Julius-Maximilians-
UNIVERSITÄT
WÜRZBURG

Subdivided Module Catalogue

for the Subject

# Applied Earth Observation and Geoanalysis (EAGLE)

as a Master's with 1 major

with the degree "Master of Science"

(120 ECTS credits)

Examination regulations version: 2021
Responsible: Faculty of Arts, Historical, Philological, Cultural and Geographical Studies
Responsible: Institute of Geography and Geology

# Learning Outcomes

German contents and learning outcome available but not translated yet.

**Wissenschaftliche Befähigung**

- Das Master#Studium der Applied Earth Observation and Geoanalysis (EAGLE) vertieft die Lehr# und Forschungsinhalte der geographischen Fernerkundung. Der Studiengang ist in einen Pflicht#, Wahlpflichtbereich untergliedert und bereitet auf eine qualifizierte Erwerbstätigkeit vor. Das Ziel der Ausbildung ist es, den Studierenden fundierte und detaillierte Kenntnisse aus den wichtigsten Teilgebieten der geographischen Fernerkundung zu vermitteln und sie mit modernen Methoden des geographischen und fernerkundlichen Denkens und Arbeitens vertraut zu machen. Deshalb wird auf das Verständnis der fundamentalen geographischen Begriffe und Theorien sowie auf einige grundlegende Methodenkenntnisse und die Entwicklung typischer Denkstrukturen besonderer Wert gelegt. Zentrales Lernziel ist somit der Erwerb der Fähigkeit, räumliche Strukturen und Entwicklungsprozesse zielgerichtet zu analysieren, zu dokumentieren und zu bewerten. Auch die Fähigkeit zum selbständigen wissenschaftlichen Arbeiten soll massiv gefördert werden.
- Der anwendungsbezogene englischsprachige Masterstudiengang bietet Möglichkeiten der Vertiefung und Spezialisierung und bereitet auf eine hoch qualifizierte Berufstätigkeit im akademischen oder im angewandten Bereich vor.
- Vertiefung des im Rahmen des ersten berufsbefähigenden Studiums erworbenen geo# und raumwissenschaftliches Fachwissens und Erweiterung des methodischen und analytischen Ansatzes; Vertiefung der Kenntnisse über die Zusammenhänge innerhalb der eigenen Disziplin und mit benachbarten Disziplinen, Befähigung komplexe, insbesondere interdisziplinäre, Probleme und Aufgabenstellungen im Umweltbereich zu erkennen und zu analysieren, zu formulieren und – unter Zuhilfenahme von selbst recherchierter Fachliteratur – zu lösen; Vertiefung und Erweiterung der Befähigung, über geographische, geo# und raumwissenschaftliche Inhalte und Probleme sowohl mit Fachkollegen und # kolleginnen als auch mit einer breiteren Öffentlichkeit zu kommunizieren; Vertiefung und Erweiterung der Befähigung, sowohl einzeln als auch als Mitglied internationaler Gruppen zu arbeiten und Projekte effektiv zu organisieren und durchzuführen sowie in eine entsprechende Führungsverantwortung hineinzuwachsen;
- Befähigung, zukünftige Probleme, Technologien und wissenschaftliche Entwicklungen in den Geo# und Raumwissenschaften zu erkennen und entsprechend in die Arbeit einzubeziehen; durch die Vertiefung wissenschaftlicher, technischer und sozialer Kompetenz (u.a. Abstraktionsvermögen, Team# und Kommunikationsfähigkeit) auf die Übernahme von Führungsverantwortung vorbereitet zu sein.

**Befähigung zur Aufnahme einer Erwerbstätigkeit**

- Definition, Reflexion und Bewertung von Zielen für Lern# und Arbeitsprozesse sowie eigenständige und nachhaltige Gestaltung von Lern# und Arbeitsprozessen: Praxisbezug: Studierende sind in der Lage, theoretisches Wissen in der Praxis anzuwenden
- Problemlösungskompetenz: Absolventen/innen können mit wissenschaftlichen Methoden auch unbekannte Herausforderungen zu analysieren und zielgerichtet zu bearbeiten.
- Teamfähigkeit / Konfliktkompetenz: Absolventen /innen sind in der Lage, konstruktiv und zielorientiert in einem heterogenen, teilweise internationalem, Team zusammenzuarbeiten, unterschiedliche Ansichten produktiv zur Zielerreichung zu nutzen und mögliche Konflikte zu bearbeiten.
- Zeitmanagement: Absolventen/innen können unterschiedliche Aufgaben parallel und unter Zeit# und Erfolgsdruck auch bei widrigen Rahmenbedingungen erfolgreich bearbeiten.

**Persönlichkeitsentwicklung**

- Diskussionskultur und Teamfähigkeit: Entwicklung der Diskussionsbereitschaft und Befähigung zur Teamarbeit.
- Interkulturelle Kompetenz: Die Absolventen /innen können ihre erworbenen Kompetenzen in unterschiedlichen interkulturellen Kontexten anwenden.
- Die Absolventen /innen können sich sicher in einem heterogenen Umfeld bewegen und andere Meinungen konstruktiv auf ein gemeinsames Ziel einbinden. Sie sind kritikfähig.

**Befähigung zum gesellschaftlichen Engagement**

- Ethisches Handeln: Die Absolventen /innen können gesellschaftliche, naturwissenschaftliche, kulturelle wie auch wirtschaftliche Entwicklungen vergleichen, kritisch reflektieren und begründet eigene Positionen beziehen. Sie haben die Fähigkeit entwickelt, ihre Kompetenzen in partizipative Prozesse einzubringen.

