

GRACE-MODULE-CATALOG

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A Topic-related curriculum

Module	Title/Content	Schedule	Responsible	Credit points	Date (time/date)	Term
A Topic-related curriculum						
A.1 Topic-related curriculum (introductory lecture series)						
A.1	Basics of environmental science [e.g. water quality + water management, urban systems, disaster management, physics of climate change, env. geochemistry]	block course	tbd	2	GRACE Science School 22. to 24. July 2015	SS 2015
A.2.X Topic-related curricula (advanced modules) (X = 1-6, topics of KIT-Center)						
A.2.1	Atmospheric chemistry and climate change This series of lectures provides the basis of atmospheric chemistry, especially the cycles of stratospheric ozone chemistry and of tropospheric air pollution (due to man-made emissions, biomass burning, long range transport of pollutants, etc.). Feedback processes relating atmospheric chemistry to climate change are addressed and current research issues are discussed.	block course	Dr. Sinnhuber	1	23. Feb to 26. Feb 2015	WS 2014/15
A.2.1	Atmospheric remote sensing and climate change Principles and methods for atmospheric remote sensing are presented. Current developments and instruments are discussed with particular focus on activities lead by IMK, and how such observations are useful for the understanding and prediction of climate change.	block course	Prof. Orphal / Dr. Butz	1	tbd	WS 2015/16

A.2.2	<p>Dynamics of Water and Mass Transport in Watersheds</p> <p>Candidates will independently apply analytical and process based modelling instruments and will thus be able to estimate model parameters from field experiments, balance the fluxes of water and substances in the critical zone and perform risk assessments on the travel distances of contaminants. In addition, candidates will be capable of assessing the limits of applicability of the models in naturally structured soils.</p>	4 SWS	Prof. Zehe	5	<p>Thu, 11:30 - 13:00, B. 20.40, Jordan HS and Thu, 14:00 - 15:30, B. 10.50, CIP 402</p>	SS 2015
A.2.2	<p>Membrane Technologies in Water Treatment</p>	block course	Prof. Dr. Horn, Dr. Saravia, (Dr. Abbt-Braun)	3	<p>Tuesday 9.45 - 11.15 starting from: 29.10.13 HS 102, Geb. 10.50</p>	WS 2014/15
A.2.2	<p>Data Analysis and Environmental Monitoring</p> <p>Candidates will become familiar with advanced analysis methods of spatial and temporal environmental data sets. In addition they will gain knowledge on the planning of experimental designs for field campaigns. Special emphasis will be put on the regionalization of point measurements. Candidates will learn the application and suitability of various kriging methods and will be able to critically evaluate interpolated maps.</p>	4 SWS	Prof. Zehe	5	<p>Monday, 11:30 - 13:00 B. 10.91, Oberer HS and Monday, 14:00 - 15:30 B. 10.50, CIP 402</p>	SS 2015
A.2.3	<p>Environmental (Geo-)Analysis</p> <p>This course focuses on trace elements in the environment and encompasses typical sampling procedures and analytical methods to quantify the distribution of trace elements in water and soils. The course contains the following methods: in situ sensor measurements, ion-chromatography, flame and flow injection AAS, ICPMS, ICPAES, photometry, XRF and CSA.</p>	1 SWS	Prof. Neumann	1	<p>Mo, 11:45 - 12:30 B. 50.41, R. -108</p> <p>please register online at ILIAS (LV [10036])</p>	SS 2015

