HUB 1 - University of Tübingen, Germany

Climate, the Environment, and Energy related courses

Winter Semester (WiSe) runs from middle October to 1st week February

Summer Semester (SoSe) runs from middle April to end of July

Compiled by: Prof. Christiane Zarfl, Prof. Todd Ehlers, Dr. Peter Merkel, Clarissa Glaser. (7 July, 2020)

*** Missing and still needed: Block courses between semesters (e.g. in Feb/March and Aug/Sept) is still incomplete and can be updated when in Oct. 2020 when our curriculum revisions are more concerete.*

*** Missing and still needed: There are currently no related biology (mostly Ecology) courses listed here. We are working on this, but it may take additional weeks/months.*

Module/ Course name	BSc	MSc	**Language taught**	**Course Type**	**Delivery Method**	**Participant Universities**	**ECTS**	**Semester: Winter (WiSe) / Summer (SoSe)**	**Comments:** **Note: The Geosciences department is currently updating their curriculum. The new curriculum goes into effect in ~WiSe 21/22. Around the end of October 2020 we can provide an update version of this list with the new course names.**
BSc Courses (Winter Semester)									
Dynamics of the Earth / Dynamik der Erde (introduction to geology)	x		English/German	on-campus Course (potential online option in Winter 2020/21)	Lecture/Exercise	_	cture), 2 (exe	WiSe	Starting WiSe 21/22 replaced by Einführung in die Geowissenschaften / Introduction to Geosciences
Groundwater Hydrology / Grundwasserhydrologie	x		German only	on-campus Course	Lecture/Exercise	_	6	WiSe	Starting WiSe 21/22 replaced by Hydrogeologie und Wasserchemie
Systems Analysis / Systemanalyse	x		German only	on-campus Course	Lecture/Exercise	_	6	WiSe	Starting WiSe 21/22 replaced by Modellierung in den Geo- und Umweltwissenschaften
Geomicrobiology / Geomikrobiologie	x		German only	on-campus Course	Lecture/Exercise	_	3	WiSe	
Biogeochemical and Pollutant Cycles / Stoffkreisläufe	x		German only	on-campus Course	Lecture/Exercise	_	3	WiSe	
Ecosystems of the Earth & Climatology/Ökosysteme der Erde & Klimatologie	x		English	on-campus Course	Lecture/Exercise	_	6	WiSe	
Practical Hydrogeology / Praktische Hydrogeologie	x		German only	on-campus Course	Lecture/Exercise	_	6	Wise	
Paleobiology / Paläobiologie	x		English/German	on-campus Course	Lecture/Exercise	_	6	WiSe	
Applications and methods of Applied Geosciences /Anwendungen und Methoden der Angewandten Geowissenschaften	x		German only	on-campus Course	Lecture/Laboratory	_	6	WiSe	
Water Treatment	x		English/German	on-campus Course	Lecture/Exercise	_	3	WiSe	
Physics of Renewable Energies / Physikalische Grundlagen der erneuerbaren Energiegewinnung	x		German only	on-campus Course	Lecture/Exercise	_	6	WiSe	
Introduction to Earth Surface Processes	x		English	on-campus Course	Lecture/Exercise	_	6	WiSe	
Physical Chemistry / Physikalische Chemie	x		German only	on-campus Course	Lecture/Exercise	_	6	SoSe	
BSc Courses (Summer Semester)									
Environmental Physics1 / Umweltphysik 1	x		German only	on-campus Course	Lecture/Laboratory	_	9	SoSe	
Geophysics	x		English/German	on-campus Course	Lecture/Field Exercise	_	6	SoSe	
Environmental Analytics / Umweltanalytik	x		German only	on-campus Course	Lecture/Laboratory	_	6	SoSe	
Environmental Physics 2 / Umweltphysik 2	x		German only	on-campus Course	Lecture, Seminar, Exercise	_	3	SoSe	
MSc Courses (Winter Semester)									
Hydrogeology		x	English	on-campus Course	Lecture/Exercise	_	6	WiSe	Starting WiSe 21/22 replaced by Groundwater Modeling 1
MSc Mapping/Kartierkurs 1&2/ MSc Field Mapping 1&2 (typically as 2-3 week block courses)		x	English/German	Field Course	Field Course	_	6	WiSe / SoSe	Starting WiSe 21/22 replaced by Advanced Field Methods in Geoscience
Environmental Modeling 1		x	English	on-campus Course	Lecture/Exercise	_	6	WiSe	Taught last time WiSe 20/21
Case Studies in Environmental Geosciences		x	English	on-campus Course	Project	_	6	WiSe	
Aquatic and Environmental Chemistry (Environmental Chemistry 1)		x	English	on-campus Course	Lecture/Exercise	_	6	WiSe	Starting WiSe 21/22 replaced by Environmental Chemistry
Lab Course Geomicrobiology		x	English	on-campus Course	Laboratory	_	6	Wise	
Environmental Analytical Chemistry		x	English	on-campus Course	Lecture/Laboratory	_	6	WiSe	
Environmental Risk Assessment		x	English	on-campus Course	Lecture / Seminar	_	6	WiSe	Starting WiSe 21/22 replaced by Environmental Risks of Chemicals
Sustainable Environmental Biotechnology Systems 2		x	English	on-campus Course	Project	_	6	WiSe	
Applied Tectonics and Surface Processes		x	English	on-campus Course	Lecture/Exercise	_	6	WiSe	Starting WiSe 21/22 replaced by Physics of the Earth's Surface

Applied Data Analysis and Models for Geoscientists		x	English	on-campus Course	Lecture/Exercise	–	6	WiSe	Last taught in WiSe 20/21 starting WiSe 21/22 part of Data Analysis and Modeling Methods in Geoscience and Environmental Science
Micropaleontology		x	English	on-campus Course	Lecture/Exercise	_	6	WiSe	
Palaeoecology of Marine Ecosystems		x	English	on-campus Course	Lecture/Exercise	_	6	WiSe	
Environmental Law I		x	German	on-campus Course	Lecture / Seminar	_	3	WiSe	
MSc Courses (Summer Semester)									
Applied Hydrogeology		x	English	on-campus Course	Lecture/Field Course	–	6	SoSe	Starting SoSe 22 replaced by Hydrogeological Field Investigation Techniques
Environmental Modeling 2		x	English	on-campus Course	Lecture/Exercise	–	6	SoSe	Starting SoSe 22 replaced by Groundwater Modeling 2
Contaminant Hydrogeology		x	English	on-campus Course	Lecture/Seminar/Exercise	–	6	SoSe	Starting SoSe 22 replaced by Remediation of Contaminated Sites
Environmental Isotope Chemistry (Environmental Chemistry 2)		x	English	on-campus Course	Lecture/Exercise	–	6	SoSe	
Environmental Microbiology and Geomicrobiology		x	English	on-campus Course	Lecture/Seminar	–	6	SoSe	
Advanced Topics in Flow and Transport		x	English	on-campus Course	Lecture, Exercise	–	6	SoSe	
Physics of the Atmospheric Boundary Layer		x	English	on-campus Course	Lecture/Exercise	–	6	SoSe	Starting SoSe 22 replaced by Atmospheric Physics
Hydrogeochemical Modeling		x	English	on-campus Course	Lecture/Exercise	–	6	SoSe	
Sustainable Environmental Biotechnology Systems 1		x	English	on-campus Course	Lecture /Field Trips	_	6	SoSe	
Applied Thermochronology and Quaternary Dating: Techniques, Interpretation and Applications		x	English	on-campus Course	Lecture/Exercise	–	6	SoSe	Last taught in SoSe21 starting WiSe 21/22 part of Data Analysis and Modeling Methods in Geoscience and Environmental Science
Climate Dynamics, Probability and Statistics		x	English	on-campus Course	Lecture/Exercise	–	6	SoSe	Starting SoSe 22 replaced by Climate Dynamics
Terrestrische Okosysteme - Grabungs- und Laborpraktikum / Terrestrial Ecosystems – Excavation and laboratory internship		x	English	on-campus Course	Field camp / Laboratory	–	6	SoSe	
Paleoecology of Terrestrial Ecosystems		x	English	on-campus Course	Lecture/Exercise	–	6	SoSe	
Engineering of microorganisms for biofuels and bioplastic production, plant biotechnology and the role of microorganisms in ecotoxicology.		x	English	workshop (rotating location)	Lecture/Excericse	Aix-Marseille, Sapienza Univ. Rome	6	SoSe (block course)	Dates not sure yet, but will occur sometime between mid April - October (not including August).
Environmental Law II		x	German	on-campus Course	Lecture / Seminar	_	3	SoSe	

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Applied Data Analysis and Modeling for Geoscientists (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
This lecture teaches universal mathematical concepts and applies them to a wide range of geologic, geoecology, and applied geology problems ranging from analysis of satellite displacement fields, to landscape evolution and isotope records of climate change. Topics include:

- **Which function fits my data?**
  - **Linear/non-linear regression and curve fitting**
  - **Statistical metrics and error analysis**
- **What signals are in my data?**
  - **Time series analysis and Fourier Transform**
  - **Signal processing (e.g. bandpass-pass filtering, deconvolution)**
  - **Principal Component Analysis**
  - **Denoising and invariants in raster data**
- **Modelling the real world, but how?**
  - **Differential equations with finite-differences/finite-element modelling**
- **Which model best describes my data?**

- **Inverse modelling for data integration**

<u>Participant prerequisites:</u> Calculus, linear algebra and ODEs, although some concepts will be reviewed in class. Prior knowledge of programming is helpful but not a hard prerequisite.

<u>Qualification goals:</u>

Numerical programming in Matlab and/or Python

Application of universal mathematical concepts (calculus, linear algebra, differential equations) for geoscientific problems using computers.

Scheduled time (if flexible, please write "flexible"):

Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Applied Tectonics and Surface Processes (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
This course highlights current methods used to quantify how tectonics and surface processes interact to form Earth's topography and sedimentary ba-sins. Emphasis is placed on understanding how different geologic, geophysi-cal, and geochemical tools can be used to understand mountain building processes and the evolution of Earth's surface. Specific topics addressed in lectures include:

- **How and why tectonics, topography, and climate interact over short and long (million year) timescales.**
- **Physical and mathematical approaches for understanding erosion and sedimentation by rivers, hillslopes, and glacial processes.**
- **Geochemical and other dating techniques for quantifying tectonic and sur-face processes, including thermochronology and cosmogenic isotopes.**
- **Examples of how the previous methods have been applied to different mountain ranges around the world.**
- **Topics addressed in the exercises and discussion include:**

- **Computer exercises using Matlab and other software to investigate physical and geochemical processes discussed in lectures.**
- **Group discussions on scientific papers that provide examples of how differ-ent techniques discussed in class are applied to geoscience studies.**

Participant prerequisites: **Introductory geology**

Qualification goals:

Goals of this class center around enabling students to:

- **Apply different geologic, geochemical, and geophysical data sets to understand tectonic and surface processes in different settings.**
- **Apply different computer software tools to investigate physical and geochemical processes associated with mountain building.**
- **Develop skills in critically reading scientific literature.**

Scheduled time (if flexible, please write "flexible"):
Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Aquatic and Environmental Chemistry (Environmental Chemistry 1) (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercises, Tutorials**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
- **Chemical thermodynamics in aqueous systems**
- **Sorption and partitioning processes of organic and inorganic compounds**
- **Sorption kinetics**
- **Practical applications and case studies**

Participant prerequisites: Basic knowledge in Chemistry, Physics, Hydrogeology
Qualification goals:
- **Role of particles as sorbents, vectors and reactants for contaminants**
- **Quantitative understanding of partitioning and sorption mechanisms of organic and inorganic compounds in the hydrosphere**
- **Knowledge of sorption QSARs for various classes of contaminants**
- **Sorption kinetics and retarded diffusion in porous media**
- **Assessment of contaminant release and cleanup strategies at contaminated sites**

Scheduled time (if flexible, please write “flexible”):
Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Case Studies in Environmental Geosciences (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Project work**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
This course is aimed to apply methods and techniques acquired in previous modules on typical environmental problems.

- **Several case studies will be presented along with all relevant data**
- **Students will work in small groups addressing specific problem scenarios**
- **Starting from initial data sets students will analyze the problem, develop solution strategies and present their solution**

Participant prerequisites: Students have competences corresponding to those of Hydrogeology, Environmental Modeling 1, Environmental Modeling 2
Qualification goals:
Highly specific subject oriented projects enable students to analyze a prob-lem, set up fundamental assumptions, collect and evaluate available data. Solving complex problems in environmental geosciences generally includes multidisciplinary approaches from various fields of expertise such as hydro-geology and hydrogeochemistry.

Dealing with such scenarios students gain experience in designing concep-tual site models, define the relevant physical and chemical processes in-volved and develop a solution strategy.
The integrative module fosters a variety of competences including the capaci-ty for analysis and teamwork, quantitative problem solving skills and presen-tation and reporting skills.

Scheduled time (if flexible, please write “flexible”):
Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Dynamics of the Earth (6 ECTS); until winter semester 2021/22

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture and Rock Lab**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:

- **Basic principles of the geosciences and how different geosystems such as tectonics, magmatism, climate, surface processes, and geobiology are linked to each other**
- **Introduction to magmatism, metamorphism, tectonics and structural geology, sedimentation, and geobiology.**
- **Interior structure of the Earth, earthquakes, and faults**
- **Surface processes including glacial, river, wind, and hillslope environments, as well as erosion and sedimentation processes, modern and past climate, the water cycle, and ocean circulation.**
- **Rock lab exercises: Identification of approx. 150 different rock samples (magmatic, sedimentary and metamorphic) using simple methods.**

Participant prerequisites: None.
Qualification goals: Students are introduced to the basic principles of modern geosciences and the relevant geodynamic processes. They will learn the origin of the Earth and its important rocks types and acquire the fundamental skill to describe and identify more than 100 rocks and minerals in practice using hand rock sample collection the rock lab.

Scheduled time (if flexible, please write “flexible”):
Lecture in winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Ecosystems of the Earth & Climatology (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercises, Seminar sessions**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:

- **Main features of the climate system and understanding of the mechanism of the current and future climate change**
- **Important characteristics of terrestrial ecosystems nowadays**
- **The role of abiotic, biotic and anthropogenic factors in the current and provisional situation of the main ecosystems of the Earth**
- **In-depth examination of the reports of the IPCC**

Participant prerequisites: None.
Qualification goals:

- **Students are familiar with the climatic system and its future change, with the main ecosystems on Earth and their anticipated evolution.**
- **They have the ability to critically assess specialized literature related to this field and to appropriately present research topics in written and oral form.**

Scheduled time (if flexible, please write “flexible”):
Lecture in winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Environmental Analytical Chemistry (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Laboratory**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
The module focuses on:

- **Analysis of new emerging and polar compounds in environmental media**
- **Basic principles of atmospheric pressure ionization techniques and mass spectrometry**
- **Advanced applications of instrumental analytical techniques with liquid chromatography-mass spectrometry**
- **Special approaches for ultratrace analysis**

Participant prerequisites: Basic knowledge in chemistry, environmental analytics and statistics.
Qualification goals:
Students understand the properties of polar compounds. They acquire the theoretical competence to select appropriate problem-oriented analytical methods for environmental pollutants.

At the same time the acquired practical skills allow them to handle sophisticated analytical instruments and to develop suitable analytical methods for variable contamination scenarios on demand.
Both, the theoretical knowledge and the practical laboratory skills are key competences for environmental scientists.

Scheduled time (if flexible, please write “flexible”):
Winter semester (Lecture middle of Oct – first week of Feb, 2 weeks of lab work in March)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Environmental Modeling 1 (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Computer Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
The module introduces important basic concepts including:
- **Principles of parameter identification and**
- **Interpolation of spatial data**

Modeling water balance is key aspect of the module and involves the topics:
- **Water and energy balance at the land surface (precipitation, infiltration, evapotranspiration, surface runoff)**
- **Modeling of groundwater flow [main focus]**
- **Modeling of open-channel flow**

Participant prerequisites: Students have a firm background in mathematics and physics corresponding to the competences acquired in the BSc modules mathematics for scientists and physics.
Qualification goals:
Students know basic modeling principles in Environmental Geosciences. They understand relevant modeling parameters and necessary data handling and processing procedures. They are acquainted with important surface processes in the hydrologic cycle and are able

select and apply adequate environmental models, their discretization and parameterization. The students know how to set up a computer model for groundwater flow and how to calibrate it.
Practical experience in environmental modeling of various systems and scales, with a focus on groundwater modeling provides them with necessary key competences needed to tackle standard hydrogeological problems and enables them to use professional standard software packages.

Scheduled time (if flexible, please write “flexible”):
Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Environmental Risk Assessment (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Seminar**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:

- **Regulatory methods for environmental risk assessment of chemicals (industrial chemicals, pesticides, pharmaceuticals), European regulation REACH, human vs. ecological risk assessment**
- **Exposure analysis: emission patterns, multimedia fate and transport models for quantifying environmental exposure, persistence and long-range transport, predicted and measured exposure concentration**
- **Effect analysis: estimation of hazard potential, tests for ecotoxicity and human health, dose-effect relationships, extrapolation methods, classification of chemicals according to modes of toxic action, prediction methods (QSARs and integrated testing strategy)**
- **Risk assessment methods (deterministic vs. probabilistic), risk assessment vs. hazard assessment PBT assessment (persistence, bioaccumulation, toxici¬ty), uncertainty and sensitivity analyses, precautionary principle**
- **Site specific risk assessment and management, water quality assessment**

- **Specific topics: risk assessment of mixtures, risk assessment of transformation products, dynamic exposure and effect assessment**

<u>Participant prerequisites:</u> None.

<u>Qualification goals:</u>

The students are familiar with regulatory approaches to environmental risk assessment of chemicals and can perform a regulatory risk assessment for an industrial chemical. They are aware of pitfalls and challenges and know about new approaches to risk assessment that are still in the research stage.

Scheduled time (if flexible, please write "flexible"):

Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Applications and methods of Applied Geosciences (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Laboratory, Field Trips**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
The module deals with laboratory and field methods of applied geosciences. In introductory lectures, basic theoretical knowledge of measuring methods from the field and laboratory is imparted. This includes basic laboratory methods for geotechnical description and classification of soils and rocks as well as the application of geotechnical and hydro- or environmental geological investigation methods and procedures. In accompanying laboratory and field tests, various methods of applied geosciences are carried out in practice and theoretical knowledge is combined and consolidated with practical experience.
Participant prerequisites: Prerequisite for this module is the successful completion of the modules Groundwater Hydrology, Physics, Chemistry 1 and Dynamics of the Earth.
Qualification goals:
The aim of the module is to enable students to independently work on geotechnical, hydrogeological and environmental geological questions, to determine parameters and to evaluate data from field and laboratory tests.

Scheduled time (if flexible, please write “flexible”):
Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Biogeochemical and Pollutant Cycles (3 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture and Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
The module deals with the basics of the cycles of substances and their dynamics in different environmental compartments with the following sub-areas:

- **balances, scales, parameters**
- **Global material cycles of elements such as C, N, O, P and S**
- **Global and regional cycles of selected trace substances**
- **Fugacity models**

Participant prerequisites: Basic knowledge in chemistry and physical chemistry, as can be acquired in the modules Chemistry 1 (general chemistry) and Physical Chemistry for environmental scientists.
Qualification goals: The students

- **know and understand the basic processes responsible for the circulation of substances**
- **know the questions and problems of substance distribution on a global and regional scale**

- **are able to apply the methods for the description and analysis of substance distribution**

Scheduled time (if flexible, please write “flexible”):
Lecture in winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Environmental Law 1 (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Prof. Dr. Johannes Saurer (Course Coordinator), University of Tübingen, Faculty of Law, johannes.saurer@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Seminar, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Course structure/content:

- **§ 1 Overview on environmental law**
- **§ 2 History of modern environmental law**
- **§ 3 Constitutional foundations**
- **§ 4 Constitutional foundations II**
- **§ 5 European legal foundations**
- **§ 6 Immission Control Law I**
- **§ 7 Immission Control Law II**
- **§ 8 Immission Control Law III**
- **§ 9 Climate protection law**
- **§ 10 Procedural environmental protection**
- **§ 11 Environmental information law**
- **§ 12 Environmental legal protection**
- **§ 13 Environmental liability/environmental criminal law**

Law text:

- **dtv, Textsammlung Umweltrecht, current version**
- **Full texts of the current version of EUV (TEU/Treaty on EU), AEUV (TFEU/Treaty on the Functioning of the EU)**
    - **GG**
    - **VwGO, VwVfG**
    - **Umweltverwaltungsgesetz Baden-Württemberg**
- **further texts after announcement in the lecture**

Scheduled time (if flexible, please write "flexible"):
Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Geomicrobiology (3 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture and Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:

- **The evolution of the Earth, material cycles and surface processes are very closely linked to the development of the biosphere. This module offers an introduction to the basics of biological processes and the diversity of organisms. The interaction between geosphere and biosphere is the main focus.**
- **The molecular basis of life, geomicrobiological processes, construction, development and classification of living organisms and their importance for geology are covered.**

Participant prerequisites: None.
Qualification goals: The students

- **gain an understanding of the basics of biology (biomolecular basics of life, biosynthesis, metabolism, bioenergetics, origin of life)**
- **have an overview of the interactions between biological processes and inanimate matter**
- **know the metabolic diversity and the structure of microorganisms**

- **can describe different methods for the cultivation and quantification of microorganisms**
- **know the most important biogeochemical material/element cycles (C,N,S)**

Scheduled time (if flexible, please write “flexible”):
Lecture in winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Groundwater hydrology (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture and Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:

