MODULE CATALOG
International Master of Science Program in
SUSTAINABLE RESOURCE MANAGEMENT

Winter semester 2012/13
Last update on 26.09.2013
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International Master of Science Program in
Sustainable Resource Management

Introduction

The master’s program in Sustainable Resource Management at the TU München fulfills the criteria of the Bologna Process detailed below, which were introduced to create uniformity (academic homologation) within the European Higher Education Area (EHEA).

Modularization: The degree program is completely modularized, i.e. individual courses were developed whose interdisciplinary content is united around a central theme. An exam is taken during the course of study for each module at the end of the semester. This increases student mobility within the EHEA insofar as credits from modules completed at other universities during an exchange program can be recognized toward degree programs at the student’s home university.

ECTS: A certain amount of credits corresponding to the student work load is assigned to each course. Work load is determined by the number of hours spent in class (contact hours), the number of hours required for preparation and review in independent study, as well as the number of hours required to prepare for and take examinations. One credit point (CP) is equal to 30 “working hours”. The number of total credits is based on the average employee work day of 1800 hours per year, or 900 hours per semester, which is equivalent to 30 credits. As a “unit of exchange”, the credit system facilitates the recognition of courses and exams taken at other universities, including those outside the EHEA.

Transparency: The learning objectives and content of the modules in the master’s program are described in detail in the brochure below.

Output Orientation: In addition to module content (input), learning objectives (output) are determined for each module.

Employability: Essential competencies to be acquired, learning objectives, and the thematic orientation of the modules were determined with regard to possible career objectives of future graduates of the program based on discussions with experts in the respective fields, through alumni questionnaires, as well as employment research studies (Future of Work, Megatrends). An 8-week internship allows students to apply knowledge acquired in their course of study, while the module itself fosters students’ competencies in presentation. All students at the TUM have access to a wide range of further education opportunities, such as foreign languages and personal development courses.

Diploma Supplement: Every graduate of the program receives a “Diploma Supplement,” an English-language annotation of the official master’s degree diploma.

1ECTS= European Credits Transfer System
Program Objectives

Natural resources, such as earth, water, air and biological diversity, constitute the foundation of human life and industry. They serve as sources of nutrition, raw material or energy, as living and recreational space, even as sinks for pollutants. Global consumption of natural resources is rapidly increasing, made more severe by global population and economic growth, leading, in turn, to an increase of pressure on all natural resources, resulting in greater environmental concerns, such as the reduction of biodiversity, soil degradation, water shortages and air pollution. Conflicts of interest arise from the ever greater scarcity of resources and lead to ever more frequent international tensions, whose comprehensive and sustainable resolution represents one of humankind’s greatest challenges to date.

In the face of these circumstances, the sustainable management of natural resources in the context of social, ecological and economic need becomes imperative. Along with solid specialist knowledge of various natural resources, this requires a thorough understanding of systems and wide-reaching competency in planning and methodology. The international master’s degree program in Sustainable Resource Management offers the essential foundations of this kind of expertise. The program’s objective is to give students the ability to sustainably manage natural resources on a scientific basis, with particular emphasis on the teaching of appropriate problem-solving management methods. Students’ professional and personal development also forms a central feature of the program. For example, students have the opportunity to develop their individual career profile through the selection of a field of concentration. The master’s program offers 8 fields of concentration (“Elective Fields”) covering the most significant natural resources and management concepts. Areas of concentration include:

- Environmental Economics and Policy
- Management and Protection of Forest Ecosystems
- Wildlife and Protected Area Management
- Landscape Management
- Renewable Resources
- Water and Soil Management
- Material and Waste Management
- Agricultural Land-Use

The international master’s program in Sustainable Resource Management is an inter- and cross-disciplinary program in which students from all over the world and from all different disciplines are equipped with the expertise to face the manifold challenges of sustainable resource management. The program’s curriculum includes a two-month internship outside the student’s country of origin in the field of sustainable resource management to provide insight into potential career fields, such as managerial positions in large companies, national and international governmental and non-governmental organizations, environmental consultancy and information services, the protection and management of ecosystems, as well as research and education.
Acquired Qualifications

In addition to specialist competencies in managing natural resources, students of the international master’s program in Sustainable Resource Management learn management methods to develop solutions for problems arising from conflicts concerning natural resources. Graduates are able to analyse and assess the impact of human activity on natural resources and, on that basis, to develop and implement viable concepts for the responsible management of natural resources. They understand the principles of sustainable human industry and activity, as well as the ecological, economic and socio-political significance of natural resources. Using methods of system analysis, students are able to identify the key interests of groups and influencing factors and take them into consideration in the development of alternative courses of action and to provide competent advice. Graduates have not only a solid knowledge of foreign languages but excellent social and intercultural skills, which serve as a basis for successful conflict management in an international context. They are also in a position to recognize and evaluate future socio-political and economic developments concerning the use of natural resources and take these into consideration in their work.

The expert knowledge and specialist competencies students acquire in the master’s program in Sustainable Resource Management are organized in the framework of the 8 fields of concentration (“Elective Fields”) as follows:

In the concentration Environmental Economics and Policy students acquire the ability to understand laws and legal structures relevant to the environment and draw conclusions about their effects on land use. They are able to discern the economic significance of natural resources and to apply appropriate methods of assessment. Moreover, they are familiar with the central tools of environmental management and environmental impact assessment, particularly with regard to legal and political frameworks.

Students in the concentration Management and Protection of Forest Ecosystems gain understanding of the socio-political and economic significance of forest ecosystems. They have knowledge of the fundamentals of sustainable forest management and are able to analyse the ecological relationships significant for forest growth and, further, to apply their knowledge toward the sustainable use and protection of forest ecosystems. Students acquire specialist skills in the areas of silvicultural planning, forest engineering, and forest operations planning.

The concentration Wildlife and Protected Area Management provides students with the skills required for protecting and managing wildlife and their habitats. Students use their understanding of relevant ecological relationships to discern the fundamental elements of sustainable wildlife and protected area management. They understand the significance of protected areas for nature and environmental protection, as well as environmental education, and are able to develop concepts for the sustainable use of such areas. Students are able to identify potential conflicts of interest and develop appropriate conflict resolution strategies.
Students in the concentration Landscape Management are able to perform comprehensive analyses for the planning and implementation of landscape development measures according to the principles of sustainability. They have knowledge of the most important methods of data gathering, analysis and assessment and are able to coordinate and apply them independently. In particular, students are able to apply their knowledge of geographical information systems in developing management solutions. They are able to make projections about the effects of interventions in the landscape and apply appropriate technologies and techniques to limit or eliminate damages resulting thereof.

In the concentration Renewable Resources, students gain knowledge of the significance of various renewable raw materials and regenerative sources of energy. Upon completion of their studies, they know the basic procedures of different types of utilization and are able to assess the economic and ecological consequences of various forms of recycling. They are able to estimate the benefits and risks relating to the use of regenerative energy sources. Moreover, they are familiar with the fundamental principles of plant breeding and understand its importance with regard to renewable resources.

Upon completion of their studies in the area Water and Soil Management, students understand the central role of water and soil in ecosystem management and are able to make projections concerning the major effects of changing environmental conditions. They are familiar with and able to apply various methods of analysis for the quantitative and qualitative assessment of soil and water quality and to interpret the outcomes of such analyses. Finally, they are able to make projections about possible future developments on the basis of these analyses and propose possible courses of action for sustainable land use.

Students in the concentration Material and Waste Management acquire knowledge of the various methods of waste disposal and their application for a variety of waste management solutions. They are versed in fundamental methods of material flow analysis and are able to use them to develop concepts for waste management, taking into account the protection of air, soil, water and human health through the assessment of different environmentally compatible alternatives.

In the concentration Agricultural Land-Use, students gain knowledge of the fundamental effects on the ecosystem of various methods of agricultural land management. They are familiar with agricultural land-use concepts from around the world and are able to assess them with regard to their sustainability. Further, students are familiar with alternative methods for the management of agricultural ecosystems and sustainable processes and can apply and further develop these methods independently.
Program Structure

The program is designed for 4 semesters. Each semester comprises a workload of 30ECTS. The first semester (October - February) covers a first set of compulsory, introductory and basic courses. The second semester (April-August) comprises the main part of the fields of concentration (2 out of 8 are chosen). In the third semester (October - February), the concentrations will be concluded and some further compulsory courses will be taught. The master`s thesis is written during the fourth semester (April-August). A two-month internship abroad is part of the program. A combination of master`s thesis and internship is recommended, but voluntary.
<table>
<thead>
<tr>
<th>4 SS</th>
<th>Master’s Thesis 30 CP</th>
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</table>
| 3 WS | „Fields of Concentration“  
[2 „Concentrations“ consisting of 4 Modules]  
Total number of Credits: 10 CP  
Human Resources and Corporate Social Responsibility 5 CP  
Research Tools in Resource Management 5 CP  
Internship 10 CP |
| 2 SS | „Fields of Concentration“  
[2 „Concentrations“ consisting of 4 Modules]  
Total number of Credits: 30 CP |
| 1 WS | Natural Resources – Traits, Management, System Analysis 5 CP  
Introduction to Economics and Ecology 5 CP  
Inventory Methods and GIS 5 CP  
Project Management and Public Relations 5 CP  
Scientific Writing and Presenting 5 CP  
International Communication 5 CP |
## Curriculum

### 1st Semester

<table>
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<th>Module ID</th>
<th>Module name</th>
<th>Type</th>
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<tr>
<td>WZ4192</td>
<td>Natural Resources - Traits, Management, Systems Analysis</td>
<td>RM</td>
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<tr>
<td>WI000924</td>
<td>Introduction to Economics and Ecology</td>
<td>RM</td>
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<td>WZ4167</td>
<td>Inventory Methods and GIS</td>
<td>RM</td>
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<td>WZ4176</td>
<td>Project Management and Public Relations</td>
<td>RM</td>
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<td>WZ4194</td>
<td>Scientific Writing and Presenting</td>
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<td>WI000925</td>
<td>International Communication</td>
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### 2nd and 3rd Semester

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<td>WZ4193</td>
<td>Research Tools in Resource Management</td>
<td>RM</td>
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<tr>
<td>WZ4190</td>
<td>Human Resources and Corporate Social Responsibility</td>
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<td>WZ4061</td>
<td>Internship</td>
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<td>WI000286</td>
<td>Environmental and Natural Resource Economics</td>
<td>Field of Concentration 1: Environmental Economics and Policy (REM)</td>
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<td>WI000926</td>
<td>International Environmental Policy and Conflict Resolution</td>
<td>Field of Concentration 1: Environmental Economics and Policy (REM)</td>
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<td>WI000927</td>
<td>Corporate Sustainability</td>
<td>Field of Concentration 1: Environmental Economics and Policy (REM)</td>
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<td>WZ4195</td>
<td>European Environmental Law and Environmental Assessment</td>
<td>Field of Concentration 1: Environmental Economics and Policy (REM)</td>
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<td>WZ4160</td>
<td>Forest Growth and Protection</td>
<td>Field of Concentration 2: Management and Protection of Forest Ecosystems (REM)</td>
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<tr>
<td>WZ4161</td>
<td>Forest Management</td>
<td>Field of Concentration 2: Management and Protection of Forest Ecosystems (REM)</td>
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<td>WZ4196</td>
<td>Forest Operations and Genetic Resources Management</td>
<td>Field of Concentration 2: Management and Protection of Forest Ecosystems (REM)</td>
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<td>WZ4082</td>
<td>Plantation Forestry and Agroforestry</td>
<td>Field of Concentration 2: Management and Protection of Forest Ecosystems (REM)</td>
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<tr>
<td>WZ4197</td>
<td>Protected Areas Biodiversity and Management</td>
<td>Field of Concentration 3: Wildlife and Protected Area Management (REM)</td>
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<td>WZ4198</td>
<td>Wildlife Management and Wildlife-Human Interactions</td>
<td>Field of Concentration 3: Wildlife and Protected Area Management (REM)</td>
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<td>WZ4199</td>
<td>Ecotourism and Nature Conservation</td>
<td>Field of Concentration 3: Wildlife and Protected Area Management (REM)</td>
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<td>WZ4200</td>
<td>Conservation Biology and Fisheries Management</td>
<td>Field of Concentration 3: Wildlife and Protected Area Management (REM)</td>
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RM = Required Module (Compulsory Modules)  
REM = Required Elective Module (Elective Modules)
### 2nd and 3rd Semester

<table>
<thead>
<tr>
<th>Module ID</th>
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<tr>
<td>WZ4201</td>
<td>Vegetation Ecology Geographical Information Systems</td>
<td>Field of Concentration 4: Landscape Management (REM)</td>
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<td>WZ4091</td>
<td>Remote Sensing and Image Processing</td>
<td>Field of Concentration 4: Landscape Management (REM)</td>
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<td>WZ4168</td>
<td>Landscape Planning and Applied Development Cooperation</td>
<td>Field of Concentration 4: Landscape Management (REM)</td>
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<td>WZ4094</td>
<td>Landscape Management - Application Study</td>
<td>Field of Concentration 4: Landscape Management (REM)</td>
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<td>WZ4177</td>
<td>Renewable Energy Technologies</td>
<td>Field of Concentration 5: Renewable Resources(REM)</td>
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<td>WZ4097</td>
<td>Agricultural Raw Materials and their Utilization</td>
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<td>WZ4098</td>
<td>Forestry Raw Materials and their Utilization</td>
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<td>WZ4202</td>
<td>Political and Social Perspectives of Renewable Resources</td>
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<td>WZ4203</td>
<td>Introduction to Soil Science and Hydrometeorology</td>
<td>Field of Concentration 6: Water and Soil Management (REM)</td>
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<td>WZ4204</td>
<td>Alpine Watersheds under Changing Climate</td>
<td>Field of Concentration 6: Water and Soil Management (REM)</td>
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<td>WZ4205</td>
<td>World Soil Resources in Theory and Field Practice</td>
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<tr>
<td>WZ4106</td>
<td>Management of Soil and Water Resources</td>
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<td>WZ4206</td>
<td>Material Flow Management and Applications</td>
<td>Field of Concentration 7: Material and Waste Management(REM)</td>
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<td>WZ4207</td>
<td>Waste and Waste Water Treatment</td>
<td>Field of Concentration 7: Material and Waste Management(REM)</td>
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<td>WZ4208</td>
<td>Utilization of Special Waste</td>
<td>Field of Concentration 7: Material and Waste Management(REM)</td>
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<td>WZ4209</td>
<td>Land-Use Systems from a Global Perspective</td>
<td>Field of Concentration 8: Agricultural Land-Use (REM)</td>
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<td>WZ4210</td>
<td>Assessment of Sustainability in Agriculture</td>
<td>Field of Concentration 8: Agricultural Land-Use (REM)</td>
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<td>WZ4211</td>
<td>Case Studies of Land-Use Management</td>
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<td>WZ4212</td>
<td>Agricultural Land-Use Systems - Application Study</td>
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### 4th Semester

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<td>WZ4002</td>
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Compulsory Modules
Natural Resources - Traits, Management, Systems Analysis

Module ID: WZ4192

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

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<td>Language:</td>
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<td>Occurrence:</td>
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<td>Total Hours:</td>
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<td>Duration:</td>
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<td>Self-study Hours:</td>
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Description of Achievement and Assessment Methods

The learning outcome will be assessed by a written exam covering the whole content of the module.

Type of Assessment: written
Duration of Assessment (min.): 90min
Homework: no
Term Paper: no
Oral Presentation: no
Conversation: no
Assessment Retake: next semester

Content

The module is intended as an introduction to the master course Sustainable Resource Management. The module ends up discussing examples for actual interdisciplinary problems of resource management and the corresponding efforts to find sustainable solutions. Each topic of the module is covered by expert scientists belonging to the school of forest science and resource management as well as by external experts.

Intended Learning Outcomes

At the end of the module the students are able to remember the most important perceptions of sustainable resource management. Moreover, they understand the typical properties of social, biological and technical systems, their combinations and interactions and they are able to illustrate the principle of sustainability, its challenges and current trends in science and practice of sustainability.

(Recommended) Prerequisites

none

Teaching and Learning Methods

Lectures providing theoretical foundations. Examples will be given during the lectures.

Media:

PowerPoint

Reading List:

Tba

Module Structure

Course 1
Lecturer 1
Form of Teaching 1
Course 2
Lecturer 2
Form of Teaching 2

Management of Human-Nature-Technology Systems
Peter Biber, Anton Fischer, Sandra Fohlmeister, Michael Leuchner, Christian Kaul, Hans Pretzsch, Karl-Heinz Häberle,
Lecture (4SWS)
System Analysis
Peter Biber
Lecture (2SWS)
Introduction to Economics and Ecology

Module ID: WI000924

Responsible for Module: Prof. Dr. Klaus Salhofer; Lehrstuhl für Volkswirtschaftslehre - Umweltökonomie und Agrarpolitik; Alte Akademie 14; 85354 Freising; 08161-71-3406; salhofer@wzw.tum.de

Module Level: Master
Credits: 5 Credits
Duration: one-semester
Language: English
Occurrence: winter semester
Total Hours: 150h
Contact Hours: 56h
Self-study Hours: 94h

Description of Achievement and Assessment Methods

The learning success will be assessed by a written examination covering the whole content of the module.

Type of Assessment: written
Duration of Assessment (min.): 90min
Homework: no
Term Paper: no
Oral Presentation: no
Conversation: no
Assessment Retake: next semester

Content

- Introduction in ecology;
- Ecological theory, concepts and principles;
- Introduction to economic theory;
- Consumer theory; production theory;
- Reasons for market failure;
- Humans in the environment;
- The economy in the environment;
- Decisions in time;
- Sustainability;
- Economic growth.

Intended Learning Outcomes

At the end of the module students have a good overview on ecology theory and concepts. They know important patterns and the ecological theories behind. Moreover, students understand the interactions between the environment and they economy and the impact of the economy on the environment and vice versa. Furthermore, they understand the most important economic principle and are able to apply it to environmental and resource problems.

(Recommended) Prerequisites

None

Teaching and Learning Methods

Lectures providing theoretical foundations in Economics and Ecology. Examples will be given during the lectures.

Media:
Reading material provided by lecturer, power point presentation

Reading List:

Module Structure

Course 1: Introduction to Economics and Ecology
Lecturer 1: Klaus Salhofer, Jörg Müller
Form of Teaching 1: Lecture (4SWS)
Inventory Methods and GIS

Module ID: WZ4167

Responsible for Module: Prof. Dr. Thomas Knoke; Fachgebiet für Waldinventur und nachhaltige Nutzung; Hans-Carl-von-Carlowitz Platz 2, 85354 Freising; 08161/71-4701, knoke@forst.wzw.tum.de

Module Level: Master
Language: English
Total Hours: 150h
Credits: 5 Credits
Contact Hours: 50h
Self-study Hours: 100h

Module Level: Master
Credits: 5 Credits
Occurrence: Winter semester
Duration: One-semester

Description of Achievement and Assessment Methods
The learning success will be assessed by a written examination covering the three main branches of the module, namely GIS, Terrestrial Inventory Methods and Remote Sensing Principles.

Type of Assessment: Written
Duration of Assessment (min.): 90min
Homework: No
Term Paper: No
Oral Presentation: No
Conversation: No
Assessment Retake: Next semester

Content
Implementation of basic concepts for acquisition, management and visualization of spatial data as well as their inter-connection with tabular data from different sources;
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. Introduction to Remote Sensing Principles: basic understanding of the physical background of remote sensing, on sensor concepts and evaluation strategies are elucidated.

Intended Learning Outcomes
At the end of the courses on Inventory methods and GIS the students are able to:
- Select an appropriate GIS program with respect to its intended field of application;
- Apply a GIS 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.

(Recommended) Prerequisites
None

Teaching and Learning Methods
The module includes lectures, exercises and accompanying examples.

Media:
Online material available at www.elearning.tum.de; Slides with lectures downloadable from a platform to be announced

Reading List:
Environmental Systems Research Institute Inc.: Map Projections. Georeferencing spatial data, ESRI Press
Vienneau, A.: Using ArcCatalog, ESRI Press

Module Structure

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<tr>
<th>Course 1</th>
<th>Lecturer 1</th>
<th>Form of Teaching 1</th>
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<tbody>
<tr>
<td>Introduction to GIS</td>
<td>Martin Döllerer</td>
<td>Lecture (2SWS)</td>
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<tr>
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<th>Form of Teaching 2</th>
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<tr>
<td>Inventory Methods</td>
<td>Thomas Knoke, Thomas Schneider</td>
<td>Lecture (2SWS)</td>
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Description of Achievement and Assessment Methods

The learning outcome will be assessed by an assignment. Additionally, the students have to give an oral presentation concerning their group work during the course.

Type of Assessment: assignment
Homework: yes
Oral Presentation: yes
Assessment Retake: next semester

Content

1. Relationship between people and project management.
2. Importance of project planning.
3. Why projects fail.
4. Project management life cycle.
5. Risk management.
6. Basic Public Relations know-how for future managers - why to communicate with stakeholders and other groups; how to plan a communication strategy; how to control PR service providers; PR and environmental organisations

Intended Learning Outcomes

At the end of the module students should be able to plan a project in all its detail and to understand communication processes in Public Relations and apply current PR instruments to the requirements of their task.

(Recommended) Prerequisites

None

Teaching and Learning Methods

The module consists of lectures where the theoretical foundations are provided and a project with group work.

Media:

PowerPoint Presentations, Presentation notes include case studies and online sources for further reference

Reading List:


Module Structure

Course 1
Lecturer 1: Walter Warkotsch
Form of Teaching 1: Lecture (4SWS)

Course 2
Lecturer 2: Katrin Röder-vom Scheidt
Form of Teaching 2: Lecture (1SWS)
**Scientific Writing and Presenting**

**Module ID**
WZ4194

**Responsible for Module:** PD Dr. Gabriele Weber-Blaschke; Lehrstuhl für Holzwissenschaft; Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/71- 5635; gabriele.weber-blaschke@wzw.tum.de

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**Description of Achievement and Assessment Methods**

The learning outcome will be assessed by an assignment where the students have to write their own scientific paper. Additionally, the students have to give an oral presentation concerning a scientific topic during the course.

**Type of Assessment:** assignment

**Duration of Assessment (min.):**

- Homework: yes
- Term Paper: no
- Oral Presentation: yes
- Conversation: no

**Assessment Retake:** next semester

**Content**

- In Scientific Writing, the following content will be taught to the students: a) purpose of scientific writing b) procedure of scientific writing c) writing a scientific paper d) details of the different chapters in a scientific paper e) looking for literature and data sources to write a scientific paper

- In Presenting, the following content will be taught to the students: a) English style of presentations, how to express transition points b) how to describe tables, graphs and charts c) the key characteristics of effective presentations, the special features of scientific presentations d) the communication process as two-way interaction e) the structural elements of a presentation f) vocal skills and body language, using and managing visual aids, persuasive language and delivery techniques g) dealing with nervousness, breaking the ice, handling questions and difficult situations h) different facilitation opportunities, challenges, and problems, verbal and nonverbal facilitation techniques, step-by-step facilitation processes and tools i) group dynamics, dealing with difficult situations and facilitating conflict resolution in groups.

**Intended Learning Outcomes**

By the means of the module Scientific Writing and Presenting the students are able to:

- understand the topic scientific writing
- apply the procedure of scientific writing
- analyse other scientific papers
- apply literature sources
- create own scientific papers
- to recognize the features of an excellent presentation,
- identify the elements of and barriers to communication,
- assess a presentation’s situation (purpose/audience/roles), effectively plan, research and structure their presentation,
- create an attention-getting introduction, sustain rapport, utilize body language and vocal skills for greater impact, speak persuasively, clearly, accurately and with conviction,
- prepare for audience questions with appropriate responses,
- summarize all key points precisely in conclusion, apply what they have learned in a professional way.

**Recommended Prerequisites**

None

**Teaching and Learning Methods**

The module includes lectures, exercises and a seminar. Lectures providing theoretical foundations in Scientific Writing and Presenting. Exercises are introduced during the lectures and the students are supposed to finish them individually as homework. Additionally, every student has to give an oral presentation in the seminar.

**Media:**

- power point presentation, lecture sheets, overhead sheets, PDFs of scientific papers,

**Reading List:**


**Module Structure**

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<tr>
<th>Course 1</th>
<th>Scientific writing</th>
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<td>Gary York</td>
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International Communication

Module ID: WI000925

Responsible for Module: Prof. Dr. Michael Suda; Lehrstuhl für Wald- und Umweltpolitik;
Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/ 71- 4625; suda@forst.wzw.tum.de

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Description of Achievement and Assessment Methods

The assessment in this module is a pass/fail requirement consisting of an oral presentation and a written examination. The students should demonstrate their ability to interact and communicate in a foreign language on cross-cultural level.

