

<h2 style="text-align: center;">Chemistry and Biology for Environmental Engineers</h2> <p style="text-align: center;">Stand: 07.04.2008</p>		
1	Modulname	Chemistry and Biology for Environmental Engineers
2	Kürzel	021230502
3	Leistungspunkte (LP)	6
4	Semesterwochenstunden (SWS)	6
5	Moduldauer (Anzahl der Semester)	1
6	Turnus	Every 2 nd semester, winter semester
7	Sprache	English
8	Modulverantwortlicher	Prof. Dr. rer. nat. habil. Jörg W. Metzger, Institut für Siedlungswasserbau, Wassergüte- und Abfallwirtschaft, Lehrstuhl für Hydrochemie und Hydrobiologie in der Siedlungswasserwirtschaft, Tel. 0711 / 685-63721 E-mail: joerg.metzger@iswa.uni-stuttgart.de
9	Dozenten	Dr. Brigitte Schwederski Dr. Biprajit Sarkar Dr. Ece Bulak Prof. Dr. Jörg Metzger Dr.-Ing. Michael Koch Prof. Dr. Karl-Heinrich Engesser Dipl.-Ing. Daniel Dobslaw
10	Verwendbarkeit/Zuordnung zum Curriculum	WAREM (MSc.), Elective, 1st semester WASTE (MSc.), core course, mandatory, 1st semester
11	Voraussetzungen	none
12	Lernziele	<p>Lecture: Inorganic chemistry The students</p> <ul style="list-style-type: none"> • know the fundamental concepts of chemistry (atomic structure, periodic system, chemical formulae, stoichiometry, molecular structures) and are able to use them, • know the principle types of chemical substances and chemical reactions and can apply their knowledge to synthetic problems, • know about the most important industrial compounds, their preparation and environmental aspects in their application. <p>Lecture: Organic chemistry The students</p> <ul style="list-style-type: none"> - can identify important functional groups in organic molecules - know the main compound classes in organic chemistry and the common rules for their nomenclature - know the most important representatives thereof and are able to draw their structural formulae - know the structure and properties of important bio-molecules such as fats, carbohydrates, proteins, nucleic acids, ATP, lignin and humic acids - know the most important reactions involved in chemical and microbial degradation of organic matter - know summary parameters used to characterize water quality - know the properties of bio-molecules and can explain their general function with respect to cell structures, enzymatic and immune reactions - knows selected environmental organic contaminants (PAH, dioxins, pesticides etc.) and their properties <p>Lecture: Biology and ecology of water, soil and air systems The students</p> <ul style="list-style-type: none"> - know about the relation between water, soil and air compartments and

		<p>many diseases, happening especially in developing countries</p> <ul style="list-style-type: none"> - know about the reasons for break out of diseases, the structure and function of prokaryotic and eucaryotic cells as well as the methods for identification and determination of growth conditions and possible growth limitations - comprehend microbial metabolism, energy production, release and conservation, enzyme syntheses and their regulation. - know important events and scientists in the history of biology - know basics in ecology of natural and artificial ('technical') ecosystems as well as selected methods to detect distorted equilibria in technical ecosystems influenced by mankind <p>Lecture: Technical and medical microbiology for engineers The students</p> <ul style="list-style-type: none"> - know the most important microorganisms being active in plants treating waste water, air and contaminated soil - know the kind of participation in purification and thus the procedures used to make them feel happy as well as the problems associated with excess biomass - are aware of a detailed overview of the kind of medically important microorganisms and of the most relevant agents of illness met in these plants; this holds also for the compartments 'drinking water' and 'sewage sludge'.
13	Inhalt	<p>Lecture: Inorganic chemistry</p> <ul style="list-style-type: none"> • atomic structure: stable nuclear particles, atomic nuclei, isotopes and radioactivity, atomic spectra and the hydrogen atom, heavier atoms • the periodic system of the elements: the sequence of elements, the electronic configuration of some elements, the periodicity of some properties • chemical bonding: the ionic bond, the metallic bond, the covalent bond, hydrogen bonding, van der Waals forces • quantitative Relationships and Stoichiometric Equations • characterizing chemical reactions: the chemical equilibrium, water: the solvent, acid/base reactions, redox reactions • descriptive part: selected chemical compounds and their preparation and properties <p>Lecture: Organic chemistry</p> <ul style="list-style-type: none"> • functional groups and compound classes • classification of chemical reactions in organic chemistry • organic bio-molecules (e.g. proteins, carbohydrates, nucleic acids, fats, humic acids, lignin): structure and function • chemical and microbial degradation of organic matter in the environment • summary parameters • organic environmental contaminants <p>Lecture: Biology and ecology of water, soil and air systems The following topics are presented within the lecture:</p> <ul style="list-style-type: none"> • Introduction in history of microbiology • Important waterbased/water related diseases • Function of microscopy of staining techniques • Structure and function of prokaryotic cells • Structure and function of eucaryotic cells • Necessity and effects of microbial nutrition • Microbial growth relations and possible limitations • Microbial metabolism: Energy production, conservation and release • Microbial metabolism: Enzymes syntheses and regulation.

		Lecture: Technical and medical microbiology for engineers <ul style="list-style-type: none"> • Important (sewage) water based /water related diseases/detection and possible countermeasures • Important soil and air connected diseases • (micro)biological principles in application of engineering techniques • Implication of engineer work on ecosystems /environment protection problems • Some test systems for estimation of (bio)degradability of chemicals will be evaluated
14	Literatur/ Lernmaterialien	Lecture notes pdf download of powerpoint slides for lectures Exercises as hand-out or download (pdf)
15	Lehrveranstaltungen und Lehrformen	Inorganic chemistry (Schwederski): Lecture, 1,5 SWH Organic chemistry (Metzger): Lecture, 1,5 SWH Biology and ecology of water, soil and air systems (Engesser): Lecture, 1 SWH Technical and medical microbiology for engineers (Engesser): Lecture, 2 SWH
16	Abschätzung des Arbeitsaufwandes	Time of attendance: 63 hours Self Study: 117 hours
17 a	Studienleistungen (unbenotet)	none
17 b	Prüfungsleistungen (benotet)	Examination Chemistry and Biology for Environmental Engineers: written, 120 min
18	Grundlage für ...	Sanitary Engineering - Practical Class (E; 3rd semester)

Zusatzinformationen

19	Medienform	Beamer (powerpoint) presentation explanations on blackboard
20	Bezeichnung der zu- gehörigen Modulprü- fung/en und Prüfernummer/n.	
21	Import-Exportmodul (von / nach)	von: nach: