcan.gc.ca/ccrs/eduref/tutorial/indexe.html>; <http://observe.ivv.nasa.gov/nasa/education/reference/main.html>; <http://rst.gsfc.nasa.gov/starthere.html>

**Modulverantwortliche(r):**

Dr. Thomas Schneider – Fachgebiet für Waldinventur und nachhaltige Nutzung  
[tomi.schneider@tum.de](mailto:tomi.schneider@tum.de)

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Remote Sensing and Image Processing (Vorlesung, 6 SWS)

Schneider T

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](http://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ4094: Landscape Management - Application Study | Landscape Management - Application Study

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 95	<b>Präsenzstunden:</b> 75

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The assessment is based on: 1. the participation intensity on discussions and the quality of the contributions during the courses; 2. the demonstrated skills in creating new data layers by combining existing data from official sources (administrations, organizations, etc.) using GIS techniques, in exploring new data and information layers (RS, vegetation ecology), etc. 3. the contribution in developing the project (planning competences); 4. the presentation style, contents and layout; 5. the team work; 6. the project report.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

The successful completion of the modules "Inventory Methods and GIS", "Remote Sensing and Image Processing", "Geographical Information Systems and Vegetation Ecology" and "Landscape Planning" or equivalent skills are required, courses on scientific writing and reporting recommended.

#### Inhalt:

1. Implementation of GIS and RS techniques.
2. Implementation of theoretical concepts of Vegetation Ecology;
3. Implementation of theoretical concepts of Landscape Planning;
4. Oral presentation of findings;
5. Elaboration of a final report.

### **Lernergebnisse:**

At the end of the module the students are able to develop or at least to contribute to a landscape management project. More in detail the students are able to:

- work in a team;
- apply the theoretical and practical skills in vegetation ecology, landscape planning, remote sensing and GIS techniques;
- contribute to context-dependant landscape-related planning;
- deliver an oral presentation to communicate their findings;
- prepare a convincing project report using supporting data to back their statements in accordance with guidelines for scientific writing.

### **Lehr- und Lernmethoden:**

Prime characteristic of the Application Study is the self-organized group work by the students to reach the defined objective of the project assignment. Progress of the team is supported by group discussions, theory input and coaching provided by lecturers on demand.

### **Medienform:**

Scripts and reports of the above listed lectures and exercises offered within the elective field; basic data sets to develop the application study (GIS, RS, etc.); additional information on request and up on necessity (project driven).

### **Literatur:**

The literature recommended within the Modules "Inventory Methods and GIS", "Remote Sensing and Image Processing", "Geographical Information Systems and Vegetation Ecology", "Landscape Planning and Applied Development Cooperation" should be used.

### **Modulverantwortliche(r):**

Dr. Thomas Schneider – Professur für Waldinventur und nachhaltige Nutzung Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/ 71-4666; tomi.schneider@tum.de

### **Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Landscape Management - Application Study (Vorlesung mit integrierten Übungen, 5 SWS)

Augenstein I, Döllerer M, Schneider T

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).



## Renewable Resources | Renewable Resources

### Modulbeschreibung

## WZ2720: Renewable Energy Technologies | Renewable Energy Technologies

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

### Beschreibung der Studien-/ Prüfungsleistungen:

The examination consists of a written test, where the students have to proof that they understand and remember the basic technical principles related to energy production and the working principles of the presented renewable energy technologies, as well as the related ecological and economical properties and frame conditions. The students have to answer questions, but may also be asked to do calculations, complete figures or prepare sketches.

### Wiederholungsmöglichkeit:

Folgesemester

### (Empfohlene) Voraussetzungen:

General understanding of natural science, mathematics and basics of technology.

### Inhalt:

The course provides an overview of the basics of thermodynamics and the principles of energy conversion. Energy conversion and its importance for the economy is discussed. Because of their transitional character due to the German "Energiewende", the course focusses on the European and German energy systems. The international students in the course are expected to support the lecture with their experiences from abroad.

Basic technical principles of energy production, efficiencies, costs and environmental impacts will be understood. The focus lies on the following areas: solar, wind, water and geothermal energy conversion.

In order to complete the picture, also storage and fossil fuel technologies will be discussed. The students will understand their role and their contribution to balancing energy production and demand.

**Lernergebnisse:**

At the end of the course, the students understand the technical principles of renewable energy conversion systems.

They are able to interpret energy scenarios and solve simple problems associated with a high renewable energy share and its implications on society.

The students can estimate the importance of distinct technologies for a sustainable energy supply.

**Lehr- und Lernmethoden:**

The course provides an overview of the basics of thermodynamics and the principles of energy conversion. Energy conversion and its importance for the economy is discussed. Because of their transitional character due to the German “Energiewende”, the course focusses on the European and German energy systems. The international students in the course are expected to support the lecture with their experiences from abroad.

Basic technical principles of energy production, efficiencies, costs and environmental impacts will be understood. The focus lies on the following areas: solar, wind, water and geothermal energy conversion.

Lecture with integrated exercises and teamwork, as well as discussions to improve understanding.

**Medienform:**

Power point presentation, black board, Videoclips

**Literatur:**

Tba

**Modulverantwortliche(r):**

Dr. Doris Schieder - Lehrstuhl für Chemie Biogener Rohstoffe [doris.schieder@tum.de](mailto:doris.schieder@tum.de)

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Renewable Energy Technologies (Vorlesung, 4 SWS)

Wieland C [L], Schieder D, Vandersickel A, Wieland C

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2721: Bioenergy Systems | Bioenergy Systems

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The learning outcome will be assessed by a written exam. The students show that they have understood the principles of biomass production for bioenergy use, biomass supply chains, and the different bioenergy systems, and are able to carry out related calculations, e.g. for estimation of energy efficiencies. The students have to answer questions, but may also be asked to do calculations, complete figures or prepare sketches.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

General understanding of natural science, mathematics and basics of technology.

#### Inhalt:

Biomass production in agriculture; physiology of biomass crops such as perennials and their production systems ; biomass supply and utilization chains; bioenergy systems: biomass combustion, biofuels for transportation, biogas technology; selected aspects of ecology and economy;

#### Lernergebnisse:

At the end of the module students have acquired knowledge of the production and utilization of renewable resources from the agricultural and forestry sector.

They know how to analyze the performance and ecological impacts of different biomass supply and utilization chains. They can estimate the suitability of various crops for bioenergy use. The

students have an insight in the physical and chemical basics of energy production from biomass and are able to apply related basic equations. They can compare different biomass combustion systems and attribute emissions. The students know the production pathways and properties of different biofuels for transportation and are able to estimate their future potentials. They understand the technological background of biogas production and can do basic designs of biomass supply and utilization chains using the example of biogas systems in agriculture.

**Lehr- und Lernmethoden:**

Lecture with integrated exercises and discussions to improve understanding. Optional: field trip.

**Medienform:**

Power point presentations, black board.

**Literatur:**

Tba.

**Modulverantwortliche(r):**

Höldrich, Alexander; Dr. agr.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Bioenergy Systems

Dr. Alexander Höldrich, Dr. Doris Schieder, Dr. Mathias Effenberger

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ4098: Forestry Raw Materials and their Utilization | Forestry Raw Materials and their Utilization

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The learning success will be assessed by a written examination (duration 60 min) where students are expected to demonstrate the level of knowledge and their ability to use and apply it in solution finding strategies. Additionally a midterm Assignment, the students have to prepare and give a structured oral presentation in a seminar organized at the end of the summer term. The topic of the presentation is defined in agreement with the lecturer. The presentation may be prepared either individually or in groups of two. The midterm presentation Assignment allows to improve the examination mark by 0.3.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basics of biology, chemistry, physics and sciences to deal with the biological production, and the processing and conversion processes of wood to final products, and the environmental assessment.

#### Inhalt:

1. Overview and global potential of forest resources;
2. Availability, characteristics and properties of forest based products (wood and non-timber forest products);
3. Technologies and processes from raw materials to final products: sawn timber, wood-based products, pulp and paper;

4. Criteria and rules of a resource efficient application;
5. Environmental assessment of forestry raw materials and products.

#### **Lernergebnisse:**

Upon successful completion of the module students are able to:

- illustrate the multidisciplinary of forests and their products;
- propose options to maximize the value chains of forest based products;
- exemplify production and process technologies and typical sector industries;
- demonstrate the role, potential and limitations of forestry raw materials in the framework of sustainable development;
- outline economical, environmental and social aspects of typical products and applications;
- develop strategies to strengthen the value and impact of typical forestry raw materials and non-timber forest products.

#### **Lehr- und Lernmethoden:**

Lecture, exercises, seminar, Optional: visits to laboratories and industry.

#### **Medienform:**

Demonstration material: raw materials and products; PP presentations; videos.

#### **Literatur:**

Fengel, D.; Wegener, G. (2003): Wood - Chemistry, Ultrastructure, Reactions. Kessel Publishers  
Dinwoodie, J.M. (2000): Timber: Its nature and behaviour. Van Nostrand Reinhold Publishers  
Forest Products Laboratory (ed) (2010): Wood as an Engineering Material: <http://www.fpl.fs.fed.us-documents-FPLGTR-fplgtr.113-PL113.htm>.  
Rowell R. ed. (2012): Handbook of Wood Chemistry and Wood Composites. Sec. Edition, CRC Press Taylor & Francis Group, 703 pp.  
Shmulsky, R., Jones P.D (2011): Forest Products & Wood Science, 6th ed. Wiley-Blackwell, Chichester UK

#### **Modulverantwortliche(r):**

Prof. Dr. Klaus Richter – Lehrstuhl für Holzwissenschaft Winzererstr. 45, 80797 München, Tel.: 089/ 2180 - 6421, [richter@hfm.tum.de](mailto:richter@hfm.tum.de)

#### **Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Forestry Raw Materials and their Utilization (Vorlesung, 2 SWS)  
Richter K, van de Kuilen J, Sanchez-Ferrer A

Forestry Raw Materials and their Utilization (Übung, 2 SWS)

Richter K, van de Kuilen J, Sanchez-Ferrer A

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](http://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ4202: Political and Social Perspectives of Renewable Resources | Political and Social Perspectives of Renewable Resources

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 105	<b>Präsenzstunden:</b> 45

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Oral presentation of the group project work, review paper for a scientific journal. The learning outcomes are assessed by a group project work concerning a selected topic related to the political and social perspectives of renewable resources. Therefore students have to prepare a scientific paper for an international journal of their choice and give a short oral presentation about the work done for the paper, similar to what would be expected in a 15 minute conference presentation.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Knowledge of sustainable resources (materials and energy). Scientific writing.

#### Inhalt:

In the lectures a number of examples of societal aspects of Sustainable Resource programs will be presented and discussed. Backgrounds are global developments such as urbanization, the rise of countries like China and India, resource availability and technological developments. Case studies deal with tropical forestry and pros and cons of tropical hardwood uses, urban planning, vernacular architecture and the use of renewable resources. We take a tour around the world and look at social housing programs in Europe, Brazil and South-East Asia. Furthermore we look at successes and failures in the German/European energy policies in comparison to the United States.

**Lernergebnisse:**

After this course, students should be able to:

1. Develop SR stimulation programs on country or regional level and priority analysis of renewable resource applications
2. Assess priorities for development and application of renewable resources in countries with different levels of development
3. Critically analyze existing SR programs taking into account social values of stakeholders,
4. Assess impacts of global developments such as urbanization and UN-policies on SR.

**Lehr- und Lernmethoden:**

Discussion and creativity sessions. Project work evolving in a scientific paper for a journal of choice. Oral presentation.

**Medienform:**

Lectures, UN-policy notes, Discussion and Creativity sessions.

**Literatur:**

Tba

**Modulverantwortliche(r):**

Prof. Dr. Jan-Willem G. van der Kuilen - Professur für Holztechnologie Winzererstr. 45, 80797 München; +49 (89) 2180 - 6462; vandekuilen@hfm.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Political and Social Perspectives of Renewable Resources (Vorlesung, 4 SWS)

van de Kuilen J [L], van de Kuilen J, Westermayr M

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).



## Climate, Air and Water | Climate, Air and Water

### Modulbeschreibung

## WZ2731: Hydrometeorology and Management of Water Resources | Hydrometeorology and Management of Water Resources

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2020

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

### Beschreibung der Studien-/ Prüfungsleistungen:

- 1) Hydrometeorology - 30 min mündliche Prüfung
  - 2) Seminar Management of Water Resources - Abgabe einer schriftlichen wissenschaftlichen Ausarbeitung in Form eines Buchkapitels.
- Wichtung der beiden Teilprüfungen im Verhältnis 60 (mündlich) zu 40 (Ausarbeitung).

### Wiederholungsmöglichkeit:

Folgesemester

### (Empfohlene) Voraussetzungen:

Basic knowledge in chemistry and physics.

### Inhalt:

1. Hydrometeorology (including hydrological cycles, precipitation-, run off-, evapotranspiration - process of formation, measurement, global and regional spatial and temporal patterns, influences by land use land cover change, climate change scientific basis, climate change impacts, adaptation, vulnerability in water resources).
2. Problems in water management according to too little water, too much or too dirty. Different aspects of water augmentation (e.g. harvesting, desalination, translocation), water conservation (irrigation, pricing, household, ...), water management processes (e.g. IWRM, virtual water) are discussed by practical examples;

### **Lernergebnisse:**

Upon the successful completion of this module the students are able to understand the basics of hydrology, and the influence of climate change on hydrological processes and management. They are able to analyze and classify various problems in water resource management and to assess the suitability and applicability of different management practices in the field of water augmentation (e.g. rain water harvesting, fog nets, dams) and water saving strategies (e.g. in irrigation, sanitation) to integratively solve water-resource-problems.

### **Lehr- und Lernmethoden:**

The basics of hydrology and meteorology are presented and discussed in a lecture with thorough explanations. Some simple case studies are used to introduce into the theoretical background (e.g. meteorological instruments at the meteorological platform). Student presentations and discussions, group work in the seminar.

### **Medienform:**

PowerPoint presentations; Presentation notes supporting the lecture. Case studies.

### **Literatur:**

Ahrends (2000) Meteorology today, 7th edition. Jones JAA (2010) Water Sustainability - A Global Perspective, Hodder Education London. Clarke R & King J (2004) The atlas of water. Figueres C. et al. (2003) Rethinking water management. Wescoat JL et al. (2003) Water for life, water management and environmental policy. Grambow M (2008) Wassermanagement.

### **Modulverantwortliche(r):**

Prof. Dr. Annette Menzel - Professur für Ökoklimatologie Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/ 71-4740, amenzel@wzw.tum.de

### **Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Management of Water Resources (Vorlesung, 2 SWS)  
Estrella N, Menzel A

Introduction to Hydrometeorology (Vorlesung, 2 SWS)

Menzel A [L], Estrella N

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2722: Mountain Catchments under Changing Climate | Mountain Catchments under Changing Climate

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2020

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 80	<b>Präsenzstunden:</b> 70

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

In a written exam, students demonstrate that they have gained an understanding of hydrological processes and that they are able to apply and run a hydrological model for a mountain catchment. By an 10min oral presentation and a 5min discussion the students' ability to understand selected hydrology-related threats for mountain catchments and to scientifically analyze and evaluate important influencing factors, to present it to an audience, and to conduct a discussion about the presented subject in a clear and concise scientific manner is assessed. The final grade is an averaged grade from the presentation (65%) and the written exam (35%).

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Introduction in Hydrometeorology and management of water resources.

#### Inhalt:

In the Field Course Applied Hydrometeorology of Mountain Catchments we will visit selected research stations, field sites, hydrological infrastructure, restoration sites, and protected areas in the Munich PreAlpine and Alpine area and learn more about hydrology-related threats for mountain catchments ranging from Glacier melt to Munich's drinking water. Sites include e.g. Environmental Research Station Schneefernerhaus, KIT Alpine Campus Garmisch, Waldklimastation Kreuth, Sachenbach catchment, Versuchstation Obernach, Sylvensteinspeicher, Walchenseekraftwerk, Versuchstation Wielenbach, Mangfall / Lech Wassereinzugsgebiet.

The Hydrological Modeling course includes:

- 1) Dominant hydrological processes in mountain catchments: Precipitation types, runoff generation, concentration and flood routing
- 2) Data in mountain catchments: Availability, quality, acquisition and analysis
- 3) Types of hydrological models
- 4) Generation, parameterization and calibration of the process based hydrological model WaSiM
- 5) Model sensitivity analyses with focus on meteorological input and land use scenarios.

**Lernergebnisse:**

After completion of the module, the students understand the main processes in mountain catchments like runoff generation, runoff concentration and flood routing processes. Additionally, they are able to use a physically based hydrological model to simulate the rainfall runoff process in mountain catchments and its influencing parameters caused by the special circumstances of these regions in a widely realistic and transparent way. The students are able to generate event based scenarios as well as land use scenarios and understand recent hydrology-related threats for mountain catchments as well as the influence of climate change on hydrological processes and management in mountain areas. They remember suitable monitoring and risk prevention strategies and are able to analyze, evaluate and communicate (both oral and written) a specific case study or research questions related to the experimental sites visited to a general audience.

**Lehr- und Lernmethoden:**

Teaching methods include lecture as well as practical exercises at PC laboratory in respect to hydrological modelling, a week of field trip to Alpine and pre-alpine areas to the listed sites with guided tours by local scientists, administrators, TUM lectures as well as short presentations by the students.

**Medienform:**

PowerPoint Presentation, Hydrological model (e.g. WaSiM), Field work

**Literatur:**

IPCC (2013) Fifth Assessment Report; Shelton ML (2009): Hydroclimatology - Perspectives and Applications; IPCC (2008) Technical Paper VI on Climate Change and Water

**Modulverantwortliche(r):**

Responsible for Module: Prof. Dr. Annette Menzel - Professur für Ökoklimatologie Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/ 71-4740, menzel@wzw.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Introduction in Hydrological Modelling (Vorlesung, 2 SWS)  
Chiogna G

Field Course in Applied Hydrometeorology (Vorlesung mit integrierten Übungen, 3 SWS)  
Menzel A [L], Lüpke M

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2732: Environmental Monitoring and Data Analysis | Environmental Monitoring and Data Analysis

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 80	<b>Präsenzstunden:</b> 70

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Upon completion of the module, the students have a profound understanding of key aspects of environmental monitoring and are able to choose appropriate as well as to efficiently run environmental measurements, to reproducibly analyze acquired data and to clearly communicate results of environmental measurements.

This ability should be demonstrated by writing a research paper following standards of reproducible research based on different aspects of environmental monitoring and data analysis with R. For the research paper, either available data or data measured during the module should be used and be analyzed in respect to defined hypotheses; developed R code has to be provided too.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in R is recommended.

#### Inhalt:

1 Environmental monitoring including principles, techniques and management issues used in environmental monitoring and assessment; Observing, recording, communicating and archiving collected data and providing it to project stakeholders in order to identify sustainable and responsible environmental practices.

Optional: short course Aerobiology, GAW program, visit of companies

## 2 Environmental data analysis

Introduction to data analysis with R; Principles of reproducible research and implementation with R; Pipelines for environmental data analysis from obtaining data via cleaning and transforming to modelling and visualization with modern R; Coverage of data retrieval from different storage types for climate, proxy, phenology, and other data (text-based, netCDF, data bases); Modeling and visualization as complementary strategies for hypothesis-driven data analysis, based on published research from different fields of environmental sciences.

### **Lernergebnisse:**

After this module, the students can plan, implement and run environmental measurements. They are able to efficiently analyze environmental data sets, including download and import of data sets and visualization and modelling with R.

### **Lehr- und Lernmethoden:**

Course 1 consists of a practical course in the laboratory and in the field where students will work in small teams on applied case studies and exercises related to environmental / meteorological monitoring. Course 2 then offers combined lecture and exercise sessions at the PC lab on how to efficiently analyze those environmental data sets of course 1.

### **Medienform:**

PowerPoint Presentation, Field work, Interactive documents for data analysis

### **Literatur:**

Beginner level tutorials for Swirl (<http://swirlstats.com/>)

### **Modulverantwortliche(r):**

Responsible for Module: Prof. Dr. Annette Menzel - Professur für Ökoklimatologie Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/ 71-4740, [menzel@wzw.tum.de](mailto:menzel@wzw.tum.de)

### **Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Environmental monitoring and data analysis; ecological data analysis (Vorlesung mit integrierten Übungen, 3 SWS)

Menzel A [L], Krause A, Zang C

Environmental monitoring and data analysis; ecological monitoring (Vorlesung mit integrierten Übungen, 2 SWS)

Menzel A [L], Lüpke M

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2730: Climate Change - Science, Impacts and Adaptation, Mitigation | Climate Change - Science, Impacts and Adaptation, Mitigation

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Assessment consisting of oral examination on the lecture and the seminar (30 min). In this oral examination the student is expected to demonstrate that he/she has understood the physical basis of the climate system and that they can identify the drivers of climate change. The student shows that he/she is able to apply his/her knowledge to develop adaptation and mitigation measures and to argue in discussions on climate change issues. A voluntary mid-term assignment (presentation) in the seminar assesses the students' ability to summarize findings from scientific publications / case studies and to present them to an audience. The presentation is complemented by the preparation of a "PICO" that is presented on an interactive screen. The presentation will serve for grade improvement by 0.3 according to §6(5) APSO.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in meteorology, physics, biology.

#### Inhalt:

Based on the newest IPCC report (AR 5) the theoretical background on the physical science basis of climate change, theory and practical application of adaptation and mitigation measures in biological, physical and chemical systems will be presented. In a related seminar, selected topics will be intensified in case studies. TUM as a NGO in the UNFCCC process offers an optional possibility also for students to take part in COP and related negotiations.



**Lernergebnisse:**

After this module, the students can understand the physical basis of the climate system, identify all drivers of climate change and falsify common arguing of "climate sceptics". They can summarize observed changes in the climate system as well as impacts in divers systems and regions. They are able to assess cross-sectorial impacts of climate change in selected areas, to evaluate and develop adaptation and mitigation measures and strategies in biological, physical and chemical systems including an analysis of their effectiveness and cost-effectiveness.

**Lehr- und Lernmethoden:**

Lecture on physical basis of the climate system, impacts of climate change and important mitigation strategies. In the seminar group presentations of various topics regarding adaptation and mitigation of climate change will be presented as case studies. Optional excursion to UNFCCC meeting if applicable.

**Medienform:**

Lecture with PowerPoint Presentation, reader and exercises. Group work in seminar including problem driven case studies and student presentations, excursion.

**Literatur:**

IPCC (2013) Fifth Assessment Report of WGI, II, III. Houghton (2015) Global warming, the complete briefing. Most recent scientific literature.

**Modulverantwortliche(r):**

Rammig, Anja; Prof. Dr. rer. nat.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Ecological, social and economic aspects of CC impacts, adaptation and mitigation on different scales (Seminar, 2 SWS)

Estrella N [L], Menzel A, Estrella N

Climate Change - The complete briefing (Vorlesung, 2 SWS)

Rammig A [L], Rammig A

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Soils and Soil Management

### Modulbeschreibung

#### WZ2733: Introduction to Soil Science | Introduction to Soil Science

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 80	<b>Präsenzstunden:</b> 70

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

In a written exam of 60 minutes duration, the students demonstrate by answering questions without helping material their understanding of the nature and properties of soils, and they remember the characteristics of the soils of the field course as well the field assessment methods. In a pass/fail exam (laboratory assignment) in the field of 10 minutes duration, they prove their ability to survey and interpret a soil profile.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in chemistry, physics, and biology.

#### Inhalt:

- What is a soil?
- Mineral (inorganic) soil components
- Soil biology and soil organic matter
- Soil chemistry
- Soil physics
- Soil survey
- Soil interpretation
- Soil hydrology

- Soil erosion assessment

**Lernergebnisse:**

The students understand the basics of soil science. They can use their knowledge from soil mineralogy, soil organic matter, soil chemistry, and soil physics to understand soil formation processes and important biochemical and physical properties. The students are able to survey a soil profile and to detect the genesis of the surveyed soil. They can evaluate the possibilities of soil use, the risks to the soil itself and the risks to its environment. They are able to evaluate the hydrology of the soil and to judge the erosion risk.

**Lehr- und Lernmethoden:**

The lecture discusses the essentials of soil science. The field assessment starts with peer instructions to analyse a soil profile. During the course, the students will do more and more group work to train the evaluation of a soil profile, its hydrology and its erosion risks.

**Medienform:**

Lecture: presentation notes. Field Assessment: spade, auger, knife, colour charts, TDR probes, suction cups, erosion assessment kits

**Literatur:**

Brady, Weil: The nature and properties of soils, 14th edition, 2007.

Blume et al.: Scheffer/SchachtschabelSoilscience, 2016.

Eash, Sauer, O'Dell, Odoi, Bratz: Soil science simplified, 6th edition, 2016.

Blum, Schad, Nortcliff: Essentials of Soil Science, 2016.

FAO Guidelines for Soil Description. Prepared by Jahn, Blume, Asio, Spaargaren, Schad, 2006.

**Modulverantwortliche(r):**

Steffens, Markus; Dr. rer. nat.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Introduction to Soil Science: Lecture (Vorlesung, 2 SWS)

Schweizer S

Introduction to soil science: Field course (Übung, 3,5 SWS)

Wiesmeier M [L], Wiesmeier M, Garcia Franco N, Huber J, Schad P, Völkel J

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2734: Soil Protection | Soil Protection

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

In an oral exam of 30 minutes duration, students demonstrate in a scientific discussion by answering questions without helping material their broad and deep understanding on how to protect soils. The understanding of soils, as achieved in the modules "Introduction to soil science" and "World soil resources", is implicitly part of the oral exam.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

The successful completion of the module "Introduction to Soil Science" or equivalent skills are required. The successful completion of the module "World Soil Resources" is recommended.

#### Inhalt:

Principles of soil degradation, the world food problem, highly erodible soils, semi-arid environments (including irrigation and salinization problems), kaolinitic soils, shifting cultivation, organic and mineral fertilization, agroforestry, land use and greenhouse gases, soil functions, organic pollutants, inorganic pollutants (heavy metals), radionuclides, pesticides, pathways of pollutants, sorption, precipitation, co-precipitation, acidification, ways to assess the mobility of pollutants, remediation of brownfields.

#### Lernergebnisse:

The students are able to apply their knowledge of soils, as achieved in the modules "Introduction to Soil Science" and "World Soil Resources", to develop strategies of soil protection. They understand

the major environmental factors that determine the food production in the world. They are able to address the specific problems of highly erodible soils, semi-arid land and kaolinitic soils and to design adequate land-use methods. The students understand the major factors that determine the fate of substances in soil. They are able to analyze and forecast the fate of heavy metals, organic pollutants and radionuclides in soil and are familiar with important techniques for managing and remediating brownfields.

**Lehr- und Lernmethoden:**

Lecture, discussions

**Medienform:**

Presentation notes.

**Literatur:**

Blanco, H., Lal, R. (2008): Principles of soil conservation and management. Diamond, J. (1998): Guns, germs and steel. A short history of everybody for the last 13,000 years. Mirsal, I. (2008): Soil Pollution.

**Modulverantwortliche(r):**

Schad, Peter; Dr. rer. silv.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Soil Protection and World Food Production (Vorlesung, 2 SWS)

Schad P

Bodenschutz - Organische und anorganische Schadstoffe in Böden (Vorlesung, 2 SWS)

Vidal A

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2735: World Soil Resources | World Soil Resources

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 80	<b>Präsenzstunden:</b> 70

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

In an oral exam of 30 minutes duration, students demonstrate in a scientific discussion by answering questions without helping material their fundamental understanding of the soils of the world in relation to other ecological factors, and they remember the soils of the field course as well as the methods of surveying and classifying soils in the field. In a pass/fail exam (laboratory assignment) in the field of 10 minutes duration, they prove their ability to survey and classify soils of various landscapes and environmental settings. The understanding of soils, as achieved in the module "Introduction to soil science" is implicitly part of the oral exam.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

The successful participation at the module "Introduction to Soil Science" (which is given in the first half of the summer semester) is required.

#### Inhalt:

- Soils of the world
- Chemical, biological and physical properties of soils
- Genesis of soils as the result of soil-forming processes
- Soil survey
- Soil classification according to the international system
- Soil interpretation.

**Lernergebnisse:**

The students are able to apply their knowledge of soils, as achieved in the module “Introduction to Soil Science”, to all soils of the world. The students understand the characteristics of the soils of the world, the pattern of their geographical distribution, their genesis, their ecological potential and the threats to their functions. The students are able to survey a soil profile, to detect the genesis of the surveyed soil and to classify it according to the international soil classification system. They are able to evaluate the possibilities and risks of soil management. They can assess the relationship between the soil and its environmental setting.

**Lehr- und Lernmethoden:**

The lecture gives an overview of all soils of the world. The field course (several days) presents soils in a landscape outside southern Bavaria. The students are trained in the methodological skills of soil survey, soil classification and soil interpretation.

**Medienform:**

Lecture: presentation notes. Field Assessment: spade, auger, knife, colour charts.

**Literatur:**

FAO Guidelines for Soil Description. Prepared by Jahn, Blume, Asio, Spaargaren, Schad, 2006.  
IUSS Working Group WRB: World Reference Base for Soil Resources 2014. Update 2015.  
Prepared by Schad, van Huyssteen, Micheli. FAO World Soil Resources Reports 106.

**Modulverantwortliche(r):**

Schad, Peter; Dr. rer. silv.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

World Soil Resources: Lecture (Vorlesung, 2 SWS)  
Schad P

Bodenansprache und Bodenklassifikation nach internationalen Standards (Übung, 2,8 SWS)  
Schad P

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2736: Analytical Characterization of Soil Resources | Analytical Characterization of Soil Resources

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The students collect their own soil samples, they prepare and analyze them, and they interpret the results. They present their results and their interpretation in a research paper of 10 pages. The research paper is accompanied by an oral presentation of 20 minutes to assess the scientific communication skills of the students.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

The successful completion of the module "Introduction to Soil Science" or equivalent skills are required.

#### Inhalt:

- Sampling and sample preparation
- Lab analyses: texture, density, water conductivity, organic and inorganic carbon, nitrogen, soil organic matter decomposition, pH, cation exchange capacity, Fe oxides, phosphate retention;
- Data interpretation

#### Lernergebnisse:

The students are able to apply their knowledge of soils, as achieved in the module "Introduction to Soil Science", to the most important physical, chemical and biological processes in soils. They are able to choose the adequate laboratory method to answer a certain question on soil management.



They know how to do sampling, sample preparation and laboratory work. They can interpret laboratory data and know, which conclusions can be made and which conclusions cannot be made. The students are able to communicate their results in a written and an oral manner.

**Lehr- und Lernmethoden:**

For every step, the lecturers give the theoretical background. Afterwards, every step is done by the students themselves, guided by the lecturers and the laboratory staff: sampling, analyses, data interpretation.

**Medienform:**

Lecture: presentation notes; sampling: field equipment; laboratory course: laboratory instruments

**Literatur:**

Will be given in the course

**Modulverantwortliche(r):**

Müller, Carsten; PD Dr. rer. nat. habil.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Chemische und physikalische Boden- und Standortscharakterisierung (Vorlesung, 2,3 SWS)  
Göttlein A

Analytical characterization of soil resources: Lecture (Vorlesung, 1 SWS)  
Müller C

Analytical characterization of soil resources: Laboratory course (Übung, 3 SWS)  
Prietzl J, Höschen C, Vidal A, Prater I, Göttlein A, Kolb E, Ettl R, Fäth J

Bodenkundliche Laborübungen (Übung, 3 SWS)  
Prietzl J, Höschen C, Vidal A, Prater I, Göttlein A, Kolb E, Ettl R, Fäth J  
Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Material and Waste Management | Material and Waste Management

### Modulbeschreibung

## WZ4206: Material Flow Management and Applications | Material Flow Management and Applications

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2018/19

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 105	<b>Präsenzstunden:</b> 45

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

### Beschreibung der Studien-/ Prüfungsleistungen:

The examination consists of a research paper of around 12-15 pages which is the means to evaluate whether the students have understood and whether they are able to apply the methodology of material flow management on a case study in a scientifically manner and to create an own scientific paper about concepts for material flow management and treatment of materials based on the methodologies of material flow analysis and life cycle assessment.

### Wiederholungsmöglichkeit:

Folgesemester

### (Empfohlene) Voraussetzungen:

knowledge in natural science (biology, chemistry, ecology, physics);  
understanding for engineering science and also for social/cultural aspects.

### Inhalt:

The students acquire detailed and differentiated knowledge about the following topics:

- need of material flow management
- procedure of material flow management
- material and substance flow analysis
- material flow assessment by sustainability indicators
- life cycle assessment

- development of strategies and measures for material flow management (e.g. resource efficiency, urban mining, industrial ecology, bio-economy, circular economy).

### **Lernergebnisse:**

By the means of the module the students are able to:

- understand the necessity of material flow management
- understand the relationships between different processes, technological treatments of materials and organizational measures
- apply the procedure of material and substance flow analysis
- apply the assessment methods of indicator systems and life cycle assessment
- create concepts for material flow management and treatment of materials.

### **Lehr- und Lernmethoden:**

Concerning teaching methods, lecture and presentation parts provide the theoretical foundation of materials flow management. Real case studies are introduced to the students and worked out in the class. Likewise within interdisciplinary projects in reality, the students have to define and to solve problems collaboratively in group work by studying specialist literature and data sources. At the end they have to create a research paper as homework about this topic. The students are supervised by tutorials by the lecturer.

### **Medienform:**

Power point presentation, lecture sheets, case studies of material and substance flow analysis and life cycle assessment.

### **Literatur:**

Brunner, P.H., Rechberger H. (2004): Practical Handbook in Material Flow Analysis. Advanced Methods in Resource and Waste Management. Lewis Publishers, Boca Raton, pp. 318.  
Brunner, P.H.; Rechberger, H.; 2016: Handbook of Material Flow Analysis: For Environmental, Resource, and Waste Engineers. Taylor & Francis Inc; 2. Revised Edition, pp. 453  
Weber-Blaschke, G.; 2009: Stoffstrommanagement als Instrument nachhaltiger Bewirtschaftung natürlicher und technischer Systeme. Ein kritischer Vergleich ausgewählter Beispiele. Schriftenreihe „Nachwachsende Rohstoffe in Forschung und Praxis“ des Wissenschaftszentrums Straubing, Bd. 1, Verlag Attenkofer, Straubing, 330 S.

### **Modulverantwortliche(r):**

Prof. Dr. Gabriele Weber-Blaschke - Lehrstuhl für Holzwissenschaft Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/71- 5635; weber-blaschke@hfm.tum.de

### **Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Material Flow Management and Application (Vorlesung, 3 SWS)

Weber-Blaschke G [L], Weber-Blaschke G

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ4207: Waste and Waste Water Treatment | Waste and Waste Water Treatment

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The exam consists of general questions and calculations. In the written exam students demonstrate by answering questions the theoretical knowledge of waste and wastewater treatment. The answers requires wording but also multiple choice tests are involved. Calculations also involved. The use of a calculator is allowed in the written exam.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Interest and basic knowledge in process engineering.

#### Inhalt:

Part waste: 1. Basics of waste management (What is waste, waste amounts, history and future of waste, waste legislation); 2. Avoidance and recovery of waste and waste management concepts; 3. Waste disposal (legal aspects of landfill, processes in above-ground landfill, above-ground landfill technologies, underground disposal sites); 4. Biological treatment (legal aspects, composting, fermentation, mechanical biological treatment, sewage sludge, substitute fuels); 5. Thermal treatment (legal aspect, thermal processes, equipment, power generation, alternative thermal processes, co-incineration, hazardous waste treatment).

Part wastewater: 1. Water treatment & management concepts; 2. Overview wastewater treatment steps; 3. Wastewater characteristics & discharge limits; 4. Mechanical wastewater treatment (technology and equipment), 5. Fundamentals in bioprocess technology; 6. Stoichiometry of

biological reactions; 7. Kinetics of biological reactions; 8. Aeration (process, limits and technology); 9. Aerobic wastewater treatment (Activated sludge process; Sequencing batch reactor technology; Biofilm technology); 10. Sewage sludge treatment

### **Lernergebnisse:**

At the end of the module, students are able to:

1. Understand the necessity and objectives of waste management.
2. Distinguish different types of waste.
3. Decide which treatment method is valid for which type of waste.
4. Know the requirements which the different treatment methods have to meet regarding legal aspects of waste treatment (emissions, waste water, deposition of waste).
5. Describe the technical composition of different types of landfills and to assign different types of wastes to the landfills.
6. Assess processes and risks arising from landfills.
8. Understand the process of composting, mechanical-biological as well as thermal treatment of waste.
7. Understand the necessity and the feasibility of waste water treatment especially in treating municipal wastewater.
8. Classify the single steps of eliminating wastewater compounds like coarse material, organic and inorganic compounds.

### **Lehr- und Lernmethoden:**

The knowledge in the field of waste management is imparted during lectures and will be extended by 3 exercises, which have to be elaborated by the students at home. Practical insight into waste management is given during an excursion to a thermal as well as a biological waste treatment plant.

### **Medienform:**

PowerPoint presentation, notices on black board, The files of the presentations during lectures are handed out to the students or are send to the students per email.

### **Literatur:**

Bilitewski B., Härdtle G., Marek K. (1996): Waste Management, Transl. and ed. by Anette Weissbach and Hennig Boeddicker. Kiely, G. (1996): Environmental Engineering. Tchobanoglous, G., Theisen, H., Vigil, S. (1996): Integrated Solid Waste Management - Engineering Principles and Management Issues. Woodward, F. (2001): Industrial Waste Treatment Handbook. Wastewater Engineering. International Edition: Treatment and Reuse (Metcalf & Eddy). Mcgraw-Hill Series in Civil and Environmental Engineering von George Tchobanoglous, Franklin L. Burton und H. D. Stensel von Mcgraw-Hill Higher Education (2002)

### **Modulverantwortliche(r):**

Apl. Prof. Dr. Brigitte Helmreich- Chair of Urban Water Systems Engineering, Am Coulombwall, 85748 Garching, 089289 13719, B.Helmreich@bv.tu-muenchen.de; Dr.-Ing. Matthias Franke - Fraunhofer UMSICHT An der Maxhütte 1, 92237 Sulzbach-Rosenberg 09661 908-438, matthias.franke@umsicht.fraunhofer.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Waste Management (Vorlesung, 2 SWS)

Bauer E, Franke M

Waste Water Treatment (Vorlesung, 2 SWS)

Koch K

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2723: Utilization and Treatment of Special Materials and Waste | Utilization and Treatment of Special Materials and Waste

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 120	<b>Präsenzstunden:</b> 30

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The learning outcome will be assessed by presentation. The presentation will be complemented by a brief written precis. This assessment method is a good means to evaluate both whether the students are able to work self-reliantly on a topic and to present their significant results to an auditorium and whether they have understood their respective selected topic.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in natural science (biology, chemistry, ecology, physics) and engineering.

#### Inhalt:

The students acquire detailed and differentiated knowledge about the following topics:

- Selected materials, products and production processes concerning high waste generation and heavy environmental problems
- Origin and types of the specific wastes,
- Classical disposal,
- Waste as a source of raw material,
- Utilization for products,
- Energetic utilization,
- Legal specification.

The special topics addressed depend on relevance, e.g. food and food waste, sewage sludge, e-waste or the like.

**Lernergebnisse:**

By the means of the module the students are able:

- to describe the differences of special waste, e.g. food waste and selected municipal or industrial waste,
- to classify the amount and quality of special waste streams,
- to analyze problems concerning the special wastes,
- to develop treatment measures to handle the waste for avoiding or reducing impacts on the environment and human health,
- to transmit developed solutions to other waste and new products.

**Lehr- und Lernmethoden:**

The module consists of a lecture, providing the theoretical foundations, in combination with a seminar including feedback by the lecturers to the students' work. The students have to define and to solve problems collaboratively in group work by studying specialist literature. At the end they have to prepare a presentation and a brief summary including problem statement and conclusions as homework under time constraint about this topic. The students are supervised by the lecturers.

**Medienform:**

PowerPoint Presentation

**Literatur:**

Oreopoulou V.; Russ W. (2007): Utilization of By-Products and Treatment of Waste in the Food Industry, Springer; New York.

Additional literature depending on themes.

**Modulverantwortliche(r):**

Prof. Dr. Gabriele Weber-Blaschke - Lehrstuhl für Holzwissenschaft Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/71- 5635; weber-blaschke@hfm.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Utilization and Treatment of Special Materials and Waste (Seminar, 2 SWS)

Weber-Blaschke G [L], Reh K

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).



## Modulbeschreibung

### WZ2724: Emission Control in Land-Use and Animal Husbandry | Emission Control in Land-Use and Animal Husbandry

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 105	<b>Präsenzstunden:</b> 45

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The oral examination will be held either as an individual or a group examination. If more than 40 students sign in for the examination the oral examination can be done in a written form. The duration of the oral examination is 20 min per person. The Students are able to describe typical agricultural production, the environmental impact and the measurement procedures to quantify and to qualify these impacts. On that basis they are able to weigh the advantages and disadvantages of possible measures of air pollution in agriculture.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Interest in the field of agriculture; willingness to learn about the causal relation between agriculture and emission control.

#### Inhalt:

Upon completion of the module, students are able to understand and analyze:

- the principle of agriculture in plant and livestock production on a basic level
- the main emissions caused by agricultural processes on a deeper level
- interactions of agricultural processes with the emission
- the environmental effects of these emission
- the measurement procedures to qualify and quantify agricultural emissions
- possibilities of emission abatement in land-use and animal husbandry.

**Lernergebnisse:**

At the end of the module students are able to:

- understand the interrelation between local causes and global impacts,
- apply the comprehension of basic physical, chemical, and biological principles to phenomena in practice,
- evaluate measurement techniques in a qualitative manner,
- evaluate measures and techniques of environment protection;
- understand the interrelation between animal husbandry and air pollution control,
- derive adequate measures of environmental protection.

**Lehr- und Lernmethoden:**

Lecture, practice course.

**Medienform:**

PowerPoint-slides, short clips.

**Literatur:**

Tba

**Modulverantwortliche(r):**

Dr. Stefan Nesper – Bavarian State Research Center for Agriculture; Institute for Agricultural Engineering and Animal Husbandry; Voettinger Strasse 36, 85354 Freising, 0049 8161 713566; stefan.nesper@lfl.bayern.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Emission control in Land-Use and Animal Husbandry (Vorlesung, 3 SWS)

Nesper S

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Sustainable Agricultural Value Chains | Sustainable Agricultural Value Chains

### Modulbeschreibung

#### WZ1921: Strategy, Supply Chain Management, and Sustainability in Agribusiness and Food Industry | Strategy, Supply Chain Management, and Sustainability in Agribusiness and Food Industry

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2019/20

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 6	<b>Gesamtstunden:</b> 180	<b>Eigenstudiums- stunden:</b> 120	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The course grade is based on the learning portfolio. The portfolio submitted includes memorandums addressing 9-10 of the case studies discussed in class; and a learning statement addressing conceptual, scientific and personal learning. Through the case memorandums the students show the ability to discuss the assigned case questions by selecting and applying suitable theoretical concepts to supply chain management and sustainability challenges in the specific context of agricultural, food, and related industries. In the learning statement students demonstrate the ability to reflect on the semester long learning process and summarize the insights gained.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Solid economic and management background; knowledge of basic concepts of strategic analysis, planning, and management (e.g., industry analysis, horizontal and vertical coordination, and SWOT), as well as the ability to apply these concepts; and knowledge of value chain management is required (e.g., theoretical background, supply chain dynamics, actors and partnerships, governance). Successful completion of a management course on M.Sc. level required, e.g.,

agribusiness management, organizational behavior, or value chain management. Medium level experience in desk research and scientific writing is required.

**Inhalt:**

Key concepts of supply chain management, strategy, and sustainability: processes of supply chain management (e.g., creating added value, management of customers and suppliers); Innovation, sustainability as innovation; sustainable supply chains; CSR and sustainability measurement; implementation of a sustainability strategy, costs and benefits of sustainable practices in the context of agricultural, food and related industries; ethical issues in supply chain management.

**Lernergebnisse:**

Upon completion of the module students are able to evaluate processes of agricultural supply chains management, e.g., creating and capturing value, management of customers, suppliers, and other stakeholders; for the areas strategy, supply chain management, and sustainability students can independently choose scientific models or concepts relevant to the analysis process and justify their evaluation; students are able to evaluate the implementation a CSR concept or sustainability strategy, and to monitor its effects on operations, suppliers, associates, and customers; Students are able identify and analyze ethical issues in supply chain management and to recommend how to apply ethical practices.

**Lehr- und Lernmethoden:**

Seminar: Case study based class discussions and presentations, group work based on cases, students' experiences and assignments. Through individually prepared class discussions and group work, students develop the ability to critically reflect and apply concepts of strategy, supply and value chain management in the context of sustainability.

**Medienform:**

Reading assignments; case descriptions, presentations, and discussions, supported by Metaplan, flipchart and other facilitation media.

**Literatur:**

Current articles from scientific journals as appropriate.

Selected chapters from

Bouchery, Corbett, Fransoo, and Tan (2017): Sustainable Supply Chains: A Research-Based Textbook on Operations and Strategy. Springer: Berlin, Heidelberg, Germany.

Pullmann and Wu (2011): Food Supply Chain Management: Economic, Social and Environmental Perspectives. Routledge, New York, US.

**Modulverantwortliche(r):**

Bitsch, Vera; Prof. Dr. Dr. h.c.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de)

## Modulbeschreibung

### WZ1567: Sustainability: Paradigms, Indicators, and Measurement Systems | Sustainability: Paradigms, Indicators, and Measurement Systems

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2019

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The assessment type for the module is a graded report (10 pages). The report includes three sections: (1) critical analysis of a published empirical sustainability study in the context of its sustainability definitions and authors' backgrounds; (2) critical analysis of a sustainability measurement system in use with regard to fulfilling requirements to be met by indicators and indicator systems; (3) critical analysis of a public sustainability claim by an organization from a consumer or citizen point of view. Each analysis is also presented by each student. Through reports, the students demonstrate the ability to understand relevant research, measurement systems and claims, as well as critically analyze and discuss these issues. Through the presentation and discussion of each analysis, students demonstrate their ability to communicate these critical issues and further reflect on each topic in the light of other students' questions and presentations.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge and understanding of economic and management concepts as well as of social science research methods is required.

### **Inhalt:**

The development of a differentiated understanding of sustainability requires the critical analysis and reflection of sustainability concepts on multiple levels. In the module the following levels are systematically analyzed and discussed based on guided discussions of assigned readings and materials developed by students based on literature and internet research:

- Paradigms and value judgments in research on and evaluation of sustainability;
- Economic, environmental and social aspects of sustainable production, marketing, and consumption;
- Measurement systems for sustainability on different levels (products, supply chains etc.);
- Public and private standards, sustainability certifications and communication;
- Consequences of measurement systems and their foci, e.g., on environmental aspects, such as carbon footprint, or on social aspects, such as fair trade

These topics are discussed in the context to current and controversial issues regarding sustainability in science and in society.

### **Lernergebnisse:**

After successfully completing the module students are able to

- Analyze and evaluate the consequences of different paradigms on the definition and understanding of sustainability and its use in published scientific articles;
- Analyze and evaluate sustainability measurement systems on the product, enterprise, and supply chain levels as well as their potential consequences;
- Evaluate public sustainability claims based on the research of available information sources;
- Apply a differentiated understanding of sustainability in an interrelated, globalized context with differing value systems and priorities in scientific and practical questions and issues.

### **Lehr- und Lernmethoden:**

The course “Sustainability: Paradigms, Indicators, and Measurement Systems” has a seminar format based on assigned readings and student presentations on assigned topic areas.

After an introductory guided class discussion on assumptions and implicit sustainability definitions of participants, readings are assigned and discussed in class to lay the basis for later student presentations. Through individual document research and individually prepared class presentations, students develop the ability to critically reflect on sustainability research, sustainability indicators and measurement systems, as well as sustainability claims by various actors and organizations. Through presentations and concept discussions, students develop in-depth knowledge of sustainability issues and hone their critical thinking skills. A final discussion summarizes students’ learning and additional findings throughout the semester in the concept of wicked problems.

### **Medienform:**

Reading assignments; use of data bases for literature research; presentation software; discussion facilitation support media, such as flipcharts and discussion boards; video clips and podcasts.

**Literatur:**

National Resource Council 2010, Toward Sustainable Agricultural Systems in the 21st Century, Washington/D.C.: National Academies Press.

Current articles on sustainability paradigms, requirements of sustainability indicators and indicator systems, and applications.

**Modulverantwortliche(r):**

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).



## Modulbeschreibung

### WI001215: Network and stakeholder analysis: Sustainable resource use and agri-food system | Network and stakeholder analysis: Sustainable resource use and agri-food system

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2019/20

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

There will be a 120-minute written exam. A written exam is necessary in order to assess the holistic understanding and analytical competencies of the students. In the exam, students will describe, discuss and analyze the concepts, dimensions and methodological approaches related to network and stakeholders in sustainable resource management and agri-food sector.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in cooperation and sustainability

#### Inhalt:

The module deals with the theoretical concepts, methodologies and measurement indicators and approaches of networks and stakeholders for sustainable resource management and agri-food system. Specific topics include the following:

- Network and stakeholder theories and concepts to understand, describe and explain the structure, characteristics, interactions among networks and stakeholders

- Concepts and approaches to examine network and stakeholder compositions, engagements, conflicts and influences in designing and implementing strategic decisions related to sustainable innovation, resource management and agri-food system.
- Types, levels and extents of risk associated with stakeholder engagement in implementing sustainability related projects and programs
- Specific methodological approaches, tools and indicators to evaluate and prioritize the performances, outcomes and implications of different network and stakeholder constellations.
- Other relevant current network and stakeholder issues in sustainable innovation, resource management and agri-food system.

### **Lernergebnisse:**

After completing the module, students are able to

- understand the theories, concepts, principles and frameworks underlying network and stakeholder issues, influences and collaborations for sustainable innovation, resource management and agri-food system
- apply relevant techniques and tools for describing social, economic, environmental and institutional contexts of network and stakeholder management and engagement policies and strategies towards achieving specific sustainable goals.
- analyze types, levels and extent of risks associated with stakeholder engagement and commitment in implementing sustainability related projects and programs
- critically assess and evaluate the structure, characteristics, and impacts of various forms of networks and stakeholder groups on the outcomes of sustainable resource management, innovation and agri-food system.

### **Lehr- und Lernmethoden:**

The module includes lectures, individual and group exercises, reading assignments, and presentations. The lectures will provide theoretical and conceptual basis. Individual and team exercises will be used to analyze and discuss specific network and stakeholder issues and their solutions.

### **Medienform:**

Präsentationen, Fallbeschreibungen, Skripte

### **Literatur:**

Freeman, R.E (1984). Strategic Management: A stakeholder Approach. Boston.

Prell, C., K. Hubacek and M. Reed (2009). Stakeholder analysis and social network analysis in natural resource management. Society & Natural Resources 22(6): 501-518.

Chiffolleau, et al. (2014) Understanding local agri-food systems through advice network analysis. *Agric Hum Values*, 31:19–32

Lange, P. et al. (2015). Sustainability in Land Management: An Analysis of Stakeholder Perceptions in Rural Northern Germany. *Sustainability*, (7): 683-704.

Reed, M. S. et al. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of Environmental Management* 90(5): 1933-1949.

Mcadam, et al. (2016). Regional Horizontal Networks within the SME Agri-Food Sector: An Innovation and Social Network Perspective. *Regional Studies*, 50(8): 1316–1329

Katz, N. et al. 2004. Network Theory and Small Groups. *Small Group Research*, 35(3): 307-332.

Sandström, A. and C. Rova (2010). Adaptive co-management networks: A comparative analysis of two fishery conservation areas in Sweden. *Ecology and Society* 15(3): 14.

Bixler, et al. R (2016). Network governance for large-scale natural resource conservation and the challenge of capture. *Frontiers in Ecology and the Environment* 14(3): 165-171.

Bixler, R. P. et al.(2016). Networks and landscapes: A framework for setting goals and evaluating performance at the large landscape scale. *Frontiers in Ecology and the Environment*, 14(3): 145-153.

Ernstson, et al. (2010). "Scale-crossing brokers and network governance of urban ecosystem services: The case of stockholm." *Ecology and Society*, 15(4): 28.

Muñoz-Erickson, T. A. and B. B. Cutts (2016). Structural dimensions of knowledge-action networks for sustainability. *Current Opinion in Environmental Sustainability*, 18: 56-64.

Wubben, E. and Gohar Isakhanyan. (2011). Stakeholder Analysis of Agroparks. *Int. J. Food System Dynamics* 2(2), 2011, 145#154.

The list will be expanded and updated using other thematically relevant books, journal articles and periodical newsletters and others.

**Modulverantwortliche(r):**

Abate Kassa, Getachew; Dr. rer. hort.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Network and stakeholder analysis: Sustainable resource use and agri-food system (WI001215)  
(Vorlesung, 4 SWS)

Abate Kassa G

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## Free Elective Modules | Free Elective Modules

### Modulbeschreibung

#### WZ2736: Analytical Characterization of Soil Resources | Analytical Characterization of Soil Resources

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The students collect their own soil samples, they prepare and analyze them, and they interpret the results. They present their results and their interpretation in a research paper of 10 pages. The research paper is accompanied by an oral presentation of 20 minutes to assess the scientific communication skills of the students.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

The successful completion of the module "Introduction to Soil Science" or equivalent skills are required.

#### Inhalt:

- Sampling and sample preparation
- Lab analyses: texture, density, water conductivity, organic and inorganic carbon, nitrogen, soil organic matter decomposition, pH, cation exchange capacity, Fe oxides, phosphate retention;
- Data interpretation

**Lernergebnisse:**

The students are able to apply their knowledge of soils, as achieved in the module “Introduction to Soil Science”, to the most important physical, chemical and biological processes in soils. They are able to choose the adequate laboratory method to answer a certain question on soil management. They know how to do sampling, sample preparation and laboratory work. They can interpret laboratory data and know, which conclusions can be made and which conclusions cannot be made. The students are able to communicate their results in a written and an oral manner.

**Lehr- und Lernmethoden:**

For every step, the lecturers give the theoretical background. Afterwards, every step is done by the students themselves, guided by the lecturers and the laboratory staff: sampling, analyses, data interpretation.