- **The module offers an introduction to the field, references and demarcation to neighbouring disciplines and deals with the following contents:**
- **Basic principles of hydrology (water balance, groundwater resources, aquifers and groundwater flow)**
- **Fundamentals of the physics of porous media and aquifers (pore space, storage density, water, mass and heat transport)**
- **Basic principles of groundwater chemistry and groundwater protection (geogenic substances, pollutants)**

Participant prerequisites: None.
Qualification goals: The students have an overview of the fields of work, methods, research directions and professional fields of groundwater hydrology as a subfield of applied geosciences. With a basic knowledge of general groundwater hydrology, a quantitative understanding of basic hydro-chemical processes as well as groundwater flow and transport, students understand groundwater systems and master the basics necessary

for the corresponding work practice. They also have the prerequisites for further courses in the field of water and environmental geosciences.
Scheduled time (if flexible, please write “flexible”):
Lecture in winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Introduction to Earth Surface Processes (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:

- **This course presents the physical basis for mass transport at the Earth's surface. Mechanisms for the production of topography and erosion/sedimentation processes are discussed.**
- **An introduction to the physics of the following processes will be covered: the chemistry and mechanics of rock weathering; glacier flow, erosion, and depositional landforms; fluvial erosion, sediment transport, and deposition; and hillslope mechanics.**
- **Data capture and analysis is introduced by a methods review and two field projects including laser scanning and photogrammetry.**

Participant prerequisites: Dynamics of the Earth, mathematics for earth scientistis (recommended)
Qualification goals: At the end of the course the students will have:

- **A good understanding of the theoretical underpinnings of the physics and chemistry of the Earth's surface;**

- **The ability to interpret processes shaping Earth's topography and differentiate their magnitudes**
- **Training to operate surface measurement devices and related soft-ware for process quantification applied in current research**

Scheduled time (if flexible, please write "flexible"):
Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Paleobiology (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercise, Seminar**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
This module offers a deeper insight into two main areas of palaeontology: Evolutionary palaeobiology and ecosystem analysis.

- **In evolutionary palaeobiology, the evolution of the major marine and terrestrial fossil groups is studied in detail. Examples from micropaleontology, invertebrate paleontology, vertebrate paleontology and paleobotany are given. The dramatic development of the Earth's organism diversity is studied in terms of the conquest of nine habitats and the influence of mass extinction events.**
- **Furthermore, the most important terrestrial and marine ecosystems are introduced. The possibilities of the functional reconstruction of organisms based on their morphology are presented. The complexity of recent and fossil communities will be taught. The evolution of ecosystems in their dependence on biotic and abiotic processes will be explained.**

Participant prerequisites: **Dynamics of the Earth.**
Qualification goals:

Students gain a deeper insight into the evolution of organisms through time. They learn about the evolution of the most important groups in micropalaeontology, invertebrate palaeontology, vertebrate palaeontology and palaeobotany, know the basics of palaeoecology and understand interrelationships and relevant processes of ecosystem evolution.

Scheduled time (if flexible, please write “flexible”):
Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Physical principles of renewable energy production (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Seminar, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
The module includes the following topics:

- **Statistics and data on energy demand;**
- **Fundamentals of energy production (thermodynamics): entropy, efficiency, forms and conversion of energy**
- **Thermal power plant**
- **Heat pump**
- **Nuclear energy as an alternative to renewable energy production**
- **Solar thermal energy**
- **Photovoltaics**
- **Wind energy use**

Participant prerequisites: Mathematical and physical basics from the corresponding compulsory lectures in environmental sciences or comparable competences.
Qualification goals:
Renewable energies are becoming increasingly important as climate-friendly, efficient solutions for sustainable energy supply. Students learn the scientific (thermodynamic and

environmental physics) basics of renewable energy production. They are able to evaluate the suitability of different methods for specific locations and determine their potential.

Scheduled time (if flexible, please write “flexible”):
Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Practical Hydrogeology (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
The module consists of the parts "Applied Hydrogeology", "Aquifersystems", and "Groundwater and Soil Protection", which are partly carried out by external lecturers with the participation of representatives of authorities and practitioners from industry.
The "Applied Hydrogeology" uses practical examples to explain how the planning and implementation of hydrogeological projects is carried out and teaches basic techniques such as drilling methods and pumping tests. "Aquifer systems" introduces the basic properties of groundwater-bearing strata (geological-hydrogeological strata layering, lithology, geohydraulic parameters) and the underlying structure-forming processes (weathering, karstification, subrosion, etc.) and shows regional hydrogeological relationships.
"Groundwater and Soil Protection" deals with conflicts of use that arise as a result of raw material extraction/recycling, geothermal energy, CO_2 sequestration, etc. with the protection of soil and groundwater resources.
Participant prerequisites: Basics of geology and groundwater hydrology.
Qualification goals:

Students know all important hydrogeological units in Baden-Württemberg and their characteristic properties. They understand the development and structure of different aquifer systems and their individual hydrogeological characteristics, taking into account the regional geological boundary conditions.
They have an insight into the practical and methodical working methods of a hydrogeologist and are able to analyse hydrogeological and geotechnical problems on the basis of case studies and develop solutions.

Scheduled time (if flexible, please write “flexible”):
Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Systems analysis (6 ECTS); until winter semester 2021/22

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture and Programming Exercises (Matlab)**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
- **Introduction to systems theory and modelling**
- **Analysis of environmental systems using mathematical models, among others: Compartment models, growth models, balance equations, reaction kinetics, oscillating systems**
- **Simulation and scenario analysis**
- **Model evaluation (sensitivity, variants, uncertainty)**
- **Introduction to programming with Matlab (syntax, graphic applications, simple algorithms)**

Participant prerequisites: background in mathematics.
Qualification goals: Students can "translate" environmental processes into mathematical descriptions (models) and independently develop and apply models. They are able to understand and critically analyse model behaviour.

Scheduled time (if flexible, please write “flexible”):

Lecture in winter semester (middle of Oct – first week of Feb), Matlab course (1 week) usually first week prior to lecture start

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Hydrogeology (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
The module gives an introduction in the science of groundwater. The course has a strong emphasis on physical hydrogeology and the quantitative description of groundwater flow and solute transport. Topics include:

- **Characterization of aquifers**
- **Concept of the porous medium**
- **Vadose zone (hydrostatics and steady-state flow)**
- **Derivation of conservation laws for water, solute mass, and heat in porous media**
- **Groundwater flow with analytical solutions for different geometries**
- **Well hydraulics**
- **Groundwater transport with analytical solutions in one and multiple dimension**

Participant prerequisites:
Students have a firm background in mathematics and physics.
Qualification goals:
Students know the basic concepts of quantitative subsurface hydrology in different geological environments and acquire general competences in the basic physical principles of groundwater flow and solute transport in the satu-rated and unsaturated zone. They

can calculate groundwater flow and solute transport for simple geometries and are aware of the underlying assumptions. With practical experience in groundwater resource development, they can address standard hydrogeological problems.