# Abbreviations used

Course types: **E** = field trip, **K** = colloquium, **O** = conversatorium, **P** = placement/lab course, **R** = project, **S** = seminar, **T** = tutorial, **Ü** = exercise, **V** = lecture

Term: **SS** = summer semester, **WS** = winter semester

Methods of grading: **NUM** = numerical grade, **B/NB** = (not) successfully completed

Regulations: **(L)ASPO** = general academic and examination regulations (for teaching-degree programmes), **FSB** = subject-specific provisions, **SFB** = list of modules

Other: **A** = thesis, **LV** = course(s), **PL** = assessment(s), **TN** = participants, **VL** = prerequisite(s)

# Conventions

Unless otherwise stated, courses and assessments will be held in German, assessments will be offered every semester and modules are not creditable for bonus.

# Notes

Should there be the option to choose between several methods of assessment, the lecturer will agree with the module coordinator on the method of assessment to be used in the current semester by two weeks after the start of the course at the latest and will communicate this in the customary manner.

Should the module comprise more than one graded assessment, all assessments will be equally weighted, unless otherwise stated below.

Should the assessment comprise several individual assessments, successful completion of the module will require successful completion of all individual assessments.

# In accordance with

the general regulations governing the degree subject described in this module catalogue:

**ASPO2015**

associated official publications (FSB (subject-specific provisions)/SFB (list of modules)):

**28-Apr-2021 (2021-49)**

This module handbook seeks to render, as accurately as possible, the data that is of statutory relevance according to the examination regulations of the degree subject. However, only the FSB (subject-specific provisions) and SFB (list of modules) in their officially published versions shall be legally binding. In the case of doubt, the provisions on, in particular, module assessments specified in the FSB/SFB shall prevail.

# The subject is divided into

| Abbreviation | Module title | ECTS credits | Method of grading | page |
|---|---|---|---|---|
| **Compulsory Courses (55 ECTS credits)** | | | | |
| **Theoretical Basics (10 ECTS credits)** | | | | |
| 04-GEO-TB1-162-m01 | Introduction to Remote Sensing and Geoanalysis | 5 | NUM | 49 |
| 04-GEO-TB2-162-m01 | Applications of Earth Observation | 5 | NUM | 50 |
| **Metholodological Basics (15 ECTS credits)** | | | | |
| 04-GEO-MB1-162-m01 | Digital Image Analysis and GIS | 5 | NUM | 21 |
| 04-GEO-MB2-182-m01 | Introduction to Programming and Statistics for Remote Sensing and GIS | 5 | NUM | 22 |
| 04-GEO-MB3-162-m01 | From Field Measurements to Geoinformation | 5 | NUM | 23 |
| **Internship (15 ECTS credits)** | | | | |
| 04-GEO-INT-162-m01 | Internship | 15 | B/NB | 18 |
| **Step towards Master Thesis (15 ECTS credits)** | | | | |
| 04-GEO-TMT1-162-m01 | Innovation Laboratory | 10 | NUM | 51 |
| 04-GEO-TMT2-162-m01 | Project Seminar | 5 | B/NB | 52 |
| **Compulsory Electives (35 ECTS credits)** | | | | |
| **Applications of Earth Observation (10 ECTS credits)** | | | | |
| 04-GEO-APP1-182-m01 | Land Surface Dynamics | 5 | NUM | 8 |
| 04-GEO-APP2-162-m01 | Land and Water Management | 5 | NUM | 9 |
| 04-GEO-APP3-162-m01 | Exploration of Mineral Deposits | 5 | NUM | 10 |
| 04-GEO-APP4-212-m01 | Remote Sensing in Biodiversity and Conservation | 5 | NUM | 11 |
| 04-GEO-APP5-212-m01 | Advanced Remote Sensing Applications | 5 | NUM | 12 |
| 04-GEO-APP6-212-m01 | Global Remote Sensing Applications | 5 | NUM | 13 |
| 04-GEO-APP7-212-m01 | Remote Sensing of Urban Areas | 5 | NUM | 14 |
| 04-GEO-APP8-212-m01 | Application of UAV Data in Remote Sensing | 5 | NUM | 16 |
| 04-GEO-APP9-212-m01 | Multi-Scale Earth Observation | 5 | NUM | 17 |
| 04-GEO-APP10-212-m01 | Multi-Temporal Earth Observation | 5 | NUM | 7 |
| **Advanced Methods and Modeling (10 ECTS credits)** | | | | |
| 04-GEO-MET1-162-m01 | Spatial Modeling and Prediction | 5 | NUM | 25 |
| 04-GEO-MET2-162-m01 | Advanced Spatial Analysis for Geoscientists | 5 | NUM | 26 |
| 04-GEO-MET3-212-m01 | Advanced Earth Observation Analysis | 5 | NUM | 27 |
| 04-GEO-MET4-212-m01 | Advanced Programming for Remote Sensing and GIS | 5 | NUM | 28 |
| 04-GEO-MET5-212-m01 | Cloud Computing in Remote Sensing | 5 | NUM | 29 |
| 04-GEO-MET6-212-m01 | Hyperspectral Remote Sensing | 5 | NUM | 30 |
| 04-GEO-MET7-212-m01 | Earth Observation Time-Series Analysis | 5 | NUM | 31 |
| 04-GEO-MET8-212-m01 | Active Remote Sensing Systems | 5 | NUM | 32 |
| 04-GEO-MET9-212-m01 | Novel Image Analysis Methods | 5 | NUM | 33 |
| 04-GEO-MET10-212-m01 | Selected spatio-temporal environmental Methods | 5 | NUM | 24 |
| **Resources and Environment (5 ECTS credits)** | | | | |
| 04-GEO-RE1-212-m01 | Selected Topics in Earth Observation | 5 | NUM | 34 |
| 04-GEO-RE2-212-m01 | Selected Topics in Geography | 5 | NUM | 35 |
| 04-GEO-RE3-212-m01 | Mineral Resources in Space and Time | 5 | NUM | 36 |
| 04-GEO-RE4-212-m01 | Urban Remote Sensing | 5 | NUM | 37 |