**Medienform:**

Lecture: presentation notes; sampling: field equipment; laboratory course: laboratory instruments

**Literatur:**

Will be given in the course

**Modulverantwortliche(r):**

Müller, Carsten; PD Dr. rer. nat. habil.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Chemische und physikalische Boden- und Standortscharakterisierung (Vorlesung, 2,3 SWS)  
Göttlein A

Analytical characterization of soil resources: Lecture (Vorlesung, 1 SWS)  
Müller C

Bodenkundliche Laborübungen (Übung, 3 SWS)  
Prietzl J, Höschen C, Vidal A, Prater I, Göttlein A, Kolb E, Ettl R, Fäth J

Analytical characterization of soil resources: Laboratory course (Übung, 3 SWS)  
Prietzl J, Höschen C, Vidal A, Prater I, Göttlein A, Kolb E, Ettl R, Fäth J  
Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2757: Advanced Environmental and Natural Resource Economics | Advanced Environmental and Natural Resource Economics

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2017

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The examination consists of a written exam (90 min), a presentation (20 min) and a term paper (around 10 pages). The written exam shall give proof that the lecture content was understood and that it can be applied in exemplary exercises. Both the presentation and the term paper shall analyse a lecture topic in detail and place it in the economic environment. Weighting is as follows: 50 % written exam, 40 % term paper, 10 % presentation.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Environmental and Natural Resource Economics (recommended)

#### Inhalt:

Dynamic optimization; Theory of optimal extraction of renewable and non-renewable resources; Theory of joint production; Application of game theory to resource management; Optimal growth and green accounting

#### Lernergebnisse:

At the end of the module students have a profound knowledge of the economics of resource problems. They can derive the optimal time path to use renewable and non-renewable resources. They can explain how resources can be incorporated in the theory of optimal growth and how they can be accounted for in welfare and sustainability measurement. They can explain how some

welfare enhancing effects are produced as a side effect of production systems. They are able to apply resource economic theory to real life resource problems. They know how to apply the basic concepts of game theory and how these can be used to explain the (im)possibilities of reaching international environmental agreements.

**Lehr- und Lernmethoden:**

Lectures will be used to teach the theoretical material. Exercises will be used to apply the theory taught in the lectures to solve problems and to facilitate a better understanding of the subject matter. In order to enable students to critically reflect on lecture topics, interactive elements are integrated (e.g. group work, case study).

**Medienform:**

Lecture notes, Excel

**Literatur:**

will be told in the lecture

**Modulverantwortliche(r):**

Sauer, Johannes; Prof. Dr. agr.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Advanced Environmental and Natural Resource Economics (Vorlesung, 4 SWS)

Sauer J [L], Mennig P, Tzemi D

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## Modulbeschreibung

### WZ2721: Bioenergy Systems | Bioenergy Systems

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The learning outcome will be assessed by a written exam. The students show that they have understood the principles of biomass production for bioenergy use, biomass supply chains, and the different bioenergy systems, and are able to carry out related calculations, e.g. for estimation of energy efficiencies. The students have to answer questions, but may also be asked to do calculations, complete figures or prepare sketches.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

General understanding of natural science, mathematics and basics of technology.

#### Inhalt:

Biomass production in agriculture; physiology of biomass crops such as perennials and their production systems ; biomass supply and utilization chains; bioenergy systems: biomass combustion, biofuels for transportation, biogas technology; selected aspects of ecology and economy;

#### Lernergebnisse:

At the end of the module students have acquired knowledge of the production and utilization of renewable resources from the agricultural and forestry sector.

They know how to analyze the performance and ecological impacts of different biomass supply and utilization chains. They can estimate the suitability of various crops for bioenergy use. The



students have an insight in the physical and chemical basics of energy production from biomass and are able to apply related basic equations. They can compare different biomass combustion systems and attribute emissions. The students know the production pathways and properties of different biofuels for transportation and are able to estimate their future potentials. They understand the technological background of biogas production and can do basic designs of biomass supply and utilization chains using the example of biogas systems in agriculture.

**Lehr- und Lernmethoden:**

Lecture with integrated exercises and discussions to improve understanding. Optional: field trip.

**Medienform:**

Power point presentations, black board.

**Literatur:**

Tba.

**Modulverantwortliche(r):**

Höldrich, Alexander; Dr. agr.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Bioenergy Systems

Dr. Alexander Höldrich, Dr. Doris Schieder, Dr. Mathias Effenberger

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ1308: Creation of a Life Cycle Assessment Study Using LCA Software | Creation of a Life Cycle Assessment Study Using LCA Software

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2020

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester/ Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 120	<b>Präsenzstunden:</b> 3

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The examination consists of an LCA report of around 20 pages which is the means to evaluate whether the students are able to create a life cycle assessment (LCA) using a special LCA software. After modelling of an own LCA case study the students write an LCA report based on a learning process and describe the used methodology for the life cycle assessment. The results of the LCA case study have to be analyzed and discussed in the report.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in Life Cycle Assessment, e.g. WZ4206 Material Flow Management and Application or WZ0156 Rohstoffmärkte, Ökobilanzierung, Waldzertifizierung (previous name Rohstoffmärkte und Qualitätssicherung), natural science (biology, chemistry, ecology, physics); understanding for agricultural and forestry production processes as well as for engineering science and social/cultural aspects.

#### Inhalt:

The students acquire detailed and differentiated knowledge about the following topics:

- need of life cycle assessment
- procedure of life cycle assessment
- material and substance flow analysis including life cycle inventory

- life cycle impact assessment
- interpretation of LCA results
- development of strategies and measures for conducting and reporting of a life cycle assessment study

### **Lernergebnisse:**

By the means of the module the students are able to:

- define a system boundary and functional unit when creating a LCA study
- create processes and flows and how to link them in product systems using LCA software
- create a project with different scenarios and the relationships between different processes
- create their own processes and flows using primary data
- apply the assessment methods of indicator systems and life cycle assessment
- evaluate the project (using different LCIA methods)
- create an LCA Report individually

### **Lehr- und Lernmethoden:**

Concerning teaching methods, lecture and presentation parts provide the extended theoretical foundation of conducting life cycle assessment. The OpenLCA software will be used for modelling and therefore installed on the students' laptop (optional) or they can work directly on a TUM-PC. LCA case studies in forestry and agricultural productions are introduced to the students and worked out in the class. A case LCA study will be examined systematically with the students with different scenarios. At the end, the students have to create their own LCA case study out of the forestry or agricultural field including the subsequent processing industries and to document all the steps done in a report including the methodology, results and discussion. The students are supervised by tutorials by the lecturers.

### **Medienform:**

PowerPoint presentation, lecture sheets, case studies, OpenLCA software.

### **Literatur:**

Klöpffer, W., Curran, M. (eds.). 2014 - 2017. LCA Compendium – The Complete World of Life Cycle Assessment. Book Series. Springer.

Klöpffer, W., Grahl, B. 2009. Ökobilanz (LCA): Ein Leitfaden für Ausbildung und Beruf. Wiley-VCH, Weinheim. 426 pp.

Brunner, P.H. Rechberger, H. 2016. Handbook of Material Flow Analysis: For Environmental, Resource, and Waste Engineers. Taylor & Francis Inc; 2. Revised Edition. 453 pp.

EC-JRC – European Commission - Joint Research Centre - Institute for Environment and Sustainability. 2010. International Reference Life Cycle Data System (ILCD) Handbook - General guide for Life Cycle Assessment - Detailed guidance. First edition March 2010. EUR 24708 EN. Luxembourg. Publications Office of the European Union. 394 pp.

Baumann, H., Tillman, A.-M. 2004. The hitch hiker's guide to LCA an orientation in life cycle assessment methodology and application. Lund, Studentlitteratur.

**Modulverantwortliche(r):**

Hijazi, Omar; Dr. rer. agr.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ1590: Climate Change Economics | Climate Change Economics

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2014/15

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester/ Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 60	<b>Präsenzstunden:</b> 90

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

There will be a written exam (Klausur) of 90 minutes at the end of the semester. The students will be asked to demonstrate, within the stipulated amount of time using predefined methods and resources, their ability to outline the challenges climate change poses to regulators, propose pragmatic solutions and strategies as well as ways of implementing them. This would be based on the competences acquired from the relevant literature of economic modeling, theories of climate change and their understanding from the course content. The written exam is an appropriate assessment method to evaluate the degree to which the students understand the theoretical framework of climate change implications as well as provides an opportunity for them to put forward arguments based on existing theory.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge:

- Micro Economics (Welfare Economics)
- Environmental Economics
- Resource Economics

#### Inhalt:

This course covers the trends in current and future climate change and their effects on economic and social outcomes.

The lectures are divided into ten sessions:

1. Introduction to the Basic Science of Climate Change

- The students will learn about the scientific themes of global climate change and the economic dimension of the phenomenon.

2. Basic Economics

- The students will learn how a market economy can be efficient and socially optimal as well as about the prospects of externality.

3. Optimal Emission Levels

- The students will learn of the optimal abatement path and its uncertainty with respect to damages as well as Integrated Assessment Models (IAMs).

4. Intra-generational equity in climate policy

- The students will learn about how to account for equity across space (intergenerational equity) when deriving optimal emission levels.

5. International Environmental Agreements

- The students will learn about the dynamics behind common strategies towards achieving some form of optimal emission level.

6. Policy Instruments

- The students will learn about diverse instruments such as quality-based approach and Pigouvian Tax.

7. Regulation via Prices vs. Quantities

- The students will learn what circumstances will a regulator prefer prices over quantities and vice versa.

8. Credit-based Mechanisms

- The students will learn about how to deal with countries that do not want to commit, but have a high potential for low-cost reductions.

9. German Climate Policy

- The students will learn about German Climate Action - strategies and policies

10. European Union Emission Trading Scheme - EU ETS

**Lernergebnisse:**

After successfully completing the module, students are able to:

- Evaluate and formulate economic models related to climate change.
- Apply theoretical model to climate change regulations as well as policies that affect emission levels.
- Analyze the complexity, uncertainty and possibilities associated with optimal emission level.
- Apply appropriate instruments for optimal emission level that are efficient and cost-effective.
- Understand climate negotiations (club) and climate action strategies are currently being implemented.

**Lehr- und Lernmethoden:**

The course mainly consists of lectures (4 SWS). The lecture will provide a foundation upon which to build the ensuing discussions on climate change issues from an economic perspective. The content of the module is expected to be transferred to the students in an interactive learning

manner were, among others, emission reduction instruments are scrutinized. This encourages the students to independently and self-reliantly study the literature guided by a structured framework.

**Medienform:**

PowerPoint, flipchart, internet portals, online reports etc.

**Literatur:**

Bréchet, T., & Eyckmans, J. (2009). Coalition theory and integrated assessment Modelling: Lessons for climate governance. *Global Environmental Commons: Analytical and Political Challenges in Building Governance Mechanisms*.

Rohling, M., & Ohndorf, M. (2012). Prices vs. quantities with fiscal cushioning. *Resource and Energy Economics*, 34(2), 169-187.

MacKenzie, I. A., & Ohndorf, M. (2012). Optimal monitoring of credit-based emissions trading under asymmetric information. *Journal of regulatory economics*, 42(2), 180-203.

Hake, J. F., Fischer, W., Venghaus, S., & Weckenbrock, C. (2015). The German Energiewende—history and status quo. *Energy*, 92, 532-546.

Climate Action Plan 2050 Principles and goals of the German government's climate policy. [https://www.bmu.de/fileadmin/Daten\\_BMU/Pools/Broschueren/klimaschutzplan\\_2050\\_en\\_bf.pdf](https://www.bmu.de/fileadmin/Daten_BMU/Pools/Broschueren/klimaschutzplan_2050_en_bf.pdf)

EU ETS Handbook. [https://ec.europa.eu/clima/sites/clima/files/docs/ets\\_handbook\\_en.pdf](https://ec.europa.eu/clima/sites/clima/files/docs/ets_handbook_en.pdf)

**Modulverantwortliche(r):**

Sauer, Johannes; Prof. Dr. agr.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Climate Change Economics (WZ1590) (Vorlesung, 4 SWS)

Sauer J [L], Ait Sidhoum A, Tzemi D

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2730: Climate Change - Science, Impacts and Adaptation, Mitigation | Climate Change - Science, Impacts and Adaptation, Mitigation

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Assessment consisting of oral examination on the lecture and the seminar (30 min). In this oral examination the student is expected to demonstrate that he/she has understood the physical basis of the climate system and that they can identify the drivers of climate change. The student shows that he/she is able to apply his/her knowledge to develop adaptation and mitigation measures and to argue in discussions on climate change issues. A voluntary mid-term assignment (presentation) in the seminar assesses the students' ability to summarize findings from scientific publications / case studies and to present them to an audience. The presentation is complemented by the preparation of a "PICO" that is presented on an interactive screen. The presentation will serve for grade improvement by 0.3 according to §6(5) APSO.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in meteorology, physics, biology.

#### Inhalt:

Based on the newest IPCC report (AR 5) the theoretical background on the physical science basis of climate change, theory and practical application of adaptation and mitigation measures in biological, physical and chemical systems will be presented. In a related seminar, selected topics will be intensified in case studies. TUM as a NGO in the UNFCCC process offers an optional possibility also for students to take part in COP and related negotiations.



**Lernergebnisse:**

After this module, the students can understand the physical basis of the climate system, identify all drivers of climate change and falsify common arguing of "climate sceptics". They can summarize observed changes in the climate system as well as impacts in divers systems and regions. They are able to assess cross-sectorial impacts of climate change in selected areas, to evaluate and develop adaptation and mitigation measures and strategies in biological, physical and chemical systems including an analysis of their effectiveness and cost-effectiveness.

**Lehr- und Lernmethoden:**

Lecture on physical basis of the climate system, impacts of climate change and important mitigation strategies. In the seminar group presentations of various topics regarding adaptation and mitigation of climate change will be presented as case studies. Optional excursion to UNFCCC meeting if applicable.

**Medienform:**

Lecture with PowerPoint Presentation, reader and exercises. Group work in seminar including problem driven case studies and student presentations, excursion.

**Literatur:**

IPCC (2013) Fifth Assessment Report of WGI, II, III. Houghton (2015) Global warming, the complete briefing. Most recent scientific literature.

**Modulverantwortliche(r):**

Rammig, Anja; Prof. Dr. rer. nat.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Ecological, social and economic aspects of CC impacts, adaptation and mitigation on different scales (Seminar, 2 SWS)

Estrella N [L], Menzel A, Estrella N

Climate Change - The complete briefing (Vorlesung, 2 SWS)

Rammig A [L], Rammig A

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## Modulbeschreibung

### POL62200: Energy Transformation | Energy Transformation

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2017/18

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester/ Sommersemester
<b>Credits:*</b> 6	<b>Gesamtstunden:</b> 180	<b>Eigenstudiums- stunden:</b> 120	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

For this module, evaluations will be based on written work and a presentation. The written assignment for the module will be of a length of approximately 20-25 pages. The topic of the module paper is to be developed in consultation with the seminar leaders and will deal with a specific topic of the seminar (energy transformation) and its technological, political, and social dimensions. The paper will be introduced with a precise question and then analyzed in depth. The methodology of research needs to be indicated and a comprehensive bibliography included. Students will be expected to prepare and give a presentation of at least 20 minutes tied to a session topic. Group presentations of up to three students are possible as long as individual contributions are discernible.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Ring lecture „Politics & Technology“

#### Inhalt:

For a variety of reasons, including energy security, environment and climate concerns, and the potential to develop new technologies and processes, cities, countries and entire regions are pursuing low-carbon energy transitions. Understandings of what the best approach to a low carbon energy transition is, however, vary widely. The extent to which energy transitions are occurring in various sectors (power, heating/cooling, transportation) differs significantly. Why is this the case? What factors support or inhibit the scaling-up of policy solutions? What are the challenges

associated with large scale energy system transformations? How similar or different are energy system transformations to other major transformations which have occurred in the past or which may need to occur in the future? This module will consider these and other questions in the context of Germany, at the European level and internationally.

**Lernergebnisse:**

After participating in this module, students will understand the arguments underpinning decisions to pursue low carbon energy transitions, how low carbon energy transitions are affected by broader economic, technological, and political factors, and the ways in which actors at the local, national, or international level may act to promote or inhibit change. They will have gained insights into system transformation thinking, understand aspects of the production, distribution and utilization of energy and their interplay; apply methods of comparative policy analysis to energy policy in different political systems; be able to identify challenges of policy-making in national politics and the European multi-level system; to critically analyze energy policy in Germany, Europe, and internationally (for example in China, Japan, India, the United States as well as at the global level); to analyze the factors determining German, European, and international energy politics, and to evaluate the effects of different energy policy governance instruments (like legal regulation, planning, incentive design, taxes, subsidies, etc.).

**Lehr- und Lernmethoden:**

The module is offered in the form of two seminars, each dealing with different, but complementary thematic areas. One will be focused more on the transition of the energy systems in Germany and Europe while the other will concentrate more on the international and global level. To obtain a deeper understanding of the module's topics a combination of independent work and general discussion will be used in the seminar. Seminars will include both direct input from the instructor and a wide variety of active learning methods. During the seminars, there will be in-depth discussions and inputs by students. Concrete examples will be used to practice, analyze, and evaluate the material which has been presented. Both the technical and scientific aspects of issues as well as their political and social implications will be discussed. The presentations developed and given by the students and ensuing discussions will contribute to the students' understanding of the seminar materials and instructor's inputs.

**Medienform:**

Online-Reader, PowerPoint

**Literatur:**

A reader of seminar texts with up-to-date and cutting edge scientific literature will be made available at the start of the semester.

**Modulverantwortliche(r):**

Schreurs, Miranda; Prof. Dr.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

(POL62200) Energy Transformation (Part 1) (Seminar, 2 SWS)

Cetkovic S ( Janßen S )

(POL62200) Energy Transformation (Part 2) (Seminar, 2 SWS)

Ohlhorst D ( Janßen S )

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## Modulbeschreibung

### WI000286: Environmental and Natural Resource Economics | Environmental and Natural Resource Economics

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2017

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The learning success will be assessed by a written exam (120 minutes)..

By answering the questions students show that they are able to understand the economic view of environmental and resource problems. Furthermore students show that they are able to compare and evaluate alternative economic instruments (e.g. taxes, emission permits, payments for environmental services). They show their ability to apply environmental policy instruments and valuation methods to specific problems. Finally students demonstrate that they are able to conduct and interpret economic cost-benefit analyses.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

A basic knowledge in Microeconomic theory is recommended

#### Inhalt:

- a) Economic growth and the environment
- b) Economic analysis of environmental problems
- c) Role of institutions and liability rules
- d) Analysis of environmental economic instruments
  - Command and control measures
  - Pollution taxes
  - Emission trading

- Payments for environmental services
- e) Valuation methods for environmental goods
- f) Cost-benefit analysis.

**Lernergebnisse:**

At the end of the module the students are able to understand the economic view of environmental and resource problems. They know alternative economic instruments, e.g. taxes, emission permits, payments for environmental services and how they work and are able to compare them regarding their economic efficiency. They know and can apply specific valuation methods to attach a monetary value to environmental effects and conduct and interpret economic cost-benefit analyses.

**Lehr- und Lernmethoden:**

The module will be held in the form of lectures which are partially combined with group discussions and exercises. The main learning objective is here to understand the economics of environmental policy. Lectures are a format suitable to convey theoretical knowledge about the welfare implications of policy interventions. Integrated exercises will help students to apply acquired knowledge to concrete problems and derive economically sound answers.

**Medienform:**

PowerPoint

**Literatur:**

A digital reader consisting of various textbook chapters and journal articles will be put on Moodle for each chapter of the course.

- Jaeger, W.K. (2005): Environmental Economics. Island Press.  
Mankiw, N.G. and M.P. Taylor (2011): Microeconomics. 2nd Edition. South Western.  
Perman, R., Y. Ma, J. McGilvray, M. Common (2003): Natural Resource and Environmental Economics. 3rd Edition. Pearson Education Limited.  
Tietenberg, T. and L. Lewis (2010): Environmental Economics & Policy. Prentice Hall.

**Modulverantwortliche(r):**

Glebe, Thilo; PD Dr. habil.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Environmental and Natural Resource Economics (WI000286) (Vorlesung mit integrierten Übungen, 4 SWS)

Glebe T

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## Modulbeschreibung

### WI001204: Economics of Water Use, Regulation and Markets | Economics of Water Use, Regulation and Markets

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2018/19

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

In a written examination at the end of the semester of 120 mins (in class), students will demonstrate the ability to understand and analyze concepts and methodological approaches related to water resource management using economic terminology, and the ability to apply mathematical tools to solve specific calculus problems. A written exam is necessary in order to assess the holistic understanding and analytical competencies of the students. Students will have to option to give an in-class presentation (~15 min) of a paper related to water resource economics that they will choose from a list of references provided by the instructor. The in-class presentation (mid-term assignment) is optional and improves the final grade by 0,3. The extra credit from the in-class presentation cannot be transferred in the case of re-examination.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Students taking this course should be familiar with the basics of microeconomics as well as mathematical economics (derivatives, basic function integrals and graphs). However, all necessary concepts will be introduced before application.

#### Inhalt:

The course will examine the incentives that lead to overexploitation of water resources and how altering these incentives can promote socially optimal use patterns. The course will also provide

the students with a set of analytical tools that can be used to work on water issues or natural resource issues more broadly.

Those topics are:

1. Introduction and Economics Basics

2. Agricultural Water Use

(water rights, agricultural water use efficiency and productivity, land allocation, technology choice, environmental quality)

3. Residential Water Use

4. Water, Land Use and Environmental Aspects of Biofuel Production

5. Other Approaches to Value Water

(hedonic modelling, experimental economics, nonmarket valuation approach)

6. Intertemporal and Interregional Aspects of Water

7. Water Markets Around the World

(Europe, China, USA)

### **Lernergebnisse:**

This course is designed to introduce students to the subject of water economics.

Upon successful completion of the module, students will be able to:

- understand the basic concepts and economic models used to study the economics of water resources issues.
- select and apply the appropriate economic model to solve water policy problems as for example producer's profit or consumer's utility maximization.
- provide economic intuition for mathematical answers to water management problems.
- apply models to address a wide range of water resource problems and assess the economic effects of decision making process at different levels based either on the water demand or the water supply side of the economy.
- critique journal articles pertaining to economics of water resources.

### **Lehr- und Lernmethoden:**

Theoretical concepts and example exercises will be given by the lecturer on the blackboard and by PowerPoint presentations to build the required knowledge base in water resource economics. Q&A sessions at the beginning of each lecture will be provided to recapitulate the previous lecture. In addition, under the supervision and help of the lecturer, in-class application exercises will be used to create real-world water management problems for which students in randomly assigned groups will create and solve problems. Discussion of relevant scholarly articles and literature will be used to aid understanding of the topic covered.

### **Medienform:**

Presentation slides, Blackboard, hand-outs, Moodle course to provide materials (pdf of papers to read)

### **Literatur:**

Auffhammer, M. et al., "The Value of Supply Reliability in Urban Water Systems," Journal of the Association of Environmental and Resource Economists, Working paper.



- Caswell, M. & D. Zilberman, "The Effects of Well Depth and Land Quality on the Choice of Irrigation Technology," *American Journal of Agricultural Economics* 68(1986): 798-811.
- Chong, H. & D. Sunding, "Water Markets and Trading," *Annual Review of Environment and Resources* 31(2006): 239-264.
- Gisser, M., "Groundwater: Focusing on the Real Issue," *Journal of Political Economy* 91(1983): 1004-1027.
- Green, G. et al., "Explaining Irrigation Technology Choices: A Microparameter Approach," *American Journal of Agricultural Economics* 78(1996): 1064-1072.
- Renwick, M. & R. Green, "Do Residential Demand Side Policies Measure Up? An Analysis of Eight California Water Agencies," *Journal of Environmental Economics and Management* 40(2000): 37-55.
- Zilberman, D. et al., "Changes in Water Allocation Mechanisms for California Agriculture," *Contemporary Economic Policy* 12(1994): 122-133.

The list will be expanded and updated using material from a variety of textbooks and journal papers corresponding to each of the topics.

**Modulverantwortliche(r):**

Prof. Dr. Johannes Sauer Jo.sauer@tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Economics of Water Use, Regulation and Markets (WI001204) (Vorlesung, 4 SWS)

Sauer J [L], Sauer J, Vrachioli M

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## Modulbeschreibung

### WZ2724: Emission Control in Land-Use and Animal Husbandry | Emission Control in Land-Use and Animal Husbandry

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 105	<b>Präsenzstunden:</b> 45

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The oral examination will be held either as an individual or a group examination. If more than 40 students sign in for the examination the oral examination can be done in a written form. The duration of the oral examination is 20 min per person. The Students are able to describe typical agricultural production, the environmental impact and the measurement procedures to quantify and to qualify these impacts. On that basis they are able to weigh the advantages and disadvantages of possible measures of air pollution in agriculture.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Interest in the field of agriculture; willingness to learn about the causal relation between agriculture and emission control.

#### Inhalt:

Upon completion of the module, students are able to understand and analyze:

- the principle of agriculture in plant and livestock production on a basic level
- the main emissions caused by agricultural processes on a deeper level
- interactions of agricultural processes with the emission
- the environmental effects of these emission
- the measurement procedures to qualify and quantify agricultural emissions
- possibilities of emission abatement in land-use and animal husbandry.

**Lernergebnisse:**

At the end of the module students are able to:

- understand the interrelation between local causes and global impacts,
- apply the comprehension of basic physical, chemical, and biological principles to phenomena in practice,
- evaluate measurement techniques in a qualitative manner,
- evaluate measures and techniques of environment protection;
- understand the interrelation between animal husbandry and air pollution control,
- derive adequate measures of environmental protection.

**Lehr- und Lernmethoden:**

Lecture, practice course.

**Medienform:**

PowerPoint-slides, short clips.

**Literatur:**

Tba

**Modulverantwortliche(r):**

Dr. Stefan Nesor – Bavarian State Research Center for Agriculture; Institute for Agricultural Engineering and Animal Husbandry; Voettinger Strasse 36, 85354 Freising, 0049 8161 713566; stefan.nesor@lfl.bayern.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Emission control in Land-Use and Animal Husbandry (Vorlesung, 3 SWS)

Nesor S

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2732: Environmental Monitoring and Data Analysis | Environmental Monitoring and Data Analysis

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 80	<b>Präsenzstunden:</b> 70

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Upon completion of the module, the students have a profound understanding of key aspects of environmental monitoring and are able to choose appropriate as well as to efficiently run environmental measurements, to reproducibly analyze acquired data and to clearly communicate results of environmental measurements.

This ability should be demonstrated by writing a research paper following standards of reproducible research based on different aspects of environmental monitoring and data analysis with R. For the research paper, either available data or data measured during the module should be used and be analyzed in respect to defined hypotheses; developed R code has to be provided too.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in R is recommended.

#### Inhalt:

1 Environmental monitoring including principles, techniques and management issues used in environmental monitoring and assessment; Observing, recording, communicating and archiving collected data and providing it to project stakeholders in order to identify sustainable and responsible environmental practices.

Optional: short course Aerobiology, GAW program, visit of companies

## 2 Environmental data analysis

Introduction to data analysis with R; Principles of reproducible research and implementation with R; Pipelines for environmental data analysis from obtaining data via cleaning and transforming to modelling and visualization with modern R; Coverage of data retrieval from different storage types for climate, proxy, phenology, and other data (text-based, netCDF, data bases); Modeling and visualization as complementary strategies for hypothesis-driven data analysis, based on published research from different fields of environmental sciences.

### **Lernergebnisse:**

After this module, the students can plan, implement and run environmental measurements. They are able to efficiently analyze environmental data sets, including download and import of data sets and visualization and modelling with R.

### **Lehr- und Lernmethoden:**

Course 1 consists of a practical course in the laboratory and in the field where students will work in small teams on applied case studies and exercises related to environmental / meteorological monitoring. Course 2 then offers combined lecture and exercise sessions at the PC lab on how to efficiently analyze those environmental data sets of course 1.