Scheduled time (if flexible, please write “flexible”):
Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Geomicrobiology Lab (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Laboratory course (2 weeks)**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
- **Cultivation and microscopic characterization of microorganisms**
- **Quantification of microbial activities**
- **Active participation in a current research project of the Geomicrobiology research group**

Participant prerequisites:
- **basic knowledge in microbial physiology and in microbial ecology.**

Qualification goals: The students
- **can apply various microbial lab techniques (sterile working techniques)**
- **are able to follow and interpret microbial activities quantitatively**
- **know about different microbial metabolic pathways, in particular microbial formation and transformation of minerals**
- **know about current topics in geomicrobiology**
- **understand and are able to present research questions, hypotheses, experimental approaches and methods, results from their experiments and the data evaluation and interpretation**

Scheduled time (if flexible, please write “flexible”):
first two weeks of Oct

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Micropaleontology (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
The module introduces the biology, ecology, morphology and geological significance and evolution of important microfossil groups. The role of microfossils as paleoenvironmental indicators and in industrial micropalaeontology and biostratigraphy is discussed. Students learn the practical skills of processing and analyzing micropaleontological samples.
Participant prerequisites: BSc Modules "Erdgeschichte", "Sedimente & Stratigraphie", "Paläontologie" (or equivalent).
Qualification goals:
Students are familiar with the process of identification and classification of microfossils and understand the evolutionary history and geological significance of microfossil-producing organisms. They are able to independently carry out paleoenvironmental analyses and age determinations with microfossils and are able to critically evaluate micropaleontological data.
Practical skills in processing of micropaleontological material from sampling to interpretation and the understanding of the potential industrial applications of micropalaeontology are a key competence needed exploration of oil and gas reservoirs.

Scheduled time (if flexible, please write “flexible”):
Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Palaeoecology of Marine Ecosystems (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
- **Relationships between organisms and their environment**
- **Analysis of organism relationships between taxa**
- **Ecosystem analysis of marine depositional systems**

Participant prerequisites: Basics in Palaeontology and Biology.
Qualification goals: The students will obtain the following qualifications:
- **Basic knowledge will be attained with respect to functional morphology, organism-relationships and ecosystems in fossil depositional systems. After attending the module, the participants will be able to make ecological interpretations of individual marine fossils, to analyze the species interactions as well as reconstruct ancient ecosystems. They will be able to apply their knowledge to recognize the reciprocal interaction of biological and physical parameters in marine ecosystems using relevant data from the geological record. The participants will be able to apply different methods for paleontological interpretations. They will be able to solve complex problems with respect to functional morphology, actualistic**

paleontology, animal relationships such as predation and encrustations as well as the paleoecology of marine ecosystems.

Scheduled time (if flexible, please write “flexible”):
Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Sustainable Environmental Biotechnology Systems 2 (6 ECTS)
Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Projects**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
This course will offer a systems approach to understand energy systems that include a bioprocessing step, such as anaerobic digestion, anaerobic fermentation, microbial fuel cells, and photobioreactors with algae. In general, this course focuses on biomass-to-bioenergy conversion, including introduction to major treatment steps, such as pretreatment steps, fermentation steps, and product separation steps. The course integrates physics, engineering, environmental impacts, economics, and sustainable development. Different energy generation technologies will be compared to gain an understanding of the advantages and limitations of these technologies. Students are expected to be interested in and appreciate the need for quantitative aspects of energy systems. An emphasis of this course is technical and economic analysis of large-scale energy systems and their conceptual design.
Participant prerequisites: Basic knowledge in microbiology or chemistry or physics or geosciences or engineering, Sustainable Environmental Biotechnology Systems 1
Qualification goals:
This course is intended to students to use the capabilities from Sustainable Environmental Biotechnology Systems 1 to:

- **Excel in a team-oriented design experience, focused on the application of renewable bioenergy technologies.**
- **2Design a “real life” renewable bioenergy system.**

Scheduled time (if flexible, please write “flexible”):
Winter semester (middle of Oct – first week of Feb); starting 2021/22

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Water Treatment (3 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
The module includes
- **Coagulation, filtration, sedimentation**
- **Adsorption**
- **Membrane Filtration**
- **Oxidation**
- **Disinfection**

Combination of individual processes
Up-to- date examples of drinking water treatment plants
Participant prerequisites: Basic background in Chemistry and Physics comparable to contents that can be accquired in the modules of the BSc program
Qualification goals:
Students understand the basics of physical and chemical processes of drinking water treatment. They know the approaches of different treatment technologies and are able to apply suitable processes to remove selected pollutants. They are able to combine suitable process steps to treatment trains which are able to solve given problems.

Scheduled time (if flexible, please write “flexible”):
Winter semester (middle of Oct – first week of Feb)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Advanced Topics in Flow and Transport (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercise, computer tutorials**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
Yearly changing topics covering aspects of mathematical modeling of flow and solute transport in rivers, soils, and aquifers. Potential topics may include:

- **Conformal mapping and other analytical methods for potential flows**
- **Laplace-transform ad Fourier-transform techniques for transport**
- **Calculation of sensitivities**
- **Uncertainty quantification**
- **Dispersion theories**
- **Unsaturated and multi-phase flow in porous media**
- **Simulation of groundwater-induced land subsidence**
- **Finite Element Methods**
- **Solving ordinary differential equations**
- **Linearization of large systems of equations**
- **Numerical methods of parameter estimation**

Participant prerequisites: Students have successfully participated in Environmental Modeling 1 and Hydrogeology.

Qualification goals:

Students understand and can apply advanced analytical and numerical techniques used in the simulation of flow and transport in terrestrial aquatic systems. They are able to choose appropriate schemes for particular applications and implement smaller self-developed codes.

Scheduled time (if flexible, please write “flexible”):
Summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Applied Hydrogeology (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercises, Hydrogeological field course (1 week block course)**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
The module deals with methods of applied hydrogeology, and focuses in particular on techniques for hydrogeologic site investigation for which the theoretical basis of hydrogeological investigation techniques is taught and consolidated in exercises. As part of a field course, the hydrogeological site investigation techniques are is transferred into practice. Methods, which are discussed in the module include among others: drilling methods, well construction, groundwater sampling, pumping tests under various boundary conditions, single well methods, and tracer testing.
Participant prerequisites: The module requires the competences of the module "Hydrogeology" (MSc).
Qualification goals:
Students are able to independently plan, carry out, and evaluate hydrogeological field tests. They develop investigation strategies for a hydrogeological exploration of a site, guide and carry out site investigations and collect and analyze data. They generate a local hydrogeological site characterization of the aquifer resp. the subsurface and provide

hydrogeological parameters of the subsurface. They are able to apply their knowledge and understanding as well as their problem solving skills in new and unfamiliar situations.

Scheduled time (if flexible, please write “flexible”):
Summer semester (middle of Apr – end of July); field course first or second week of Aug

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Applied Thermochronology and Quaternary Dating: Techniques, Interpretation and Applications (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **10 days block course**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
In this block course the following topics will be lectured and practically learned:

- **- General principles of absolute and relative dates**
- **- Radiometric dating methods**
- **- Cosmogenic radionuclide dating**
- **- Optical- and thermo-stimulated luminescence dating**
- **- Heat transport in the crust**
- **- Low-temperature thermochronology**
- **- Fission track dating method**
- **- (U-Th)/He dating method**
- **- Detrital thermochronology data interpretation**
- **- Thermal history modelling**
- **- Thermokinematic modelling**

Participant prerequisites:
Introductory Geology
Qualification goals:

After this block course the students:

- **- Know the theoretical basis of different dating techniques**
- **- Have acquired practical (laboratory) experience in thermochronology**
- **- Use computer skills to quantitatively interpret thermochronological data**
- **- Gain expertise in deriving geodynamic models from data through case studies**

Scheduled time (if flexible, please write “flexible”):
Sep/Oct (starting from 2021)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Engineering of microorganisms for biofuels and bioplastic production, plant biotechnology and the role of microorganisms in ecotoxicology

Participant universities:
University of Tübingen, Univ. Aix-Marseille, Sapienza, Univ. Rome.