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|---|---|---|---|---|
| 04-GEO-RE5-212-m01 | Risk and Disaster Earth Observation | 5 | NUM | 38 |
| **Soft Skills (5 ECTS credits)** | | | | |
| 04-GEO-SOS1-212-m01 | Scientific Presentation | 5 | NUM | 40 |
| 04-GEO-SOS2-212-m01 | Advanced skills on the Master's Level | 5 | B/NB | 41 |
| 04-GEO-SOS3-212-m01 | Advanced Instructions on Scientific Working | 5 | B/NB | 42 |
| 04-GEO-SOS4-212-m01 | Research Project Management | 5 | NUM | 43 |
| 04-GEO-SOS5-212-m01 | Scientific Writing | 5 | NUM | 44 |
| 04-GEO-SOS6-212-m01 | Scientific Maps | 5 | NUM | 45 |
| 04-GEO-SOS7-212-m01 | Scientific Graphs | 5 | NUM | 46 |
| 04-GEO-SOS8-212-m01 | Science from Wall-to-Wall | 5 | NUM | 47 |
| 04-GEO-SOS9-212-m01 | Innovative Research Approaches | 5 | NUM | 48 |
| 04-GEO-SOS10-212-m01 | Innovative Outreach Approaches | 5 | NUM | 39 |
| **Thesis (30 ECTS credits)** | | | | |
| 04-GEO-MA1-162-m01 | Master-Thesis EAGLE | 28 | NUM | 19 |
| 04-GEO-MA2-162-m01 | Final Colloquium on Master Thesis | 2 | NUM | 20 |

| Module title | | | Abbreviation |
|---|---|---|---|
| **Multi-Temporal Earth Observation** | | | 04-GEO-APP10-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Possibilities, limitations and challenges for time series remote sensing analyses are presented and discussed. The availability of time-series data sets and their possible uses are discussed. Platforms for processing spatio-temporal data are introduced and time-series analyses are carried out.

**Intended learning outcomes**

Participants will gain a detailed and comprehensive overview and understanding of the possibilities and limitations of time-series analyses. In addition, the students are given tools to carry out time-series analyses by themselves.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Land Surface Dynamics** | | | 04-GEO-APP1-182-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Topics cover most aspects of remote sensing based assessment of Land Surface Dynamics. Topics such as snow cover dynamics, water body dynamics, forest cover and further vegetation dynamics, urbanization dynamics, coastal dynamics, or dynamics of geophysical parameters such as land surface temperature or selected indices will be addressed. In these contexts we look at opportunities arising from optical-, multi-spectral- and radar sensors, as well as thermal imagery. Data availability and access, as well as typical software tools for handling of multispectral data or time series analyses will be addressed as well.

**Intended learning outcomes**

Participants will gain a thorough and comprehensive overview and understanding of dynamic processes on the land surface that can be monitored using remote sensing imagery. Seminar papers or oral presentations will provide first experiences in scientific writing and presentation.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Land and Water Management** | | | 04-GEO-APP2-162-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

A general introduction on the land and water management and its demand for integrative knowledge in numerous fields of environmental and social sciences is given. The students select topics in which remote sensing and geoanalysis can significantly contribute parameters for answering relevant management questions. The topics include the derivation and use of parameters for monitoring land and/or water resources and examples how to use them in analytical or predictive models, or in indicator systems.

**Intended learning outcomes**

Participants will increase their knowledge about remote sensing approaches and geoanalytical methods which support different fields of land and water management. The students will gain practical experiences in selected examples.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2016)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Exploration of Mineral Deposits** | | | 04-GEO-APP3-162-m01 |
| **Module coordinator** | | | **Module offered by** |
| holder of the Professorship of Geodynamics and Geomaterials Research | | | Institute of Geography and Geology |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The examples may include the management of the resources in rangelands, croplands, irrigation and drainage systems, river catchments, urban areas, or others. Focus may be set on special geographical settings. Depending on the selected topics and scale relevant Earth Observation parameters can include land cover and land use mapping, biophysical variables (LAI/FPAR/Chlorophyll, evapotranspiration, etc.), biomass or crop yields, soil moisture, phenological metrics and other dynamic parameters.

**Intended learning outcomes**

Application of Remote Sensing in Mineral Deposit research

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2016)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Remote Sensing in Biodiversity and Conservation** | | | 04-GEO-APP4-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The module focuses on remote sensing applications relevant for spatial and temporal modelling of Earth Observation data in ecology and conservation. Applications of various remote sensing approaches for ecological, biodiversity and conservation research are targeted.