### **Medienform:**

PowerPoint Presentation, Field work, Interactive documents for data analysis

### **Literatur:**

Beginner level tutorials for Swirl (<http://swirlstats.com/>)

### **Modulverantwortliche(r):**

Responsible for Module: Prof. Dr. Annette Menzel - Professur für Ökoklimatologie Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/ 71-4740, [menzel@wzw.tum.de](mailto:menzel@wzw.tum.de)

### **Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Environmental monitoring and data analysis; ecological data analysis (Vorlesung mit integrierten Übungen, 3 SWS)

Menzel A [L], Krause A, Zang C

Environmental monitoring and data analysis; ecological monitoring (Vorlesung mit integrierten Übungen, 2 SWS)

Menzel A [L], Lüpke M

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](http://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### **BGU62039: Fallstudien nachhaltiger Quartiers-, Stadt- und Infrastrukturentwicklungen | Case Studies of Sustainable Urban Developments and Infrastructure [FNQSI]**

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2019

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 6	<b>Gesamtstunden:</b> 180	<b>Eigenstudiums- stunden:</b> 120	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### **Beschreibung der Studien-/ Prüfungsleistungen:**

Die Prüfungsleistung wird durch die Erstellung einer wissenschaftlichen Arbeit in Form eines Essays (etwa 5-7 Seiten) erbracht. Dieses wird in Gruppen von 2-3 Student\*Innen erarbeitet. Zum Ende des Semesters werden die Ergebnisse in einem benoteten Kurzvortrag präsentiert und abschließend besprochen.

Die Student\*Innen stellen jeweils die Arbeit einer anderen Gruppe vor und moderieren die anschließende Diskussion.

Dabei soll nachgewiesen werden, dass die Student\*Innen sowohl die wesentlichen Aspekte, wie eine nachhaltigen Quartiers-, Stadt- und Infrastrukturentwicklung an der behandelten Fallstudie umgesetzt wurde, verstanden haben und kritisch reflektieren können wie auch in angemessener Form präsentieren können.

Die Gesamtnote des Moduls setzt sich aus dem Essay (70%) sowie dem Kurzvortrag (30%) zusammen.

#### **Wiederholungsmöglichkeit:**

Folgesemester

#### **(Empfohlene) Voraussetzungen:**

Die Inhalte der Module

BV620007 Grundlagen des nachhaltigen Bauens

BV000029 Verkehrstechnik und Verkehrsplanung Grundmodul  
BV000031 Siedlungswasser- und Abfallwirtschaft Grundmodul

sollten den Student\*Innen geläufig sein.

### **Inhalt:**

In diesem Modul werden die Zusammenhänge zwischen stadtplanerischen und ingenieurwissenschaftlichen sowie architektonischen Konzepten und den hiermit in Verbindung stehenden Energie-, Stoff- und Verkehrsströmen aufgezeigt und vor allem deren Umsetzung genauer behandelt.

Einzelne Projekte im Bereich Hoch- und Tiefbau sowie Infrastruktursysteme und Siedlungsquartiere werden genauer betrachtet und analysiert. Die Umsetzung dieser Projekte unter Berücksichtigung des Standortes, der sozialen und gesellschaftlichen Aspekte sowie die Einbindung der energetischen und politischen Fragestellungen werden anhand von Fallstudien praxisnah untersucht. Der Neubau ebenso wie Vorhaben der Sanierung, Projekte im Bereich Plusenergiehaus, Null-Emissionsquartiere werden herangezogen.

Hierbei wird auf die Kriterien der Nachhaltigkeit exemplarisch in den Phasen Planung, Bau, Betrieb und Rückbau eingegangen, um in einer aktiven Auseinandersetzung zukünftig Gebäude, Strukturen, Systeme und Entwicklungen bewerten zu können.

### **Lernergebnisse:**

Nach dem Besuch des Moduls sind die Student\*Innen in der Lage:

- die Kriterien für Nachhaltigkeit anhand von beispielhaften Projekten anzuwenden sowie deren Beeinflussung und Wechselwirkungen bei den mitspielenden Parameter zu verstehen.
- nachhaltige Entwicklungen in Städten und Quartieren sowie von Tief- und Hochbauten unter räumlichen, strukturellen, materiellen, kulturellen und gesellschaftlichen Aspekten zu verstehen.
- die verschiedenen Subsysteme wie Infrastruktur, Gebäudebestand, Neubau, städtebauliche Rahmenbedingungen, Energieversorgung, Verkehr, Mobilität, Wasser, Müll, Nahrung, Bildung, soziale Struktur, Ressourcen/ Kreisläufe auf Quartiersebene, Mikroklima, Lebensqualität, Gesellschaftsstrukturen, Nutzungsstrukturen, Wirtschaftsstrukturen zu bewerten.
- Konzepte der aktiven und passiven Gebäudetechnik sowie intelligente Gebäudehüllen und Systeme der Gebäudesteuerung zu verstehen.
- Faktoren wie Komfort, Klima, Energieverbrauch, Endlichkeit der Ressourcen und CO<sub>2</sub> Ausstoß und deren gegenseitige Beeinflussung zu verstehen.
- szenarische Analysen und Beispiele zu verstehen und diese auf andere Objekte mit eigenen Lösungsvorschlägen anzuwenden.

### **Lehr- und Lernmethoden:**

Das Modul setzt sich aus einer Vorlesungsreihe sowie einem Seminar zusammen.

Ergänzend zu den Dozent\*Innen sind externe Expert\*Innen aus Wissenschaft und Praxis in die Vorlesungsreihe eingebunden. Die verschiedenen Akteur\*Innen der Stadtentwicklung vermitteln den Student\*Innen praxisnah Einblicke in die unterschiedlichen Subsysteme der Stadt und stehen für Diskussionen zur Verfügung.

Im Seminar werden die in der Vorlesung vermittelten Inhalte durch interaktive Formate wie Workshops, Diskussionen, studentische Präsentationen und Gruppenbetreuungen sowie eine mehrtägige Exkursion zur aktuellen Fallstudie weiter vertieft.

Die Teilnehmer\*Innen des Moduls suchen sich zu Beginn des Semesters jeweils ein Thema/Objekt aus den Lehrinhalten aus. Die möglichen Schwerpunkte beziehen sich auf die Fallstudie des aktuellen Semesters. Diese sind einem der übergeordneten Themenfeldern der Stadt wie beispielsweise Materialströme, Mobilität, Quartiere oder Gebäude zugeordnet.

Während des Semesters wird das gewählte Thema/Objekt von den Student\*Innen intensiv untersucht, ggf. vor Ort besichtigt sowie vorgestellt. Die Erarbeitung findet in kleinen Gruppen von jeweils 2-3 Student\*Innen statt.

Zusätzlich werden durch begleitende Workshops einzelne Inhalte und Methoden weiter vertieft. Die Zwischenpräsentationen, im Verlaufe der Erarbeitung des Essays, dienen der Übung.

Die Student\*Innen gestalten aktiv die Exkursionskomponenten mit und erarbeiten hierzu teils eigenständige Konzepte und Strategien.

Gegen Ende des Semesters wird das Ergebnis als schriftliche Ausarbeitung (Essay mit 5-7 Seiten zzgl. Grafiken, Bilder, Anhänge etc.) abgegeben.

Anschließend wird es in Form eines Kurzvortrags vorgestellt und gemeinsam diskutiert. In der Regel stellen die Student\*Innen jeweils die Arbeit einer anderen Gruppe vor

### **Medienform:**

Folien, Skriptum (wird erarbeitet aus den jeweiligen Vorlesungsschwerpunkten des Semesters), Poster, Beamerpräsentationen.

Exkursionen und Besichtigung der in den Fallstudien besprochenen Objekte mit unterstützenden Gastvorträgen und Führungen vor Ort.

### **Literatur:**

Bott, H., Grassl, G. C., & Anders, S. (2018). Nachhaltige Stadtplanung: lebendige Quartiere, Smart Cities, Resilienz

(2. Aufl., überarbeitet und aktualisiert). München: Detail.

Ekardt, F. (2016). Theorie der Nachhaltigkeit: Ethische, rechtliche, politische und transformative Zugänge - am

Beispiel von Klimawandel, Ressourcenknappheit und Welthandel (2. Aufl., vollständig überarbeitet und aktualisiert).

Baden-Baden: Nomos.

Friedman, T. L. (2009). Hot, flat, and crowded: Why we need a green revolution--and how it can renew America



(Release 2.0, updated and expanded ; 1st Picador ed.). New York: Picador/Farrar, Straus and Giroux.

Heck, H.-D., & Meadows, D. L. (1972). Dennis Meadows [u.a.] Die Grenzen des Wachstums (The limits to growth, dt.).

McDonough, W., & Braungart, M. (2002). Cradle to cradle: Remaking the way we make things (First edition). New York: North Point Press.

Meadows, D. H., Meadows, D. L., & Randers, J. (1992). [Hauptband] (6. Aufl.). Die neuen Grenzen des Wachstums: die Lage der Menschheit: Bedrohung und Zukunftschancen / Donella H. Meadows: A. Stuttgart: Dt. Verl.-Anst.

Zusätzlich wird zu Semesterbeginn jeweils eine ergänzende fallstudienspezifische Literaturliste auf Moodle zur Verfügung gestellt.

**Modulverantwortliche(r):**

Prof. Dr.-Ing. Werner Lang sekretariat.enpb.bgu@tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Nachhaltige Quartiers-, Stadt- und Infrastrukturentwicklungen (Vorlesung, 2 SWS)

Lang W [L], Hernández Chamorro A, Schade C, Schwering K

Fallstudien nachhaltiger Quartiers-, Stadt- und Infrastrukturentwicklungen (Seminar, 2 SWS)

Lang W [L], Hernández Chamorro A, Schade C, Schwering K

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2716: Forest Growth and Forest Operations | Forest Growth and Forest Operations

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The learning success of the module Forest Growth and Forest Operations will be assessed by a written examination of 90 minutes. This is due to the fact that biometric topics, growth processes and analyses as well as the forest growth modelling part of the lecture can be presented best in a written form by drawings, figures, calculation schemes, etc. For example the description of biological processes and growth cycles in forest growth simulators can best be explained and depicted by graphical representations.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in biology and forest science.

#### Inhalt:

The part Forest Growth deals with objectives and methods of forest growth and yield science. First, as fundamental topic, principal factors of the organic production of forest stands based on the driving forces (climate, water, nutrients) are shown and explained. In a next step growth and yield is analyzed more closely as part of the total production of plant communities. This leads to principles of tree shape development, tree growth and carbon dynamics in general. From individual tree growth the course proceeds to structure and development of whole forest stands. Both previous subjects provide the basic knowledge for understanding the effect of silvicultural treatment on quantitatively measured growth and yield characteristics. Growth trends, productivity

and carbon dynamics of the main tree species in Central Europe are presented. Analyses of stand structure, growth and yield in the view of climate change are discussed. Different types of forest growth models on tree, stand and forest enterprise levels are introduced. The part Forest Operations can be divided in 5 topics: (1) Overview of mechanized harvesting (methods and most common systems), (2) Environmentally sound resource road planning and construction, (3) Assessing the environmental impacts of forest operations on forest stands and soils, (4) Means of eco-efficient wood transportation from the forest to the mill and (5) Current developments in small-scale forest operations.

### **Lernergebnisse:**

On successful completion of the module, students are able to

- Understand the environmental factors influencing the forest stand production
- Describe the effects of silvicultural treatment on quantitatively measured growth and yield characteristics
- Understand the principles of growth models
- Analyze and evaluate the impact of environmental changes on tree and stand growth
- Create possible silvicultural measures to mitigate negative effects of environmental changes on forest stand growth
- Understand and evaluate the impact of biotic and abiotic factors on growth, vitality and stability of individual trees and forest stands
- Understand the fundamentals of sound resource road planning and construction
- Describe the links between mechanized harvesting and potential stand and soil damages
- Evaluate the productivity and carbon footprint of different harvesting systems.

### **Lehr- und Lernmethoden:**

Lectures and presentations, field trip (optional).

### **Medienform:**

Lectures and presentations (pdfs).

### **Literatur:**

FOREST GROWTH: Pretzsch, H., (2009): Forest Dynamics, Growth and Yield. Springer Verlag, Berlin, 664 S. 2009 published as Hardcover (ISBN 978-3-540-88306-7) 2010 published as paperback (ISBN 978-3-642-14861-3)

FOREST OPERATIONS: Bowers, S. 2012. Designing woodland roads. Oregon State University. EC 1137. 21 pp. Dykstra, D. P. and Heinrich, R. 1996. FAO Model code of forest harvesting practice. 85 pp. Enters, D., Applegate, G.B., Kho, P. C.S., and Man, G. (Eds.) 2002. Applying reduced impact logging to advance sustainable forest management. FAO. Heinrich, R. Recent developments on environmentally friendly forest road construction and wood transportation in mountainous forests. Rummer, B. 2009. New technology in forest operations. [www.forestlandowners.com](http://www.forestlandowners.com). 3 pp. Sutherland, B.J. 2003. Preventing soil compaction and rutting in the boreal forest of western Canada. FERIC. 53 pp.

**Modulverantwortliche(r):**

Rötzer, Thomas; Apl. Prof. Dr. agr. habil.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Low Impact Forest Operations (Vorlesung, 1,5 SWS)

Bauer E, Engler B

Low Impact Forest Operations Technology (Exkursion, ,5 SWS)

Bauer E, Engler B

Forest Growth (Vorlesung, 2 SWS)

Pretzsch H, Rötzer T, Torano Caicoya A

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ4098: Forestry Raw Materials and their Utilization | Forestry Raw Materials and their Utilization

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The learning success will be assessed by a written examination (duration 60 min) where students are expected to demonstrate the level of knowledge and their ability to use and apply it in solution finding strategies. Additionally a midterm Assignment, the students have to prepare and give a structured oral presentation in a seminar organized at the end of the summer term. The topic of the presentation is defined in agreement with the lecturer. The presentation may be prepared either individually or in groups of two. The midterm presentation Assignment allows to improve the examination mark by 0.3.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basics of biology, chemistry, physics and sciences to deal with the biological production, and the processing and conversion processes of wood to final products, and the environmental assessment.

#### Inhalt:

1. Overview and global potential of forest resources;
2. Availability, characteristics and properties of forest based products (wood and non-timber forest products);
3. Technologies and processes from raw materials to final products: sawn timber, wood-based products, pulp and paper;

4. Criteria and rules of a resource efficient application;
5. Environmental assessment of forestry raw materials and products.

### **Lernergebnisse:**

Upon successful completion of the module students are able to:

- illustrate the multidisciplinary of forests and their products;
- propose options to maximize the value chains of forest based products;
- exemplify production and process technologies and typical sector industries;
- demonstrate the role, potential and limitations of forestry raw materials in the framework of sustainable development;
- outline economical, environmental and social aspects of typical products and applications;
- develop strategies to strengthen the value and impact of typical forestry raw materials and non-timber forest products.

### **Lehr- und Lernmethoden:**

Lecture, exercises, seminar, Optional: visits to laboratories and industry.

### **Medienform:**

Demonstration material: raw materials and products; PP presentations; videos.

### **Literatur:**

Fengel, D.; Wegener, G. (2003): Wood - Chemistry, Ultrastructure, Reactions. Kessel Publishers  
Dinwoodie, J.M. (2000): Timber: Its nature and behaviour. Van Nostrand Reinhold Publishers  
Forest Products Laboratory (ed) (2010): Wood as an Engineering Material: <http://www.fpl.fs.fed.us-documents-FPLGTR-fplgtr.113-PL113.htm>.  
Rowell R. ed. (2012): Handbook of Wood Chemistry and Wood Composites. Sec. Edition, CRC Press Taylor & Francis Group, 703 pp.  
Shmulsky, R., Jones P.D (2011): Forest Products & Wood Science, 6th ed. Wiley-Blackwell, Chichester UK

### **Modulverantwortliche(r):**

Prof. Dr. Klaus Richter – Lehrstuhl für Holzwissenschaft Winzererstr. 45, 80797 München, Tel.: 089/ 2180 - 6421, [richter@hfm.tum.de](mailto:richter@hfm.tum.de)

### **Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Forestry Raw Materials and their Utilization (Übung, 2 SWS)  
Richter K, van de Kuilen J, Sanchez-Ferrer A

Forestry Raw Materials and their Utilization (Vorlesung, 2 SWS)  
Richter K, van de Kuilen J, Sanchez-Ferrer A

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](http://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ4161: Forest Management | Forest Management

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The module integrates different scientific and management methods with the objective to develop concepts for the sustainable management of forest. Forest managers must understand complex content and be able to explain it to a critical audience. The learning outcome will be assessed by an oral exam covering the whole outcomes of the module.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

None

#### Inhalt:

1. Definition of forest and forest ecosystem;
2. Overview of forestry on global, regional and local scales;
3. Introduction into objectives and methods of forest ecosystem management and forest management planning;
4. Demonstration of forest decision support systems and multiple-objective optimization;
5. Overview of silvicultural techniques;
6. Basic Knowledge of Forest economics;
7. Demonstration of examples in lowland and mountain forest management.

#### Lernergebnisse:

At the end of the module the students are able to:

- understand different concepts of Forest Management;
- understand different demands in forest management;
- apply means of linear programming to harmonize different measures;
- apply decision support systems;
- evaluate different forest management measures.

**Lehr- und Lernmethoden:**

The module is separated into lectures and exercises. Lectures providing the theoretical foundations and concepts in Forest Management. Exercises are done in supervised groups in the field.

**Medienform:**

PowerPoint presentation, additional reading material, software application

**Literatur:**

FAO (2009): State of the World's Forests; FAO (2006): Global Forest Resources Assessment 2005.

**Modulverantwortliche(r):**

Dr. Bernhard Felbermeier, felbermeier@lrz.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Forest Ecosystem Management (Vorlesung, 2 SWS)

Annighöfer P, Aramayo Schenk V, Felbermeier B

Forest Management Planning (Übung, 3,5 SWS)

Knoke T, Döllerer M, Gosling E, Kienlein S

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).



## Modulbeschreibung

### WZ4189: Fisheries and Aquatic Conservation | Fisheries and Aquatic Conservation

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2018/19

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Current information regarding the limited activities with physical presence due to the CoViD19-pandemic:

In case the framework requirements (hygiene, distance rules etc.) for examinations with physical presence are not met, the planned examination format can be changed to a digital (remote) examination according to §13a APSO. The decision on this change will be communicated as soon as possible, however latest 14 days before the actual examination date, by the responsible examiner in coordination with the examinations board.

The examination consists of a 60 min. written exam (Klausur). The examination means to measure the student's ability to assess anthropogenic influence on aquatic ecosystem functioning, evaluate the socioeconomic importance of fisheries and aquaculture, explain factors affecting susceptibility to and recovery from overexploitation and recall fisheries management tools for wild populations as well as of the underlying biological principles such as fish population dynamics. In the written examination students demonstrate by answering questions under time pressure and without helping material their theoretical and practical (e.g. application of methods) knowledge about fisheries management. For answering the questions, the students require their own wording. The regular examination consists of a 60 min. written exam (Klausur). The examination means to measure the student's ability to assess anthropogenic influence on aquatic ecosystem functioning, evaluate the socioeconomic importance of fisheries and aquaculture, explain factors affecting susceptibility to and recovery from overexploitation, create and apply sustainable aquatic conservation tools and recall fisheries management tools for wild populations as well as of the underlying biological principles such as fish population dynamics. In the written

examination students demonstrate by answering questions under time pressure and without helping material their theoretical and practical (e.g. application of methods) knowledge about fisheries management. For answering the questions, the students require their own wording. In the practical exercise the students prepare a brochure or poster to practice the knowledge transfer to specific target audiences in the context of fisheries and aquatic conservation.

### **Wiederholungsmöglichkeit:**

### **(Empfohlene) Voraussetzungen:**

Interest in aquatic biology, social sciences, conservation biology and management; this course can be selected

independently from other courses in the fields of Fish Biology and Limnology at TUM

### **Inhalt:**

The module combines the theoretical background and the practical implementation of fisheries management and aquatic conservation. The key aspects are:

1. Introduction to fish, shellfish and fisheries management,
2. The socioeconomic importance of fisheries and aquaculture,
3. The functioning of aquatic ecosystems and the impacts of fisheries on aquatic ecosystem health,
4. Factors affecting susceptibility to and recovery from overexploitation,
5. Fisheries Management Tools for wild populations,
6. Aquaculture,
7. Aquatic Biodiversity Conservation,
8. Case study and knowledge transfer/communication exercise

### **Lernergebnisse:**

At the end of the module students understand the importance of aquatic resources for mankind and the variables which influence ecosystem functions as well as the principles of aquatic biodiversity conservation. They are able to analyze the effects of natural and man-made disturbances in aquatic ecosystems (e.g. overexploitation) based upon an interdisciplinary understanding of methodological aquatic and fisheries biology, human dimensions, socioeconomic factors and management skills. In addition, students are able to objectively integrate knowledge from different disciplines (e.g. fish biology, conservation biology, commercial fishing techniques, aquatic habitat assessment and management) to evaluate sustainable resource management.

### **Lehr- und Lernmethoden:**

The module combines a lecture "Fisheries Management" with an accompanying practical exercise "Applied Aquatic Conservation". The lecture contents will be presented using lectures based on power-point presentation, group work and interactive role plays in order to combine activating teaching methods with classic presentation techniques. In the accompanying practical exercise to the lecture the students will apply the gained theoretical knowledge by conducting case studies

or participating research experiments with various content in the field of freshwater ecology and aquatic conservation. The content of the practical work is incorporated into running research projects at the chair (e.g. habitat restoration, artificial breeding programmes, habitat assessment, conservation genetics). Additionally, the students learn to independently screen the respective literature in this field and learn methods in science communication.

**Medienform:**

Form of presentation: lecture, case study, movie segment and practical exercise  
material: lecture notes, flip-chart/board, plus different materials for methodological/technical training

**Literatur:**

1. King (2007) Fisheries Biology, Assessment and Management
2. Helfman (2007) Fish Conservation: A guide to understanding and restoring global aquatic biodiversity and fishery resources
3. Moyle & Cech (2004) Fishes An introduction to Ichthyology
4. Primack (2008) A primer of conservation biology

**Modulverantwortliche(r):**

Prof. Dr. Jürgen Geist, [geist@wzw.tum.de](mailto:geist@wzw.tum.de)

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Fisheries Management (Vorlesung, 2 SWS)  
Geist J

Applied Aquatic Conservation (Übung, 2 SWS)

Geist J [L], Bayerl H, Geist J, Pander J, Stoeckle B

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### IN2124: Grundlegende Mathematische Methoden für Imaging und Visualisierung | Basic Mathematical Methods for Imaging and Visualization

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2011/12

<b>Modulniveau:</b> Bachelor/Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Prüfungsart: schriftliche Klausur

Die Prüfungsleistung wird in Form einer 75-minütigen schriftlichen Klausur erbracht, in der die Studierenden anhand der gestellten Aufgaben nachweisen, dass sie über Kenntnisse der grundlegenden mathematischen Methoden verfügen, und diese erfolgreich bei der Lösung von einfachen, abstrakten mathematischen Problemstellungen anwenden können. Ferner demonstrieren die Studierenden beim Lösen von Aufgaben mit Bezug zu konkreten Anwendungen in Image Processing und Computer Vision, dass sie Anwendungsprobleme mathematisch formulieren können, ihre mathematischen Eigenschaften analysieren können, und mit geeigneten Methoden lösen können.

#### Wiederholungsmöglichkeit:

Semesterende

#### (Empfohlene) Voraussetzungen:

IN0015 Diskrete Strukturen, IN0018 Diskrete Wahrscheinlichkeitstheorie, IN0019 Numerisches Programmieren, MA0901 Lineare Algebra für Informatik, MA0902 Analysis für Informatik

#### Inhalt:

Grundlegende, oft angewandte Techniken werden in der Vorlesung präsentiert und anhand von Anwendungen aus Image Processing und Computer Vision demonstriert. Dieselben

mathematischen Methoden kommen aber auch in anderen Ingenieurs-Disziplinen wie Künstliche Intelligenz, Machine Learning, Computergrafik, Robotik etc. zum Einsatz.

Folgende Inhalte werden beispielhaft behandelt:

- Lineare Algebra
- ++ Vektorräume und Basen
- ++ Lineare Abbildungen und Matrizen
- ++ Lineare Gleichungssysteme, Lösen von linearen Gleichungssystemen
- ++ Methode der kleinsten Quadrate
- ++ Eigenwertprobleme und Singulärwertzerlegung
- Analysis
- ++ Metrische Räume und Topologie
- ++ Konvergenz, Kompaktheit
- ++ Stetigkeit und Differenzierbarkeit im Mehrdimensionalen, Taylor-Entwicklung
- Optimierung
- ++ Existenz und Eindeutigkeit von Minimierern, Identifikation von Minimierern
- ++ Gradientenabstieg, Conjugate Gradient
- ++ Newton-Verfahren, Fixpunktiterationen
- Wahrscheinlichkeitstheorie
- ++ Wahrscheinlichkeitsräume, Zufallsvariablen
- ++ Erwartungswert und bedingte Erwartung
- ++ Schätzer, Expectation Maximization Methode

In den Übungen gibt es die Möglichkeit für die Teilnehmer bei der Implementation oder Anwendung der Methoden zur Lösung von realen Problemstellungen ein tieferes Verständnis zu erlangen und praktische Erfahrung zu sammeln.

### **Lernergebnisse:**

Nach der erfolgreichen Teilnahme an diesem Modul verstehen die Teilnehmer die grundlegenden mathematischen Techniken und Methoden. Sie sind dann in der Lage, reale Aufgabenstellungen im Gebiet Imaging und Visualisierung zu formulieren sowie Methoden für die Problemlösung auszuwählen, zu optimieren und zu bewerten. Sie können diese Techniken und Methoden auch auf andere Ingenieurs-Disziplinen wie Künstliche Intelligenz, Machine Learning, Computergrafik, Robotik, etc. anwenden.

### **Lehr- und Lernmethoden:**

Das Modul besteht aus einer Vorlesung und einer begleitenden Übungsveranstaltung. Die Inhalte der Vorlesung werden im Vortrag und durch Präsentation mit Tafelanschrieb vermittelt. Studierende werden insbesondere durch die Lösung von Übungsblättern zur inhaltlichen Auseinandersetzung mit den Themen und ihren Anwendungen angeregt. Die Lösung der Übungsaufgaben wird in der Übungsveranstaltung besprochen.

### **Medienform:**

Folienpräsentation, Tafelanschrieb

**Literatur:**

**MATLAB**

- Cleve Moler, first chapter of Numerical Computing with MATLAB, SIAM Linear Algebra
  - Yousef Saad, Iterative Methods for Sparse Linear Systems, SIAM
  - Lloyd N. Trefethen and David Bau, Numerical Linear Algebra, SIAM
  - Gilbert Strang, Introduction to Linear Algebra, Wellesley-Cambridge Press Analysis
  - Walter Rudin, Real and Complex Analysis, McGraw-Hill Optimization
  - Ake Björck, Numerical Methods for Least Squares Problems, SIAM
  - Jonathan Shewchuk, An Introduction to the Conjugate Gradient Method Without the Agonizing Pain
  - Uri Ascher, A first course in numerical methods, SIAM Probability Theory
  - Heinz Bauer, Measure and Integration Theory, deGruyter
  - Sheldon Ross, Introduction to probability and statistics for engineers and scientists, Elsevier
- PDEs**
- Lloyd Nick Trefethen , Finite Difference and Spectral Methods for Ordinary and Partial Differential Equations
  - Cleve Moler, chapter 11 of Numerical Computing with MATLAB, SIAM

**Modulverantwortliche(r):**

Navab, Nassir; Prof. Ph.D.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Grundlegende Mathematische Methoden für Imaging und Visualisierung (IN2124) (Vorlesung mit integrierten Übungen, 4 SWS)

Lasser T [L], Lasser T ( Nickel M, Simson W, Stefanoiu A )

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2717: Genetic Resources Management and Forest Protection | Genetic Resources Management and Forest Protection

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2020

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The learning outcome will be assessed by a written exam (duration 60 min) where the student have to analyze the risk of given pest and abiotic hazard-scenarios and to develop adequate management strategies. Furthermore they have to analyze a case study and interpret the genetic diversity situation presented there, including discussion of possible management strategies and problems. In this way, the students can demonstrate that they have obtained the ability to use their knowledge in real world management situations.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in biology and forest science

#### Inhalt:

Part I: Genetic Resource Management

1. introduction: DNA, genetic code, genes, alleles, genomes
2. speciation, hybridization, phylogenies
3. basics of population genetics
4. genetic variation in forest ecosystems
5. tree breeding, gene conservation & sampling strategies, certification of gene resources
6. genetics of plants and animals in the mountains
7. genetics of plants and animals in the Tropics

## 8. sustainable management strategies

Part II: Forest Protection- pathogens, insect pests, climatic and abiotic factors.