Type of Assessment: written
Duration of Assessment (min.): yes

Homework: yes
Term Paper: yes
Oral Presentation: yes
Conversation: yes
Assessment Retake: next semester

Content

Foreign Language: Depending on the initial knowledge of the participants courses of different levels are offered; based on situations of the everyday life (personal introduction, German food, visit of a medical doctor...) the following skills are trained: Listening, speaking, reading, writing; adequate grammar and vocabulary; German native speakers are obliged to study a language of their choice other than German.

Cross Cultural Communication: Theory and practice of cross-cultural communication, exercises in dealing with different perceptions; rhetoric exercises individually and in team work.

Facilitation: Theory and practice of methods aimed at brainstorming, fact finding or problem-solving in heterogeneous groups

Intended Learning Outcomes

At the end of the module students are able to interact in a foreign language, for foreign students especially German - depending on the level; beginners: a command of 1500 words and knowledge of the basic grammar (casus, verbs, declination, pronouns...); advanced: vocabulary, grammar knowledge as well as listening, speaking, reading, writing skills; professional level: text production in a foreign language. Furthermore the students are able to understand cross-cultural differences and to apply techniques to avoid miscommunication based on cross-cultural differences. Finally, the Facilitation part of the module increases awareness of group dynamics and provides students with some basic understanding how to use these dynamics for different purposes.

(Recommended) Prerequisites

None

Teaching and Learning Methods

The module is separated into lectures, exercises and supervised group work. This combination intends to provide the students with basic knowledge of a chosen foreign language, CCC and facilitation; and apply and experience these insights

Media:
Presentations, additional readings, case studies (if available)

Reading List:
TBA

Module Structure

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<td>Course 3</td>
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<td>Francis Bisasso</td>
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Research Tools in Resource Management

Module ID: WZ4193

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

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**Description of Achievement and Assessment Methods**

The assessment is based on a written examination at the end of semester. Part of this are "Information Management" and "Statistics of Natural Management" as written examination as well as a "Master’s Thesis Proposal (MTP)" and "Literature retrieval" as assignment.

- **Type of Assessment:** written
- **Duration of Assessment (min.):** 75min
- **Homework:** yes
- **Term Paper:** no
- **Oral Presentation:** no
- **Conversation:** yes
- **Assessment Retake:** next semester

**Content**

- **Master’s Thesis and Scientific Proposals:**
  - Scientific Proposals: purpose of writing proposals, procedure of writing proposals, details of the different chapters in a proposal, recommendations for writing a proposal; recommendations and information for getting funding (grants and scholarships)

- **Statistics in Resource Management:**
  - Justification of statistics, descriptive statistics and exploration: Frequencies and their graphical representation, distributions and their moments, testing hypotheses, regression analysis, analysis of variance.

- **Information Management:**
  - Information Literacy: reference management; literature retrieval;
  - Information management: typical activities and responsibilities
  - Data management: storing and organizing data
  - Data security: risks and protection
  - Sustainable information management

**Intended Learning Outcomes**

- **Master’s Thesis and Scientific Proposals:**
  - applying the procedure of writing a Master’s Thesis, - creating the own "Master’s Thesis", - applying the procedure of writing Scientific Proposals, - creating own Scientific Proposals

- **Statistics in Resource Management:**
  - understanding 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

- **Information Management:**
  - applying reference management software, - creating, employing and reviewing a search strategy, - applying tools to obtain full texts, - understanding data storing concepts - understanding the risks of storing and transmitting information, - considering different approaches to information and data

**Recommended Prerequisites**

- Lecture and Seminar Scientific Writing (basic understanding and applying of writing scientific papers)
- Module Inventory Methods and GIS (basic understanding of recording data)

**Teaching and Learning Methods**

Exercises in computer rooms, empirical data provided

**Media:**

- Master’s Thesis and Scientific Proposals: - power point presentation, case studies, review
- Statistics in Resource Management: - based on MS EXCEL and SPSS
- Information Management: - Moodle

**Reading List:**

- Master’s Thesis and Scientific Proposals: - guideline: "How to survive the master’s thesis", - guideline: "How to write a proposal"
- handouts
- Discovering statistics using SPSS Field, Andy P. 2009
- Information Management: - videos and handouts before the lecture

**Module Structure**

| Course 1 | Information Management
| Lecturer 1 | Olaf Strehl, Birgid Schlindwein
| Course 2 | Master’s Thesis and Scientific Proposals:
| Lecturer 2 | Gabriele Weber-Blaschke, Andreas Hahn, Verena Griess
| Course 3 | Statistics of Natural Resources
| Lecturer 3 | Thomas Knoke, Ricardo Acevedo Cabra

**Form of Teaching 1** Lecture (2SWS)

**Form of Teaching 2** Lecture (2SWS)

**Form of Teaching 3** Lecture (2SWS)
Human Resources and Corporate Social Responsibility

Module ID: WZ4190

Responsible for Module: As regards content: Dr. Michael Berger, PEFC International, Route de l’Aéroport 10, Case Postale 636, 1215 Genf, michael.berger@pefc.org, +41 (22) 799 4540
Administrative: Dr. Kathrin Böhling; Lehrstuhl für Wald- und Umweltpolitik, Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/71 - 4624, boehling@forst.tu-muenchen.de

Module Level: Master
Credits: 5 Credits
Language: English
Occurrence: winter semester
Duration: one-semester
Total Hours: 150h
Contact Hours: 75h
Self-study Hours: 75h

Description of Achievement and Assessment Methods

The learning outcome will be assessed by an assignment on a specific topic related to Human Resources Management and Corporate Social Responsibility.

Type of Assessment: assignment
Duration of Assessment (min.):
Homework: no
Term Paper: yes
Oral Presentation: no
Conversation: no
Assessment Retake: next semester

Content
- Managing Human Resources: An Introduction to HRM,
- Managing Diversity/CSR Approach,
- Recruiting and Selecting Employees,
- Rewarding Employees,
- Appraising and Managing Performance,
- Employee Development: Training the Workforce

Intended Learning Outcomes

After finishing the module students are able to:
- discuss HR issues
- understand the trade-offs involved in responsible HR decisions
- analyse how business competition, labour markets, technology, unions, and government regulations affect responsible HR decisions
- understand how the interdependencies between HR policies create HR systems where the “whole is greater than the sum of the parts
- assess how HR systems support the firm’s business strategy

(Recommended) Prerequisites
Organizational Behaviour Course; Courses with a psychological dimension (but not mandatory)

Teaching and Learning Methods

Lectures, class discussion and exchange for personal experience, case presentation and discussion, group work, videos, role plays, etc.

Media:
Hand-outs including Case Studies, Articles, etc.; PowerPoint Presentations; Videos; Internet

Reading List:

Module Structure

Course 1
Lecturer 1
Form of Teaching
Course 2
Lecturer 2
Form of Teaching 2

Human Resources Management
Christine Naschberger
Lecture (2,5SWS)
Corporate Social Responsibility
Michael Berger
Lecture (2,5SWS)
**Internship**

**Responsible for Module:** General information: Elke Pukall (Program Coordinator), Studienfakultät Forstwissenschaft und Ressourcenmanagement, Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/71-4464; elke.pukall@forst.wzw.tum.de  
Internship advisor: Prof. Dr. Thomas Knoke; Fachgebiet für Waldinventur und nachhaltige Nutzung; Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/71-4701, knoke@forst.wzw.tum.de

**Module ID:** WZ4061

**Module Level:** Master  
**Credits:** 10 Credits  
**Language:** English  
**Occurrence:**  
**Total Hours:** 300h  
**Contact Hours:** 0h  
**Self-study Hours:** 300h  
**Duration:** eight weeks

**Description of Achievement and Assessment Methods**

After completion of the internship, the student has to hand in an internship report and a certification letter where the employer verifies the duration with eventual miss-outs and the kind of work which was performed from the trainee.

**Type of Assessment:** Internship Report  
**Duration of Assessment (min.):**  
**Homework:** no  
**Term Paper:** no  
**Oral Presentation:** no  
**Conversation:** no  
**Assessment Retake:**

**Content**

According to the study rules for the Master Program "Sustainable Resource Management", every student has to serve an internship outside his/her home country with a minimum duration of 2 months (10 ECTS credits). The internship should act as a possibility for the trainee to get insight into the different areas of operation for sustainable resource managers. The student should be enabled to survey his individual career aspirations and to contact potential employers. The student has to search for an internship by his/her own and it has to be scheduled in a way that it does not conflict with the lecture periods. A recommended time spell for the internship is between the second and third semester (August – October). The internship can be split into two parts with a minimum duration of one month each. Further divisions are possible just due to significant reasons, but have to be approved in advance by the internship advisor. It is possible to serve the internship in different organisations; however the minimum duration of one month must be kept. The internship must take place outside a university. Recommended are organisations that are potential employers. The program coordinator and the internship advisor can give guidance regarding choices of possible organisations.

**Intended Learning Outcomes**

On successful completion of the module, students are able to apply their theoretical knowledge in a practical environment. Furthermore, they are able to incorporate themselves into new companies and to analyse and assess business organisations.

**Recommended Prerequisites**

None
Master’s Thesis

Module Level: Master  
Credits: 30 Credits  
Duration: one-semester

Language: English  
Occurrence: summer semester  
Self-study Hours: 900h

Total Hours: 900h

Description of Achievement and Assessment Methods

The assessment in this module is based on the successful completion of the Master’s Thesis

Type of Assessment: Master’s Thesis  
Duration of Assessment (min.):

Homework: no  
Term Paper: no

Oral Presentation: no  
Conversation: no

Assessment Retake: no

Content

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. 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 examination office (Verwaltungsstelle Weihenstephan, Prüfungsamt Forst). 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.

Intended Learning Outcomes

After finishing the module the students have the ability 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.

(Recommended) Prerequisites

None

Teaching and Learning Methods

Learning activities: literature search, scientific reading, to solve problems, to practice, to design an experiment,

Media:

Depending on the topic of the thesis e.g. specialised literature, software

Reading List:

Depending on the topic of the thesis

Module Structure

Course 1  
Master’s Thesis

Lecturer 1

Form of Teaching

Fields of Concentration
Concentration 1: Environmental Economics and Policy

Environmental and Natural Resource Economics

Module ID
WI000286

 Responsible for Module: Prof. Dr. Klaus Salhofer; Lehrstuhl für Volkswirtschaftslehre - Umweltökonomie und Agrarpolitik; Alte Akademie 14; 85354 Freising; 08161-71-3406; salhofer@wzw.tum.de

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Description of Achievement and Assessment Methods

The learning success will be assessed by a written examination covering the whole content of the module.

Type of Assessment: written

Duration of Assessment (min.): 120min

Homework: yes

Term Paper: no

Oral Presentation: no

Conversation: no

Assessment Retake: next semester

Content

- Environmental externalities
- Economic growth and the environment
- Analysis of Environmental Economic instruments
- Valuation methods for Environmental resources
- Irreversibility’s
- Cost-Benefit Analysis

Intended Learning Outcomes

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, and how they work and are able to compare them regarding their efficiency. They know and can apply different methods to value environmental resources and conduct a Cost-Benefit Analysis.

(Recommended) Prerequisites

A basic knowledge in Ecological Economics is recommended.

Teaching and Learning Methods

The module includes lectures, exercises and group discussions.

Media:

PowerPoint

Reading List:


Module Structure

| Course 1 | Environmental and Natural Resource Economics |
| Form of Teaching 1 | Lecture (0.66WS) |
| Lecturer 1 | Klaus Salhofer |

| Course 2 | Environmental and Natural Resource Economics |
| Form of Teaching 2 | Lecture (0.66WS) |
| Lecturer 2 | Justus Wesseler |

| Course 3 | Environmental and Natural Resource Economics |
| Form of Teaching 3 | Lecture (0.66WS) |
| Lecturer 3 | Maarten Punt |

| Course 4 | Environmental and Natural Resource Economics |
| Form of Teaching 4 | Lecture (2SWS) |
| Lecturer 4 | Thilo Glebe |
International Environmental Policy and Conflict Resolution

Module ID: W000926

Responsible for Module: Dr. Kathrin Böhling, Prof. Dr. Michael Suda; Lehrstuhl für Wald- und Umweltpolitik; Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/ 71- 4624; boehling@forst.tu-muenchen.de

Module Level: Master
Language: English
Total Hours: 150h
Credits: 5 Credits
Duration: one-semester
Occurrence: summer semester
Contact Hours: 50h
Self-study Hours: 100h

Description of Achievement and Assessment Methods

The contents of the course consist of factual knowledge, conceptualizations and introductions to related scholarly debates. In order for the students to demonstrate that they have mastered the contents they will have to explain these concepts as well as demonstrate their knowledge of exploring and comparing policies. Therefore a written exam is most appropriate.

Type of Assessment: written
Duration of Assessment (min.): 90min
Homework: yes
Term Paper: yes
Oral Presentation: yes
Conversation: yes
Assessment Retake: next semester

Content

The module consists of two parts:

1. The goal of “International Environmental Policy” is to explore the emergence and development of the international environmental regime from 1970-2010. The course analyses the development of a variety of environmental policy instruments 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”). The course, therefore, analyses a global shift from “government to governance”. We will discuss this shift using the most interesting examples of international environmental policy instruments, including international conventions (e.g. International Convention on Biological Diversity and UN Framework Convention on Climate Change), private regulatory instruments (environmental certification and labelling), participatory instruments (private-public partnerships, multi-stakeholder instruments) and market-based instruments (emission trading). The course will include lectures, group discussions, group work and reading assignments.

2. “Conflict Resolution” – the second part of the overall module – is concerned with the increasing range of conflicts which emerge from (over-)use of natural resources (e.g. land, forests, water, minerals). These resources are not just “out there”, ready to be consumed. Rather, their use is embedded in distinct institutions and entails a variety of different actors with partly incompatible interests, values, perceptions and goals (e.g. economically-driven land use vs. nature conservation). An emerging trend in the resolution – or better – management of these conflicts is to rely on multi-stakeholder dialogues and arrangements. In addition to exploring different conflict cases, this trend will be assessed and critically assessed in class.

Intended Learning Outcomes

At the end of the module, students are able to:
(a) understand the history of international environmental policy;
(b) evaluate the shift from government to governance in international environmental policy;
(c) analyse the effectiveness of treaties and schemes at a basic level;
(d) analyse and evaluate environmental- and resource-based conflicts; and
(e) suggest possible resolution strategies.

(Recommended) Prerequisites

None

Teaching and Learning Methods

The module will include lectures, group discussions, group work and reading assignments (also some home reading).

Media:

Power Point, Board, Flip Chart, Reader

Reading List:


Module Structure

Course 1
Lecturer 1
Form of Teaching 1
International Environmental Policy
Olga Malets, Kathrin Böhling
Lecture (2SWS)

Course 2
Lecturer 2
Form of Teaching 2
Conflict Resolution
Kathrin Böhling
Lecture (1SWS)
Corporate Sustainability

Module ID: WI000927

Responsible for Module: Prof. Dr. Frank Martin Belz; Professur für Betriebswirtschaftslehre Brau- und Lebensmittelindustrie; Alte Akademie 14, 85354 Freising; 08161/71-3279; Jeanette.Kralisch@wi.tum.de

Module Level: Master
Credits: 5

Language: English
Occurrence: summer semester
Duration: one-semester
Total Hours: 150h
Contact Hours: 60h
Self-study Hours: 90h

Description of Achievement and Assessment Methods
The assessment is based on the group assignment (creative video) during the course and one final written exam.

Type of Assessment: written
Duration of Assessment (min.): 120min

Homework: yes
Term Paper: no
Oral Presentation: no
Conversation: no
Assessment Retake: next semester

Content
Sustainable Marketing:
- Part I: Understanding Sustainability and Marketing; Marketing in the 21st Century; Framing Sustainability Marketing Management;
- Part II: Developing Sustainability Marketing Opportunities; Socio-ecological Problems; Consumer Behaviour;
- Part III: Developing Sustainability Marketing Standards and Strategies; Sustainability Marketing Values and Objectives; Sustainability Marketing Strategies;
- Part IV: Developing the Sustainability Marketing Mix ("4 C's"); Customer Solutions; Communications; Customer Cost; Convenience;
- Part V: Developing the Future of Sustainability Marketing; Sustainability Marketing Transformations; Reframing Sustainability Marketing Economics of the sustainable enterprise (ESE):
- Historical development of ESE
- Actors of environmental policy
- European and international environmental policy
- Sustainability reporting
- Corporate social responsibility (CSR)
- Creating Shared Value (CSV)
- The sustainable enterprise in practice
- Environmental Management System Implementation (EMS)
- Eco-Management and Audit Scheme (EMAS)

Intended Learning Outcomes
At the end of the module the students are able to:
1. Understand the ambivalent relationship between sustainability and marketing,
2. Analyse the link between socio-ecological problems and consumer behaviour,
3. Develop a sustainability marketing strategy and a sustainability marketing mix (the "four Cs"),
4. Apply the sustainability marketing concept to different kinds of companies and industries.
5. Understand economic concepts and theories for analysing sustainable development,
6. Understand sustainable reporting principles and concepts,
7. Understand major certifications and how to use them,
8. Establish an organizational culture in which sustainability is institutionalized

(Recommended) Prerequisites
None (a basic understanding of conventional marketing management is helpful, but not necessary/required)

Teaching and Learning Methods
Lectures including classroom participation and discussions

Media:
Presentation in the form of power points slides; videos; different types of cases, that is sustainability marketing stories (for illustrative purposes) and sustainability marketing challenges (to stimulate discussions); review questions; and discussion questions

Reading List:

Module Structure
Course 1: Sustainability marketing
Lecturer 1: Frank-Martin Belz
Form of Teaching 1: Lecture (2SWS)
Course 2: Economics of the sustainable enterprise
Lecturer 2: Wiendl Andreas
Form of Teaching 2: Lecture (2SWS)
European Environmental Law and Environmental Assessment

Module ID
WZ4195

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

Module Level:
Master

Credits:
5 Credits

Occurrence:
winter semester

Duration:
one-semester

Language:
English

Total Hours:
150h

Self-study Hours:
100h

Contact Hours:
50h

Description of Achievement and Assessment Methods
Successful completion of the course will be based on the following considerations: quality of written exam, quality of assignment (oral presentation), contributions to class discussions.

Type of Assessment:
written exam and assignment

Duration of Assessment (min.):
60min

Homework:
yes

Term Paper:
no

Oral Presentation:
yes

Conversation:
no

Assessment Retake:
next semester

Content

Course 1 "European Environmental Law": Objectives, Principles and Conditions of EU Environmental Law; Actors, Instruments and Decision-Making Procedures in the EU legislative process; Participation and Information Rights; Environmental Impact Assessment, Strategic Environmental Assessment; Nature Conservation Law (Natura 2000: Protection of SPA/SAC, Protection of Species); Environmental Liability; Implementation of EU Environmental Law.

Course 2 "Methods of Environmental Assessment": The course provides an overview of methods and tools for assessing and predicting environmental consequences of development actions in advance. Being an integral part of a systematic planning procedure (such as Environmental Impact Assessment and Strategic Environmental Assessment) environmental assessment procedures integrate biophysical and socioeconomic information to evaluate the impacts associated with proposed projects, plans and policies. The course focuses on the methods and tools, what they are meant to accomplish and how they should be designed to be sound and effective.

Intended Learning Outcomes

Learning objectives are to provide students with basic knowledge on the characteristics of EU Environmental Law from a European perspective; understanding of the structure and the functioning of important EU environmental legal provisions, especially in the context of land management and infrastructural planning; and the role of environmental law in the context of environmental protection. Furthermore, the students are given the opportunity to explore, discuss and understand the concepts and philosophy of environmental assessment in the seminar. Participants get to know methods and tools for analysing and evaluating environmental impacts as well as current practice and potentials. Besides, they develop a range of communication and problem-solving skills.

(Recommended) Prerequisites

None

Teaching and Learning Methods

Lectures provide students with a basic grasp of European environmental law. In the seminar, presentations by students and the lecturers give an overview of methods, tools and techniques to solve legal problems and cases, and to assess and evaluate potential impacts of proposed development projects, plans and programs. Class discussions engage students in critical thinking and analysing the scope and limitations of the presented material.

Media:

Lectures; presentations; class discussions; additional reading material

Reading List:

Module Structure

Course 1 European Environmental Law

Lecturer 1 Stefan Wagner

Form of Teaching Lecture (2SWS)

Course 2 Methods of Environmental Assessment

Lecturer 2 Isabel Augenstein

Form of Teaching Seminar (2SWS)
Forest Growth and Protection

Module ID: WZ4160

Responsible for Module: Dr. Thomas Rötzer, Lehrstuhl für Waldwachstumskunde, Hans-Carl-von-Carlowitz Platz 2, 85354 Freising, thomas.roetzer@tum.de, Tel.: 08161/71-4667

Module Level: Master
Language: English
Total Hours: 150h
Credits: 5
Occurrence: summer semester
Duration: one-semester
Self-study Hours: 104h
Contact Hours: 46h

Description of Achievement and Assessment Methods

The learning success of the module Forest Growth and Protection will be assessed by a written examination.

Type of Assessment: written
Duration of Assessment (min.): 90min
Homework: no
Term Paper: no
Oral Presentation: no
Conversation: no
Assessment Retake: next semester

Content

*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 analysed 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 Protection addresses pathogens, insect pests and impacts by climatic and abiotic factors. The first section deals with important host-pathogen- interactions between fungal und fungal-like pathogens and their woody host plants. Exemplarily Phytophthora-woody plant interactions known worldwide are described and discussed in detail with the intention to develop management strategies for nurseries and forest ecosystems. The overall aim is to establish techniques to identify and to inhibit the spread of these devastating pathogens. This approach is demonstrated for several European countries as well as for the United States of America, Australia and New Zealand.

*The section “Protection against insect pests” presents a rough overview of some topics in insect biology (development, morphology and anatomy; pheromone communication) and highlights the impact on tress due to insect damages of foliage, buds, cambium/phloem, wood body and roots. The most prominent families of the different herbivorous guilds are treated. The lecture proceeds to ecological measures to prevent outbreaks of insect pest due to quarantine, silviculture techniques, stabilization of the food web and plant resistance. With regard to an actual risk of an outbreak, monitoring and forecast methods as well as criteria for control decisions were presented. The part of actual pest control includes the action mode and application of biopesticides (virus and bacteria), pheromones, moulting inhibitors and contact insecticides. The lecture closes with an ecological discussion of the different control measures with regard to the impact on the ecosystem.

Intended Learning Outcomes

On successful completion of the module, students are able to:
- understand the principal factors that influence forest growth and production
- analyse tree and stand growth of central European forest based on site conditions
- evaluate the effects of silvicultural treatments
- understand the need, the possibilities and functionality of forest growth models
- understand the impact of biotic and abiotic factors on vitality and stability of individual trees and forest stands
- understand the impact of insects on trees
- apply their ecological knowledge to minimize and forecast the risk of damages by insect pests
- characterise the action mode of insecticides and the application of appropriate measures of pest control taking into account the side effects of pesticide

Prerequisites

Basic knowledge in biology and forest science

Teaching and Learning Methods

lectures and presentations, field trip (optional)

Media:

lectures and presentations (pdfs)

Reading List:


Module Structure

Course 1
Lecturer 1
Hans Pretzsch, Thomas Rötzer
Form of Teaching1
Lecture (2SWS)
Course 2
Lecturer 2
Reinhard Schopf, Wolfgang Oßwald, Michael Weber
Form of Teaching 2
Lecture (2SWS)
Module ID: WZ4161

Responsible for Module: Prof. Dr. Reinhard Mosandl, Lehrstuhl für Waldbau, Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/71-4551, mosandl@forst.tu-muenchen.de

Module Level: Master
Language: English
Total Hours: 150h

Description of Achievement and Assessment Methods
The learning outcome will be assessed by an oral exam covering the whole content of the module.

Type of Assessment: oral
Duration of Assessment (min.): 30min
Homework: no
Term Paper: no
Oral Presentation: no
Conversation: no
Assessment Retake: next semester

Content
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.

Intended Learning Outcomes
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.

(Recommended) Prerequisites
None

Teaching and Learning Methods
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.