**Intended learning outcomes**

The participants gain theoretical and methodological knowledge on the use of remote sensing in ecology and conservation sciences and studies.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Advanced Remote Sensing Applications** | | | 04-GEO-APP5-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

This course provides an overview of an scientific field thas has been emerging around the interface of Earth observation and Movement Ecology or movement data analyis in general. The course covers the fundamentals of movement tracking in the context of Earth observation and takes a look at the recent history and bleeding edge developments in combining Earth observation and movement tracking. Furthermore, the course sheds light on potential analytical outcomes that could be achieved in the near future once the methodolgies from the clashing disciplines have been further melted to allow advanced mixed-data analyses.

**Intended learning outcomes**

Participants will gain a thorough and comprehensive overview and understanding of the interface of Earth observation and movement data analyis. The course aims to build basic knowledge that enables participants to think independently and cirtically within the field covered by the course and allows them to creatively think of the potentials and possible analytical treasures that one might be able to lift by combining Earth observation and movement data in the near future.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Global Remote Sensing Applications** | | | 04-GEO-APP6-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Possibilities, limitations and challenges for remote sensing analyses on a global scale are presented and discussed. The availability of global data sets and their possible uses are discussed. Platforms for processing and analyzing spatial data on global scales are presented and earth-wide analyses are carried out.

**Intended learning outcomes**

Participants will gain a detailed and comprehensive overview and understanding of the possibilities and limitations of global studies. In addition, the students are given tools to carry out large-scale analyses by themselves.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Remote Sensing of Urban Areas** | | | 04-GEO-APP7-212-m01 |
| **Module coordinator** | | | **Module offered by** |
| holder of the Professorship of Remote Sensing | | | Institute of Geography and Geology |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The drivers of this global process of urbanization from demographic to economic and the related structural changes cities are facing will be discussed in this course. Remote sensing is one crucial data source in this dynamic transformation and its products are highly relevant for urban planning, as well as environmental management. Within this course different approaches and techniques are covered focusing on deriving relevant information about urbanized areas on different levels of detail. Uni-temporal-, multi-temporal-, and time series based image classification, segmentation, the analyses of point patterns, GIS analyses to assess spatial context and dependencies, as well as analyses in the 3D domain will be addressed in this course. This will be done providing and discussing example applications from different regions globally (e.g. urban sprawl analysis of megacities, the development of new dimensions of urban landscapes such as mega-regions, the rearrangement of business districts within the urban landscape, etc.). You will learn what capabilities Earth observation data, methods and products have for urban research and applications and how to design remote sensing based urban analysis, how to avoid caveats, troubleshoot errors and interpret the results.

**Intended learning outcomes**

Aim of this course is to provide you with an overview on geographic processes of urbanization, the related demographic and structural changes of cities, and data analyses methods using remote sensing data for applications in urban geography.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

--

**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Application of UAV Data in Remote Sensing** | | | 04-GEO-APP8-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Topics cover most aspects of UAV based remote sensing. We look at opportunities arising from optical-, multi-spectral- and thermal UAV based sensorsfor remote sensing research

**Intended learning outcomes**

Participants will gain a thorough and comprehensive overview and understanding of UAV based data and analysis

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Multi-Scale Earth Observation** | | | 04-GEO-APP9-212-m01 |
| **Module coordinator** | | | **Module offered by** |
| holder of the Professorship of Remote Sensing | | | Institute of Geography and Geology |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The topics cover different aspects of terrestrial remote sensing. Here, emphasis is placed on the intersection of different data recorded by different sensors.

**Intended learning outcomes**

Students will gain a detailed and comprehensive overview and understanding of the blending of disparate remotely sensed data and the validation of the fused products.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Internship** | | | 04-GEO-INT-162-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 15 | (not) successfully completed | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The background of the research idea, the methodological background hosting institution as well as the aim of the internship will be presented. The work during the internship as well as the outcome should be covered by this presentation. Moreover the students are encouraged to provide valuable insights into the respective research in order to help fellow students to gain a better understanding of the value of each approach.

**Intended learning outcomes**

The presentation of the internship for the whole EAGLE students and lecturer

**Courses** (type, number of weekly contact hours, language — if other than German)

P (0)
Module taught in: English or German

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

report in the form of a presentation (approx. 15 minutes)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)

**Allocation of places**

--

**Additional information**

Additional information on module duration: 8 weeks.

**Workload**

450 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2016)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Master-Thesis EAGLE** | | | 04-GEO-MA1-162-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 28 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The student should show within the Msc thesis that he/she is capable of working scientifically without major supervision. Defining the aim, the hypothesis and structuring a research topic is the main first content followed by the actual analysis of spatial data (Earth Observation mainly satellite remote sensing but also airborne data or auxiliary data). Defining the methods and describing these including the results and discuss the outcome critically. Moreover an appropriate visual presentation (typesetting and graphics, as well as maps) and writing is expected. The Msc thesis is graded on the difficulty of the topic, on the amount of needed supervision (independent work is expected as well as regular meetings with the supervisors), the writing and especially the discussion of the Msc thesis. The thesis structure can comply to a standard scientific article but should exceed 50 pages.

**Intended learning outcomes**

Conducting an independent research topic within 6 months

**Courses** (type, number of weekly contact hours, language — if other than German)

No courses assigned to module

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

Master's thesis (approx. 60 pages)
Language of assessment: English

**Allocation of places**

--

**Additional information**

Time to complete: 6 months.

**Workload**

840 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2016)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2024)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Final Colloquium on Master Thesis** | | | 04-GEO-MA2-162-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 2 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| | graduate | -- | |

**Contents**

The final colloquium aims to present the aim and results of the Msc thesis to a scientific audience (EAGLE lecturer and students) who are all allowed to ask questions and discuss the outcome critically. The presentation ought to follow scientific standards and should take 20mins. The presentation is not graded but is needed to finish the Msc.

**Intended learning outcomes**

Presentation of the final Msc thesis

**Courses** (type, number of weekly contact hours, language — if other than German)

K (0)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

talk (approx. 30 minutes) with subsequent discussion (approx. 15 minutes)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)

**Allocation of places**

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**Additional information**

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**Workload**

60 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2016)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2024)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Digital Image Analysis and GIS** | | | 04-GEO-MB1-162-m01 |
| **Module coordinator** | | | **Module offered by** |
| holder of the Professorship of Remote Sensing | | | Institute of Geography and Geology |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The module comprises the following practical topics: Managing and geoprocessing of raster and vector data including digitization and analysis/ visualization of geodata / preprocessing of optical remote sensing data (geometric and atmospheric corrections, dimension reduction) / different approaches, algorithms, sampling and validation strategies for validation / change detection, vegetation indices / basics in the derivation of geophysical and biophysical parameters (e.g. LAI, FAPAR, Chlorophyll content of leafs, Land Surface Temperature, Surface Albedo

**Intended learning outcomes**

The seminar aims at improving the methodological skills of the participants in digital image processing and the use of Geographical Information Systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

Ü (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
creditable for bonus

**Allocation of places**

--

**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2016)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Introduction to Programming and Statistics for Remote Sensing and GIS** | | | 04-GEO-MB2-182-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Theoretical basics and practical examples of programming and geostatistics focused on application within Remote Sensing and GIS are provided. Basic functionality such as script structure, implementation, functions, loops as well as programming syntax using the R language are introduced. Moreover, statistical basics related to environmental analysis are covered such as Random Forest or spatial queries.

**Intended learning outcomes**

Introduction to programming and geostatistics for environmental data analysis.

**Courses** (type, number of weekly contact hours, language — if other than German)

Ü (4)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **From Field Measurements to Geoinformation** | | | 04-GEO-MB3-162-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

This module sets a strong focus on field methods and data integration for selected types of land mapping. The contents of the course comprises the preparation of field campaigns, i.e. the selection of sampling schemes and methods appropriate for the subsequent analysis. A broad sequence of field devices will be introduced to the students. The field data collection can focus on different fields of environmental mapping, e.g. land use or vegetation, climate soil, geology, and others. Depending of the special focus of course, spatial integration and interpolation methods are presented.

**Intended learning outcomes**

The students will gain knowledge in how to collect field data for the purposes of training and validation land cover maps and geo-/biophysical parameters.

**Courses** (type, number of weekly contact hours, language — if other than German)

Ü (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2016)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2024)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Selected spatio-temporal environmental Methods** | | | 04-GEO-MET10-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

This course focuses on the joint analysis of different spatio-temporal data. It introduces (1) methods to process, visualize and analyse spatio-temporal trajectory data such as animal movement data, traffic movement data or other kinds of tracking data and (2) methods to combine Earth observation data such as remote sensing imagery with trajectory data for joint analysis. The course focuses on techniques form both the discrete and the continous time modelling approaches. It uses such to derive and quaintify common trajectory metrics such as sampling frequency or telemetry error, space use, corridors, stopping sites etc. in an automatized manner. The course lays a practical focus on implementing the learned methods with a programming language such as R or Python.

**Intended learning outcomes**

Participants learn the skills to handle trajectory data, understand their dimensionalities, their metrics, their challenges and limitations but also their potentials. An important learning aim is to develop a base knowledge on which kind of ecological or environmental analyes using trajectory data could be well supplemented by Earth observation data and vice versa. Understanding trajectory data and what is special about it compared to other spatio-temporal data and understanding the applicable methods are key to later-on be able to use trajecotry data of any kind in scientifc work.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Spatial Modeling and Prediction** | | | 04-GEO-MET1-162-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Different statistical methods will be applied for analysing spatial point patterns, such as vegetation samples or biodiversity related information. These results will be statistically predicted using methods such as GLM, GAM, Random Forest or MaxEnt. Implications of spatial point patterns as well as chosen environmental parameters will be discussed. All methods will be practically applied during the course using the programming language R

**Intended learning outcomes**

Within this course different methods to analyse point pattern statistically and conduct a spatial prediction are covered. Students will learn how to design such analysis, how to avoid caveats, troubleshoot errors and interpret the results.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2016)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Advanced Spatial Analysis for Geoscientists** | | | 04-GEO-MET2-162-m01 |
| **Module coordinator** | | | **Module offered by** |
| holder of the Professorship of Soil Science | | | Institute of Geography and Geology |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

No information on contents available.

**Intended learning outcomes**

No information on intended learning outcomes available.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2016)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Advanced Earth Observation Analysis** | | | 04-GEO-MET3-212-m01 |
| **Module coordinator** | | | **Module offered by** |
| holder of the Professorship of Remote Sensing | | | Institute of Geography and Geology |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The course will provide advanced and current approaches in the processing, interpretation, and application of Earth observation data from variety of sensors and missions. The concepts presented, e.g. fusion of multi-sensor data, are based on the current state of the art. Approaches and concepts will be presented and discussed in detail using selected case studies and/or example data sets.