### a) fungal pathogens in forest ecosystems

1. fungal pathogens-woody plant interactions worldwide (incl. Phytophthora pathogens)
2. techniques to identify fungal pathogens in forest ecosystems
3. techniques to inhibit pathogen spread
4. management strategies for nurseries and forest ecosystems

### b) insect pests in forest ecosystems

1. insect morphology, anatomy and development
2. insect biology
3. herbivorous insects on trees
4. economically important herbivorous insects
5. pest control (monitoring and forecast)
7. insect pest management

### c) Abiotic hazards

This part addresses risks of non-biotic damages (wind, water in different aggregation states, fire, pollutants, extreme climate conditions) and its interactions with pests and diseases as well as preventive management activities.

### **Lernergebnisse:**

On successful completion of the module, students are able to

- assess genetic diversity patterns in natural populations of different groups of organisms (mammals, birds, plants)
- understand the importance of maximizing genetic diversity
- understand the impact of biotic and abiotic factors on vitality and stability of individual trees and forests;
- assess the impact of fungal pathogens and insects on tree health;
- apply their ecological knowledge to minimize and forecast the risk of damages by fungal pathogens and insect pests;
- characterize the impact of forest management on insect populations and crop loss.

### **Lehr- und Lernmethoden:**

lectures and presentations, field trip (optional)

### **Medienform:**

lectures and presentations (pdfs)

### **Literatur:**

Agrios, G.N. 2005, Plant Pathology, 5th edition. Elsevier Academic Press, Oxford \* Speight, M.R. & Wylie, F.R., 2001: Insect pests in tropical forestry. CABI publishing. \* Ruppert, E.E. & Barnes, R.D., 1993: Invertebrate Zoology 6th edition (Chapter 16 insects; p 825-862)



**Modulverantwortliche(r):**

Prof. Dr. Hanno Schäfer – Plant Biodiversity Research, Emil-Ramann-Str. 2, 85354 Freising, 08161/71-5884, [hanno.schaefer@tum.de](mailto:hanno.schaefer@tum.de)

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Biotic and Abiotic Forest Protection (Vorlesung, 2 SWS)  
Gruppe A, Seidl R

Genetic Resource Management (Vorlesung, 2 SWS)  
Schäfer H

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ1545: Human Resource Management in Agriculture and Related Industries | Human Resource Management in Agriculture and Related Industries

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2018/19

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

During the written exam (90 min.) students demonstrate their ability to understand human resource management practices, to select and adapt techniques suitable to specific contexts in agriculture and life science industries, to compare and contrast techniques and practices, to evaluate and change selected practices in case applications. Example practices cover the fields of planning the workforce, recruiting, selecting, and training employees, as well as providing feedback to, and evaluating employees, as well as discipline and dismissal, compensation, incentive plans, benefits and services, and workplace diversity. Students analyze exam questions and write up answers in their own words.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

BS Degree. Prior knowledge of basic ideas of economics and management is required; knowledge in strategic management is recommended.

#### Inhalt:

The course is designed to provide master level students with an understanding of pertinent human resource management practices and how to adapt practices from other industries to farms, horticultural and landscaping operations, in agribusinesses, in the food industry, and in related businesses. Practices relate to planning the workforce, recruiting, selecting, and training

employees, as well as providing feedback to, and evaluating employees. Additional practices relate to discipline and dismissal, compensation, incentive plans, benefits and services, and workplace diversity. Examples of current issues as well as laws and regulations provide context for different human resource management practices.

**Lernergebnisse:**

After successfully completing the module, students are able to accomplish the following:

- understand human resource management practices and their objectives;
- evaluate human resource management practices in use;
- develop and adapt appropriate human resource management practices for specific organizations in agriculture and the life science industries.
- determine the fit of different human resource management practices with different organizational goals and environments.

**Lehr- und Lernmethoden:**

Lectures serve to introduce human resource management practices and their objectives.

Video clips serve to illuminate HRM practices and as a basis of discussion of practices. Case descriptions and task sheets are analyzed in small groups and discussed in class to empower students to apply human resource management practices in specific constellations.

**Medienform:**

Presentation software, case descriptions and task sheets, discussion facilitation support media, video clips

**Literatur:**

Dessler, G. (latest edition). Human resource management, Prentice Hall: Upper Saddle River/NJ.

**Modulverantwortliche(r):**

Vera Bitsch bitsch@tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Human Resource Management in Agriculture and Related Industries (Seminar, 4 SWS)

Bitsch V [L], Bitsch V

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ1545: Human Resource Management in Agriculture and Related Industries | Human Resource Management in Agriculture and Related Industries

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2018/19

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

During the written exam (90 min.) students demonstrate their ability to understand human resource management practices, to select and adapt techniques suitable to specific contexts in agriculture and life science industries, to compare and contrast techniques and practices, to evaluate and change selected practices in case applications. Example practices cover the fields of planning the workforce, recruiting, selecting, and training employees, as well as providing feedback to, and evaluating employees, as well as discipline and dismissal, compensation, incentive plans, benefits and services, and workplace diversity. Students analyze exam questions and write up answers in their own words.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

BS Degree. Prior knowledge of basic ideas of economics and management is required; knowledge in strategic management is recommended.

#### Inhalt:

The course is designed to provide master level students with an understanding of pertinent human resource management practices and how to adapt practices from other industries to farms, horticultural and landscaping operations, in agribusinesses, in the food industry, and in related businesses. Practices relate to planning the workforce, recruiting, selecting, and training

employees, as well as providing feedback to, and evaluating employees. Additional practices relate to discipline and dismissal, compensation, incentive plans, benefits and services, and workplace diversity. Examples of current issues as well as laws and regulations provide context for different human resource management practices.

**Lernergebnisse:**

After successfully completing the module, students are able to accomplish the following:

- understand human resource management practices and their objectives;
- evaluate human resource management practices in use;
- develop and adapt appropriate human resource management practices for specific organizations in agriculture and the life science industries.
- determine the fit of different human resource management practices with different organizational goals and environments.

**Lehr- und Lernmethoden:**

Lectures serve to introduce human resource management practices and their objectives.

Video clips serve to illuminate HRM practices and as a basis of discussion of practices. Case descriptions and task sheets are analyzed in small groups and discussed in class to empower students to apply human resource management practices in specific constellations.

**Medienform:**

Presentation software, case descriptions and task sheets, discussion facilitation support media, video clips

**Literatur:**

Dessler, G. (latest edition). Human resource management, Prentice Hall: Upper Saddle River/NJ.

**Modulverantwortliche(r):**

Vera Bitsch bitsch@tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Human Resource Management in Agriculture and Related Industries (Seminar, 4 SWS)

Bitsch V [L], Bitsch V

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2731: Hydrometeorology and Management of Water Resources | Hydrometeorology and Management of Water Resources

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2020

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

- 1) Hydrometeorology - 30 min mündliche Prüfung
- 2) Seminar Management of Water Resources - Abgabe einer schriftlichen wissenschaftlichen Ausarbeitung in Form eines Buchkapitels.

Wichtung der beiden Teilprüfungen im Verhältnis 60 (mündlich) zu 40 (Ausarbeitung).

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in chemistry and physics.

#### Inhalt:

1. Hydrometeorology (including hydrological cycles, precipitation-, run off-, evapotranspiration - process of formation, measurement, global and regional spatial and temporal patterns, influences by land use land cover change, climate change scientific basis, climate change impacts, adaptation, vulnerability in water resources).
2. Problems in water management according to too little water, too much or too dirty. Different aspects of water augmentation (e.g. harvesting, desalination, translocation), water conservation (irrigation, pricing, household, ...), water management processes (e.g. IWRM, virtual water) are discussed by practical examples;

**Lernergebnisse:**

Upon the successful completion of this module the students are able to understand the basics of hydrology, and the influence of climate change on hydrological processes and management. They are able to analyze and classify various problems in water resource management and to assess the suitability and applicability of different management practices in the field of water augmentation (e.g. rain water harvesting, fog nets, dams) and water saving strategies (e.g. in irrigation, sanitation) to integratively solve water-resource-problems.

**Lehr- und Lernmethoden:**

The basics of hydrology and meteorology are presented and discussed in a lecture with thorough explanations. Some simple case studies are used to introduce into the theoretical background (e.g. meteorological instruments at the meteorological platform). Student presentations and discussions, group work in the seminar.

**Medienform:**

PowerPoint presentations; Presentation notes supporting the lecture. Case studies.

**Literatur:**

Ahrends (2000) Meteorology today, 7th edition. Jones JAA (2010) Water Sustainability - A Global Perspective, Hodder Education London. Clarke R & King J (2004) The atlas of water. Figueres C. et al. (2003) Rethinking water management. Wescoat JL et al. (2003) Water for life, water management and environmental policy. Grambow M (2008) Wassermanagement.

**Modulverantwortliche(r):**

Prof. Dr. Annette Menzel - Professur für Ökoklimatologie Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/ 71-4740, amenzel@wzw.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Management of Water Resources (Vorlesung, 2 SWS)  
Estrella N, Menzel A

Introduction to Hydrometeorology (Vorlesung, 2 SWS)

Menzel A [L], Estrella N

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### EI7467: Interdisciplinary Project Internship Concept Development of a Renewable Energy System in a Developing Country | Interdisciplinary Project Internship Concept Development of a Renewable Energy System in a Developing Country

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2016/17

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 6	<b>Gesamtstunden:</b> 180	<b>Eigenstudiums- stunden:</b> 135	<b>Präsenzstunden:</b> 45

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

#### Inhalt:

#### Lernergebnisse:

#### Lehr- und Lernmethoden:

#### Medienform:



**Literatur:**

**Modulverantwortliche(r):**

Hamacher, Thomas; Prof. Dr.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Interdisziplinäres Projektpraktikum Konzeptentwicklung eines Erneuerbaren Energiesystems in einem Entwicklungsland (Forschungspraktikum, 4 SWS)

Hamacher T, Winklmaier J

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2733: Introduction to Soil Science | Introduction to Soil Science

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 80	<b>Präsenzstunden:</b> 70

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

In a written exam of 60 minutes duration, the students demonstrate by answering questions without helping material their understanding of the nature and properties of soils, and they remember the characteristics of the soils of the field course as well the field assessment methods. In a pass/fail exam (laboratory assignment) in the field of 10 minutes duration, they prove their ability to survey and interpret a soil profile.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in chemistry, physics, and biology.

#### Inhalt:

- What is a soil?
- Mineral (inorganic) soil components
- Soil biology and soil organic matter
- Soil chemistry
- Soil physics
- Soil survey
- Soil interpretation
- Soil hydrology
- Soil erosion assessment

**Lernergebnisse:**

The students understand the basics of soil science. They can use their knowledge from soil mineralogy, soil organic matter, soil chemistry, and soil physics to understand soil formation processes and important biochemical and physical properties. The students are able to survey a soil profile and to detect the genesis of the surveyed soil. They can evaluate the possibilities of soil use, the risks to the soil itself and the risks to its environment. They are able to evaluate the hydrology of the soil and to judge the erosion risk.

**Lehr- und Lernmethoden:**

The lecture discusses the essentials of soil science. The field assessment starts with peer instructions to analyse a soil profile. During the course, the students will do more and more group work to train the evaluation of a soil profile, its hydrology and its erosion risks.

**Medienform:**

Lecture: presentation notes. Field Assessment: spade, auger, knife, colour charts, TDR probes, suction cups, erosion assessment kits

**Literatur:**

Brady, Weil: The nature and properties of soils, 14th edition, 2007.  
Blume et al.: Scheffer/Schachtschabel Soils Science, 2016.  
Eash, Sauer, O'Dell, Odoi, Bratz: Soil science simplified, 6th edition, 2016.  
Blum, Schad, Nortcliff: Essentials of Soil Science, 2016.  
FAO Guidelines for Soil Description. Prepared by Jahn, Blume, Asio, Spaargaren, Schad, 2006.

**Modulverantwortliche(r):**

Steffens, Markus; Dr. rer. nat.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Introduction to Soil Science: Lecture (Vorlesung, 2 SWS)  
Schweizer S

Introduction to soil science: Field course (Übung, 3,5 SWS)

Wiesmeier M [L], Wiesmeier M, Garcia Franco N, Huber J, Schad P, Völkel J

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ4094: Landscape Management - Application Study | Landscape Management - Application Study

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 95	<b>Präsenzstunden:</b> 75

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The assessment is based on: 1. the participation intensity on discussions and the quality of the contributions during the courses; 2. the demonstrated skills in creating new data layers by combining existing data from official sources (administrations, organizations, etc.) using GIS techniques, in exploring new data and information layers (RS, vegetation ecology), etc. 3. the contribution in developing the project (planning competences); 4. the presentation style, contents and layout; 5. the team work; 6. the project report.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

The successful completion of the modules "Inventory Methods and GIS", "Remote Sensing and Image Processing", "Geographical Information Systems and Vegetation Ecology" and "Landscape Planning" or equivalent skills are required, courses on scientific writing and reporting recommended.

#### Inhalt:

1. Implementation of GIS and RS techniques.
2. Implementation of theoretical concepts of Vegetation Ecology;
3. Implementation of theoretical concepts of Landscape Planning;
4. Oral presentation of findings;
5. Elaboration of a final report.

### **Lernergebnisse:**

At the end of the module the students are able to develop or at least to contribute to a landscape management project. More in detail the students are able to:

- work in a team;
- apply the theoretical and practical skills in vegetation ecology, landscape planning, remote sensing and GIS techniques;
- contribute to context-dependant landscape-related planning;
- deliver an oral presentation to communicate their findings;
- prepare a convincing project report using supporting data to back their statements in accordance with guidelines for scientific writing.

### **Lehr- und Lernmethoden:**

Prime characteristic of the Application Study is the self-organized group work by the students to reach the defined objective of the project assignment. Progress of the team is supported by group discussions, theory input and coaching provided by lecturers on demand.

### **Medienform:**

Scripts and reports of the above listed lectures and exercises offered within the elective field; basic data sets to develop the application study (GIS, RS, etc.); additional information on request and up on necessity (project driven).

### **Literatur:**

The literature recommended within the Modules "Inventory Methods and GIS", "Remote Sensing and Image Processing", "Geographical Information Systems and Vegetation Ecology", "Landscape Planning and Applied Development Cooperation" should be used.

### **Modulverantwortliche(r):**

Dr. Thomas Schneider – Professur für Waldinventur und nachhaltige Nutzung Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/ 71-4666; tomi.schneider@tum.de

### **Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Landscape Management - Application Study (Vorlesung mit integrierten Übungen, 5 SWS)

Augenstein I, Döllerer M, Schneider T

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WI001164: Modeling and Optimization in Energy Markets | Modeling and Optimization in Energy Markets

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2017

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester/ Sommersemester
<b>Credits:*</b> 6	<b>Gesamtstunden:</b> 180	<b>Eigenstudiums- stunden:</b> 120	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The module examination consists of laboratory assignments. Students are paired into groups of two (or three) and will work on two case study projects throughout the semester. Each group is evaluated based on their performance in each project, and each project requires the submission of a written report and an in-class presentation of their work. Therefore, students must submit two written reports and give two presentations overall. The presentations will be held on the last two sessions of the course, each group presenting one project on each session.

The reports are a means to assess the students' understanding of theories and methods, their ability to apply them to real world problems, and to implement their solution using a programming language. The presentations measure the students' ability to structure and present their results, connect them with state-of-the-art methods and theories, and present them in a scientific way. The students' reaction to questions and their critical analysis of their work reflect their ability to defend the results obtained based on rigorous scientific reasoning.

The final grade consists of a weighted average encompassing both projects. Each project will be weighted at 50%, and the project components will be such that the report weighs 70% and the presentation 30%.

Students will require the MATLAB skills they have learned during the course to carry out their project work, as well as all material and content that is presented during the course.

#### Wiederholungsmöglichkeit:

Folgesemester

## **(Empfohlene) Voraussetzungen:**

### **Inhalt:**

The course is an introduction to modelling and optimisation in the energy markets. During this course, students will learn how to use Matlab and solve some optimization problems using this tool. Furthermore, they will have the opportunity to understand optimisation theory and the basics of financial mathematics used in the energy markets. Additionally, some applications will be presented and analysed, while giving an overview of possible future research topics.

### **Lernergebnisse:**

Upon successful completion of this module, students will be able to use MATLAB as a tool to build standard mathematical models (1), to analyse statistical data sets (2), and to apply this framework in a financial setting (3). In particular, they will be able to explain the difference between financial products, price these products and model stock prices. They will be able to use MATLAB to (4) solve most linear (convex) optimisation problems, (5) and apply an optimisation mindset to real world problems in the Energy Markets, namely in production planning and storage.

### **Lehr- und Lernmethoden:**

The module combines various learning methods:

- Basic knowledge, theoretical concepts and practical examples are provided through the lecture;
- A practical component, students will require their laptops with an installed version of MATLAB, as they will apply what is learnt in interactive sessions.

Course content is transferred to students in typical class exposition, where the lecturer presents the course material with the assistance of lecture slides and the whiteboard.

However, students will be asked to apply the learned content immediately, interactively, through exercises and examples that will allow them to develop a practical understanding of the presented concepts.

Students perform these activities in groups of two, to stimulate discussion and reflection, and engage in a positive and informal learning environment.

### **Medienform:**

Presentation, white board, exercises in MATLAB

### **Literatur:**

Bhattacharyya, S. (2011) Energy Economics – Concepts, Issues, Markets and Governance; Springer 2011.

Erdmann, G. / Zweifel, P. (2010) Energieökonomik – Theorie und Anwendungen; 2. Auflage; Springer 2010.

Ströbele, W. / Pfaffenberger, W. / Heuterkes, M. (2010) Energiewirtschaft – Einführung in Theorie und Politik; 2. Auflage; Oldenbourg 2010.

**Modulverantwortliche(r):**

Wozabal, David; Prof. Dr. rer. soc.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Modeling and Optimization in Energy Markets (WI001164) (Vorlesung, 4 SWS)

Wozabal D [L], de Almeida Terca G

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).



## Modulbeschreibung

### WZ2722: Mountain Catchments under Changing Climate | Mountain Catchments under Changing Climate

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2020

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 80	<b>Präsenzstunden:</b> 70

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

In a written exam, students demonstrate that they have gained an understanding of hydrological processes and that they are able to apply and run a hydrological model for a mountain catchment. By an 10min oral presentation and a 5min discussion the students' ability to understand selected hydrology-related threats for mountain catchments and to scientifically analyze and evaluate important influencing factors, to present it to an audience, and to conduct a discussion about the presented subject in a clear and concise scientific manner is assessed. The final grade is an averaged grade from the presentation (65%) and the written exam (35%).

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Introduction in Hydrometeorology and management of water resources.

#### Inhalt:

In the Field Course Applied Hydrometeorology of Mountain Catchments we will visit selected research stations, field sites, hydrological infrastructure, restoration sites, and protected areas in the Munich PreAlpine and Alpine area and learn more about hydrology-related threats for mountain catchments ranging from Glacier melt to Munich's drinking water. Sites include e.g. Environmental Research Station Schneefernerhaus, KIT Alpine Campus Garmisch, Waldklimastation Kreuth, Sachenbach catchment, Versuchstation Obernach, Sylvensteinspeicher, Walchenseekraftwerk, Versuchstation Wielenbach, Mangfall / Lech Wassereinzugsgebiet.

The Hydrological Modeling course includes:

- 1) Dominant hydrological processes in mountain catchments: Precipitation types, runoff generation, concentration and flood routing
- 2) Data in mountain catchments: Availability, quality, acquisition and analysis
- 3) Types of hydrological models
- 4) Generation, parameterization and calibration of the process based hydrological model WaSiM
- 5) Model sensitivity analyses with focus on meteorological input and land use scenarios.

**Lernergebnisse:**

After completion of the module, the students understand the main processes in mountain catchments like runoff generation, runoff concentration and flood routing processes. Additionally, they are able to use a physically based hydrological model to simulate the rainfall runoff process in mountain catchments and its influencing parameters caused by the special circumstances of these regions in a widely realistic and transparent way. The students are able to generate event based scenarios as well as land use scenarios and understand recent hydrology-related threats for mountain catchments as well as the influence of climate change on hydrological processes and management in mountain areas. They remember suitable monitoring and risk prevention strategies and are able to analyze, evaluate and communicate (both oral and written) a specific case study or research questions related to the experimental sites visited to a general audience.

**Lehr- und Lernmethoden:**

Teaching methods include lecture as well as practical exercises at PC laboratory in respect to hydrological modelling, a week of field trip to Alpine and pre-alpine areas to the listed sites with guided tours by local scientists, administrators, TUM lectures as well as short presentations by the students.

**Medienform:**

PowerPoint Presentation, Hydrological model (e.g. WaSiM), Field work

**Literatur:**

IPCC (2013) Fifth Assessment Report; Shelton ML (2009): Hydroclimatology - Perspectives and Applications; IPCC (2008) Technical Paper VI on Climate Change and Water

**Modulverantwortliche(r):**

Responsible for Module: Prof. Dr. Annette Menzel - Professur für Ökoklimatologie Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/ 71-4740, menzel@wzw.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Introduction in Hydrological Modelling (Vorlesung, 2 SWS)  
Chiogna G

Field Course in Applied Hydrometeorology (Vorlesung mit integrierten Übungen, 3 SWS)  
Menzel A [L], Lüpke M

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ4206: Material Flow Management and Applications | Material Flow Management and Applications

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2018/19

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 105	<b>Präsenzstunden:</b> 45

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The examination consists of a research paper of around 12-15 pages which is the means to evaluate whether the students have understood and whether they are able to apply the methodology of material flow management on a case study in a scientifically manner and to create an own scientific paper about concepts for material flow management and treatment of materials based on the methodologies of material flow analysis and life cycle assessment.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

knowledge in natural science (biology, chemistry, ecology, physics);  
understanding for engineering science and also for social/cultural aspects.

#### Inhalt:

The students acquire detailed and differentiated knowledge about the following topics:

- need of material flow management
- procedure of material flow management
- material and substance flow analysis
- material flow assessment by sustainability indicators
- life cycle assessment
- development of strategies and measures for material flow management (e.g. resource efficiency, urban mining, industrial ecology, bio-economy, circular economy).

**Lernergebnisse:**

By the means of the module the students are able to:

- understand the necessity of material flow management
- understand the relationships between different processes, technological treatments of materials and organizational measures
- apply the procedure of material and substance flow analysis
- apply the assessment methods of indicator systems and life cycle assessment
- create concepts for material flow management and treatment of materials.

**Lehr- und Lernmethoden:**

Concerning teaching methods, lecture and presentation parts provide the theoretical foundation of materials flow management. Real case studies are introduced to the students and worked out in the class. Likewise within interdisciplinary projects in reality, the students have to define and to solve problems collaboratively in group work by studying specialist literature and data sources. At the end they have to create a research paper as homework about this topic. The students are supervised by tutorials by the lecturer.

**Medienform:**

Power point presentation, lecture sheets, case studies of material and substance flow analysis and life cycle assessment.

**Literatur:**

Brunner, P.H., Rechberger H. (2004): Practical Handbook in Material Flow Analysis. Advanced Methods in Resource and Waste Management. Lewis Publishers, Boca Raton, pp. 318.  
Brunner, P.H.; Rechberger, H.; 2016: Handbook of Material Flow Analysis: For Environmental, Resource, and Waste Engineers. Taylor & Francis Inc; 2. Revised Edition, pp. 453  
Weber-Blaschke, G.; 2009: Stoffstrommanagement als Instrument nachhaltiger Bewirtschaftung natürlicher und technischer Systeme. Ein kritischer Vergleich ausgewählter Beispiele. Schriftenreihe „Nachwachsende Rohstoffe in Forschung und Praxis“ des Wissenschaftszentrums Straubing, Bd. 1, Verlag Attenkofer, Straubing, 330 S.

**Modulverantwortliche(r):**

Prof. Dr. Gabriele Weber-Blaschke - Lehrstuhl für Holzwissenschaft Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/71- 5635; weber-blaschke@hfm.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Material Flow Management and Application (Vorlesung, 3 SWS)

Weber-Blaschke G [L], Weber-Blaschke G

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WI001215: Network and stakeholder analysis: Sustainable resource use and agri-food system | Network and stakeholder analysis: Sustainable resource use and agri-food system

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2019/20

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

There will be a 120-minute written exam. A written exam is necessary in order to assess the holistic understanding and analytical competencies of the students. In the exam, students will describe, discuss and analyze the concepts, dimensions and methodological approaches related to network and stakeholders in sustainable resource management and agri-food sector.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in cooperation and sustainability

#### Inhalt:

The module deals with the theoretical concepts, methodologies and measurement indicators and approaches of networks and stakeholders for sustainable resource management and agri-food system. Specific topics include the following:

- Network and stakeholder theories and concepts to understand, describe and explain the structure, characteristics, interactions among networks and stakeholders

- Concepts and approaches to examine network and stakeholder compositions, engagements, conflicts and influences in designing and implementing strategic decisions related to sustainable innovation, resource management and agri-food system.
- Types, levels and extents of risk associated with stakeholder engagement in implementing sustainability related projects and programs
- Specific methodological approaches, tools and indicators to evaluate and prioritize the performances, outcomes and implications of different network and stakeholder constellations.
- Other relevant current network and stakeholder issues in sustainable innovation, resource management and agri-food system.

### **Lernergebnisse:**

After completing the module, students are able to

- understand the theories, concepts, principles and frameworks underlying network and stakeholder issues, influences and collaborations for sustainable innovation, resource management and agri-food system
- apply relevant techniques and tools for describing social, economic, environmental and institutional contexts of network and stakeholder management and engagement policies and strategies towards achieving specific sustainable goals.
- analyze types, levels and extent of risks associated with stakeholder engagement and commitment in implementing sustainability related projects and programs
- critically assess and evaluate the structure, characteristics, and impacts of various forms of networks and stakeholder groups on the outcomes of sustainable resource management, innovation and agri-food system.

### **Lehr- und Lernmethoden:**

The module includes lectures, individual and group exercises, reading assignments, and presentations. The lectures will provide theoretical and conceptual basis. Individual and team exercises will be used to analyze and discuss specific network and stakeholder issues and their solutions.

### **Medienform:**

Präsentationen, Fallbeschreibungen, Skripte

### **Literatur:**

Freeman, R.E (1984). Strategic Management: A stakeholder Approach. Boston.

Prell, C., K. Hubacek and M. Reed (2009). Stakeholder analysis and social network analysis in natural resource management. Society & Natural Resources 22(6): 501-518.

Chiffolleau, et al. (2014) Understanding local agri-food systems through advice network analysis. *Agric Hum Values*, 31:19–32

Lange, P. et al. (2015). Sustainability in Land Management: An Analysis of Stakeholder Perceptions in Rural Northern Germany. *Sustainability*, (7): 683-704.

Reed, M. S. et al. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of Environmental Management* 90(5): 1933-1949.

Mcadam, et al. (2016). Regional Horizontal Networks within the SME Agri-Food Sector: An Innovation and Social Network Perspective. *Regional Studies*, 50(8): 1316–1329

Katz, N. et al. 2004. Network Theory and Small Groups. *Small Group Research*, 35(3): 307-332.

Sandström, A. and C. Rova (2010). Adaptive co-management networks: A comparative analysis of two fishery conservation areas in Sweden. *Ecology and Society* 15(3): 14.

Bixler, et al. R (2016). Network governance for large-scale natural resource conservation and the challenge of capture. *Frontiers in Ecology and the Environment* 14(3): 165-171.

Bixler, R. P. et al. (2016). Networks and landscapes: A framework for setting goals and evaluating performance at the large landscape scale. *Frontiers in Ecology and the Environment*, 14(3): 145-153.

Ernstson, et al. (2010). "Scale-crossing brokers and network governance of urban ecosystem services: The case of stockholm." *Ecology and Society*, 15(4): 28.

Muñoz-Erickson, T. A. and B. B. Cutts (2016). Structural dimensions of knowledge-action networks for sustainability. *Current Opinion in Environmental Sustainability*, 18: 56-64.

Wubben, E. and Gohar Isakhanyan. (2011). Stakeholder Analysis of Agroparks. *Int. J. Food System Dynamics* 2(2), 2011, 145#154.

The list will be expanded and updated using other thematically relevant books, journal articles and periodical newsletters and others.

**Modulverantwortliche(r):**

Abate Kassa, Getachew; Dr. rer. hort.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Network and stakeholder analysis: Sustainable resource use and agri-food system (WI001215)  
(Vorlesung, 4 SWS)

Abate Kassa G

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## Modulbeschreibung

### WZ2719: Landscape Planning | Landscape Planning

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2016

<b>Modulniveau:</b>	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The attainment of learning outcomes for the module will be assessed in a piece of research paper in which students work independently on complex issues of contemporary landscape planning demonstrating their breadth of understanding in drawing out implications of their findings and putting them into a broader context. The written assignment is complemented by a presentation and/or a colloquium for the purpose of assessing the capacity of the students to communicate their findings orally to an audience. Depending on the number of participants, research paper and accompanying talk may be prepared either individually or in groups.

#### Wiederholungsmöglichkeit:

#### (Empfohlene) Voraussetzungen:

Basis understanding of environmental systems. Course 2: Class discussion is a core element of the seminar. Therefore, students are expected to take part and contribute to the discussions.

#### Inhalt:

Concerned with the stewardship and enhancement of environmental systems, Landscape Planning is the key planning instrument for nature conservation and landscape management in Germany. The module introduces Landscape Planning and reflects on its potential contribution to sustainable land use with a focus on non-urban areas.

Course 1: Lectures will address the guiding principles, formal instruments and procedural elements of Landscape Planning; present methodological approaches for the assessment of natural assets and landscape functions including methods and tools for data collection, analysis and evaluation;

illustrate target formulation and implementation strategies with examples from the planning practice.

Course 2: The seminar gives students the opportunity to deepen their knowledge by reflecting on readings and planning documents as well as by discussing in class such topics as: contemporary and emerging scientific theories and methodological approaches relevant for environmental planning; rationale of stakeholder involvement; context-dependency of spatial planning; comparison of current jurisdictional and institutional arrangements on landscape-related planning in the home countries of the students and their implications.

**Lernergebnisse:**

Upon completion of the module, students are able to:

- recognize the purpose and objectives of Landscape Planning;
- explain instruments and procedural elements of contemporary Landscape Planning;
- select appropriate methods and tools to assess natural assets and landscape functions;
- be aware of the role of Landscape Planning in the decision-making upon the use of land;
- retrieve and interpret information from different sources;
- communicate key concepts relevant for environmental planning (both written and oral).

**Lehr- und Lernmethoden:**

Lectures provide subject specific knowledge; class discussions of selected readings engage students in critical thinking; in group work activities students experience the application of selected methods and tools.

**Medienform:**

Lectures, presentations, class discussions, small group exercises, assigned readings.

**Literatur:**

Haaren, Chr. v., Galler, C. & S. Ott (2008): Landscape planning. The basis of sustainable landscape development. Ed. by Federal Agency for Nature. Additional material will be provided.

**Modulverantwortliche(r):**

Dr. Isabel Augenstein – Lehrstuhl für Strategie und Management der Landschaftsentwicklung Emil-Ramann-Str. 6, 85354 Freising; 08161/71- 4783; isabel.augenstein@lrz.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Landscape Planning - lecture (Vorlesung, 2 SWS)  
Augenstein I

Landscape Planning - seminar (Seminar, 2 SWS)  
Augenstein I

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## Modulbeschreibung

### WI001205: People in Organizations: Managing Change and Sustainability in Agribusiness and the Food Industry | People in Organizations: Managing Change and Sustainability in Agribusiness and the Food Industry

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2018/19

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 6	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The course grade is based on a learning portfolio. The portfolio submitted includes memorandums addressing 9-10 of the case studies discussed in class; and a concept paper addressing an organizational concept. The concept paper is also presented by each student. Through the case memorandums the students demonstrate the ability to discuss the assigned case questions by selecting and applying suitable theoretical concepts. Building on the reflection process for each individual memorandum and the cases, which build on each other, deep-level contextual learning is achieved. In the concept paper, students demonstrate their ability to research and critically evaluate a current organizational concept. Through the presentation and discussion of the concept paper, students demonstrate their ability to communicate theoretical concepts and their application to realworld companies.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Advanced course. Prior knowledge of economics and management concepts is required. Successful completion of a management course on MSc. level is required, e.g., Human Resource Management in Agriculture and Related Industries or Agribusiness Management. Experience in desk research and scientific writing is required. Knowledge of basic concepts of human resource management and management skills is required.

### **Inhalt:**

Key concepts in organizational behavior, theory, and development:

- perspectives on organizations, their strengths and limitations;
- the role of the individual, the group, and the organization in a high performance environment;
- sustainability challenges, business ethics, and ethical conduct in bio-based industries;
- adapting to current challenges and changes in the institutional environment of agriculture and the food industry;
- understanding organizational change, facilitating change processes, and overcoming barriers in the context of agricultural, food, and related industries.

### **Lernergebnisse:**

Upon completion of the module students are able

- to select and apply suitable concepts of organizational behavior, theory, and development to meet organizational challenges and context, with a focus on sustainability;
- contrast the strengths and limitations of different perspectives on organizations;
- evaluate the potential impacts of various organizational management options on the individual, group, and organizational levels;
- identify ethical challenges and options;
- structure organizational change processes, apply models of organizational change, and evaluate their potential implications;
- adapt organizational management and development practices to specific contexts in the agricultural, food, and related industries.

### **Lehr- und Lernmethoden:**

Seminar: Case study based class discussions and presentations, group work based on cases and students' experiences, and assignments; student presentations and concept discussions; forum and group discussions based on individual document research. Through individually prepared class discussions and group work, students develop the ability to critically reflect and apply organizational behavior, theory, and development concepts; through presentations and concept discussions, students develop in-depth knowledge of exemplary theoretical concepts.

### **Medienform:**

Reading assignments; case descriptions, presentations, and discussions, supported by flipchart and other facilitation media

### **Literatur:**

Selected chapters from

Brown, Donald R. (latest edition). *An Experiential Approach to Organization Development*, Prentice Hall: Boston.

Daft, Richard L. (latest edition). *Organizational Theory and Design*. South-Western/Cengage Learning.

Kreitner, Robert and Kinicki, Angelo (latest edition). *Organizational Behavior*. McGraw-Hill Irwin.

Morgan, Gareth 2006. *Images of Organization*. Updated ed., Sage: Thousand Oaks/CA.

**Modulverantwortliche(r):**

Vera Bitsch bitsch@tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

People in Organizations: Managing Change and Sustainability in Agribusiness and Food Industry (WZ1563, WI001205) (Seminar, 4 SWS)

Bitsch V [L], Bitsch V, Benda L, Gabriel A

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ4082: Plantation Forestry and Agroforestry | Plantation Forestry and Agroforestry

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The learning outcomes are assessed by an oral examination. Based on specific problem statements the students have to demonstrate their ability to analyze and assess the situation, to understand the origin of the problem and to propose solutions adapted from the methodologies and techniques procured in the course.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

none

#### Inhalt:

Plantation forestry: Background, Definitions, Plantations in the Context of International Forest Policy, Plantation Forestry Purposes, Plantation Silviculture, Management and Economics;  
 Agroforestry (AF): Introduction (global land-use problems, definitions, terminology), Traditional AF Systems, Environmental, economic and socio-cultural aspects of AF, Interactions in AF systems, Important tree groups in AF (NFT's, MPT's, Palms), Planning in AF, Legal aspects  
 Forest Management for Carbon Sequestration: Role of forests in the global carbon cycle, Possible impacts of climate change on forests, International climate policy, Forest in the Kyoto Protocol (KP), Flexible mechanisms of the KP, REDD and REDD+, Forest management options, Modelling forest sequestration with CO2FIX, Case studies.

### **Lernergebnisse:**

Students will be able to

- understand and evaluate the major issues of plantations in the context of international forest policy,
- explain the fundamental purposes of Plantation Forestry,
- properly deploy the essential techniques of Plantation Silviculture, e.g. for establishment, tending and maintenance
- critically examine plantation projects (management, work volume, economic results).
- understand the fundamental principles and practices of agroforestry land use,
- analyze the interactions among different components of an AF system,
- assess the ecological and economic effects of AF-systems and develop adequate management options,
- address problems in the context of rural development and identify AF-based solutions
- understand the role of forests and forest management activities in the global C-cycle,
- assess forest management options for different purposes within the framework of the international climate policy,
- identify and develop concepts for mitigation projects.

### **Lehr- und Lernmethoden:**

Knowledge and skills are imparted by lectures, group discussions, presentation of case studies and small exercises; the learning methods are learning, reviewing scientific articles, and research reference articles. The lectures will provide theories and basic reference materials which will be deepened and proved by reviewing articles. The achieved skills will be used to develop and discuss solutions for specified problems.

### **Medienform:**

The module includes lectures - providing the theoretical foundations, discussions and small exercises.

### **Literatur:**

ABARE - JaakoPöyry (1999): Global Outlook for Plantations. Australian Bureau of Agricultural and Resource Economics (ABARE) Research Report 99.9, [www.abare.gov.au](http://www.abare.gov.au). Evans, J., Turnbull, J. W. (2004): Plantation forestry in the tropics. FAO, (1998): FRA 2000 - Terms and definitions. Forest Resources Assessment Programme, Working Paper 1. FAO (2001): Global Forest Resources Assessment 2000. FAO Forestry Paper 140. Pandey, D. and Ball, J. (1998): The role of industrial plantations in future global fibre supplies. *Unasylva* 193, Vol. 49, 37 - 43. Sawyer, J., (1993): Plantations in the Tropics. Smith, D.M., Larson, B.C., Kelty, M.J. and Ashton, P.M.S. (1997): The Practice of Silviculture: Applied Forest Ecology. Smith, J. (2002): Afforestation and reforestation in the clean development mechanism of the Kyoto protocol: implications for forests and forest people. *Int. J. Global Environmental Issues* 2 (3/4): 322-343. Shepherd, K.R. (1986): Plantation Silviculture. West, P. W. (2006): Growing Plantation Forests. Ashton, M.S. and Montagnini, F. (2000): The silvicultural Basis for Agroforestry Systems. *Agroforestry: Principles and Practice: Special issue of Forest Ecology and Management*, 45 (1991). Nair, P.K.R. (2012): Agroforestry, the future of global land use. Atangana et al. (2014): Tropical Agroforestry. Springer Verlag

**Modulverantwortliche(r):**

Dr. Bernhard Felbermeier; felbermeier@lrz.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Agroforestry and Forest Management for Carbon Sequestration (Vorlesung, 2 SWS)

Felbermeier B

Plantation Forestry (Vorlesung, 2 SWS)

Stimm B

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).



## Modulbeschreibung

### WZ4197: Protected Areas Biodiversity and Management | Protected Areas Biodiversity and Management

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2020

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Final oral examination of 20 minutes in the field of protected areas biodiversity and its management to examine whether the students have understood the problematic of securing biodiversity in protected areas and are able to verify conservation measurements.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Successful completion of the 1st semester of the Master Program Sustainable Resource Management is recommended

#### Inhalt:

Biodiversity and protected areas: A worldwide survey on ecozones and altitudinal belts of the world as carriers of natural biodiversity; protection of biological units; IUCN protected areas classification, the European FFH Directive as an example of a continent-wide tool for nature protection.

Habitat analysis and management: Habitat types, tools for protecting habitats, design of management plans, visitor management, best practice examples in sustainable biodiversity and habitat protection.

#### Lernergebnisse:

On successful completion of the module students are able to:

- to put ecosystems and its utilisation options as well as its threats into a global perspective
- give clear options for further management, both regarding utilisation and protection

**Lehr- und Lernmethoden:**

Lecture, case studies, practical experiments / demonstrations, discussions.

**Medienform:**

PowerPoint Presentation.

**Literatur:**

Jürgen Schultz (2005): The Ecozones of the World: Ecological Divisions of the Geosphere. Springer, Berlin. 459p.

**Modulverantwortliche(r):**

Prof. Dr. Ralph Kühn; kuehn@wzw.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Biodiversity in Protected Areas (Vorlesung, 2 SWS)

Kühn R [L], Gula R, Rödl T

Protected Area Management (Vorlesung, 2 SWS)

Kühn R [L], Gula R, Rödl T

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ4202: Political and Social Perspectives of Renewable Resources | Political and Social Perspectives of Renewable Resources

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 105	<b>Präsenzstunden:</b> 45

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Oral presentation of the group project work, review paper for a scientific journal. The learning outcomes are assessed by a group project work concerning a selected topic related to the political and social perspectives of renewable resources. Therefore students have to prepare a scientific paper for an international journal of their choice and give a short oral presentation about the work done for the paper, similar to what would be expected in a 15 minute conference presentation.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Knowledge of sustainable resources (materials and energy). Scientific writing.

#### Inhalt:

In the lectures a number of examples of societal aspects of Sustainable Resource programs will be presented and discussed. Backgrounds are global developments such as urbanization, the rise of countries like China and India, resource availability and technological developments. Case studies deal with tropical forestry and pros and cons of tropical hardwood uses, urban planning, vernacular architecture and the use of renewable resources. We take a tour around the world and look at social housing programs in Europe, Brazil and South-East Asia. Furthermore we look at successes and failures in the German/European energy policies in comparison to the United States.

**Lernergebnisse:**

After this course, students should be able to:

1. Develop SR stimulation programs on country or regional level and priority analysis of renewable resource applications
2. Assess priorities for development and application of renewable resources in countries with different levels of development
3. Critically analyze existing SR programs taking into account social values of stakeholders,
4. Assess impacts of global developments such as urbanization and UN-policies on SR.

**Lehr- und Lernmethoden:**

Discussion and creativity sessions. Project work evolving in a scientific paper for a journal of choice. Oral presentation.

**Medienform:**

Lectures, UN-policy notes, Discussion and Creativity sessions.

**Literatur:**

Tba

**Modulverantwortliche(r):**

Prof. Dr. Jan-Willem G. van der Kuilen - Professur für Holztechnologie Winzererstr. 45, 80797 München; +49 (89) 2180 - 6462; vandekuilen@hfm.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Political and Social Perspectives of Renewable Resources (Vorlesung, 4 SWS)

van de Kuilen J [L], van de Kuilen J, Westermayr M

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### EI74661: Renewable Energy Systems in Developing Countries | Renewable Energy Systems in Developing Countries [RiVEEE]

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2018/19

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 105	<b>Präsenzstunden:</b> 45

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Schriftliche Klausur von 60 Minuten:

- In Multiple-Choice- und Kurzfragen wird geprüft, ob die Studierenden Kennzahlen und theoretischen Kenntnisse korrekt wiedergegeben
- In Rechenaufgaben wird überprüft, ob die Studierenden Auslegungsberechnungen korrekt durchführen
- In Textaufgaben wird geprüft, ob die Studierenden Erneuerbare Energiesysteme in Entwicklungsländern korrekt charakterisieren und bewerten
- Die Klausur wird benotet.

Es können insgesamt bis zu 20% der Klausur durch Ankreuzen von vorgegeben Mehrfachantworten abgenommen werden.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

- Bachelor in einem technischen Studiengang oder TUM-BWL
- Interesse an Energiesystemen und deren Einsatz/Umsetzung in Entwicklungsländern
- Interesse an Wissen, das einerseits vom Fokus des eigenen Studiums abweichen kann, andererseits aber für das ganzheitliche Verständnis eigener Studieninhalte essentiell ist

### **Inhalt:**

Überblick über alle relevanten Themengebiete zu Energiesystemen in Entwicklungsländern:

- Verständnis der wichtigsten Komponenten erneuerbarer Energiesysteme (PV, Wind, Wasser, Biogas, Abfall, Dieselgeneratoren, Asynchronmotoren, Speichersysteme, einfache Steuer- und Regelungstechnik)
- Gesamtintegration (Kopplung der Einzelkomponenten zu einem Gesamtsystem)
- Wirtschaftliche Bewertung des Systems im Kontext der regionalen Märkte
- Kenntnis der Finanzierungsmöglichkeiten
- Bewertung sozio-kultureller Auswirkung des Technikeinsatzes

### **Lernergebnisse:**

Nach erfolgreichem Abschluss des Moduls sind die Studierenden in der Lage:

- alle Aspekte, welche für ein Energiesystem relevant sind, zu verstehen
- auch fachfremdes, für die ganzheitliche Analyse von Energiesystemen relevantes Wissen anwenden zu können
- Energiesysteme in Entwicklungsländern anhand technologischer, sozialer und wirtschaftlicher Möglichkeiten, Anforderungen und Beschränkungen bewerten zu können

### **Lehr- und Lernmethoden:**

Vorträge und Präsentationen von verschiedenen Dozenten.

In Übungsaufgaben soll das vermittelte Wissen der Vorlesungen zu Beispielthemen angewandt werden. Diese werden zu jedem Themengebiet zunächst von den Studierenden in Eigenarbeit bearbeitet und dann in der Übungsstunde erörtert. Dies werden vor allem Rechenaufgaben zu technischen Komponenten sein, jedoch auch Anwendungsbeispiele zu Finanzierungsmöglichkeiten oder Bewertungsmethoden soziokultureller Auswirkungen. Die Übungsaufgaben werden nicht benotet.

### **Medienform:**

Folgende Medienformen werden verwendet:

- Rechnergestützte Präsentation für die Vorträge
- Übungsaufgaben
- Besprechung ausgegebener Literatur

### **Literatur:**

- Engineers without Borders UK 2014 - Engineering in Development (die gesamte Vorlesung begleitende Literatur)
- Vortragsfolien der Dozenten
- Weitere themenspezifische Literatur auf Empfehlung der Dozenten

### **Modulverantwortliche(r):**

Prof. Dr. rer. nat. Thomas Hamacher

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Ringvorlesung Erneuerbare Energiesysteme in Entwicklungsländern (Vorlesung mit integrierten  
Übungen, 3 SWS)

Hamacher T, Winklmaier J

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte  
[campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### POL40100: Ringvorlesung: Politics & Technology | Introductory Lecture: Politics and Technology

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2020

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 6	<b>Gesamtstunden:</b> 180	<b>Eigenstudiums- stunden:</b> 120	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Current notice in view of the restricted presence operation due to the CoViD19 pandemic: If the general conditions (hygiene, distance rules, etc.) for a presence test are not available, the planned form of examination can be switched to electronic (remote) testing in accordance with §13a APSO. The decision about this change will be announced as soon as possible, but at the latest 14 days before the examination date by the examiner after consultation with the responsible examination board.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Keine

#### Inhalt:

The module is intended as an introduction to the questions and research being addressed in the main thematic areas of the master's program: big transformations and their environmental, technological, and social dimensions; democracy in a digital age; and global governance, ethics and technology. The links between these areas and research areas found in the TUM, such as economics and policy, digital technologies, social responsibility and corporate governance, and urbanization, mobility, and energy will be explained.



**Lernergebnisse:**

After participating in the module, students will have a strong overview of the kinds of research questions being addressed by faculty in the HfP. They will be knowledgeable about some of the big questions driving the study of politics and research methods and theories which are used to address those questions: What role does the state play in technological innovation? How well do different political systems address major challenges like climate change, biodiversity loss, and ocean acidification? How is support for democracy impacted by growing economic inequalities? How might new technologies alter forms of societal participation in governance processes?

**Lehr- und Lernmethoden:**

The module is offered in the form of two seminars, each dealing with different, but complementary thematic areas. One will focus on big questions for politics in a world of rapidly changing technologies, globalization, migration, and challenges to democracy. The other will look at major policy problems (the Energiewende, Resource depletion, urbanization) and how they are being addressed by governments, industrial actors, and civil society.

**Medienform:**

Online-Reader, PowerPoint

**Literatur:**

A reader of seminar texts with up-to-date and cutting edge scientific literature will be made available at the start of the semester.

**Modulverantwortliche(r):**

Schreurs, Miranda; Prof. Dr.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

(POL40100) Introduction to Politics, Technology & Sustainability (Vorlesung, 4 SWS)

Schreurs M ( Janßen S ), Ohlhorst D

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ1674: Research Methods and Economic Research Project | Research Methods and Economic Research Project

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2015

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester/ Sommersemester
<b>Credits:*</b> 6	<b>Gesamtstunden:</b> 180	<b>Eigenstudiums- stunden:</b> 120	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Examination Duration (in min.): 30.

The course grade consists of two parts: 50% project report and 50% in-class grade. The in-class grade consists of equal parts each, proposal presentation, project results presentation, peer review of another student's proposal, peer review of another student's project results, and discussion of applications of economic concepts.

Justification: Students demonstrate their ability to apply economic concepts through class discussions and development of project ideas.

Students demonstrate their ability to develop an economics research projects through the stages of proposal presentation, result presentation, and project report.

Students demonstrate their ability to evaluate other researchers' proposals and results in a constructive manner through presentations of reviews.

Students demonstrate their ability to manage resources, and deadlines through timely submission of the enumerated tasks in stages throughout their research projects.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

BSc. Degree. Prior knowledge of basic ideas of economics and management recommended.

### **Inhalt:**

The module provides master level students with an advanced understanding of the research process, its quality criteria, and the application of economic concepts to questions of food and agriculture. Key economic ideas are applied to everyday questions in class discussions based on economic texts, podcasts, and others. The development, execution, publication, and review of disciplinary and interdisciplinary research is explained in lectures and carried out by each student from beginning to end.

Steps include developing project ideas and research questions; using peer-reviewed literature to frame a student project; designing research plans with the appropriate methods and suitable techniques of data collection; structuring, preparing, presenting, and critically reviewing research proposals; data collection, data analysis, and data presentation; discussion and conclusions based on reflecting own empirical research in the light of the literature; disciplinary, professional, and ethical quality criteria of research in economics and management

### **Lernergebnisse:**

Students are able to apply economic ideas to questions related to food and agriculture in everyday life.

Students are able to develop and execute an economic research project in the field of agriculture, horticulture, and food.

Specifically, students are able to develop a project idea, develop a research question and objectives based on the project idea and the related scientific literature, and create a research plan, including the suitable combination of research methods and techniques; defend a research proposal based on the research plan.

Students are able to evaluate other (student) researchers' proposals and present such evaluations in a suitable form, orally.

Furthermore, students are able to apply their research plan through data collection, data analysis, and presentation of research results, in oral and written form; and are able to evaluate other (student) researchers' research process, results, and conclusions.

Students are able to manage resources and deadlines.

### **Lehr- und Lernmethoden:**

Lectures, class discussions, and guided student project development and project evaluation (project proposal, proposal review, project results, results review, and research report).

### **Medienform:**

Presentation slides, websites, articles and short texts, multi-media (podcasts, video clips), student presentations, and reviews.

### **Literatur:**

Hartford, Tim (latest edition). *The Undercover Economist*. Random House: New York.

O'Leary, Zina (latest edition). *The Essential Guide to Doing Your Research Project*. Sage: Los Angeles.

Committee on Science, Engineering, and Public Policy,  
National Academy of Sciences, National Academy of

Engineering, and Institute of Medicine (latest edition). On Being a Scientist: A Guide to Responsible Conduct in Research.

**Modulverantwortliche(r):**

Vera Bitsch bitsch@tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Research Methods and Economics Research Project (WZ1559, WZ1674) (Seminar, 4 SWS)

Bitsch V, Benda L

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ1674: Research Methods and Economic Research Project | Research Methods and Economic Research Project

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2015

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester/ Sommersemester
<b>Credits:*</b> 6	<b>Gesamtstunden:</b> 180	<b>Eigenstudiums- stunden:</b> 120	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Examination Duration (in min.): 30.

The course grade consists of two parts: 50% project report and 50% in-class grade. The in-class grade consists of equal parts each, proposal presentation, project results presentation, peer review of another student's proposal, peer review of another student's project results, and discussion of applications of economic concepts.

Justification: Students demonstrate their ability to apply economic concepts through class discussions and development of project ideas.

Students demonstrate their ability to develop an economics research projects through the stages of proposal presentation, result presentation, and project report.

Students demonstrate their ability to evaluate other researchers' proposals and results in a constructive manner through presentations of reviews.

Students demonstrate their ability to manage resources, and deadlines through timely submission of the enumerated tasks in stages throughout their research projects.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

BSc. Degree. Prior knowledge of basic ideas of economics and management recommended.

### **Inhalt:**

The module provides master level students with an advanced understanding of the research process, its quality criteria, and the application of economic concepts to questions of food and agriculture. Key economic ideas are applied to everyday questions in class discussions based on economic texts, podcasts, and others. The development, execution, publication, and review of disciplinary and interdisciplinary research is explained in lectures and carried out by each student from beginning to end.

Steps include developing project ideas and research questions; using peer-reviewed literature to frame a student project; designing research plans with the appropriate methods and suitable techniques of data collection; structuring, preparing, presenting, and critically reviewing research proposals; data collection, data analysis, and data presentation; discussion and conclusions based on reflecting own empirical research in the light of the literature; disciplinary, professional, and ethical quality criteria of research in economics and management

### **Lernergebnisse:**

Students are able to apply economic ideas to questions related to food and agriculture in everyday life.

Students are able to develop and execute an economic research project in the field of agriculture, horticulture, and food.

Specifically, students are able to develop a project idea, develop a research question and objectives based on the project idea and the related scientific literature, and create a research plan, including the suitable combination of research methods and techniques; defend a research proposal based on the research plan.

Students are able to evaluate other (student) researchers' proposals and present such evaluations in a suitable form, orally.

Furthermore, students are able to apply their research plan through data collection, data analysis, and presentation of research results, in oral and written form; and are able to evaluate other (student) researchers' research process, results, and conclusions.

Students are able to manage resources and deadlines.

### **Lehr- und Lernmethoden:**

Lectures, class discussions, and guided student project development and project evaluation (project proposal, proposal review, project results, results review, and research report).

### **Medienform:**

Presentation slides, websites, articles and short texts, multi-media (podcasts, video clips), student presentations, and reviews.

### **Literatur:**

Hartford, Tim (latest edition). *The Undercover Economist*. Random House: New York.

O'Leary, Zina (latest edition). *The Essential Guide to Doing Your Research Project*. Sage: Los Angeles.

Committee on Science, Engineering, and Public Policy,  
National Academy of Sciences, National Academy of

Engineering, and Institute of Medicine (latest edition). On Being a Scientist: A Guide to Responsible Conduct in Research.

**Modulverantwortliche(r):**

Vera Bitsch bitsch@tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Research Methods and Economics Research Project (WZ1559, WZ1674) (Seminar, 4 SWS)

Bitsch V, Benda L

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2720: Renewable Energy Technologies | Renewable Energy Technologies

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The examination consists of a written test, where the students have to proof that they understand and remember the basic technical principles related to energy production and the working principles of the presented renewable energy technologies, as well as the related ecological and economical properties and frame conditions. The students have to answer questions, but may also be asked to do calculations, complete figures or prepare sketches.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

General understanding of natural science, mathematics and basics of technology.

#### Inhalt:

The course provides an overview of the basics of thermodynamics and the principles of energy conversion. Energy conversion and its importance for the economy is discussed. Because of their transitional character due to the German "Energiewende", the course focusses on the European and German energy systems. The international students in the course are expected to support the lecture with their experiences from abroad.

Basic technical principles of energy production, efficiencies, costs and environmental impacts will be understood. The focus lies on the following areas: solar, wind, water and geothermal energy conversion.



In order to complete the picture, also storage and fossil fuel technologies will be discussed. The students will understand their role and their contribution to balancing energy production and demand.

**Lernergebnisse:**

At the end of the course, the students understand the technical principles of renewable energy conversion systems.

They are able to interpret energy scenarios and solve simple problems associated with a high renewable energy share and its implications on society.

The students can estimate the importance of distinct technologies for a sustainable energy supply.

**Lehr- und Lernmethoden:**

The course provides an overview of the basics of thermodynamics and the principles of energy conversion. Energy conversion and its importance for the economy is discussed. Because of their transitional character due to the German “Energiewende”, the course focusses on the European and German energy systems. The international students in the course are expected to support the lecture with their experiences from abroad.

Basic technical principles of energy production, efficiencies, costs and environmental impacts will be understood. The focus lies on the following areas: solar, wind, water and geothermal energy conversion.

Lecture with integrated exercises and teamwork, as well as discussions to improve understanding.

**Medienform:**

Power point presentation, black board, Videoclips

**Literatur:**

Tba

**Modulverantwortliche(r):**

Dr. Doris Schieder - Lehrstuhl für Chemie Biogener Rohstoffe [doris.schieder@tum.de](mailto:doris.schieder@tum.de)

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Renewable Energy Technologies (Vorlesung, 4 SWS)

Wieland C [L], Schieder D, Vandersickel A, Wieland C

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2737: Remote Sensing and Image Processing | Remote Sensing and Image Processing

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 80	<b>Präsenzstunden:</b> 70

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Achievements will be assessed by exercises, a presentation and a final report. On behalf of home exercises the students get a first insight into concepts of image analysis. "Hands on" exercises with state of the art software packages are employed to train the main image processing steps and to assess the understanding of the students in implementing the basic concepts of remote sensing from data take to data analysis. Regular discussions with the tutor measure the student's ability to develop an idea from initial concepts to the complete picture within a given timeframe, delivering interim results at relevant milestones (35%). On behalf of a presentation of a topic related to remote sensing the student's ability to understand a technical/scientific subject, to analyze and evaluate facts and factors of influence, to summarize the subject and present it to an audience, and to conduct a discussion about the presented subject is assessed. With the final report the students demonstrate that they have gained deeper knowledge of the specific image analysis software packages and its components, of differing analysis concepts and that they are prepared to evaluate an existing situation as imaged by the respective remote sensing data set. They demonstrate further that they are able to create new geodata layers appropriated to be analyzed in an integrating GIS environment (65%). The grade weights of module examination components correspond to the weighting factors given in brackets.

#### Wiederholungsmöglichkeit:

Folgesemester

### **(Empfohlene) Voraussetzungen:**

Module "Inventory Methods and GIS" of the 1st semester of the Master Program "Sustainable Resource Management" passed, computer skills at least at working level .

### **Inhalt:**

The implementation of data interpretation and information extraction concepts and techniques is trained "hands on" with the help of advanced image processing and analysis programs. Topics: 1. Introduction to image processing concepts; 2. Implications of air- and space borne data takes; 3. Data types: Digital aerial photographs, high to very high resolution multispectral and hyperspectral scanner data, LIDAR data; 4. Development of interpretation keys; 5. Exercises on data pre-processing; 6. Unsupervised and supervised classification concepts, pixel-based, object based classification strategies; 7. Exercises on land use/land cover classification; 8. Basic verification concepts; 9. Exercises on the extraction of bio-geo-chemo-physical parameter from RS data; 10. Change detection concepts; 11. Interrelation of Remote Sensing with GIS; 12. Access and data download from geodata provider.

### **Lernergebnisse:**

At the end of the Remote Sensing and Image Processing module (RSIP) the students are able to:

- decide which data set is most appropriated to solve his thematic task, - access data bases, download and open a data set for image processing, - geocode/georeference digital data sets,
- develop appropriated interpretation keys fitting the data set and the targeted thematic goal,- visualize and enhance the data set for interpretation, - extract spectral signatures, - calculate indices on behalf of the data,
- learn how to extract bio-geo-chemo-physical parameter from the data set, - perform unsupervised and supervised classifications, - proof the quality of the results by an accuracy assessment, - perform a change detection study, - export the results as GIS layer.

### **Lehr- und Lernmethoden:**

By using advanced image processing software packages the theoretical explained concepts are exercised "hands on" and discussed on basis of different data types applying the "just in time teaching (JiTT)" technique; the practical courses are prepared by homework (presentation of specific related topics, exercises); the short presentations will be given during the courses, contents, layout and style discussed and narrated; the home exercises explained in close relation to the computer exercises just done. The definition of the problem to be solved by image analysis techniques and the development of appropriated solutions needs research of reference materials. The final outcome of the courses, the classification result, will be used as basis for the Module "Application Study" of the concentration field "Landscape Management".

### **Medienform:**

Image processing software and tutorials, prepared exercises, different data types

### **Literatur:**

The literature recommended within the Modules "Inventory Methods and GIS", "Remote Sensing and Image Processing", [www.wiau.man.ac.uk/courses/cvmsc/Terminol.htm#SplitMerge](http://www.wiau.man.ac.uk/courses/cvmsc/Terminol.htm#SplitMerge);

[www.pfc.cfs.nrcan.gc.ca/landscape/inventory/wulder/large\\_area\\_rs/index.html](http://www.pfc.cfs.nrcan.gc.ca/landscape/inventory/wulder/large_area_rs/index.html); <http://www.pfc.cfs.nrcan.gc.ca/landscape/inventory/wulder/hirespres.html>; Uni Zürich, RSL: <http://www.geo.unizh.ch/rsl2/>; EARSeL: <http://www-earsel.cma.fr/>; <http://www.ccrs.nrcan.gc.ca/ccrs/eduref/tutorial/indexe.html>; <http://observe.ivv.nasa.gov/nasa/education/reference/main.html>; <http://rst.gsfc.nasa.gov/starthere.html>

**Modulverantwortliche(r):**

Dr. Thomas Schneider – Fachgebiet für Waldinventur und nachhaltige Nutzung  
[tomi.schneider@tum.de](mailto:tomi.schneider@tum.de)

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Remote Sensing and Image Processing (Vorlesung, 6 SWS)

Schneider T

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](http://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ1567: Sustainability: Paradigms, Indicators, and Measurement Systems | Sustainability: Paradigms, Indicators, and Measurement Systems

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2019

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The assessment type for the module is a graded report (10 pages). The report includes three sections: (1) critical analysis of a published empirical sustainability study in the context of its sustainability definitions and authors' backgrounds; (2) critical analysis of a sustainability measurement system in use with regard to fulfilling requirements to be met by indicators and indicator systems; (3) critical analysis of a public sustainability claim by an organization from a consumer or citizen point of view. Each analysis is also presented by each student. Through reports, the students demonstrate the ability to understand relevant research, measurement systems and claims, as well as critically analyze and discuss these issues. Through the presentation and discussion of each analysis, students demonstrate their ability to communicate these critical issues and further reflect on each topic in the light of other students' questions and presentations.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge and understanding of economic and management concepts as well as of social science research methods is required.

### **Inhalt:**

The development of a differentiated understanding of sustainability requires the critical analysis and reflection of sustainability concepts on multiple levels. In the module the following levels are systematically analyzed and discussed based on guided discussions of assigned readings and materials developed by students based on literature and internet research:

- Paradigms and value judgments in research on and evaluation of sustainability;
- Economic, environmental and social aspects of sustainable production, marketing, and consumption;
- Measurement systems for sustainability on different levels (products, supply chains etc.);
- Public and private standards, sustainability certifications and communication;
- Consequences of measurement systems and their foci, e.g., on environmental aspects, such as carbon footprint, or on social aspects, such as fair trade

These topics are discussed in the context to current and controversial issues regarding sustainability in science and in society.

### **Lernergebnisse:**

After successfully completing the module students are able to

- Analyze and evaluate the consequences of different paradigms on the definition and understanding of sustainability and its use in published scientific articles;
- Analyze and evaluate sustainability measurement systems on the product, enterprise, and supply chain levels as well as their potential consequences;
- Evaluate public sustainability claims based on the research of available information sources;
- Apply a differentiated understanding of sustainability in an interrelated, globalized context with differing value systems and priorities in scientific and practical questions and issues.

### **Lehr- und Lernmethoden:**

The course “Sustainability: Paradigms, Indicators, and Measurement Systems” has a seminar format based on assigned readings and student presentations on assigned topic areas.

After an introductory guided class discussion on assumptions and implicit sustainability definitions of participants, readings are assigned and discussed in class to lay the basis for later student presentations. Through individual document research and individually prepared class presentations, students develop the ability to critically reflect on sustainability research, sustainability indicators and measurement systems, as well as sustainability claims by various actors and organizations. Through presentations and concept discussions, students develop in-depth knowledge of sustainability issues and hone their critical thinking skills. A final discussion summarizes students’ learning and additional findings throughout the semester in the concept of wicked problems.

### **Medienform:**

Reading assignments; use of data bases for literature research; presentation software; discussion facilitation support media, such as flipcharts and discussion boards; video clips and podcasts.

**Literatur:**

National Resource Council 2010, Toward Sustainable Agricultural Systems in the 21st Century, Washington/D.C.: National Academies Press.

Current articles on sustainability paradigms, requirements of sustainability indicators and indicator systems, and applications.

**Modulverantwortliche(r):**

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

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## Modulbeschreibung

### WZ1921: Strategy, Supply Chain Management, and Sustainability in Agribusiness and Food Industry | Strategy, Supply Chain Management, and Sustainability in Agribusiness and Food Industry

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2019/20

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 6	<b>Gesamtstunden:</b> 180	<b>Eigenstudiums- stunden:</b> 120	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The course grade is based on the learning portfolio. The portfolio submitted includes memorandums addressing 9-10 of the case studies discussed in class; and a learning statement addressing conceptual, scientific and personal learning. Through the case memorandums the students show the ability to discuss the assigned case questions by selecting and applying suitable theoretical concepts to supply chain management and sustainability challenges in the specific context of agricultural, food, and related industries. In the learning statement students demonstrate the ability to reflect on the semester long learning process and summarize the insights gained.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Solid economic and management background; knowledge of basic concepts of strategic analysis, planning, and management (e.g., industry analysis, horizontal and vertical coordination, and SWOT), as well as the ability to apply these concepts; and knowledge of value chain management is required (e.g., theoretical background, supply chain dynamics, actors and partnerships, governance). Successful completion of a management course on M.Sc. level required, e.g., agribusiness management, organizational behavior, or value chain management. Medium level experience in desk research and scientific writing is required.



**Inhalt:**

Key concepts of supply chain management, strategy, and sustainability: processes of supply chain management (e.g., creating added value, management of customers and suppliers);  
Innovation, sustainability as innovation;  
sustainable supply chains; CSR and sustainability measurement; implementation of a sustainability strategy, costs and benefits of sustainable practices in the context of agricultural, food and related industries;  
ethical issues in supply chain management.

**Lernergebnisse:**

Upon completion of the module students are able to evaluate processes of agricultural supply chains management, e.g., creating and capturing value, management of customers, suppliers, and other stakeholders;  
for the areas strategy, supply chain management, and sustainability students can independently choose scientific models or concepts relevant to the analysis process and justify their evaluation;  
students are able to evaluate the implementation a CSR concept or sustainability strategy, and to monitor its effects on operations, suppliers, associates, and customers;  
Students are able identify and analyze ethical issues in supply chain management and to recommend how to apply ethical practices.

**Lehr- und Lernmethoden:**

Seminar: Case study based class discussions and presentations, group work based on cases, students' experiences and assignments. Through individually prepared class discussions and group work, students develop the ability to critically reflect and apply concepts of strategy, supply and value chain management in the context of sustainability.

**Medienform:**

Reading assignments; case descriptions, presentations, and discussions, supported by Metaplan, flipchart and other facilitation media.

**Literatur:**

Current articles from scientific journals as appropriate.

Selected chapters from

Bouchery, Corbett, Fransoo, and Tan (2017): Sustainable Supply Chains: A Research-Based Textbook on Operations and Strategy. Springer: Berlin, Heidelberg, Germany.

Pullmann and Wu (2011): Food Supply Chain Management: Economic, Social and Environmental Perspectives. Routledge, New York, US.

**Modulverantwortliche(r):**

Bitsch, Vera; Prof. Dr. Dr. h.c.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

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## Modulbeschreibung

### WZ1921: Strategy, Supply Chain Management, and Sustainability in Agribusiness and Food Industry | Strategy, Supply Chain Management, and Sustainability in Agribusiness and Food Industry

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2019/20

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 6	<b>Gesamtstunden:</b> 180	<b>Eigenstudiums- stunden:</b> 120	<b>Präsenzstunden:</b> 60

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#### Beschreibung der Studien-/ Prüfungsleistungen:

The course grade is based on the learning portfolio. The portfolio submitted includes memorandums addressing 9-10 of the case studies discussed in class; and a learning statement addressing conceptual, scientific and personal learning. Through the case memorandums the students show the ability to discuss the assigned case questions by selecting and applying suitable theoretical concepts to supply chain management and sustainability challenges in the specific context of agricultural, food, and related industries. In the learning statement students demonstrate the ability to reflect on the semester long learning process and summarize the insights gained.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Solid economic and management background; knowledge of basic concepts of strategic analysis, planning, and management (e.g., industry analysis, horizontal and vertical coordination, and SWOT), as well as the ability to apply these concepts; and knowledge of value chain management is required (e.g., theoretical background, supply chain dynamics, actors and partnerships, governance). Successful completion of a management course on M.Sc. level required, e.g., agribusiness management, organizational behavior, or value chain management. Medium level experience in desk research and scientific writing is required.

**Inhalt:**

Key concepts of supply chain management, strategy, and sustainability: processes of supply chain management (e.g., creating added value, management of customers and suppliers);  
Innovation, sustainability as innovation;  
sustainable supply chains; CSR and sustainability measurement; implementation of a sustainability strategy, costs and benefits of sustainable practices in the context of agricultural, food and related industries;  
ethical issues in supply chain management.

**Lernergebnisse:**

Upon completion of the module students are able to evaluate processes of agricultural supply chains management, e.g., creating and capturing value, management of customers, suppliers, and other stakeholders;  
for the areas strategy, supply chain management, and sustainability students can independently choose scientific models or concepts relevant to the analysis process and justify their evaluation;  
students are able to evaluate the implementation a CSR concept or sustainability strategy, and to monitor its effects on operations, suppliers, associates, and customers;  
Students are able identify and analyze ethical issues in supply chain management and to recommend how to apply ethical practices.

**Lehr- und Lernmethoden:**

Seminar: Case study based class discussions and presentations, group work based on cases, students' experiences and assignments. Through individually prepared class discussions and group work, students develop the ability to critically reflect and apply concepts of strategy, supply and value chain management in the context of sustainability.

**Medienform:**

Reading assignments; case descriptions, presentations, and discussions, supported by Metaplan, flipchart and other facilitation media.

**Literatur:**

Current articles from scientific journals as appropriate.

Selected chapters from

Bouchery, Corbett, Fransoo, and Tan (2017): Sustainable Supply Chains: A Research-Based Textbook on Operations and Strategy. Springer: Berlin, Heidelberg, Germany.

Pullmann and Wu (2011): Food Supply Chain Management: Economic, Social and Environmental Perspectives. Routledge, New York, US.

**Modulverantwortliche(r):**

Bitsch, Vera; Prof. Dr. Dr. h.c.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de)

## Modulbeschreibung

### WZ2734: Soil Protection | Soil Protection

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

In an oral exam of 30 minutes duration, students demonstrate in a scientific discussion by answering questions without helping material their broad and deep understanding on how to protect soils. The understanding of soils, as achieved in the modules "Introduction to soil science" and "World soil resources", is implicitly part of the oral exam.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

The successful completion of the module "Introduction to Soil Science" or equivalent skills are required. The successful completion of the module "World Soil Resources" is recommended.

#### Inhalt:

Principles of soil degradation, the world food problem, highly erodible soils, semi-arid environments (including irrigation and salinization problems), kaolinitic soils, shifting cultivation, organic and mineral fertilization, agroforestry, land use and greenhouse gases, soil functions, organic pollutants, inorganic pollutants (heavy metals), radionuclides, pesticides, pathways of pollutants, sorption, precipitation, co-precipitation, acidification, ways to assess the mobility of pollutants, remediation of brownfields.

#### Lernergebnisse:

The students are able to apply their knowledge of soils, as achieved in the modules "Introduction to Soil Science" and "World Soil Resources", to develop strategies of soil protection. They understand

the major environmental factors that determine the food production in the world. They are able to address the specific problems of highly erodible soils, semi-arid land and kaolinitic soils and to design adequate land-use methods. The students understand the major factors that determine the fate of substances in soil. They are able to analyze and forecast the fate of heavy metals, organic pollutants and radionuclides in soil and are familiar with important techniques for managing and remediating brownfields.

**Lehr- und Lernmethoden:**

Lecture, discussions

**Medienform:**

Presentation notes.

**Literatur:**

Blanco, H., Lal, R. (2008): Principles of soil conservation and management. Diamond, J. (1998): Guns, germs and steel. A short history of everybody for the last 13,000 years. Mirsal, I. (2008): Soil Pollution.

**Modulverantwortliche(r):**

Schad, Peter; Dr. rer. silv.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Soil Protection and World Food Production (Vorlesung, 2 SWS)

Schad P

Bodenschutz - Organische und anorganische Schadstoffe in Böden (Vorlesung, 2 SWS)

Vidal A

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### BGU70005: Transportökonomie | Transportation Economics [Transportökonomie]

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2017/18

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 6	<b>Gesamtstunden:</b> 180	<b>Eigenstudiums- stunden:</b> 120	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Die Prüfungsleistung ist eine Projektarbeit (Gruppenprojekt)

Im Rahmen der Projektarbeit wird anhand einer realistischen Aufgabenstellung aus dem Bereich der ökonomischen Bewertung von Verkehrssystemen (z.B. City-Maut, Infrastrukturinvestitionen, Sharing-Konzepte) überprüft, ob die Studierenden die Eignung der verschiedenen in der Vorlesung präsentierten Bewertungsmethoden für ihre Aufgabenstellung bewerten können und passende Methoden aussuchen können. Ferner zeigen sie, dass sie die ausgewählten Methoden auf das konkrete Beispiel richtig anwenden, quantitativ berechnen und die Ergebnisse zur Bewertung der Machbarkeit bzw. der Auswirkungen des Projekts verwenden können. Der Fortschritt des Projektes wird über eine Zwischenpräsentation geprüft. Am Ende wird die schriftliche Projektarbeit abgegeben, die zudem in einem Abschlussvortrag präsentiert wird. Die Note setzt sich wie folgt zusammen: Zwischenvortrag 15%, Abschlussvortrag 35%; schriftliche Projektarbeit 50%.

#### Wiederholungsmöglichkeit:

Semesterende

#### (Empfohlene) Voraussetzungen:

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#### Inhalt:

Das Modul vermittelt den Studierenden einen Überblick über die Werkzeuge und Methoden, die zur Bewertung von Transportsystemen aus ökonomischer Sicht zur Verfügung stehen. Folgende Schlüsselbereiche werden abgedeckt:



- Einführung in die Transportökonomie
- Nachfrage und Angebot
- Gleichgewicht
- Externe Interaktionen
- Projektbeurteilung
- Transportinvestitionen
- Preisgestaltung
- Frachtökonomie
- Sharing-Ökonomie

### **Lernergebnisse:**

Nach Abschluss des Moduls verstehen die Studierenden die methodischen Grundlagen zur ökonomischen Bewertung von Verkehrssystemen und Infrastrukturinvestitionen. Sie sind in der Lage, die wichtigsten wirtschaftlichen Aspekte aus dem Bereich der Transportsysteme, Investitionen und Maßnahmen zu bewerten und Aussagen über ihre wirtschaftliche Machbarkeit zu treffen. Des Weiteren sind die Studierenden in der Lage, eine Reihe von Kerntheorien der Verkehrsökonomie, wie der externen Kosten, der Grenzkosten, der Kosten/ Nutzen Betrachtungen, der Nachfrage-Versorgung Interaktionen und Elastizitäten auf praktische Aufgabenstellungen anzuwenden und die Ergebnisse dieser Anwendungen für reelle Transport-Projekte zu interpretieren und zu Empfehlungen auszuarbeiten.

### **Lehr- und Lernmethoden:**

Format: Vorlesung mit integrierten Übungen;

In den Vorlesungen werden zunächst die theoretischen Grundlagen, beispielsweise der verschiedenen Modellbausteine zur ökonomischen Bewertung von Verkehrssystemen, ihre Einsatzmöglichkeiten- und Grenzen sowie ihre datentechnischen Voraussetzungen, unterstützt durch Bilder, ggf. Filme und Diskussionen vermittelt. Berechnungsbeispiele aus praxisnahen Untersuchungen und Modellen sowie die parallel laufende Bearbeitung einer Projektarbeit vermitteln die quantitativen Methoden zur Berechnung der verschiedenen Methoden und zur Interpretation der Berechnungsergebnisse in Hinblick auf Machbarkeit bzw. ökonomischer Wirkung von Projekten und Maßnahmen.

### **Medienform:**

Präsentationsfolien, Whiteboard, Lesungen

### **Literatur:**

Small, Kenneth. Urban transportation economics. Vol. 4. Taylor & Francis, 2013.

Button, Kenneth. Transport economics. Edward Elgar Publishing, 2010.

Gómez-Ibáñez, José A., William B. Tye, and Clifford Winston, eds. Essays in transportation economics and policy: a handbook in honor of John R. Meyer. Brookings Institution Press, 2011.

### **Modulverantwortliche(r):**

Constantinos Antoniou c.antoniou@tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Transportation Economics (Vorlesung mit integrierten Übungen, 4 SWS)

Antoniou C [L], Al Haddad C, Antoniou C, Cantelmo G, Ezzati Amini R

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### POL24302: The Political Economy of Technical Standards | The Political Economy of Technical Standards

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2017/18

<b>Modulniveau:</b> Bachelor/Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 3	<b>Gesamtstunden:</b> 90	<b>Eigenstudiums- stunden:</b> 60	<b>Präsenzstunden:</b> 30

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The evaluation of this module will be based on: (1) A 10-12 double spaced pages (not including the bibliography) term paper, which will be worth 90% of the final grade. Students will be required to submit a research proposal that provides an introduction and a research question/topic on week four of the semester (worth 20%). Additionally, students will be required to present the status of their work in front of the class during the last two weeks for critics and feedback (worth 30%). The final version of the paper (in journal format) should be submitted before the end of the semester (worth 40%). (2) A participation grade which is worth 10% of the grade. Students will be graded based on their level of participation discourse. This entails having carefully read and annotated the required readings before the class and active participation during the seminar.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

This is an introductory course geared toward students without prior knowledge or trainings in the standardization field.

#### Inhalt:

This seminar focuses on the interrelated themes of the political economy of standardization and certification within the context of global governance. This will naturally cover the topic of standards as they are at the center, and a main output, of the standardization process. In this course, a standard is defined as a technical document that is designed to be used as a rule or a guideline

for doing something. We will cover various types of standards, such as product and management system standards. The first part of the course deals with the fundamentals of standardization and standards: different types of standards and their historical background, the economic theories behind standards, standardization and standard-setting processes, the role of standards in innovation and their impact on the micro (organizations) and the macro (states) levels, ways of ensuring compliance, and the role of standards in market governance. In the second part we build upon what has been introduced during the first part, but now with a focus on global governance. We will examine the role of inter- and transnational standards development organizations in the global economy, the politics of standards setting, public and private stakeholders role in standards setting, standards wars.

**Lernergebnisse:**

Drawing upon literature from political science, sociology and economics, this course aims to offer students conceptual tools to open the blackbox of standards/standardization. Instead of viewing standards as ready-made rules, this course is designed to help students think critically about how standards come into being, as well as the impact, power, and limitations of standards as a tool of governance from the political and social perspectives. Students who successfully complete this class will develop a critical and interdisciplinary thinking toward standardization and related policy/governance issues.

**Lehr- und Lernmethoden:**

The module consists of a single 2 hours/week highly interactive seminar, accompanied by weekly reading assignments. Close advance reading of the assigned texts for each week's lecture will be expected.

**Medienform:**

**Literatur:**

**Modulverantwortliche(r):**

Büthe, Tim; Prof. Dr.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Seminar:

The political economy and global governance of standardization and certification (2 SWS)

Abdel fattah Alshadafan

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## Modulbeschreibung

### **POL61300: The Politics of Market Competition in a Global Economy | The Politics of Market Competition in a Global Economy**

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2017/18

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester/ Sommersemester
<b>Credits:*</b> 6	<b>Gesamtstunden:</b> 180	<b>Eigenstudiums- stunden:</b> 120	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### **Beschreibung der Studien-/ Prüfungsleistungen:**

Form of examination ("Prüfungsleistung"): Research paper ("wissenschaftliche Ausarbeitung"). The research paper (on a topic of each student's own choosing, subject to instructor approval based on a research proposal early in the semester, which accounts for 10% of the grade) provides students with an opportunity to demonstrate their mastery of the course material and the learning objectives through in-depth social-scientific research on a specific question concerning the politics (and law and economics) of competition policy. A presentation of each student's research-in-progress provides the opportunity to demonstrate communicative competence related to the student's own research project. The presentation is part of the "wissenschaftliche Ausarbeitung" and counts for 20% of the final grade; the final written paper counts for the remaining 70%.

#### **Wiederholungsmöglichkeit:**

Folgesemester

#### **(Empfohlene) Voraussetzungen:**

#### **Inhalt:**

This seminar examines the law, economics, and politics of competition policy ("antitrust") in comparative perspective. Competition law and policy seeks to encourage and safeguard competition in markets by controlling economic power. It makes cartels, bid-rigging, and other anti-competitive practices illegal. It also seeks to prevent monopoly, often through the regulation of mergers and acquisitions. The enforcement of such laws, also known as "antitrust" law in the

U.S. tradition, is one of the most powerful tools governments have at their disposal to ensure that the benefits of a market economy are widely shared, and to maintain incentives for innovation, lowering prices, increasing efficiency. Competition law enforcement is, however, inherently political and therefore often controversial, since it entails the use of the power of the state to constrain and possibly redistribute private economic power. It also has been rapidly shifting from being a domestic to being (also) a transnational and international issue since the boundaries of many markets extend far beyond the borders of any one jurisdiction. Any company considering a foreign acquisition, joint venture, or even just market entry is well advised to be attentive to competition law and policy, both at home and abroad. After an introduction to the law, economics, and politics of competition policy, we will begin by studying the history, normative underpinnings, and politics of antitrust thought and practice in the United States, Europe, Africa, Asia, Latin America, and the Middle East. We will consider the relationship between competition policy and development; the causes and consequences of the recent, strikingly rapid proliferation of antitrust laws across the globe, and international conflict and cooperation over antitrust law and enforcement. We will aim for a positive analysis of antitrust law and practice, but will also discuss the broader normative and policy questions, including what the goals of competition policy should and can be in an age of global markets.

#### **Lernergebnisse:**

This seminar-based module seeks to introduce graduate students to the inherently interdisciplinary topic of competition law and policy, with a special appreciation for its political aspects (see description of course contents). Through readings, class discussion, and ultimately their own research paper, students will gain greater experience in developing sophisticated critiques of theoretical arguments and in assessing and conducting empirical analyses, treating all claims about competition law and policy (including claims about its political causes and consequences) as hypotheses. Class participation and the formal presentations of the students' own research-in-progress additionally allow students to gain and hone their communicative skills.