Media:
PowerPoint presentations, additional reading material, software application

Reading List:

Module Structure

<table>
<thead>
<tr>
<th>Course</th>
<th>Lecturer</th>
<th>Form of Teaching</th>
<th>Content</th>
</tr>
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<tbody>
<tr>
<td>1</td>
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<td>Lecture (2SWS)</td>
<td>Forest Ecosystem Management</td>
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<td></td>
<td>2</td>
<td>Practical (2SWS)</td>
<td>Forest Management Planning</td>
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</table>

[Module ID: WZ4161]
Forest Operations and Genetic Resources Management

**Module ID:** WZ4196

**Responsible for Module:** Prof. Dr. Walter Warkotsch; Lehrstuhl für Forstliche Arbeitswissenschaft und Angewandte Informatik; Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/ 71- 4761, arbwiss@forst.wzw.tum.de

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<td>Language:</td>
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**Description of Achievement and Assessment Methods**

The learning outcome will be assessed by an oral exam covering the whole content of the module.

- **Type of Assessment:** oral
- **Duration of Assessment (min.):** 30min
- **Homework:** no
- **Term Paper:** no
- **Oral Presentation:** no
- **Conversation:** no
- **Assessment Retake:** next semester

**Content**

1. Environmental impacts of technologies to the forest soil and stand;
2. Impacts of forest roads and sound road planning and design;
3. Environmentally friendly harvesting operations;
4. Impacts of forest operations on labour.
5. Biodiversity and genetic resources in forestry;
6. Assessment of genetic variation and its dynamics in tree populations; response to stress, genetic adaptation and survival;
7. Quantification of genetic resources in tree populations; management and legislation of forest reproductive material; certifications schemes; genetically sustainable forest management;
8. Case studies on genetic resources in alpine forest ecosystems and tropical rain forests.

**Intended Learning Outcomes**

On successful completion of the module, students are able to:
- evaluate impacts and risks of mechanized harvesting operations,
- classify forest road planning procedures,
- apply sound road construction and environmentally harvesting operations to prevent environmental damages,
- describe genetic tools for certification, risk evaluation and sustainable forest management under varying environmental conditions,
- assess the quality of genetic resources, particularly forest reproductive material,
- understand the importance of protecting genetic resources.

**(Recommended) Prerequisites**

No specific prerequisites; basic knowledge in biological and/or related applied sciences is very helpful.

**Teaching and Learning Methods**

Lecture and excursions.

**Media:**
Condensed version of the lecture and references are supplied.

**Reading List:**


**Module Structure**

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<tr>
<th>Course</th>
<th>Lecturer</th>
<th>Form of Teaching</th>
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<tbody>
<tr>
<td>1</td>
<td>Genetic Resources Management</td>
<td>Hanno Schäfer</td>
</tr>
<tr>
<td>2</td>
<td>Low Impact Forest Operations</td>
<td>Walter Warkotsch</td>
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</table>

**Course 1**
Lecture (2SWS)

**Course 2**
Lecture (2SWS)
Plantation Forestry and Agroforestry

Module ID
WZ4082

Responsible for Module: Prof. Dr. Michael Weber; Lehrstuhl für Waldbau;
Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/71- 4689, m.weber@forst.wzw.tum.de

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<td>Self-study Hours:</td>
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Description of Achievement and Assessment Methods
Written or oral exam with questions covering the whole content of the module. The type of assessment depends on the number of students.

<table>
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<tr>
<th>Type of Assessment:</th>
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<tbody>
<tr>
<td>Duration of Assessment (min.):</td>
<td>60min or 30min</td>
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</table>

| Homework: | yes |
| Oral Presentation: | no |
| Assessment Retake: | next semester |

| Term Paper: | no |
| Conversation: | yes |

Content
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 Temperate AF Systems, Reasons for renaissance of AF, Environmental aspects (radiation, temperature, humidity, Soil/nutrients, Interactions), Socio-cultural aspects, Economical aspects, Classification of AF, Important AF-practices, Important tree groups in AF (NFT’s, MPT’s, Palms), Planning in AF, Obstacles for introduction of AF;
Forest Management for Carbon Sequestration: Global carbon cycle, 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.

Intended Learning Outcomes
Students who participate successfully in this class have demonstrated that they are able to
- understand and outline the major issues of plantations in the context of international forest policy,
- explain the fundamental purposes of Plantation Forestry,
- understand the essentials of Plantation Silviculture,
- critically examine plantation projects, e. g. on management, work volume and economic results.
- understand the fundamental principles and practices of agroforestry land use,
- assign different AF-land use systems to certain categories of AF,
- understand the interactions among different components of an AF systems,
- assess the ecological and economic effects of AF-systems, know central management options,
- address problems and chances of AF in the context of rural development;
- understand the role of forests and forest management activities in the global C-cycle,
- assess the forest management options for different purposes within the framework of the international climate policy and
- identify and develop mitigation project concepts.

(Recommended) Prerequisites
None

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

Media:
PowerPoint presentations, case studies, additional reading material

Reading List:

Module Structure
Course 1
Plantation Forestry and Agroforestry

Lecturer 1
Michael Weber, Bernd Stimm

Form of Teaching1
Lecture (4SWS)
Protected Areas Biodiversity and Management

Module ID: WZ4197

Responsible for Module: Prof. Dr. Anton Fischer; Fachgebiet für Geobotanik; Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/71-4729; a.fischer@forst.wzw.tum.de

Module Level: Master
Language: English
Total Hours: 150h
Credits: 5
Occurrence: summer semester
Duration: one-semester
Self-study Hours: 90h
Contact Hours: 60h

Description of Achievement and Assessment Methods
The learning outcome will be assessed by a written examination covering the whole content of the module.

Type of Assessment: written
Duration of Assessment (min.): 90
Homework: no
Term Paper: no
Oral Presentation: yes
Conversation: no
Assessment Retake: next semester

Content
Biodiversity and protected areas:
- Biodiversity on a local and a global level;
- Protection of biological units;
- IUCN protected areas classification,

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 (Bavarian Forest national Park)

Intended Learning Outcomes
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

(Recommended) Prerequisites
Successful completion of the 1st semester of the Master Program Sustainable Resource Management is recommended

Teaching and Learning Methods
The module is separated into lectures and a field trip. Lectures providing theoretical foundations which are deepened on the field trip.

Media:
PowerPoint Presentation,

Reading List:

Module Structure

<table>
<thead>
<tr>
<th>Course 1</th>
<th>Lecturer 1</th>
<th>Form of Teaching 1</th>
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<tbody>
<tr>
<td>Biodiversity in Protected Areas</td>
<td>Anton Fischer</td>
<td>Lecture (2SWS)</td>
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<tr>
<th>Course 2</th>
<th>Lecturer 2</th>
<th>Form of Teaching 2</th>
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<tr>
<td>Protected Area Management</td>
<td>Jörg Müller, Thomas Rödl</td>
<td>Lecture (2SWS)</td>
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</table>
Module ID: WZ4198

**Responsible for Module:** Thomas Rödl Ph.D., Prof. Dr. Ralph Kühn, Lehrstuhl für Zoologie, Liesel-Beckmann-Str. 4/1, 85354 Freising, 08161/71-4608; thomas.roedl@googlemail.com

**Module Level:** Master  
**Credits:** 5 Credits  
**Occurrence:** summer semester  
**Duration:** one-semester  
**Language:** English  
**Occurrence:** summer semester  
**Total Hours:** 150h  
**Contact Hours:** 56h  
**Self-study Hours:** 94h

### Description of Achievement and Assessment Methods

Final written examination in the field of species management and conservation strategies and written assignment 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 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.

- **Type of Assessment:** written  
- **Duration of Assessment (min.):** 90min  
- **Homework:** no  
- **Term Paper:** yes  
- **Oral Presentation:** no  
- **Conversation:** yes  
- **Assessment Retake:** next semester

### Content


### Intended Learning Outcomes

After the course students are able to: understand important ecological concepts in wildlife management; understand the importance of the human dimension in wildlife management; analyse 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.

### (Recommended) Prerequisites

None

### Teaching and Learning Methods

- Lecture, video, group exercises, discussions

### Media:

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

### Reading List:


### Module Structure

<table>
<thead>
<tr>
<th>Course 1</th>
<th>Wildlife Management</th>
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<tbody>
<tr>
<td>Lecturer 1</td>
<td>Thomas Rödl</td>
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<tr>
<td>Form of Teaching 1</td>
<td>Lecture (2SWS)</td>
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<tr>
<th>Course 2</th>
<th>Wildlife-Human Interactions</th>
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<tr>
<td>Lecturer 2</td>
<td>Alistair James Bath</td>
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<tr>
<td>Form of Teaching 2</td>
<td>Seminar (2SWS)</td>
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</tbody>
</table>
Ecotourism and Nature Conservation

Responsible for Module: Prof. Dr. Anton Fischer; Fachgebiet für Geobotanik; Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/71-4729; a.fischer@forst.wzw.tum.de

Module ID:
WZ4199

Module Level: Master
Language: English
Total Hours: 150h

Credits: 5 Credits
Occurrence: summer semester
Contact Hours: 78h
Duration: one-semester
Self-study Hours: 72h

Description of Achievement and Assessment Methods

Final written examination and oral report requiring review of literature, synthesis and integration of key concepts and findings from the literature.

Type of Assessment: written and oral
Duration of Assessment (min.): 60min and 20min
Homework: no
Term Paper: no
Oral Presentation: yes
Conversation: yes
Assessment Retake: next semester

Content

Basis of nature conservation and ecotourism; Contents and strategies of applied ecotourism; Potential of touristic use; Ecotourism as a niche; Five days ecotourism orientated field trip to the Bohemian Forest (Nationalpark Bavarian Forest, Nationalpark Sumava) with topics of applied nature conservation and applied ecotourism.

Intended Learning Outcomes

At the end of the module students understand the importance of Nature Conservation and it’s interaction with Human Dimensions. They have an overview of applied interdisciplinary Nature Conservation management methods and are able to evaluate management strategies. In addition students understand the philosophy of Ecotourism, have insights into possibilities and challenges of applied Ecotourism and are able to evaluate Ecotourism strategies and it’s implementations.

(Recommended) Prerequisites
None

Teaching and Learning Methods

The module consists of lectures and an additional excursion.

Media:
PowerPoint Presentation

Reading List:
Current literature is announced in the first lecture.

Module Structure

Course 1: Ecotourism
Lecturer 1: Anton Fischer
Form of Teaching 1: Lecture (2SWS)
Course 2: Case Studies in Nature Conservation and Ecotourism
Lecturer 2: Anton Fischer, Ralph Kühn
Form of Teaching 2: Excursion (3SWS)
Conservation Biology and Fisheries Management

**Module ID:** WZ4200

**Responsible for Module:** Prof. Dr. Ralph Kühn; Lehrstuhl für Zoologie, Liesel-Beckmann-Str.4/I, 85354 Freising; 08161/71-4608, ralphkuehn@mytum.de

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<td>Self-study Hours:</td>
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**Description of Achievement and Assessment Methods**

Final written examination in the field of conservation biology and fisheries management and written assignment requiring review of literature, synthesis and integration of key concepts to develop a coherent research proposal in a conservation genetics topic.

**Type of Assessment:** written/midterm  
**Duration of Assessment (min.):** 120min  
**Homework:** no  
**Term Paper:** yes  
**Oral Presentation:** yes  
**Conversation:** yes  
**Assessment Retake:** next semester  

**Content**


**Intended Learning Outcomes**

At the end of the module students understand the importance of Biodiversity of terrestrial and aquatic resources for mankind and are able to evaluate the anthropogenic impact on it. They are able to apply and to evaluate Conservation Genetics methods and strategies in securing Biodiversity based upon an interdisciplinary understanding of genetic and biotechnology methods as well as theoretical basics in micro and macro evolution. In addition they are able to assess 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. Students learn to objectively integrate and apply knowledge from different disciplines to develop sustainable resource management and show their comprehension by creating interdisciplinary projects.

**Recommended Prerequisites**

Basics in biology, ecology and genetics

**Teaching and Learning Methods**

Case studies, practical experiments / demonstrations

**Media:**

Power-Point presentation, blackboard, flip-chart, hand-outs

**Reading List:**

Primack (2004): Conservation Biology; Frankham (2002): Conservation Genetics; Reading List Intranet; Michael King: Fisheries Biology, Assessment and Management; Blackwell Publishing

**Module Structure**

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<tr>
<th>Course 1</th>
<th>Genetic and Conservation Biology</th>
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<td>Lecturer 1</td>
<td>Ralph Kühn</td>
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<td>Jürgen Geist</td>
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Vegetation Ecology and Geographical Information Systems

Module ID: WZ4201

Responsible for Module: Dr. Martin Döllerer; Lehrstuhl für Forstliche Arbeitswissenschaften und Angewandte Informatik; Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/71-4656, doellerer@tum.de

Module Level: Master
Language: English
Total Hours: 150h
Credits: 5 Credits
Occurrence: summer semester
Duration: one-semester
Contact Hours: 60h
Self-study Hours: 90h

Description of Achievement and Assessment Methods

The learning outcome will be assessed by a written examination covering the whole content of the module. Additionally, the students have to give an oral presentation and hand in a term paper about their developed proposals on specific landscape management measures during the semester.

Type of Assessment: written and mid-term
Homework: no
Oral Presentation: yes
Assessment Retake: next semester
Duration of Assessment (min.): 90min
Term Paper: yes
Conversation: no

Content

1. Advanced analysis and visualisation of spatial data;
2. GIS based raster analysis.
3. Introduction to the vegetation ecology, theory of plant distribution and of plant communities;
4. Methods of habitat mapping;
5. Habitat mapping in the field;
6. Field data analysis;
7. Management measures for management plans.

Intended Learning Outcomes

At the end of the module students are able to:
- manage, analyse and visualise 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 management plans based on vegetation and habitat data;
- ascertain and classify habitats.

(Recommended) Prerequisites

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

Teaching and Learning Methods

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.

Media:

GIS Software, PowerPoint Presentation

Reading List:

To be announced

Module Structure

Course 1: GIS (Landscape Management)
Lecturer 1: Martin Döllerer
Form of Teaching 1: Lecture + Exercises (2SWS)
Course 2: Vegetation Ecology
Lecturer 2: Hagen Fischer
Form of Teaching 2: Lecture (2SWS)
Remote Sensing and Image Processing

Module ID
WZ4091

Responsible for Module: Dr. Thomas Schneider, Fachgebiet für Waldinventur und nachhaltige Nutzung, Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161 / 71-4666, tomi.schneider@tum.de

Module Level: Master
Credits: 5 Credits

Language: English
Occurrence: summer semester
Duration: one-semester

Total Hours: 150h
Contact Hours: 70h
Self-study Hours: 80h

Description of Achievement and Assessment Methods

The assignments are based on: 1. the home exercises; 2. the participation intensity on discussions and the quality of the contributions during the courses; 3. the demonstrated skills in operating the image analysis software, 4. the presentation style, contents and layout of the home prepared talk; 5. the final report

Type of Assessment: assignment
Duration of Assessment (min.):

Homework: yes
Term Paper: no
Oral Presentation: yes
Conversation: yes
Assessment Retake: next semester

Content


Intended Learning Outcomes

At the end of the Remote Sensing and Image Processing module (RSIP) the students are able to:
- decide which data set is the most appropriated one for his task,
- download and open a data set for image processing,
- georeference digital data sets;
- develop an interpretation according to the analysed data set and the thematic goal;
- visualize and enhance the data set for interpretation,
- extract spectral signatures,
- perform unsupervised and supervised classifications,
- calculate indices on behalf of the data,
- learn how to extract bio-geo-chemo-physical parameter from the data set;
- perform a change detection study,
- proof the quality of the results by an accuracy assessment,
- export the results as GIS layer

(Recommended) Prerequisites

Module “Inventory Methods and GIS” of the 1th semester of the Master’s Program “Sustainable Resource Management” passed, at least working level computer skills

Teaching and Learning Methods

By using an image processing software the theoretical explained concepts are exercised on basis of different data types; the practical courses are prepared by homework (presentation of specific related topics, exercises); the short presentations will be given during the courses, the home exercises explained in close relation to the computer exercises just done

Media:

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

Reading List:

The literature recommended within the Modules “Inventory Methods and GIS”, “Remote Sensing and Image Processing”,
www.wiau.man.ac.uk/courses/cvmsc/Terminol.html#SplitMerge;
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/airespres.html; Uni Zürich, RSL: http://www.geo.unizh.ch/rs2/; EARSeL:

Module Structure

Course 1 Remote Sensing and Image Processing
Lecturer 1 Thomas Schneider
Form of Teaching Seminar with exercises (5 SWS)
Landscape Planning and Applied Development Cooperation

Module ID: WZ4168

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

Module Level: Master
Language: English
Total Hours: 150h

Credits: 5 Credits
Occurrence: summer semester
Contact Hours: 50h
Self-study Hours: 100h

Duration: one-semester

Description of Achievement and Assessment Methods

Successful completion of the course will be based on the following considerations: quality of written exam, contributions to class discussions, participation in small group exercises.

Type of Assessment: written
Duration of Assessment (min.): 90min
Homework: yes
Term Paper: no
Oral Presentation: yes
Conversation: no
Assessment Retake: next semester

Content

Course 1: "Landscape Planning": Principles and concepts of Landscape Planning (with special focus on the German and European context and experiences); approaches for the assessment of landscape functions including methods and tools for data collection, analysis and evaluation; techniques for conflict analysis and target formulation.

Course 2: "Land Use Management in Applied Development Cooperation": Structure and guiding principles of German Development Cooperation; participatory methods; governance for sustainable resource use; conflict management; environmental communication; implementation-oriented introduction to instruments developed by International Development Cooperation, based on case studies from real project examples.

Intended Learning Outcomes

Upon termination of the module, students are enabled to understand the requirements, relevant concepts, methods and tools to assess and evaluate landscape functions and natural resources, and processes of contemporary sustainable landscape planning. Besides, they are sensitized to recognize factors being keys for sustainable land use management in developing countries, such as stakeholder involvement, governance or conflict management. Thus, the module’s overall target consists in increasing the students’ capability to apply the methods of sustainable landscape development in the context of their individual home countries’ conditions.

(Recommended) Prerequisites

Basic understanding of landscape ecology; basic know-how of project management

Teaching and Learning Methods

Lectures provide knowledge (theoretical concepts and instruments of Landscape Planning and the key factors of Applied Development Cooperation); class discussions of selected papers and film contributions engage students in critical thinking (incl. analysing, evaluating and problem solving); in group work activities students experience the application of selected methods and tools.

Media:

Presentations, film contributions, additional reading material

Reading List:


Module Structure

Course 1
Lecturer 1: Isabel Augenstein
Form of Teaching 1: Lecture (2SWS)
Course 2
Lecturer 2: Sandra Fohlmeister
Form of Teaching 2: Seminar (2SWS)
Module ID
WZ4094

Responsible for Module: Dr. Thomas Schneider, Fachgebiet für Waldinventur und nachhaltige Nutzung,
Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161 / 71-4666, tomi.schneider@tum.de

Module Level: Master      Credits: 5 Credits
Language: English         Occurrence: winter semester
Total Hours: 150h          Duration: one-semester
Contact Hours: 60h         Self-study Hours: 90h

Description of Achievement and Assessment Methods

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, organisations, 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

Type of Assessment: assignment
Duration of Assessment (min.):
Homework: yes
Term Paper: yes
Oral Presentation: yes
Conversation: yes
Assessment Retake: next semester

Content

1. Implementation of GIS and RS techniques.
2. Implementation of theoretical concepts of Vegetation Ecology.
3. Implementation of theoretical concepts Landscape Planning.
5. Preparation of the material and final presentation of the results.

Intended Learning Outcomes

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 and landscape planning, remote sensing and GIS techniques;
- reflect upon the application of the acquired skills in the context of developing countries;
- develop a landscape planning project according to the legislative framework;
- present the results in the frame of a simulated public presentation and by preparing a project report with the required supporting data.

(Recommended) Prerequisites

The successful completion of the modules "Inventory Methods and GIS", "Remote Sensing and Image Processing", "Geographical Information Systems and Vegetation Ecology", "Landscape Planning and Applied Development Cooperation" or equivalent skills are required

Teaching and Learning Methods

The application study combines elements of a seminar, a workshop, exercises and project work.

Media:
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).

Reading List:
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.

Module Structure

Course 1: Landscape Management - Application Study
Lecturer 1: Thomas Schneider, Isabella Augenstein, Sandra Fohlmeister, Martin Döllerer
Form of Teaching: Seminar and project work (5 SWS)
Renewable Energy Technologies

Responsible for Module: Dr. Doris Schieder, Lehrstuhl für Chemie Biogener Rohstoffe, Schulgasse 16, 94315 Straubing, 09421187108, doris.schieder@wzw.tum.de

Module Level: Master Credits: 5
Language: English Occurrence: summer semester
Total Hours: 150h Contact Hours: 50h
Self-study Hours: 100h

Duration: one-semester

Description of Achievement and Assessment Methods

Written examination with questions covering the whole content of the module.

Type of Assessment: written
Duration of Assessment (min.): 90min
Homework: no
Term Paper: no
Oral Presentation: no
Conversation: no
Assessment Retake: next semester

Content

Technologies (major focus), properties, efficiencies, costs and selected environmental aspects of renewable energy production are presented. The focus is on wind, solar, hydro and biomass. Benefits, drawbacks and future perspectives also will be discussed.

Intended Learning Outcomes

The aim of the course is to provide an insight in the technologies and potentials but also in the challenges of renewable energy production. At the end of the course, the students understand the benefits and drawbacks of the discussed technologies and are able to evaluate present and future renewable energy pathways and projects with respect to technical, ecological and economical aspects.

(Recommended) Prerequisites

Basic knowledge of physics, chemistry and biology are strictly required to understand the technological aspects

Teaching and Learning Methods

The module includes lectures, exercises and an optional field trip.

Media:
Power point presentation, black board, video (optional)

Reading List:
Tba

Module Structure

Course 1 Renewable Energy Technologies
Lecturer 1 Doris Schieder
Form of Teaching1 Lecture (4SWS)
### Description of Achievement and Assessment Methods

The learning outcome will be assessed by a written exam covering the whole content of the module.

<table>
<thead>
<tr>
<th>Type of Assessment</th>
<th>Duration of Assessment (min.)</th>
</tr>
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<tbody>
<tr>
<td>written</td>
<td>90min</td>
</tr>
<tr>
<td>Homework</td>
<td>no</td>
</tr>
<tr>
<td>Oral Presentation</td>
<td>no</td>
</tr>
<tr>
<td>Assessment Retake</td>
<td>next semester</td>
</tr>
</tbody>
</table>

### Content

1. Biomass production in agriculture;
2. Systematic of renewable resources;
3. Utilization chains;
4. Physiology of biomass crops;
5. Production systems;
6. Survey of breeding methods in agriculture; increase of yield and quality of products;
7. Biomass supply chains;
8. Quality management for biomass;
9. Ecological aspects of the production of renewable resources in agriculture;

### Intended Learning Outcomes

At the end of the module students are able to understand renewable resources from the agricultural sector, to analyse performance and advantages of different biomass supply chains, to evaluate biomass projects and the political and economic frame conditions of biomass production and use. They know which plants are used for renewable energies and have an understanding of methods and goals of plant breeding in agriculture, insight on advantages and risks of breeding technologies. In addition to this the students know how to seed or plant these special plants as well as how to harvest them. They are able to list economic aspects and the solution of improvements for certain biomass supply chains.

### (Recommended) Prerequisites

General understanding of natural science, mathematics and basics of technology

### Teaching and Learning Methods

Lectures providing theoretical foundations concerning Agricultural Raw Materials and their Utilization. Examples will be given during the lectures.

### Media:

Power Point

### Reading List:

Tba

### Module Structure

<table>
<thead>
<tr>
<th>Course 1</th>
<th>Agricultural Raw Materials and their Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecturer 1</td>
<td>Alexander Höldrich</td>
</tr>
<tr>
<td>Form of Teaching 1</td>
<td>Lecture (4SWS)</td>
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</table>
Forestry Raw Materials and their Utilization

Module ID: WZ4098

Module Level: Master
Language: English
Total Hours: 150h

Description of Achievement and Assessment Methods

The learning success will be assessed by a written examination covering the whole content of the module. Additionally, the students have to give an oral presentation and hand in a term paper concerning different forest raw materials and their utilization.

Type of Assessment: written
Homework: no
Oral Presentation: yes
Assessment Retake: next semester

Content

1. Overview and potential of forest resources;
2. Availability, characteristics and properties of products;
3. Potential for important products and employment;

Intended Learning Outcomes

At the end of the module students are able to understand important forest raw materials and potential uses, to analyse ecological, economic and social aspects of typical forest raw materials and NTFP, to evaluate production technologies and industries, including strategic decisions in management and administration.

(Recommended) Prerequisites

Basics of biology, chemistry and physics as a prerequisite to deal with the conversion processes of wood to final products

Teaching and Learning Methods

Lecture, exercises, seminar, Optional: visits to industry

Media:

Demonstration material: raw materials and products; PP presentations; films

Reading List:

Corrado, T.: Bioactive compounds from natural sources: Isolation, characterisation and biological properties.

Module Structure

Course 1
Forestry Raw Materials and their Utilization
Lecturer 1
Klaus Richter, Jan-Willem van de Kuilen
Form of Teaching1
Lecture (2SWS)
Course 2
Forestry Raw Materials and their Utilization
Lecturer 2
Klaus Richter, Jan-Willem van de Kuilen
Form of Teaching 2
Exercise (2SWS)
Description of Achievement and Assessment Methods

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 report and give an oral presentation about their findings.

Type of Assessment: Assignment
Homework: no
Oral Presentation: yes
Assessment Retake: next semester

Duration of Assessment (min.):
Term Paper: yes
Conversation: no

Content
- International political framework for the production of renewable resources;
- global perspectives and availability of renewables;
- ethical and social aspects;
- land-use and development.

Intended Learning Outcomes

At the end of the module the students are able to analyse political and social aspects regarding sustainable resource planning in intercultural environments.

(Recommended) Prerequisites

None

Teaching and Learning Methods

The module includes lectures, group discussions and group work. The lecture provides theoretical foundations. Examples will be given during the lectures. Besides, the students will have to prepare a report on a selected topic and present it. This will be done in groups.

Media:
Power Point

Reading List:
Tba

Module Structure

Course 1
Political and Social Perspectives of Renewable Resources

Lecturer 1
Jan-Willem van de Kuilen, Michael Weber, Michael Suda

Form of Teaching
Lectures (4SWS)
Introduction to Soil Science and Hydrometeorology

 Responsible for Module: Dr. Markus Steffens; Lehrstuhl für Bodenkunde, Emil-Ramann-Straße 2, 85354 Freising; 08161/71-4195, markus.steffens@mytum.de

<table>
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<th>Module Level:</th>
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<tr>
<td>Language:</td>
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<td>Total Hours:</td>
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<td>Credits:</td>
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<tr>
<td>Occurrence:</td>
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<tr>
<td>Contact Hours:</td>
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<td>Duration:</td>
<td>one-semester</td>
</tr>
<tr>
<td>Self-study Hours:</td>
<td>100h</td>
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</table>

Description of Achievement and Assessment Methods

The learning outcome will be assessed by a written exam covering the whole content of the module.

<table>
<thead>
<tr>
<th>Type of Assessment:</th>
<th>written</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of Assessment (min.):</td>
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<td>Term Paper:</td>
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<td>Oral Presentation:</td>
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</tr>
<tr>
<td>Conversation:</td>
<td>no</td>
</tr>
<tr>
<td>Assessment Retake:</td>
<td>next semester</td>
</tr>
</tbody>
</table>

Content


2. Hydrometeorology and climate change (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);

Intended Learning Outcomes

At the end of the module the students are able to understand the basics of soil science, hydrology, and the influence of climate change on hydrological processes and management. They can apply their knowledge from soil mineralogy, soil organic matter, soil chemistry, and soil physics to all soils that are presented to them. They are able to analyse results of hydrological measurements according to their importance for water management.

(Recommended) Prerequisites

Basic knowledge in chemistry, physics, and biology.

Teaching and Learning Methods

The basics of soil science and hydrology are presented and discussed. Some simple case studies are used to introduce into the theoretical background (e.g. minerals and rocks in the showcase, various 3-dimensional models of clay minerals, meteorological instruments at the meteo platform).

Media:

Presentation notes, case studies

Reading List:


Module Structure

Course 1 Introduction to Soil Science
Lecturer 1 Markus Steffens
Form of Teaching 1 Lecture (2SWS)
Course 2 Introduction to Hydrometeorology
Lecturer 2 Michael Leuchner
Form of Teaching 2 Lecture (2SWS)
Alpine Watersheds under Changing Climate

Description of Achievement and Assessment Methods

The learning outcome will be assessed by an assignment on a specific topic related to hydrology and limnology. Additionally the students have to give an oral presentation about their topic.

Type of Assessment: assignment
Duration of Assessment (min.):
Homework: no
Term Paper: yes
Oral Presentation: yes
Conversation: no
Assessment Retake: next semester

Content


2. Introduction in Applied Limnology: Position of Limnology within natural science; Age and genesis of lakes; Physical and chemical conditions in lakes; Field trip lake Osterseen area; Microscopic exercises; Basic knowledge on food webs in lakes

Intended Learning Outcomes

After this combined field trip with lectures and computer work, the students are able to apply basics in hydrology and limnology in alpine watersheds to various problems. They can run different hydrological models and understand the influence of climate change on hydrological processes and management in mountainous areas. They are able to assess and understand results of major experimental sites according to their importance for water management.

(Recommended) Prerequisites

Introduction in Hydrometeorology

Teaching and Learning Methods

Lecture and field trips in the Garmisch and Kreuth area, in limnology a practical stage of two days at the field stations / lakes in Iffeldorf - Combined lecture, laboratory work, and excursion at the Limnologische Station Iffeldorf

Media:
PowerPoint Presentation

Reading List:

Module Structure

Course 1
Lecturer 1
Form of Teaching
Introduction in Applied Limnology
Uta Raeder
Lecture and exercise (1SWS)
Course 2
Lecturer 2
Form of Teaching
Field Course in Applied Hydrometeorology
Michael Leuchner, Lothar Zimmermann
Lecture and exercise (4SWS)
World Soil Resources in Theory and Field Practice

**Responsible for Module:** Dr. Peter Schad, Lehrstuhl für Bodenkunde; Emil-Ramann-Str. 2, 85354 Freising, 08161/71-4735, schad@tum.de

<table>
<thead>
<tr>
<th>Module Level:</th>
<th>Master</th>
<th>Credits:</th>
<th>5 Credits</th>
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<tr>
<td>Language:</td>
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<td>Occurrence:</td>
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<td>Total Hours:</td>
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<tr>
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<td>Contact Hours:</td>
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<tr>
<td></td>
<td></td>
<td>Self-study Hours:</td>
<td>80h</td>
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**Description of Achievement and Assessment Methods**

The assessment in this module is based on two elements: an oral examination covering the whole content of the module and a pass/fail requirement about the field course. The students should demonstrate the ability to examine soils and to assess their usability.

<table>
<thead>
<tr>
<th>Type of Assessment:</th>
<th>oral</th>
<th>Duration of Assessment (min.):</th>
<th>30min</th>
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<tbody>
<tr>
<td>Homework:</td>
<td>no</td>
<td>Term Paper:</td>
<td>no</td>
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<tr>
<td>Oral Presentation:</td>
<td>no</td>
<td>Conversation:</td>
<td>no</td>
</tr>
<tr>
<td>Assessment Retake:</td>
<td>next semester</td>
<td></td>
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</tbody>
</table>

**Content**

1. Soils of the world;
2. Properties of soils;
3. Genesis of soils;
4. Classification of soils;
5. Soil survey;
6. Soil hydrology;
7. Soil erosion assessment.

**Intended Learning Outcomes**

The students understand the characteristics of all soils of the world, the pattern of their geographical distribution, their genesis and their ecological potential. The students are able to examine a soil profile and to detect the genesis of the examined soil. They are able to 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 assess the erosion risk.

**(Recommended) Prerequisites**

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

**Teaching and Learning Methods**

The lecture gives the overview over all soils of the world. The field course gives practical experience on how to describe and understand soils, soil hydrology and soil erosion risk.

**Media:**

- Lecture: presentation notes; Field course: spade, auger, knife, colour charts, TDR probes, suction cups, erosion assessment kits,

**Reading List:**


**Module Structure**

<table>
<thead>
<tr>
<th>Course 1</th>
<th>World Soil Resources - Lecture</th>
<th>Lecturer 1</th>
<th>Peter Schad</th>
</tr>
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<tbody>
<tr>
<td>Form of Teaching 1</td>
<td>Lecture (2SWS)</td>
<td></td>
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<tr>
<td>Course 2</td>
<td>World Soil Resources - Field Assessment</td>
<td>Lecturer 2</td>
<td>Peter Schad, Jörg Prietzel, Carsten Müller, Thilo Rennert, Jörg Vökel</td>
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<tr>
<td>Form of Teaching 2</td>
<td>Field Course (3,5SWS)</td>
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Management of Soil and Water Resources

Module ID: WZ4106

Responsible for Module: Prof. Dr. Michael Leuchner, Fachgebiet für Ökoklimatologie, Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/71-4745, leuchner@wzw.tum.de

Module Level: Master
Language: English
Total Hours: 150h
Credits: 5
Occurrence: oral exam
Contact Hours: 50h
Duration: one-semester
Self-study Hours: 100h

Description of Achievement and Assessment Methods

The learning outcome will be assessed by an oral exam covering the whole content of the module.

Type of Assessment: oral exam
Duration of Assessment (min.): 30min
Homework: no
Term Paper: no
Oral Presentation: yes
Conversation: no
Assessment Retake: next semester

Content

1. 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, presented by students in seminar talks;

2. Soils functions, chemical pollution of soils, anthropogenic soils, the world food problem, fertile land, marginal lands (high erosion risk, semi-arid climate, highly weathered tropical soils), agroforestry for soil management.

Intended Learning Outcomes

At the end of the module students are able to analyse and classify various problems in water resource management and to apply different management practices to solve water-resource-problems; The students understand the relationship between soil properties, soil functions, and soil vulnerability. They are able to assess threats to soils, degradation of soils, productivity of soils and management of soils.

(Recommended) Prerequisites

The successful completion of the modules "Introduction to Soil Science and Hydrometeorology" and "World Soil Resources in Theory and Field Practice" or equivalent skills are required.

Teaching and Learning Methods

Lectures with thorough explanations providing the theoretical foundations and presentations of students in the Management of Water and Soil Resources. Examples will be given during the lectures.

Media:

Presentation notes supporting the lecture.

Reading List:


Module Structure

Course 1 Management of Soil Resources
Lecturer 1 Peter Schad, Katja Heister
Form of Teaching 1 Lecture (2SWS)
Course 2 Management of Water Resources
Lecturer 2 Michael Leuchner
Form of Teaching 2 Seminar (2SWS)
Material Flow Management and Applications

Module ID: WZ4206

Responsible for Module: PD Dr. Gabriele Weber-Blaschke; Lehrstuhl für Holzwissenschaft;
Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising; 08161/71- 5635; gabriele.weber-blaschke@wzw.tum.de

Module Level: Master
Language: English
Total Hours: 150h
Credits: 5 Credits
Occurrence: summer semester
Contact Hours: 60h
Duration: one-semester
Self-study Hours: 90h

Description of Achievement and Assessment Methods

Assignment: Writing a paper about a case study to material flow management and reports about the treatment plants

Type of Assessment: assignment
Homework: yes
Oral Presentation: no
Assessment Retake: next semester (only the assignment, not the field trips!)

Content

In Management of Material Flows and Applications, the following content will be taught by theory, case studies and field trips to the students:
- need of material flow management
- procedure of material flow management
- material and substance flow analysis
- material flow assessment by sustainability indicators and life cycle assessment
- development of strategies and measures
- field trips to production, treatment and/or recycling plants (contaminated soils, waste, waste water, biomass, biogas etc.)

Intended Learning Outcomes

After finishing the Module "Management of Material Flows" the students are able to:
- understand the topic material flow management
- understand the relationships between different processes, technological treatments of materials and organisational measures
- apply the procedure of material and substance flow analysis and the assessment methods of indicator systems and life cycle assessment
- create concepts for material flow management and treatment of materials

(Recommended) Prerequisites

Basics in natural, ecological and engineering science

Teaching and Learning Methods

lecture, exercises, case studies, on-site-lecture

Media:

Power point presentation, lecture sheets, overhead sheets, case studies of material and substance flow analysis and life cycle assessment, field trips to treatment plants

Reading List:

* hand-outs about the field trips

Module Structure

Course 1
Lecturer 1: Gabriele Weber-Blaschke
Form of Teaching 1: Lecture (2SWS)

Course 2
Lecturer 2: Gabriele Weber-Blaschke, Brigitte Helmreich, Matthias Franke, Stefan Neser, Matthias Leopold, Thomas Herfellner
Form of Teaching 2: on-site-lecture (2SWS)
**Waste and Waste Water Treatment**

**Module ID**: WZ4207

**Responsible for Module**: Prof. Dr. Brigitte Helmreich, Lehrstuhl für Siedlungswasserwirtschaft, Am Coulombwall 8, 85748 Garching, 089289 13719, B.Helmreich@bv.tu-muenchen.de; Dr.-Ing. Matthias Franke, Frauenhofer UMSICHT-ATZ, An der Maxhütte 1, 92237 Sulzbach-Rosenberg 09661 908-438, franke@atz.de

**Module Level**: Master

**Credits**: 5 Credits

**Language**: English

**Occurrence**: summer semester

**Duration**: one-semester

**Total Hours**: 150h

**Contact Hours**: 60h

**Self-study Hours**: 90h

**Description of Achievement and Assessment Methods**

The exercises deal with the contents of the lectures to assess and to influence the success of learning. Finally, the module is finished by the examination.

**Type of Assessment**: written

**Duration of Assessment (min.)**: 90min

**Homework**: no

**Term Paper**: no

**Oral Presentation**: no

**Conversation**: no

**Assessment Retake**: next semester

**Content**


**Intended Learning Outcomes**

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.

**Recommended Prerequisites**

Interest and basic knowledge in process engineering

**Teaching and Learning Methods**

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

**Media**

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

**Reading List**


**Module Structure**

**Course 1**

Waste Management

**Lecturer 1**

Matthias Franke

**Form of Teaching**

Lecture (2SWS)

**Course 2**

Waste Water Treatment

**Lecturer 2**

Brigitte Helmreich

**Form of Teaching 2**

Lecture (2SWS)
Emission and Immission Protection in Land-Use and Animal Husbandry

Module ID WZ4113

Responsible for Module: Dr. Stefan Noser, Bayerische Landesanstalt für Landwirtschaft, Institut für Landtechnik und Tierhaltung, Arbeitsbereich Umwelttechnik in der Landnutzung, Vöttinger Str. 36, 85354 Freising, stefan.noser@lfl.bayern.de, Tel.: 08161 / 71 – 3566

Module Level: Master
Language: English
Total Hours: 150h
Credits: 5 Credits
Occurrence: summer semester
Duration: one-semester
Contact Hours: 105h
Self-study Hours: 45h

Description of Achievement and Assessment Methods

Oral exam on the contents of the module.

Type of Assessment: oral
Duration of Assessment (min.): 30min
Homework: no
Term Paper: no
Oral Presentation: no
Conversation: no
Assessment Retake: next semester

Content

1. Scales of environmental impact;
2. Objectives and methods of air pollution measurement;
3. Factors on volatilisation;
4. Measures to reduce air pollution and to control immissions;
5. Instruments and methods for assessments in air pollution control;
6. Training by examples.

Intended Learning Outcomes

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 in the context of the general conditions in countries with different development status.
- derive adequate measures of environmental protection.

(Recommended) Prerequisites

Basics in mathematics, chemistry, physics and biology are essential; knowledge in agricultural science advantageous

Teaching and Learning Methods

The module includes lectures and exercises.

Media:
Power Point Presentation

Reading List:
Tba

Module Structure

Course 1 Emission and Immission Protection in Land-Use and Animal Husbandry
Lecturer 1 Stefan Noser, Renate Dörfler
Form of Teaching 1 Lecture (4SWS)
Utilization of Special Waste

Module ID WZ4208

Responsible for Module: General information: Elke Pukall (Program Coordinator), Studienfakultät Forstwissenschaft und Ressourcenmanagement, Hans-Carl-von-Carlowitz-Platz 2, 85354 Freising, 08161/71-4464; elke.pukall@forst.wzw.tum.de

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<td>Language:</td>
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Description of Achievement and Assessment Methods

The learning outcome will be assessed by an assignment. Additionally, the students have to give an oral presentation about the topics of their assignments during the course.

Type of Assessment: assignment
Homework: no
Oral Presentation: yes
Assessment Retake: next semester

Duration of Assessment (min.):
Term Paper: no
Conversation: no

Content

1. Typical foods and their production process.
2. Wastes of the food industry;
3. Origin and types of the specific wastes;
4. Classical disposal;
5. Food waste as a source of biogenic raw material
6. Utilization for products
7. Energetic utilization;
8. Legal specifications.

Intended Learning Outcomes

The students are able to describe the difference of food waste and common industrial waste. Besides, the students are able to classify the amount and quality of waste streams. Furthermore, they can transmit developed solutions to other waste and new products.

(Recommended) Prerequisites
Basic knowledge in engineering and biology

Teaching and Learning Methods

The module consists of a lecture, providing the theoretical foundations, in combination with a seminar. In the seminar the students will have to prepare a presentation on a selected topic and present it.

Media:
PowerPoint Presentation

Reading List:

Module Structure

<table>
<thead>
<tr>
<th>Course 1</th>
<th>Utilization of Waste from the Food Industry</th>
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<tr>
<td>Lecturer 1</td>
<td>Thomas Herfellner</td>
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<td>Lecture (2SWS)</td>
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<td>Course 2</td>
<td>Waste in Landscapes</td>
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<td>Lecturer 2</td>
<td>Jörg Vökel</td>
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</table>
Land-Use Systems from a Global Perspective

Responsible for Module: Dr. Hans-Jürgen Reents; Dipl. Ing. Max Kainz; Lehrstuhl für Ökologischen Landbau und Pflanzenbausysteme, Alte Akademie 12, 85354 Freising, 08161/71 - 3778, reents@wzw.tum.de, kainz@wzw.tum.de

Module ID
WZ4209

Module Level: Master
Language: English
Total Hours: 150h
Credits: 5 Credits
Occurrence: summer semester
Duration: one-semester
Self-study Hours: 90h
Contact Hours: 60h

Description of Achievement and Assessment Methods

The learning outcome will be assessed by an oral exam covering the whole content of the module.

Type of Assessment: oral
Duration of Assessment (min.): 30min
Term Paper: no
Conversation: no
Assessment Retake: next semester

Content

Basic information on farming in Bavaria/Germany: crops, crop rotations, soil management, weed management; implements and machinery; organic and mineral fertilizers; pesticide use; livestock: animal keeping, breeding criteria, consumer expectations; permanent crops: hops and orchards. Introduction to farming systems worldwide: pastoral systems, permanent crops, mixed systems, arable systems, intensive animal keeping; students experience with agricultural land use in their countries

Intended Learning Outcomes

On successful completion of the module students are able to:
- illustrate the basics about farming, elements of farms and farming systems;
- understand key processes going along with farming;
- classify land-use systems worldwide
- evaluate the development of land-use in respect to natural and human resources.

(Recommended) Prerequisites
None

Teaching and Learning Methods

Lectures providing theoretical foundations. Examples will be given during the lectures.

Media:
Power Point

Reading List:
Tba

Module Structure

Course 1 Land-Use Systems from a Global Perspective
Lecturer 1 Hans-Jürgen Reents, Max Kainz
Form of Teaching1 Lecture (4SWS)
Assessment of Sustainability in Agriculture

Module ID: WZ4210

Responsible for Module: Dr. Hans-Jürgen Reents; Dipl. Ing. Max Kainz; Lehrstuhl für Ökologischen Landbau und Pflanzenbausysteme, Alte Akademie 12, 85354 Freising, 08161/71 - 3778, reents@wzw.tum.de, kainz@wzw.tum.de

Module Level: Master
Language: English
Total Hours: 150h
Credits: 5 Credits
Occurrence: summer semester
Duration: one-semester
Self-study Hours: 90h

Description of Achievement and Assessment Methods

The learning outcome will be assessed by an oral exam covering the whole content of the module.

Type of Assessment: oral
Duration of Assessment (min.): 30min
Homework: no
Term Paper: no
Oral Presentation: no
Conversation: no
Assessment Retake: next semester

Content

- Sustainability in a farms context: criteria, inquiry strategies, use of models, benchmarking.
- Sustainability in a rural landscape: scaling up, emerging properties, sustainability aspects in landscape-planning.
- The concept of sustainability in relation to time and space.

Intended Learning Outcomes

The students will be able to understand the idea of sustainability in the context of farms and landscapes and will be able to assess farming systems.

Recommended Prerequisites

None

Teaching and Learning Methods

Lectures providing theoretical foundations. Examples will be given during the lectures.

Media:

Power Point

Reading List:

Tba

Module Structure

Course 1 Assessment of Sustainability in Agriculture
Lecturer 1 Hans-Jürgen Reents, Max Kainz
Form of Teaching Lecture (4SWS)
Case Studies of Land-Use Management

Module ID
WZ4211

Responsible for Module: Dr. Hans-Jürgen Reents; Dipl. Ing. Max Kainz; Lehrstuhl für Ökologischen Landbau und Pflanzenbausysteme, Alte Akademie 12, 85354 Freising, 08161/71 - 3778, reents@wzw.tum.de, kainz@wzw.tum.de

Module Level: Master
Language: English
Total Hours: 150h
Credits: 5 Credits
Occurrence: summer semester
Contact Hours: 60h
Duration: one-semester
Self-study Hours: 90h

Description of Achievement and Assessment Methods

The learning outcome will be assessed by an assignment on a specific topic related to farming systems.

Type of Assessment: assignment
Duration of Assessment (min.):
Homework: no
Term Paper: yes
Oral Presentation: no
Conversation: no
Assessment Retake: next semester

Content

Intensive arable farming systems and farms: organic vs. conventional farming, vegetable production in arable farms, special emphasis on the influence on soils and groundwater; extensive farming: dairy farming with different intensities, agriculture and tourism, agriculture and wildlife, animal grazing and forestry. Agricultural systems and their relation to natural and human resources; aims and scenarios for future development.

Intended Learning Outcomes

After finishing the module the students are able to assess farms in respect to sustainability and to create scenarios for future development.

(Recommended) Prerequisites
None

Teaching and Learning Methods

Lectures providing theoretical foundations. Examples will be given during the lectures. Additionally every student has to prepare a term paper on a specific topic related to farming systems.

Media:
Power Point

Reading List:
Tba

Module Structure

Course 1 Case Studies of Land-Use Management
Lecturer 1 Hans-Jürgen Reents, Max Kainz
Form of Teaching1 Lecture (4SWS)
Agricultural Land-Use Systems - Application Study

Module ID WZ4212

Responsible for Module: Dipl. Ing. Max Kainz; Lehrstuhl für Ökologischen Landbau und Pflanzenbausysteme, Alte Akademie 12, 85354 Freising, 08161/71 - 3034, kainz@wzw.tum.de

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Description of Achievement and Assessment Methods

Successful completion of the course will be based on contribution to class discussions, participation in small group exercises and quality of an oral (group) presentation during class.

Type of Assessment: assignment
Homework: yes
Oral Presentation: yes
Assessment Retake: next semester

Content

An agricultural business will be analysed by using elements of the model "REPRO". Data acquisition, modelling of environmental and economic impact and evaluation curves will be discussed. Strength/weaknesses of the enterprise will be detected. With help of literature studies the students create scenarios to overcome the weaknesses and to enhance overall sustainability of the enterprise.

Intended Learning Outcomes

At the end of the module the students are able to
1) apply methods of assessing sustainability to research objects (farms),
2) to analyse strengths and weaknesses and
3) create scenarios for enhancing the sustainability of the company researched.

Academic, methodical and interdisciplinary skills are strengthened.

(Recommended) Prerequisites

None

Teaching and Learning Methods

The module includes some input by the teacher, group discussions and group work to prepare an oral group presentation. Some home reading is expected.

Media:

Presentation notes

Reading List:

Tba

Module Structure

Course 1 Agricultural Land-Use Systems - Application Study
Lecturer 1 Max Kainz
Form of Teaching Lecture (4SWS)
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Material and Waste Management: PD Dr. Gabriele Weber-Blaschke, gabriele.weber-blaschke@wzw.tum.de
Agricultural Land-Use: Dr. Hans Jürgen Reents, reents@wzw.tum.de

Subject to alterations- Only the officially published German version of ‘Subject Examination and General Academic Regulations for the Master’s Program Sustainable Resource Management (Nachhaltiges Ressourcenmanagement) at the Technische Universität München’ shall have legal force