A.2.3	<p>Environmental (Geo-)Analysis – lab work and case study</p> <p>Additionally to the above described theory, sampling takes place in an old mining area, where toxic metals pollute soil and groundwater. The student quantifies the trace element contents of the collected samples in the lab. The data are compared with official environmental regulation limits.</p>	4 SWS	Prof. Neumann	3	<p>field trip: 20. April 2015 Begin lab work: 4. May Mon, 08:30 - 11:30 alternatively Mon, 13:15 - 16:15 B. 50.40. lab please register online at ILIAS (LV [10037])</p>	SS 2015
A.2.4	<p>Climate impact research - Impact of climate change to geoecology</p> <p>This seminar provides a basic understanding of geoecological consequences of climate change on regional as well as global scales, such as change of phenomenology and decoupling of interactions, environmental consequences of global warming and glacier melt. Current research projects are presented.</p>	2 SWS	Dr. Dolos	3	tbd	SS 2015
A.2.4	<p>Climate impact research - Global impact of climate change</p> <p>Candidates become familiar with global vegetation modeling, the impact of climate change to vegetation, the effect of changing land use to global climate and the application of LPJ-GUESS. The course incorporates student presentations and exercises.</p>	block course (3 SWS)	Prof. Arneth	5	<p>20. Jul to 24. Jul 2015 please register via email</p>	SS 2015

A.2.4	<p>Urban ecology</p> <p>This lecture covers all aspects related to understand ecological systems in urbanized areas, such as climate, soil, vegetation, wild life, water, development, built environment. The goal is to assess and to investigate ecological processes in urbanized areas and link their relevance to a sustainable urban development as well as to aspects of health. Regional differences of urban agglomerations are discussed.</p>	2 SWS	Dr. Norra	2	Tue, 9:45-11:15 B. 10.50, R. 102	SS 2015
A.2.5	<p>Material moisture in research and application</p> <p>This course imparts knowledge on clay mineralogy, sensor technologies and corresponding applications.</p>	block course	Dr. Emmerich	2	5. Oct to 6. Oct 2015 please contact Dr. Emmerich	SS 2015
A.2.5	<p>Building Ecology - Design for Environment</p> <p>Ecological building is a series of lectures that aims to equip students with an understanding of environmental impacts and solutions in the construction sector and related engineering principles. Topics covered are: energy/ resource efficiency, tools and assessment systems and relevant principles for the sustainable design, construction and operation of buildings. The lecture series is held in German. For English speaking students an intensive block course of similar content could be arranged.</p>	block course	Prof. Lützkendorf	1	Wed, 9:45 - 13:00	WS 2014/15
A.2.6	<p>Geological Hazards and Risks</p>	2 SWS	Prof. Wenzel Dr. Gottschämmer	2	Fri, 8:00-11:15 B. 06.42, R. 001	WS 2014/15

B Cross-cutting modules (CCM)

Module	Title/Content	Schedule	Responsible	Credit points	Date (time/date)	Term
B Cross-cutting modules (CCM)						
B.1.X CCM “remote sensing” (X = 1 “introduction”; X = 2 “advanced”)						
B.1.1	<p>Sensors and signals in remote sensing</p> <p>Remote sensing in climate and environment is introduced and typical applications are presented. Principles of active and passive remote sensing (LIDAR, RADAR / SAR, CCD, CMOS, Range Imaging, etc.), current airborne and spaceborne remote sensing sensors are reviewed. Lectures on signals and statistics as well as advanced signal processing (F-, L-, Z-Transform, convolution filter design, statistical signal processing) are also given. Applications of signal processing in current remote sensing</p>	2h/week	Dr. Jutzi	2	with sufficient registrations please register via mail	SS 2015
B.1.1	<p>Sensors and signals in remote sensing (lab)</p> <p>The theoretical knowledge gained in the lectures will be applied in programming exercises.</p>	laboratory	Dr. Jutzi	1	with sufficient registrations please register via mail	SS 2015
B.1.2	<p>Image processing and computer vision</p> <p>Concepts of 2D and 3D image processing (filtering, segmentation, structure analysis, 3D photogrammetry) are introduced. Imagebased 3D reconstruction techniques (feature detection, matching, modelbased blunder reduction) will be discussed in the lecture along with high level vision (object modeling, representation techniques, extraction strategies) and automatic reasoning (contextual and fuzzy-reasoning).</p>	2h/week	Dr. Weidner	2	Wed, 17:30 - 19:00 (by request)	WS 2014/15
B.1.2	<p>Image processing and computer vision (lab)</p> <p>Practical applications aim to deepen the knowledge gained in the theoretical lectures.</p>	laboratory	Dr. Weidner	1	in coordination to the lecture (B.1.2)	WS 2014/15