#### **Lehr- und Lernmethoden:**

The module consists of a single reading- and research-intensive seminar. Close advance reading of the assigned texts and active participation in the seminar will be critical to allow students to gain a full understanding of the complex and inherently interdisciplinary topic of competition policy and to be able to develop a research project of their own choosing (on some political aspect of competition law and policy). To provide an opportunity for feedback and allow the students to learn from each other, each student will during the final 2-3 weeks of the semester give a brief presentation of his/her research-in-progress.

#### **Medienform:**

Various, including readings, class discussion, research-in-progress presentations with slides

#### **Literatur:**

To be announced at the beginning of the semester; mostly journal articles.

**Modulverantwortliche(r):**

Büthe, Tim; Prof. Dr.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Seminar 1 + 2:

Competition Law, Economics and Policy/ Politics in Practice (4 SWS)

Prof. Dr. Tim Büthe

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## Modulbeschreibung

### WZ2936: Sustainable and Environmental Regulations | Sustainable and Environmental Regulations

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2017

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 100	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Successful completion of the course will be based in both seminars on the quality of the presentation in the seminar and a term paper on the topic of the presentation. The presentation is a means to measure the students' ability to understand the context and complexity of sustainable development in different countries and formal impact assessment procedures by preparing and delivering a well-researched and instructive oral presentation on a certain facet. An accompanying executive summary of major findings and conclusions indicates the capacity of the students to summarise the presentation in a clear and concise manner. In addition, the students are expected to show their oral communication skills by responding competently to questions and comments by the audience as well as by contributing to class discussions. Depending on the number of seminar participants, the presentation may be given either individually or in groups.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Class discussion is a core element of the seminars. Therefore, students are expected to take part and contribute to the discussions.

#### Inhalt:

Course 1 "Sustainable Development and Regime Type": The seminar introduces both the theoretical debate on sustainable development and the discussion about the role political regime type (democracy, autocracy, hybrid regime) play for the sustainability performance of a country.



What are the goals of "sustainable development"? Which policy areas have a strong relationship to sustainability? To what extent do countries differ in their "sustainability profile" in various policy areas? What influence does the regime type play in this regard?

The seminar investigates these theoretical and empirical issues in the context of pressing future challenges, such as rising government debt in many countries, growing global competition for innovation, and intensifying global environmental degradation and resource scarcity. The seminar will focus on discussing theoretical approaches to current "sustainability debates" and considering what defines generationally just behavior. In addition, empirically based comparisons of countries under different political leadership will be made looking at several sustainability areas (e.g. economic, financial, educational, research, family, pension, environmental and energy policy).  
Course 2 "Methods of Environmental Assessment": The seminar introduces the methodology of EIA and SEA as worldwide established instruments for assisting sound environmental management. Being integral parts of spatial planning and decision-making, the assessment procedures integrate biophysical and socioeconomic information to predict and evaluate the environmental consequences of proposed projects, plans and policies and to suggest means to avoid or mitigate significant impacts. The seminar gives an overview of the concepts, methods, procedural elements of EIA and SEA and stimulates discussion on key aspects of environmental assessment.

### **Lernergebnisse:**

At the conclusion of the module, the students will have basic knowledge on sustainable development, its theoretical and empirical implications and its most important policy fields. The students understand the structure and the functioning of different political regimes and are able to evaluate their impact on the sustainable development of a country. Furthermore, the students are able to: appreciate the purpose of EIA and SEA and their role in the decision-making process; explain the major principles and procedural steps of EIA and SEA; know options for estimating environmental impacts; reflect critically on the strength and limitations of the instruments; communicate findings in class and comment on the work of fellow students.

### **Lehr- und Lernmethoden:**

In the SDRT seminar lectures, presentations and discussions provide students with a basic knowledge on sustainable development and political regime type and allows them to evaluate the performance of different states with regard to their sustainability performance. In the MEA seminar, presentations by students and the lecturers provide the basis for exploring and discussing the concepts, methodology, current practice and potentials of environmental assessment. Class discussions engage students in critical thinking and analysing the scope and limitations of the presented material.

### **Medienform:**

The module includes lectures, presentations, class discussions, (small group) exercises and assigned readings.

**Literatur:**

Wintrobe, R. (2000): The Political Economy of Dictatorship, Cambridge University Press, Cambridge; Tremmel, J. (2006): Handbook of intergenerational justice, Edward Elgar, Cheltenham; Morris, P. & R. Therivel (Eds., 2009): Methods of Environmental Impact Assessment. 3rd edition. Routledge, London and New York; Sadler, B., Aschemann, R., Dusik, J, Fischer, T.B., Partidário, M.R. & R. Verheem (2011): Handbook of Strategic Environmental Assessment. Earthscan, London, Washington, DC. Additional material will be provided.

**Modulverantwortliche(r):**

Dr. Isabel Augenstein; Lehrstuhl für Strategie und Management der Landschaftsentwicklung; Emil-Ramann-Str. 6, 85354 Freising; 08161/71- 4783; isabel.augenstein@lrz.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Methods of Environmental Assessment (Seminar, 2 SWS)

Augenstein I

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2723: Utilization and Treatment of Special Materials and Waste | Utilization and Treatment of Special Materials and Waste

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 120	<b>Präsenzstunden:</b> 30

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The learning outcome will be assessed by presentation. The presentation will be complemented by a brief written precis. This assessment method is a good means to evaluate both whether the students are able to work self-reliantly on a topic and to present their significant results to an auditorium and whether they have understood their respective selected topic.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Basic knowledge in natural science (biology, chemistry, ecology, physics) and engineering.

#### Inhalt:

The students acquire detailed and differentiated knowledge about the following topics:

- Selected materials, products and production processes concerning high waste generation and heavy environmental problems
- Origin and types of the specific wastes,
- Classical disposal,
- Waste as a source of raw material,
- Utilization for products,
- Energetic utilization,
- Legal specification.

The special topics addressed depend on relevance, e.g. food and food waste, sewage sludge, e-waste or the like.

**Lernergebnisse:**

By the means of the module the students are able:

- to describe the differences of special waste, e.g. food waste and selected municipal or industrial waste,
- to classify the amount and quality of special waste streams,
- to analyze problems concerning the special wastes,
- to develop treatment measures to handle the waste for avoiding or reducing impacts on the environment and human health,
- to transmit developed solutions to other waste and new products.

**Lehr- und Lernmethoden:**

The module consists of a lecture, providing the theoretical foundations, in combination with a seminar including feedback by the lecturers to the students' work. The students have to define and to solve problems collaboratively in group work by studying specialist literature. At the end they have to prepare a presentation and a brief summary including problem statement and conclusions as homework under time constraint about this topic. The students are supervised by the lecturers.

**Medienform:**

PowerPoint Presentation

**Literatur:**

Oreopoulou V.; Russ W. (2007): Utilization of By-Products and Treatment of Waste in the Food Industry, Springer; New York.

Additional literature depending on themes.

**Modulverantwortliche(r):**

Prof. Dr. Gabriele Weber-Blaschke - Lehrstuhl für Holzwissenschaft Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/71- 5635; weber-blaschke@hfm.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Utilization and Treatment of Special Materials and Waste (Seminar, 2 SWS)

Weber-Blaschke G [L], Reh K

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ4201: Vegetation Ecology and Geographical Information Systems | Vegetation Ecology and Geographical Information Systems

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### **Beschreibung der Studien-/ Prüfungsleistungen:**

A written exam of 90 minutes assesses whether the students understand the basic concepts of spatial data analysis as well as vegetation ecology with respect to manage landscapes, the students' ability to apply these techniques to certain problems in landscape management as well as the students' ability to precisely describe solutions to achieve certain results within a limited amount of time.

A Mid-Term assignment (presentation) assesses the students' ability to communicate management plans based on vegetation and habitat data. It will serve for grade improvement by 0,3 according to §6 (5) APSO.

#### **Wiederholungsmöglichkeit:**

Folgesemester

#### **(Empfohlene) Voraussetzungen:**

Basic knowledge in GIS, remote sensing, for example learned by attending the module "Inventory Methods and GIS". Basic knowledge of plant species.

#### **Inhalt:**

1. Advanced analysis and visualization of spatial data;
2. GIS based raster analysis;
3. GIS and satellite navigation;
3. Application of GIS in selected projects;
4. Introduction to the vegetation ecology, theory of plant distribution and of plantcommunities;

5. Methods of habitat mapping;
6. Habitat mapping in the field;
7. Field data analysis;
8. Management measures for management plans.

**Lernergebnisse:**

At the end of the module students are able to:

- manage, analyze and visualize spatial data to solve problems related to landscape management;
- break down general problems in landscape management to tasks which can be solved by using a GIS;
- develop and communicate management plans based on vegetation and habitat data;
- ascertain and classify habitats.

**Lehr- und Lernmethoden:**

Theoretical explanation of certain topics followed by practical exercises using GIS software supported by screen animations.

Transfer of theoretical knowledge in lectures (vegetation ecology, habitat mapping), practical field work and presentation of proposals for landscape management measures.

**Medienform:**

GIS Software, PowerPoint Presentation

**Literatur:**

To be announced

**Modulverantwortliche(r):**

Dr. Martin Döllerer – Professur für Waldinventur und nachhaltige Nutzung Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/71-4656, doellerer@tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

GIS (Landscape Management) (Übung, 2 SWS)  
Döllerer M

Vegetation Ecology (Vorlesung, 2 SWS)

Teixeira Pinto L

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ2735: World Soil Resources | World Soil Resources

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 80	<b>Präsenzstunden:</b> 70

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

In an oral exam of 30 minutes duration, students demonstrate in a scientific discussion by answering questions without helping material their fundamental understanding of the soils of the world in relation to other ecological factors, and they remember the soils of the field course as well as the methods of surveying and classifying soils in the field. In a pass/fail exam (laboratory assignment) in the field of 10 minutes duration, they prove their ability to survey and classify soils of various landscapes and environmental settings. The understanding of soils, as achieved in the module "Introduction to soil science" is implicitly part of the oral exam.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

The successful participation at the module "Introduction to Soil Science" (which is given in the first half of the summer semester) is required.

#### Inhalt:

- Soils of the world
- Chemical, biological and physical properties of soils
- Genesis of soils as the result of soil-forming processes
- Soil survey
- Soil classification according to the international system
- Soil interpretation.

**Lernergebnisse:**

The students are able to apply their knowledge of soils, as achieved in the module “Introduction to Soil Science”, to all soils of the world. The students understand the characteristics of the soils of the world, the pattern of their geographical distribution, their genesis, their ecological potential and the threats to their functions. The students are able to survey a soil profile, to detect the genesis of the surveyed soil and to classify it according to the international soil classification system. They are able to evaluate the possibilities and risks of soil management. They can assess the relationship between the soil and its environmental setting.

**Lehr- und Lernmethoden:**

The lecture gives an overview of all soils of the world. The field course (several days) presents soils in a landscape outside southern Bavaria. The students are trained in the methodological skills of soil survey, soil classification and soil interpretation.

**Medienform:**

Lecture: presentation notes. Field Assessment: spade, auger, knife, colour charts.

**Literatur:**

FAO Guidelines for Soil Description. Prepared by Jahn, Blume, Asio, Spaargaren, Schad, 2006.  
IUSS Working Group WRB: World Reference Base for Soil Resources 2014. Update 2015.  
Prepared by Schad, van Huyssteen, Micheli. FAO World Soil Resources Reports 106.

**Modulverantwortliche(r):**

Schad, Peter; Dr. rer. silv.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

World Soil Resources: Lecture (Vorlesung, 2 SWS)  
Schad P

Bodenansprache und Bodenklassifikation nach internationalen Standards (Übung, 2,8 SWS)  
Schad P

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## Modulbeschreibung

### WZ4198: Wildlife Management and Wildlife-Human Interactions | Wildlife Management and Wildlife-Human Interactions

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Written assignment (ca. 15 pages) requiring review of literature, synthesis and integration of key concepts and findings from the literature to develop a coherent research proposal that clearly demonstrates knowledge in the field of species management and conservation strategies and of human dimensions as a research and applied field of study. Expected to read in advance where possible assigned readings so to be prepared for course lectures.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

None

#### Inhalt:

This lecture combines contents of Wildlife Management and Wildlife Human Interactions. The key aspects are: 1) Principles of Wildlife Management & Wildlife Science, 2) Planning tools, 3) Case study: Strategic planning, 4) Conflicting views in WMT with case studies, 5) Basic Concepts in Ecology, 6) Reintroductions studies, 7) Global threats to Conservation, 8) Nature of human dimensions (HD) from a research perspective through various examples 9) Nature of various wildlife-human interactions from different perspectives, 10) Nature of public involvement and HD as an applied approach 11) Types of conflict, levels of planning and how to work with people toward solutions, 12) Understanding decision-making processes.

**Lernergebnisse:**

After the course students are able to: understand important ecological concepts in wildlife management; understand the importance of the human dimension in wildlife management; analyze a conservation strategy for a species; apply wildlife management plans; evaluate species and protected area management plans; understand the importance and nature of objectivity in conducting research and being a human dimension researcher; develop the ability to synthesize relevant literature pertinent to a research problem; organize ideas effectively and communicate these in a well-organized and developed written proposal.

**Lehr- und Lernmethoden:**

Lecture, video, group exercises, discussions

**Medienform:**

lecture notes, flip-chart/board, hand-outs, additional reading material

**Literatur:**

Sinclair et al. 2006, Wildlife Ecology, Conservation, and Management, ISBN 1-4051-0737-5 ;  
Krausman 2002, Wildlife Management, ISBN 0-1328-0850-1; Pullin 2002, Conservation Biology, ISBN 0-521-64482-8

**Modulverantwortliche(r):**

Kühn, Ralph; Apl. Prof. Dr. agr. habil.

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Wildlife-Human Interactions (Seminar, 2 SWS)

Kühn R [L], Bath A

Wildlife Management (Vorlesung, 2 SWS)

Kühn R [L], Rödl T

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## Modulbeschreibung

### WZ4207: Waste and Waste Water Treatment | Waste and Waste Water Treatment

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2015/16

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 90	<b>Präsenzstunden:</b> 60

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The exam consists of general questions and calculations. In the written exam students demonstrate by answering questions the theoretical knowledge of waste and wastewater treatment. The answers requires wording but also multiple choice tests are involved. Calculations also involved. The use of a calculator is allowed in the written exam.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Interest and basic knowledge in process engineering.

#### Inhalt:

Part waste: 1. Basics of waste management (What is waste, waste amounts, history and future of waste, waste legislation); 2. Avoidance and recovery of waste and waste management concepts; 3. Waste disposal (legal aspects of landfill, processes in above-ground landfill, above-ground landfill technologies, underground disposal sites); 4. Biological treatment (legal aspects, composting, fermentation, mechanical biological treatment, sewage sludge, substitute fuels); 5. Thermal treatment (legal aspect, thermal processes, equipment, power generation, alternative thermal processes, co-incineration, hazardous waste treatment).

Part wastewater: 1. Water treatment & management concepts; 2. Overview wastewater treatment steps; 3. Wastewater characteristics & discharge limits; 4. Mechanical wastewater treatment (technology and equipment), 5. Fundamentals in bioprocess technology; 6. Stoichiometry of

biological reactions; 7. Kinetics of biological reactions; 8. Aeration (process, limits and technology); 9. Aerobic wastewater treatment (Activated sludge process; Sequencing batch reactor technology; Biofilm technology); 10. Sewage sludge treatment

### **Lernergebnisse:**

At the end of the module, students are able to:

1. Understand the necessity and objectives of waste management.
2. Distinguish different types of waste.
3. Decide which treatment method is valid for which type of waste.
4. Know the requirements which the different treatment methods have to meet regarding legal aspects of waste treatment (emissions, waste water, deposition of waste).
5. Describe the technical composition of different types of landfills and to assign different types of wastes to the landfills.
6. Assess processes and risks arising from landfills.
8. Understand the process of composting, mechanical-biological as well as thermal treatment of waste.
7. Understand the necessity and the feasibility of waste water treatment especially in treating municipal wastewater.
8. Classify the single steps of eliminating wastewater compounds like coarse material, organic and inorganic compounds.

### **Lehr- und Lernmethoden:**

The knowledge in the field of waste management is imparted during lectures and will be extended by 3 exercises, which have to be elaborated by the students at home. Practical insight into waste management is given during an excursion to a thermal as well as a biological waste treatment plant.

### **Medienform:**

PowerPoint presentation, notices on black board, The files of the presentations during lectures are handed out to the students or are send to the students per email.

### **Literatur:**

Bilitewski B., Härdtle G., Marek K. (1996): Waste Management, Transl. and ed. by Anette Weissbach and Hennig Boeddicker. Kiely, G. (1996): Environmental Engineering. Tchobanoglous, G., Theisen, H., Vigil, S. (1996): Integrated Solid Waste Management - Engineering Principles and Management Issues. Woodward, F. (2001): Industrial Waste Treatment Handbook. Wastewater Engineering. International Edition: Treatment and Reuse (Metcalf & Eddy). Mcgraw-Hill Series in Civil and Environmental Engineering von George Tchobanoglous, Franklin L. Burton und H. D. Stensel von Mcgraw-Hill Higher Education (2002)

### **Modulverantwortliche(r):**

Apl. Prof. Dr. Brigitte Helmreich- Chair of Urban Water Systems Engineering, Am Coulombwall, 85748 Garching, 089289 13719, B.Helmreich@bv.tu-muenchen.de; Dr.-Ing. Matthias Franke - Fraunhofer UMSICHT An der Maxhütte 1, 92237 Sulzbach-Rosenberg 09661 908-438, matthias.franke@umsicht.fraunhofer.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Waste Management (Vorlesung, 2 SWS)

Bauer E, Franke M

Waste Water Treatment (Vorlesung, 2 SWS)

Koch K

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

## Modulbeschreibung

### WZ6432: Wildlife and Conservation Biology | Wildlife and Conservation Biology

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Sommersemester 2020

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Sommersemester
<b>Credits:*</b> 5	<b>Gesamtstunden:</b> 150	<b>Eigenstudiums- stunden:</b> 75	<b>Präsenzstunden:</b> 75

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The examination consists of an oral examination (30 min). The examination means to measure the student's ability to assess anthropogenic influence on Biodiversity, to explain factors affecting Wildlife, to recall methods in Conservation Biology and applied Genetics and to evaluate Conservation Biology concepts. In the written examination students demonstrate by answering questions under time pressure and without helping material their theoretical and practical knowledge about Wildlife and Conservation Biology. For answering the questions, the students require their own wording. In the practical exercise the students present a case study and design a own research project proposal to practice their scientific communication skills and to transfer the theoretical knowledge to practical projects.

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

Interest in Wildlife Conservation Biology and Nature Conservation. Basic background in Biology

#### Inhalt:

The module combines the theoretical background and the practical implementation of Wildlife Conservation Biology, Conservation Genetics and Nature Conservation. The key aspects are:

1. Scope and tasks of Conservation Biology and applied Genetics
2. Biodiversity, Ecosystems, Ecosystem Services and Green Banking
3. Factors affecting terrestrial and aquatic Biodiversity

4. Methods in Wildlife Conservation Biology and applied Genetics
5. Conservation Biology concepts and strategies for natural population using international examples
6. Case studies and applied Nature Conservation, from theory to praxis

**Lernergebnisse:**

At the end of the module students understand the importance of Biodiversity of terrestrial resources and its interaction with human dimensions. They are able to apply and to evaluate Conservation Biology methods and strategies based upon an interdisciplinary understanding of species biology, conservation biology and applied genetics. In addition, students are able to integrate interdisciplinary knowledge into applied conservation management on a regional and international scale. They have an overview of applied interdisciplinary Nature Conservation management and are able to evaluate sustainable resource management strategies.

**Lehr- und Lernmethoden:**

The module combines the lecture "Wildlife and Conservation Biology" with an accompanying practical exercise " Case Studies in Nature Conservation". The lecture contents will be presented using lectures based on power-point presentation and group work in order to combine activating teaching methods with classic presentation techniques. In the accompanying practical exercise, the students will apply the gained theoretical knowledge by conducting case studies (research programs), and presenting own concepts of research project in various content in the field of Wildlife Conservation Biology and Nature Conservation. Here the students learn to independently screen the respective literature in this field and learn methods in science communication.

**Medienform:**

Form of presentation: lecture, case study, movie segment and practical exercise  
material: lecture notes, flip-chart/board, plus different materials for methodological/technical training

**Literatur:**

1. Primack (2014) Essentials of Conservation Biology
2. Frankham (2010) Introduction to Conservation Genetics
3. Sutherland (2009) Conservation Science and Action

**Modulverantwortliche(r):**

Prof. Dr. Ralph Kühn – Lehrstuhl für Zoologie Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/71-4608; kuehn@wzw.tum.de

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Conservation Biology and Applied Genetics (Vorlesung, 2 SWS)  
Kühn R

Case Studies in Nature Conservation (Übung, 3 SWS)

Kühn R, Bässler C, Stoeckle B

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).



## Studienleistungen | Course Achievement

### Modulbeschreibung

#### WZ4061: Internship | Internship

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2019/20

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b>	<b>Häufigkeit:</b> Wintersemester
<b>Credits:*</b> 12	<b>Gesamtstunden:</b> 300	<b>Eigenstudiums- stunden:</b> 300	<b>Präsenzstunden:</b> 0

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

Nach Abschluss des Praktikums muss der Student einen Praktikumsbericht und ein Bestätigungsschreiben des Praktikumsgebers einreichen, in dem der Arbeitgeber die Dauer des Praktikums mit eventuellen Fehlzeiten und die Art der Arbeit, die vom Praktikanten geleistet wurde, spezifiziert.

#### Wiederholungsmöglichkeit:

#### (Empfohlene) Voraussetzungen:

Keine

#### Inhalt:

Gemäß den Studienregeln für den Masterstudiengang "Nachhaltiges Ressourcenmanagement" muss jeder Studierende ein Praktikum außerhalb seines Heimatlandes mit einer Mindestdauer von 8 Wochen (12 ECTS-Credits) absolvieren. Das Praktikum sollte den Auszubildenden ermöglichen, Einblicke in die verschiedenen Tätigkeitsbereiche für nachhaltiges Ressourcenmanagement zu erhalten.

Der Student sollte in die Lage versetzt werden, seine individuellen Karrierewünsche auszuloten und potenzielle Arbeitgeber zu kontaktieren.

Der Student muss selbst nach einem Praktikum suchen und es so planen, dass es nicht in Konflikt mit den Vorlesungszeiten steht. Eine empfohlene Zeitspanne für das Praktikum liegt zwischen dem zweiten und dritten Semester (August-Oktober).

Das Praktikum kann in zwei Teile mit einer Mindestdauer von jeweils einem Monat aufgeteilt werden.

Aus wichtigen Gründen sind weitere Aufteilungen möglich, müssen aber vorab durch das Praktikantenamt genehmigt werden.

Es ist möglich, das Praktikum in verschiedenen Organisationen zu absolvieren; die Mindestdauer von einem Monat ist aber einzuhalten.

Das Praktikum muss außerhalb einer Universität stattfinden. Empfohlen werden Organisationen, die als potentielle Arbeitgeber geeignet sind. Der Programmkoordinator und das Praktikantenamt können Anleitung zur Auswahl möglicher Optionen geben.

**Lernergebnisse:**

Nach erfolgreichem Abschluss des Moduls sind die Studierenden in der Lage, ihr theoretisches Wissen in der Praxis anzuwenden. Darüber hinaus sind sie in der Lage, sich in neue Unternehmen zu integrieren und deren Struktur zu analysieren und zu bewerten.

**Lehr- und Lernmethoden:**

**Medienform:**

**Literatur:**

**Modulverantwortliche(r):**

Friederike Dörr – Praktikantenamt Weihenstephan – [www.praktikantenamt-weihenstephan.de](http://www.praktikantenamt-weihenstephan.de) Alte Akademie 1, 85354 Freising, 08161 / 71-3710, [friederike.doerr@paw.bayern.de](mailto:friederike.doerr@paw.bayern.de)

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](http://campus.tum.de) oder [hier](#).

## Master's Thesis | Master's Thesis

### Modulbeschreibung

#### WZ2754: Master's Thesis | Master's Thesis

Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt

Modulbeschreibungsversion: Wintersemester 2016/17

<b>Modulniveau:</b> Master	<b>Sprache:</b> Englisch	<b>Semesterdauer:</b> Einsemestrig	<b>Häufigkeit:</b> Wintersemester/ Sommersemester
<b>Credits:*</b> 30	<b>Gesamtstunden:</b> 900	<b>Eigenstudiums- stunden:</b> 890	<b>Präsenzstunden:</b> 10

\* Die Zahl der Credits kann in Einzelfällen studiengangsspezifisch variieren. Es gilt der im Transcript of Records oder Leistungsnachweis ausgewiesene Wert.

#### Beschreibung der Studien-/ Prüfungsleistungen:

The assessment in this module is based on the successful completion of the Master's Thesis including the starting Master's Thesis Proposal. In order to promote the competences required for the Master's thesis, the proposal should be submitted before the registration of the thesis

#### Wiederholungsmöglichkeit:

Folgesemester

#### (Empfohlene) Voraussetzungen:

None

#### Inhalt:

The Master Thesis is the closure project of the program on which students have the opportunity to show their availability to work independently and adapt to a problem in a limited period of time. The student selects a topic of his/her own choice on which he/she will work according to scientific methods. A combination of the master's thesis and an internship is possible if the rules for internships are kept. It would be ideal if student's master's thesis is based on the internship experience. Discussing the topic and the methods with a guiding professor or lecturer before starting the master's thesis is absolutely necessary. Therefore, for all students a starting seminar "Master's Thesis Proposal" is offered to guide them 1) theoretically in structuring their 6 months' work and 2) in practice in writing a proposal which outlines their thesis topic including the state of

knowledge, the research gaps, the goal of the Master's Thesis, the planned methods and - which is really important - a working and a financial plan. It also includes training on literacy strategy.

The thesis must be written under supervision of a tutor who must be a lecturer of TUM and has the approval to conduct exams at TUM. It is recommended to select a lecturer of the "Sustainable Resource Management" Program. The tutor will in the end evaluate and mark the master's thesis. The thesis can be done at the faculty, outside the university, abroad or in the student's home-country, with previous consent of the tutor. Students can start writing their thesis in the fourth semester of the Master Program. To officially register the master's thesis, students have to hand in the application form for the master's thesis in the program coordination office. The form has to be completed together with the tutor. After this registration the student has a timeframe of six months to finish the master's thesis.

**Lernergebnisse:**

After finishing the module the students have the availability to work independently and adapt to a problem in a limited period of time. Additionally, they are able to draw conclusions from the data they found and to present and discuss their results in an appropriate way.

**Lehr- und Lernmethoden:**

Learning activities: literature search, scientific reading, to solve problems, to practice, to design an experiment, to create a scientific proposal and a scientific thesis, to constructive critique their own work and to revise it on basis of feedback, all parts under time constraints. Therefore, the learning methods are: an introduction lecture to support a structured procedure and peer instructions for their individual work.

**Medienform:**

Dependent on the topic of the thesis; e.g. specialized literature, software

**Literatur:**

Dependent on the topic of the thesis

**Modulverantwortliche(r):**

General information: Dr. Eva Bauer (Program Coordinator) Studienfakultät Forstwissenschaft und Ressourcenmanagement, Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/71-4464; srm@wzw.tum.de;

**Lehrveranstaltungen (Lehrform, SWS) Dozent(in):**

Für weitere Informationen zum Modul und seiner Zuordnung zum Curriculum klicken Sie bitte [campus.tum.de](https://campus.tum.de) oder [hier](#).

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