Participant academics (indicating university, department, e-mail)
Prof. Dr. Karl Forchhammer University of Tübingen, Interfaculty Institute for Microbiology and Infection Medicine, karl.forchhammer@uni-tuebingen.de

Co-taught with:
Prof. Amel Latifi (Biology Department, Univ. Aix-Marseille)
Prof. Ascenzioni Fiorentina: Department of Biology and Biotechnology (Sapienza, Univ. Rome)

Kind of activity:

Individual courses
x Virtual mobility courses/modules (2x 6ECTS)
X Short courses/workshops (1-2 ECTS)
□ Summer School
X Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
□ Erasmus-term semesters (30 ECTS)
Various
□ Other (please elaborate): ……

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
- **Introduction to cyanobacterial autotrophic metabolism and metabolic engineering strategies for feedstock production.**
- Examples on biopolymer synthesis in Cyanobacteria: new concepts and future perspectives for sustainable economy.
- **Production of PHB and cyanophycin in lab-scale: experimental testing of cultivation conditions.**
- **Product extraction and analysis**
- **Comparison between genetically engineered strains**
- **Participant prerequisites: background in molecular biology**

Scheduled time (if flexible, please write “flexible”):
Flexible

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): multidisciplinary character: this is a joint project with Prof. **Amel Latifi** (Biology Department, Univ. Aix-Marseille) and **Prof. Ascenzioni Fiorentina**: Department of Biology and Biotechnology (Sapienza, Univ. Rome)

The program of the first year will focus on energy and value-added products production and the second year will be dedicated to topics related to environment. Two summer-workshops will be organized on each topic to deepen the knowledge provided in the courses.

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Climate Dynamics, Probability and Statistics (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, computer exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
This module offers an introduction to atmospheric processes and climate change of the past, present and future. Furthermore, it teaches theoretical and practical knowledge of probability theory, and basic to advanced methods from descriptive and inferential statistics, which are required for the description, explanation and prediction of climate and other Earth systems. Module core content includes:

- **processes governing the climate system on different scales;**
- **climate change of the past, present and future;**
- **physics- and statistics-based modelling of the atmosphere;**
- **concepts of frequentist and Bayesian probabilities and statistics;**
- **data handling: from high dimensionality to sparse records;**
- **synoptic statistical tools for (palaeo)climatology and geoscience;**
- **detection and explanation of patterns in large datasets;**
- **intelligent, self-improving models: letting models learn from new data.**

Participant prerequisites:
Basic knowledge of statistics and programming is useful, but not required.
Qualification goals:

Students have a basic understanding of the processes governing climate and climate change and are able to understand and apply basic and advanced tools of descriptive and inferential statistics to typical problems in climatology and geoscience. The students will be able to implement these tools as self-developed (Python or other) programming code.

Scheduled time (if flexible, please write “flexible”):
Summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Contaminant Hydrogeology (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Seminar, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:

- **Subsurface contaminant distribution**
- **Non aqueous phase liquids in porous media (NAPLs): Behavior and dissolution kinetics**
- **Dissolved compounds: Transport in groundwater**
- **Site investigation and sampling strategies**
- **Integral pumping tests**
- **In situ and ex situ source zone remediation technologies**
- **Plume remediation: Natural attenuation, permeable reactive barriers, pump-and-treat**
- **Remediation technology selection: Technical, economical and environmental aspects**
- **Integrated contaminated land management**

Participant prerequisites: MSc modules Hydrogeology, Aquatic & Environmental Chemistry or equivalent competences
Qualification goals:

Students learn to address real case scenarios of contaminated sites and to interpret the inherent contamination characteristics due to subsurface conditions and the compounds under consideration.
The comprehensive overview on practical aspects of contaminant hydrogeology involves building of conceptual models of a contaminated site, assessing potential risks and developing solution strategies for subsurface contaminations, a key competence of environmental geoscientists.

Scheduled time (if flexible, please write “flexible”):
Summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Environmental Isotope Chemistry (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
- **Basic principles of isotope chemistry**
- **Relevant isotope systems for the hydrosphere (esp. C, H, O, N, S)**
- **Compound-specific organic isotope chemistry**
- **Application of isotope systems for dating, forensic and process identification purposes**
- **Principles of isotope analysis**
- **Applications and case studies**

Participant prerequisites: **Basic knowledge in chemistry and physics for geoscientists**
Qualification goals:
- **Knowledge of prospects, limitations and applications of isotope methods in environmental chemistry**
- **Knowledge of theory and interpretation of isotope fractionation processes**
- **Knowledge of basic principles and applications of core methods for isotope analysis**
- **Application of isotope methods in the context of contaminant hydrology (nat-ural attenuation and tracer studies)**

Scheduled time (if flexible, please write “flexible”):

Summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Environmental Microbiology and Geomicrobiology (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Seminar, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
- **General environmental microbiology and geomicrobiology**
- **Microbial degradation of pollutants**
- **Redox zonation, thermodynamics**
- **Microbe-mineral interactions**
- **Bioremediation**
- **Biogeochemical cycles**

Participant prerequisites: Geomicrobiology; basic knowledge in microbial physiology and in microbial ecology
Qualification goals: The students
- **can read and evaluate current literature about various topics in Environmental Microbiology and Geomicrobiology and can present these topics to an interdisciplinary audience of students**
- **obtain an advanced and detailed understanding of current topics Geomicrobiology and Environmental Microbiology**

- **understand the kinetics and energetics of microbially catalyzed processes and the consequences of these processes for the environment**
- **know about the contribution role of microbial processes for biogeochemical cycling (C, N, S, Fe, Si, P)**
- **know about environmental behavior and microbial transformation of selected organic and inorganic pollutants**
- **understand the interactions of microorganisms with solid substrates (minerals and surfaces)**

Scheduled time (if flexible, please write “flexible”):
Summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Environmental Modeling 2 (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Computer Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
Contents of the advanced environmental modeling module are:

- **Modeling of energy and mass balance in mixed systems (e.g. temperature model of a lake)**
- **Modeling of conservative transport in porous media and open channels**
- **Modeling of reactive transport**
- **Coupling to mass transfer**
- **Coupling to (bio)chemical transformations**

Participant prerequisites: Students have competences corresponding to those of MSc Modules Hydrogeology and Environmental Modeling 1, Aquatic and Environmental Chemistry.
Qualification goals:
Based on their firm understanding of conservation principles students are able to set up mathematical models to determine transport, fate and behavior of aqueous-phase compounds in groundwater. They are experienced in addressing the behavior of relevant contaminant groups and apply modeling principles to practical examples of solute

transport. They are able to under-stand and interpret the interactions between transport processes, inter-phase mass transfer, and chemical transformation processes in environmental systems, mainly in porous media.

Scheduled time (if flexible, please write “flexible”):
Summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Field Mapping Course (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Field course (about 2 weeks)**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
One mapping course entails:

- **Geological mapping of an area, individually or in small groups**
- **Drawing of a geological map, as well a graphical representation of the stratigraphy and/or lithological relationships in the form of stratigraphical columns, cross sections, etc.**
- **Writing of a report that summarizes the observations and interpretation of the geology and geological history of the mapping area**
- **Depending on the duration of the course, credits may need to be gained with additional assignments. This must be defined and announced by the course leader before the mapping course itself. These can be, for example, additional field days, participation in preparation seminars, home work, etc.**

Participant prerequisites:

- **Successfully completed BSc-degree in geosciences**

Qualification goals:
Students learn to independently apply geological field methods and techniques and gain practical experience in the geological analysis of a new area. They will undertake

measurements, determine lithologies and stratigraphic sequences and will put these in their spatial context. The ability to make geological maps, cross sections and stratigraphical columns is among the core competencies of a geoscientist.

Scheduled time (if flexible, please write “flexible”):
Aug or Sep (changes every year)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Environmental Analytics (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Seminar, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
The lecture should introduce the students to the special problems and approaches of environmental analysis. This includes:

- **Methods of environmental analysis**
- **Sampling and sample treatment**
- **Instrumental analysis methods**
- **Water analysis**

Some topics will be taken up and discussed in the seminar. Theoretical contents are put into practice in the corresponding practical training.
Participant prerequisites: Basic knowledge of chemistry, as can be acquired in the modules Chemistry 1 (General Chemistry), Chemistry 2 (Organic Chemistry) and Chemistry 3 (Analytical Chemistry).
Qualification goals:
The students know the basic methods and approaches of quantitative analysis and are able to apply environmental analytical methods to selected problems. They know the questions, methods and approaches of water analysis.

In addition, students acquire important practical skills in the performance of complex analytical procedures and the safe use of modern laboratory infrastructure.

Scheduled time (if flexible, please write “flexible”):
Lecture in summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Environmental field course (8 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
X Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Seminar, Field and Laboratory Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
Teams of students work on different aspects of an environmental science question within the framework of an overall project. They present theoretical principles, collect relevant data in field and laboratory studies, evaluate and interpret the results. The results of the individual groups are summarized in a comprehensive report. The respective questions, project areas and tasks change.
Participant prerequisites: Basic knowledge in chemistry, environmental physics, mathematics and environmental systems analysis, as acquired in the modules Chemistry 1 (General Chemistry), Chemistry 2 (Organic Chemistry) and Chemistry 3 (Analytical Chemistry), Mathematics 1 and 2, Environmental Physics 1 and 2, and Environmental Systems Analysis.
Qualification goals:
Students are able to analyse complex environmental problems and to develop suitable investigation concepts. They master the basic hydraulic, water-chemical and environmental-physical measuring methods and are able to apply these in the field.

The evaluation, presentation, interpretation and summarizing presentation of project results are fundamental core competences for students in their later professional life. Through the cooperation of several working groups, each working on different partial aspects of a project, students learn to connect their own results with those of other groups and to bring them together to form a comprehensive overall picture.

Scheduled time (if flexible, please write “flexible”):
Summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Environmental Law 2 (3 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Prof. Dr. Johannes Saurer (Course Coordinator), University of Tübingen, Faculty of Law, johannes.saurer@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Seminar, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Course structure/content:

- **§ 1 Nature conservation law I**
- **§ 2 Nature conservation law II**
- **§ 3 Nature conservation law III**
- **§ 4 Environmental energy law I**
- **§ 5 Environmental Energy Law II**
- **§ 6 Environmental Energy Law III / Water Law I**
- **§ 7 Water Law II**

Law text:

- **dtv, Textsammlung Umweltrecht, current version**
- **Full texts of the current version of EUV (TEU/Treaty on EU), AEUV (TFEU/Treaty on the Functioning of the EU)**
    - **GG (German Federal Constitution)**
    - **VwGO, VwVfG**
    - **Umweltverwaltungsgesetz Baden-Württemberg**

- **further texts after announcement in the lecture**

Scheduled time (if flexible, please write “flexible”):
Summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Environmental Physics 2 (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Seminar, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
The module includes the following topics:

- **Radiation and heat balance of the earth's surface;**
- **vertical structure of the atmosphere, shear, thermal stratification;**
- **Introduction to atmospheric boundary layer;**
- **advection and diffusion**
- **Equations of motion**
- **Fundamentals of fluid mechanics**
- **equation of motion of a coagulum**
- **Global circulation: West wind zone, Rossby waves, cyclogenesis**
- **Clouds**
- **Introduction to Synoptics**

Participant prerequisites: Mathematical and physical basics from the corresponding compulsory lectures of the previous semesters, module UWP1.
Qualification goals:

Students know and understand the global currents and the basic principles of the processes taking place in the lower atmosphere. With the basic theoretical understanding of natural currents and the ability to describe them mathematically, they are able to establish and solve equations of motion for different currents. They have a quantitative understanding of the energy balance of the Earth's surface and of atmospheric processes from the microscale to the synoptic scale, in which information from local information sources is combined into a regional picture.

Scheduled time (if flexible, please write “flexible”):
Lecture in summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Environmental physics (9 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercises, Laboratory**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:

- **Basic thermodynamic quantities and associated measurement methods in atmosphere physics**
- **Thermodynamics and fluid mechanics (lecture, laboratory)**
- **Basics of time series analysis**
- **Statistics and Spectral Analysis (lecture, exercises)**
- **Introduction to turbulent flows (lecture, exercises)**

Participant prerequisites: Mathematical and physical basics from the corresponding compulsory lectures of the previous semester.
Qualification goals: Students have a basic physical understanding of thermodynamic parameters of natural, turbulent flow. They are able to design and use simple measurement equipment on their own. They are able to measure basic thermodynamic parameters in a fluid, both with simple and slow measurement techniques (average values), as well as with fast and complex sensor technology (turbulence).
You can statistically analyze and interpret the measured data and identify and quantify statistical and systematic errors. The practical and methodical procedures introduced in

the collection and handling of measurement data represent a key scientific competence and can be applied in a variety of ways in the further course of studies.

Scheduled time (if flexible, please write “flexible”):
Lecture in summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Physical chemistry (3 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
Introduction to thermodynamics and kinetics
- **Basic concepts of thermodynamics, energy and work, enthalpy, entropy and free enthalpy, laws of thermodynamics**
- **Ideal and real gases**
- **Phase transformations between gaseous, liquid and solid phases, phase diagrams**
- **Chemical mixtures and solutions**
- **Chemical reactions, redox reactions, acid-base reactions**

Solubility, activity coefficients
- **Environmentally relevant distribution equilibria of organic substances**
- **Mass balances**
- **Interactions between molecules**
- **Kinetics of reactions, hydrolysis**

Participant prerequisites: None.
Qualification goals: The students

- **understand the basics of thermodynamics and kinetics and can apply them to examples of phase transformations, material distribution and reactions in the environment**
- **are able to calculate the equilibria of reactions and substance distribution on selected examples**
- **understand the temperature dependence of vapour pressure, distribution processes and reactions**
- **know the basic methods, processes and questions of substance distribution and reactions in the environment**

Scheduled time (if flexible, please write “flexible”):
Lecture in summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Geophysics (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercises, Field Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
Geophysics introduces students to the fundamentals of general and applied geophysics including the topics:

- **gravity field, magnetic field, seismology, physical parameters of Earth**
- **methods of gravity, geomagnetics, palaeomagnetics and environmental magnetics, geoelectrics, electromagnetics, ground penetrating radar, seismics, tomography**

Field based exercises in small groups offer 'hands on' experiences in collecting, processing and interpretation of data
Participant prerequisites: Students have a firm background in mathematics and physics.
Qualification goals:
Students have a basic understanding of physical processes and properties associated with Earth. They know the most important geophysical methods for subsurface investigations and have practical skills in performing and interpreting basic geophysical investigations.