B.1.2	Active Sensors for Computer Vision Introduction to Active Sensing, Measurement Technique (Atmosphere, Navigation, Pulse-CW Modulation), Full Waveform (Laser beam, Signal), Laser-scanning (Special Systems, Quality Aspects), Range imaging (Special Systems), Data processing	block course	Dr. Jutzi	1	please register via mail	SS 2015
B.2.X CCM “systems analysis” (X = 1 “introduction”; X = 2 “advanced”)						
B.2.1	Interdisciplinary perspective in Environmental Science: Global challenges and strategies The block course introduces in the complex interdisciplinary analysis of environmental challenges taking into account scientific, socio-economic or legal aspects.	block course	Prof. Schebek	2	18.-22.02.2013 (enquired)	SS 2014
B.2.1	Energy and Environment (in german lang.)	2h/week	Prof. Ute Karl	2	Mon, 09:45 - 11:15, B. 20.21, R. 217	SS 2015
B.2.1	Environmental Communication	1h/week	Dr. Kämpf	1	Thu, 14:00 - 15:30 B. 10.81, R. 313 start: 17. April	SS 2015
B.2.1	Communication - Collaboration - Presentation	1h/week	Dr. Schneider	1	enquired	SS 2014
B.2.2	Systematic Sustainability Assessment It is mandatory for decision makers to take into account the possible impact of their decisions on environment, society and economy. The Integrative Concept on Sustainable Development “ICoSuD” developed by KIT is introduced and used as a tool for systems analysis.	summer school (1 week)	Dr. Stelzer	1,5	at the end of the semester	SS 2015
B.3.X CCM „transport phenomena“ (X = 1 “introduction”; X = 2 “advanced”)						

B.3.1	<p>Solutes transport in the Environment</p> <p>The module provides descriptions of transport processes that determine mass propagation along transport paths in the environment. Mathematical principles and numerical solution approaches will be presented at selected examples of mass transport in the (subsurface) environment. A focus is set on mass transfer processes at interfaces as well as feedback mechanisms of reactive processes on flow and transport.</p>	2h/week	Dr. Mohrlök	2	Tue. 14:00-15:30 (HS59, Build.10.81) (enquired)	WS 2014/15
B.3.2	<p>Thermodynamics in environmental systems</p> <p>Candidates will become familiar with the basics of environmental systems theory and thermodynamics. They will get to know the global components of global energy and entropy flows as well as the main global mass cycles (using the example of the water cycle) and will learn how to quantify them. Based on the principles of thermodynamics students will gain insight in the mechanics of formation and conservation of complex structures, as for example of ecosystems.</p>	block course	Prof. Zehe / Dr. Ehret	6	with sufficient registrations please register via mail	SS 2015
B.3.2	<p>Water resources and river basin management</p> <p>Candidates can independently apply the state of the art application-specific methods and tools for river basin management. They have extensive knowledge of hydrological processes and possess expertise on the use of water balance models. By setting up their own hydrological model the students got to know the basic data needs of hydrological models, its potential applications and they can assess the reliability of the model results.</p>	4h/week	Dr. Ehret / Dr. Ihringer	5	Thur, 8:00- 11:15, B. 10.50, CIP 402	SS 2015

C Competence skills

Module	Title/Content	Schedule	Responsible	Credit points	Date (time/date)	Term
C Competence skills						
C.1	Science: Theory and practice Concepts of scientific discovery: positivism, falsificationism, historicism, structuralism, constructive empiricism; how are these concepts linked to everyday research? scientific explanation; planning and structure of scientific work; scientific communication (talks, posters, articles); the main elements of scientific articles; the review process of scientific articles; good scientific practice; intellectual property, copyright, and related problems.	block course (5 days)	Priv.-Doz. Dr. Clarmann	3	with sufficient registrations please register via mail	SS 2015

Competence skills please follow this link: http://www.grace.kit.edu/downloads/Module_SoftSkills.pdf

D Special Events