**Intended learning outcomes**

In this course, students deepen their knowledge in the processing and application of Earth observation data while learning advanced methods of remote sensing analysis. In addition, students learn about the state of the art in research through intensive discussion of current scientific studies.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Advanced Programming for Remote Sensing and GIS** | | | 04-GEO-MET4-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

This course aims to deepen the participants' knowledge base and technical skills in the field of developing reproducible workflows to analyse scientific data and building software tools. Special focues lay on building models for pattern detection in Earth observation data using deep neural networks and machine learning, applying techniques to assess model trust and model applicability, implementing collaborative software development principals for automating development environments and utilizing machine-to-machine communication. The contents of the course are theoretically introduced, before they are practically applied and implemented using programming languages such as R or Python.

**Intended learning outcomes**

Participants learn the skills to develop reproducible workflows for data analysis and how to build there own tools to do so. An important learning aim is to develop a profound transfer knowledge that enables participants to answer questions such as the following ones: Why is reprodubility important in science? How can analytical workflows be designed to be as reproduible as possible? How can trustworthiness and applicability of machine learning models be assessed and quantified, especially since the reproducibility of training such models is difficult? Challenges, opportunities, limitiations and risks of the introduced methods are discussed. Understanding such intuitively is another important learning aim.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Cloud Computing in Remote Sensing** | | | 04-GEO-MET5-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Google Earth Engine is a cloud-based geospatial processing platform allowing for planetary-scale analysis. Next to a large amount of raw processing power provided by Google's computational infrastructure, Earth Engine offers a rich data catalog which stores several petabytes of publically available and analysis ready geospatial data sets. Topics covered are vector and raster data manipulation, working with ImageCollections, time-series analysis, classification, iteration, visualization and animation of spatial data.

**Intended learning outcomes**

Students will be introduced to the platform and gain fundamental knowledge about the usage of Google Earth Engines processing power and data offer.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Hyperspectral Remote Sensing** | | | 04-GEO-MET6-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Spectroscopy and hyperspectral remote sensing enables to retrieve very detailed spectral information about a certain surface in dense bandwith intervalls. Information on the "spectral fingerprints" of surfaces is then available in a near-continuous manner. This allows for the differentiation of materials, such different geologic surfaces, different urban materials, or plants of different composition and vigor. Especially field- and laboratory spectroscopy has shown many benefits, as measurements can be carried out in a controlled environment, and can be directly visualized and explained. This course provides insights into practical experiments using a field spectrometer, and subsequent data analysis to assess key environmental parameters such as plant health, soil moisture content, and geologic composition.

**Intended learning outcomes**

The content of this course includes both the theoretical background of field and imaging spectroscopy, as well as practical experiments and subsequent data analysis. It is the aim to gain knowledge and understanding of the following particular topics: the theoretical background of field and imaging spectroscopy, general reflectance and transmittance properties of plant leaves, canopies and soils, the quantification of biophysical and biochemical properties using spectroscopic measurements, feature parametrization and regression analysis, the advantages and challenges of existing and planned hyperspectral spaceborne sensors

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

--

**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Earth Observation Time-Series Analysis** | | | 04-GEO-MET7-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Time series of remote sensing data are valuable to reveal short and long term processes occurring on the Earth's surface. Impacts of climate change on land cover, start and end of the growing season, the dynamic behavior of snow covered or glaciated areas, or even extreme events such as forest fires, floods, and droughts are possible applications for time series data. In order to be able to analyze such time series accordingly, the data need to be preprocessed before applying techniques to extract the desired information.

**Intended learning outcomes**

In this seminar, necessary preprocessing measures as well as techniques to analyze time series of remote sensing data will be discussed. Water body, snow cover, and vegetation dynamics will be extracted from MODIS and Sentinel data using routines developed and prepared together in Python (or IDL). After learning the basic techniques the participants of the seminar will choose a topic of their own choice as their final project.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

--

**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Active Remote Sensing Systems** | | | 04-GEO-MET8-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Methodological and technical basics of active remote sensing systems, e.g. LiDAR and SAR, are presented. The basics of data collection, processing and interpretation will be discussed and demonstrated on selected case studies. Using example datasets, the processing of active remote sensing data using appropriate software will be demonstrated and practiced.

**Intended learning outcomes**

In this course, students learn about the functional principle, basics of data processing and possible applications of selected active remote sensing systems. The strengths and limitations of the respective methods will be explained and discussed.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

--

**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Novel Image Analysis Methods** | | | 04-GEO-MET9-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The basics of object-oriented image analysis (OBIA) are laid. Different segmentation methods are tested and evaluated. Using current software products, options for describing image objects are also learned and subsequently transferred to image classifications.

**Intended learning outcomes**

Students get to know the advantages and disadvantages of OBIA compared to pixel-based methods, especially in the processing of high-resolution remote sensing data. Image segmentation procedures and object-based classification methods are developed in theory and in practice.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1) + Ü (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, summer semester
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Selected Topics in Earth Observation** | | | 04-GEO-RE1-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Physical Geography | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

In this module, selected established and new applications and research topics in the field of Earth observation and remote sensing will be presented and discussed. Different methodological approaches and/or thematic aspects will be addressed.

**Intended learning outcomes**

Students deepen their knowledge in the use of remotely sensed data on selected topics, and/or on various methods and applications.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) written examination (approx. 45 minutes)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Selected Topics in Geography** | | | 04-GEO-RE2-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Physical Geography | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The emphasis of this course is on linking geographical approaches with current Earth Observation research. The aim is to learn how historical and landscape patterns can be analysed with established geographical methods and how remote sensing data analysis can be best incorporated. After completing the course, each student should have developed a sound understanding in each geographical approaches and potential of remote sensing integration.

**Intended learning outcomes**

The module deepens student's knowledge on selected environmental theories and approaches and their relevance for applied remote sensing.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) written examination (approx. 45 minutes)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | Abbreviation |
|---|---|
| **Mineral Resources in Space and Time** | 04-GEO-RE3-212-m01 |

| Module coordinator | Module offered by |
|---|---|
| holder of the Professorship of Geodynamics and Geomaterials Research | Institute of Geography and Geology |

| ECTS | Method of grading | Only after succ. compl. of module(s) |
|---|---|---|
| 5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
|---|---|---|
| 1 semester | graduate | -- |

**Contents**

The course provides an overview of the multitude of mineral deposits -- essential georesources for the sustainable utilization of planet Earth. In particular, processes that can lead to the economic concentration of mineral resources will be discussed using examples of major deposit types. This includes magmatic, hydrothermal and sedimentary processes that resulted in the formation of economically viable deposits of ore minerals, solid fuels and industrial minerals.

**Intended learning outcomes**

The students obtain basic, up-to-date insights into the geology of mineral deposits on the basis of concrete examples. Furthermore they obtain the ability to classify known and new mineral deposits/occurrences in a genetic way, thus laying the foundation for optimising future exploitation and exploration strategies.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) written examination (approx. 45 minutes)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Urban Remote Sensing** | | | 04-GEO-RE4-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Geodynamics and Geomaterials Research | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Urban space as human living space is discussed and urban spaces are characterized. The special surface properties in the settlement area as well as their representation in satellite image data are learned. The classification of settlement areas and their surrounding areas are practiced.

**Intended learning outcomes**

The students learn remote sensing methods that are particularly relevant for the characterization of urban spaces. You will be able to select and use suitable image data for processing urban issues in remote sensing.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) written examination (approx. 45 minutes)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Risk and Disaster Earth Observation** | | | 04-GEO-RE5-212-m01 |
| **Module coordinator** | | | **Module offered by** |
| holder of the Professorship of Geodynamics and Geomaterials Research | | | Institute of Geography and Geology |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The module focuses the georisks and environmental disasters.

**Intended learning outcomes**

The students learn synthesis and integration of their knowledge on georisks. They are able to consider risks and disasters.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) written examination (approx. 45 minutes)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Innovative Outreach Approaches** | | | 04-GEO-SOS10-212-m01 |
| **Module coordinator** | | | **Module offered by** |
| holder of the Professorship of Remote Sensing | | | Institute of Geography and Geology |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Challenges and potential of novel scientific approaches will be introduced and discussed. The various steps will the discussed within the group and optimal workflows provided.

**Intended learning outcomes**

Knowledge of identifying and approaching challenges and potential within novel research approaches.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

--

**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Scientific Presentation** | | | 04-GEO-SOS1-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Existing presentations will be discussed and evaluated with regard to visual appearance. Moreover design and appearance of presentations will be discussed and guidelines provided. Individual training of presentations will be part of it as well. Alternative presentation methods will be introduced (e.g knitr, beamer).

**Intended learning outcomes**

Presentations and articles will be discussed with regard to its scientific content and goal to ensure high quality presentations.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages) or
d) log (2 to 3 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Advanced skills on the Master's Level** | | | 04-GEO-SOS2-212-m01 |
| **Module coordinator** | | | **Module offered by** |
| holder of the Professorship of Remote Sensing | | | Institute of Geography and Geology |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | (not) successfully completed | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Moreover scientific articles will be discussed and own articles be written. The structure as well as wording will be covered. Moreover, general writing guidelines, journal guidelines etc. will be introduced.

**Intended learning outcomes**

Presentations and articles will be discussed with regard to its scientific content and goal to ensure high quality presentations as well as articles.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages) or
d) log (2 to 3 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Advanced Instructions on Scientific Working** | | | 04-GEO-SOS3-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | (not) successfully completed | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Moreover scientific articles will be discussed and own articles be written. The structure as well as wording will be covered. Moreover, general writing guidelines, journal guidelines etc. will be introduced.

**Intended learning outcomes**

Presentations and articles will be discussed with regard to its scientific content and goal to ensure high quality presentations as well as articles.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English or German

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Research Project Management** | | | 04-GEO-SOS4-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The course of research projects is discussed. The possibilities and standard processes for acquiring third-party funds are shown. Typical research project structures and contents are introduced and discussed. Teamwork and team structures in typical research projects are practiced.

**Intended learning outcomes**

The aim is to provide students with basic knowledge in acquiring, processing and completing research projects. The students are then able to plan and organize their own projects.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Scientific Writing** | | | 04-GEO-SOS5-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Existing articles will be discussed and evaluated with regard to their content and writing. Moreover the structure will be discussed and guidelines provided. Individual training of article writing will be part of it as well. Relevant programs will be introduced (e.g bibliography software).

**Intended learning outcomes**

Articles will be discussed with regard to its scientific content and goal to ensure high quality articles.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

--

**Additional information**

--

**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--

**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Scientific Maps** | | | 04-GEO-SOS6-212-m01 |
| **Module coordinator** | | | **Module offered by** |
| holder of the Professorship of Remote Sensing | | | Institute of Geography and Geology |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Existing maps will be discussed and evaluated with regard to visual appearance. Moreover design and appearance of maps will be discussed and guidelines provided. Individual training of map creation will be part of it as well. Relevant programs will be introduced.

**Intended learning outcomes**

Maps will be discussed with regard to its scientific content and goal to ensure high quality spatial information.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Scientific Graphs** | | | 04-GEO-SOS7-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Existing graphs and figures will be discussed and evaluated with regard to visual appearance. Moreover content and message of graphs will be discussed and guidelines provided. Individual training of graph creation will be part of it as well. Relevant software methods will be introduced (e.g ggplot, shiny).

**Intended learning outcomes**

Figures and graphs will be discussed with regard to its scientific content and goal to ensure high quality graphs.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

--

**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Science from Wall-to-Wall** | | | 04-GEO-SOS8-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Existing scientific working levels will be introduced and discussed. The various steps such as definition of a research topic, project proposal and project management will the discussed and guidelines provided.

**Intended learning outcomes**

Current project, project proposal and intial ideas will be discussed with regard to its goal and workload.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Innovative Research Approaches** | | | 04-GEO-SOS9-212-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

Challenges and potential of novel scientific approaches will be introduced and discussed. The various steps will the discussed within the group and optimal workflows provided.

**Intended learning outcomes**

Knowledge of identifying and approaching challenges and potential within novel research approaches.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)
Assessment offered: Once a year, winter semester

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Introduction to Remote Sensing and Geoanalysis** | | | 04-GEO-TB1-162-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The lecture "Introduction to Remote Sensing" ensures that participants will gain a solid understanding of the following topics: the role of remote sensing in nowadays world / basics of electromagnetic radiation / history of remote sensing and image acquisition platforms / satellite orbits and orbit geometry / current spaceborne sensors / impacts of the atmosphere / geocorrection of digital imagery / radiometric correction of digital images / principles of image classifications / time series and big data / geodata concepts / geodata standards / geodata visualization / the job market for remote sensing and geo IT specialists

**Intended learning outcomes**

The lecture provides participants with a solid and comprehensive theoretical background of the background and physical principles of remote sensing, gives an introduction into digital image processing, as well as geodata concepts, standards and future developments

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

written examination (approx. 45 minutes)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)

**Allocation of places**

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**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2016)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2024)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Applications of Earth Observation** | | | 04-GEO-TB2-162-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The lecture addresses applications of remote sensing of the atmosphere, the oceans, and particularly the land surface. The presented materials include among others applications in geography, environmental planning, ecology, biology, oceanology, soil science, geology, atmospheric science, but also e.g. pollution control (monitoring) and natural resource management. Which research questions can be answered by the means of Earth Observation and geoanalysis? The lecture comprises commonly used methodological approaches for the derivation of the different parameters. The covers the issue of implementation of the remote sensing technology into practice, e.g. the implementation of information systems. It outlines at selected examples, how remote sensing based results can be transferred to the workplace of professionals also beyond science.

**Intended learning outcomes**

The lecture gives a broad overview about the applications of remote sensing. The participants will learn how the different disciplines of environmental sciences and studies utilize the potentials of active and passive sensors for quantification and assessment.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

written examination (approx. 45 minutes)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)

**Allocation of places**

--

**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2016)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2024)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Innovation Laboratory** | | | 04-GEO-TMT1-162-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 10 | numerical grade | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The content of the innovation laboratory can be decided by each student individually and either a research topic is offered by a lecturer or the student is proposing an own topic. Research topics need to be discussed and proposed to one EAGLE lecturer who will also be in charge of supervising and grading the students work. Topics of the innovation laboratory can cover all aspects of the EAGLE study program with a strong focus on Earth Observation such as linking spectrometer field studies to remotely sensed data or the exploration of UAV based imagery and its usefulness for remote sensing sciences.

**Intended learning outcomes**

The innovation laboratory will allow the participant to focus on one particular topic in his/her field of interest. The aim is to get an in depth practical knowledge in how to address an own research in the field of the study program. The innovation laboratory aims to provide first insights into independent research projects such as a MSc study.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (3)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) presentation (approx. 30 minutes) or
b) preparing a poster (approx. 10 hours total) or
c) term paper (approx. 15 pages)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)

**Allocation of places**

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**Additional information**

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**Workload**

300 h

**Teaching cycle**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2016)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)

| Module title | | | Abbreviation |
|---|---|---|---|
| **Project Seminar** | | | 04-GEO-TMT2-162-m01 |
| **Module coordinator** | | **Module offered by** | |
| holder of the Professorship of Remote Sensing | | Institute of Geography and Geology | |
| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** | |
| 5 | (not) successfully completed | -- | |
| **Duration** | **Module level** | **Other prerequisites** | |
| 1 semester | graduate | -- | |

**Contents**

The innovation laboratory shall provide the students with the opportunity to work independently on a defined research topic and explore the potential, challenges and limits of Earth Observation in a practical approach.

**Intended learning outcomes**

The presentation of the planned Msc. thesis for the whole EAGLE students and lecturer

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

presentation (approx. 30 minutes)
Language of assessment: English or German (assessment will be held in English; in addition, the examiner may, where possible, decide to hold assessment in German)

**Allocation of places**

--

**Additional information**

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**Workload**

150 h

**Teaching cycle**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module appears in**

Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2016)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2018)
Master's degree (1 major) Applied Earth Observation and Geoanalysis (EAGLE) (2021)