Scheduled time (if flexible, please write "flexible"):
Lecture in summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Hydrogeochemical Modeling (Environmental Chemistry 4) (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Computer Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
- **Chemical thermodynamics in aqueous systems**
- **Chemical speciation modelling (quantitative hydrochemistry)**
- **Sorption and Partitioning processes of organic and inorganic compounds in the hydrosphere**
- **Practical case studies**

Participant prerequisites: Physics, Chemistry, Biology for geoscientists. BSc Module Biogeochemistry and/or Environmental Chemistry 1.
Qualification goals:
- **Knowledge of basic principles and features of chemical speciation software codes**
- **Quantitative understanding and prediction of aqueous speciation, dissolution of and complex formation at minerals, redox using chemical modelling soft-ware**
- **Informed application of PHREQC software**

Scheduled time (if flexible, please write “flexible”):
Summer semester (1 week Block most likely in August/September)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Paleoecology of Terrestrial Ecosystems (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Seminar, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:

- **Important characteristics of terrestrial ecosystems nowadays and in the past**
- **Description of the main approaches (autoecology, synecology, geochemical tracers)**
- **Taphonomy, diagenesis and palaeoecology of terrestrial ecosystems**
- **Initial adaptations and the early terrestrial record**
- **Terrestrial ecosystems through time**
- **The role of biotic and abiotic factors in the evolution of terrestrial ecosystems**
- **The impact of mass extinctions on terrestrial ecosystems**
- **Changes in terrestrial ecosystems and human evolution**

Participant prerequisites: Bachelor courses „History of the Earth“, „Palaeontology“, „Palaeobiology“ or equivalent.
Qualification goals:

- **Students are familiar with the history of life on land and can apply the methods used to reconstruct this history.**
- **They have the ability to critically assess specialized literature related to this field and to appropriately present research topics in written and oral form.**

Scheduled time (if flexible, please write “flexible”):
Summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Physics of the Atmospheric Boundary Layer (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture, Exercises**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
This course presents the main features of atmospheric physics with a focus on the boundary layer and airborne research. Aircraft have been applied very effectively in many aspects of environmental research and are a powerful instrument for studying the Earth's surface and atmosphere. Instrumented aircraft in situ measurements with minimum disturbances to the atmosphere between sensor and object. Since the recent development of small unmanned aerial vehicles (UAV) research aircraft have opened new possibilities in boundary layer research.
This module gives an introduction to these exciting research topics and covers the following topics in lecture, tutorials and hands-on practice:

- **Introduction to atmospheric physics and the boundary layer**
- **history of research flight**
- **the physics of flight: aerodynamics, avionics and inertial navigation systems, coordinate systems, aircraft icing**
- **measurement and calibration of basic thermodynamic quantities: temperature, pressure, altitude, water vapour, wind vector**

- **turbulent fluxes and small-scale turbulence**
- **flight strategies and field exercise (with UAV)**
- **software strategies for atmospheric data analysis (using RAMA)**

Participant prerequisites: Lectures on mathematics and physics of a BSc study completed by lectures on thermodynamics, atmospheric physics and basics in flow mechanics (UWP1 and UWP2 of the BSc Umweltnaturwissenschaften)

Qualification goals:

Students are familiar with the potential and limits of research aircraft in general, especially regarding UAV, airborne measurement instruments and flight strategies. They will be able to decide what instruments (in terms of suitable aircraft and sensors) are suited for certain environmental studies, particularly regarding costs and experimental effort. They plan, carry out and analyze flight experiments for environmental studies in the lower troposphere.

Scheduled time (if flexible, please write "flexible"):
Summer semester (middle of Apr – end of July)

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Sustainable Environmental Biotechnology Systems 1 (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Lecture and field trips**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:
This course will offer a systems approach to understand energy systems that include a bioprocessing step, such as anaerobic digestion, anaerobic fermentation, microbial fuel cells, and photobioreactors with algae. In general, this course focuses on biomass-to-bioenergy conversion, including introduction to major treatment steps, such as pretreatment steps, fermentation steps, and product separation steps. The course integrates physics, engineering, environmental impacts, economics, and sustainable development. Different energy generation technologies will be compared to gain an understanding of the advantages and limitations of these technologies. Students are expected to be interested in and appreciate the need for quantitative aspects of energy systems. An emphasis of this course is technical and economic analysis of large-scale energy systems and their conceptual design
Participant prerequisites: Basic knowledge in microbiology or chemistry or physics or geosciences or engineering
Qualification goals:
This course is intended to students to gain the capabilities to:

- **Use a systems approach to design renewable bioenergy systems.**
- **Explain the energy conversion processes for biomass systems.**
- **Evaluate the advantages and limitations of renewable bioenergy systems.**
- **Assess a system by using nontechnical factors (environmental impacts, economics, and sustainable development) during the design phase.**
- **Identify which information is missing during the design phase.**

Scheduled time (if flexible, please write “flexible”):
Summer semester (middle of Apr – end of July); starting in 2021

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……

CALL FOR HUB 1 ACTIVITIES

Title of the proposed activity:
Terrestrial Ecosystems – excavation and laboratory internship (6 ECTS)

Participant universities:
University of Tübingen

Participant academics (indicating university, department, e-mail)
Dr. Peter Merkel (Course Coordinator), University of Tübingen, Department of Geoscience, peter.merkel@uni-tuebingen.de

Kind of activity:

Individual courses
□ Virtual mobility courses/modules
□ Short courses/workshops (1-2 ECTS)
□ Summer School
□ Workshops/Days
Terms/semesters
□ Erasmus research exchanges/traineeships
□ Independent projects (e.g. joint supervision of thesis work)
X Erasmus-term semesters (30 ECTS)
Various
X Other (please elaborate): **Field course and Laboratory internship**

Capacity (total # of participants):
2 – 10 (please contact the course coordinator for available capacities)

Brief description of the activity (Aims and Scopes, content, etc):
Module content:

- **Fundamentals of paleontological excavation methods**
- **Types of continental sediments and their description**
- **Analytical field methods**
- **Fossil recovery, documentation, sampling**
- **Treatment of continental sediments (wet sieving)**
- **Preparation of fossil vertebrates**
- **Isotope laboratory, preparation of fossil material for geochemical isotope analyses**

Participant prerequisites:
Basics in palaeontology and sedimentary geology
Qualification goals:
The methodical search for fossils in a systematic paleontological excavation requires basic competences in methodology and practical experience. The students know the practical and methodical procedure of prospecting continental fossil assemblages. They have practical experience in paleontological excavation methods, treatments and analyses including the isotope geochemistry. This comprehensive knowledge enable them to

participate on future excavation campaigns and are a fundamental requirement for their own advanced research activities.

Scheduled time (if flexible, please write “flexible”):
Excavation field course usually in Aug, Laboratory internship in Oct

Other remarkable features of the proposal (interdisciplinary/multidisciplinary character; contribution to CIVIS goals; etc): ……