Modulhandbuch

Studiengang Master of Science Water Resources Engineering and Management Mara Incoming Double Degree

Prüfungsordnung: 913MaI2012

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111 Compulsory Modules

Zugeordnete Module:

19330	Industrial Waste Water
50090	Environmental Fluid Mechanics I
50110	Requirements of Professional Life and Engineering in Practise
50120	Environmental Informatics
55990	German Language

Modul: 19330 Industrial Waste Water

2. Modulkürzel:	021210151	5. Moduldauer:	Einsemestrig
3. Leistungspunkte:	6 LP	6. Turnus:	Wintersemester
4. SWS:	4	7. Sprache:	Englisch

8. Modulverantwortlicher:	Prof.Uni.Reg.de Blumenau Uwe Menzel
9. Dozenten:	Michael Koch Uwe Menzel
10. Zuordnung zum Curriculum in diesem Studiengang:	
11. Empfohlene Voraussetzungen:	
12. Lernziele:	Students have: • a basic understanding for the problems and requirements of industrial waste water treatment • an overview of measures for production integrated environmental protection, relevant treatment methods for process water and its characterization • an overview of water analysis including sampling, the main principles of different analytical techniques and the ways to assure the quality of chemical analysis
13. Inhalt:	Fundamentals of industrial waste water treatment Determiniation of current situation possible process integrated measures, arrangements for reuse and recirculation of water mass and concentration balance Basic elements and examples for applications of advanced purification processes Biological waste water treatment Sampling and analytical techniques using on-site measurements, oxidation - reduction, acids and bases, sum parameters, photometry, spectrometry and chromatography Analytical quality assurance
14. Literatur:	• lecture notes (approx. 400 pages) • exercises • Lehr- und Handbuch der Abwassertechnik, 4. revised edition, volume I. GFA-Verlag St. Augustin 1994. • ATV V: Lehr- und Handbuch der Abwassertechnik, volume v: Organisch verschmutzte Abwässer der Lebensmittelindustrie, Wilhelm Ernst und Sohn Verlag, Berlin. • ATV VII: Lehr- und Handbuch der Abwassertechnik, volume VII: Industrieabwässer mit anorganischen Inhaltsstoffen, Wilhelm Ernst und Sohn Verlag, Berlin. • Deutsche Einheitsverfahren zur Wasser-, Abwasser und Schlammuntersuchung -Standard Methods for the Examination of Water and Wastewater • Wenclawiak, Koch, Hajicostas: Quality Assurance in Analytical Chemistry. Springerverlag 2003
15. Lehrveranstaltungen und -formen:	• 193301 Lecture Treatment of Industrial Waste Water • 193302 Lecture Water Analysis and Analytical Quality Control

16. Abschätzung Arbeitsaufwand:	Time of attendance: I Treatment of Industrial Waste Water: 2 SWS = 24 hours II Water Analysis and Analytical Quality Control: 2 SWS = 24 hours Exam: 2 hours sum of attendance: 50 hours self-study: 130 hours **total: 180 hours**
17. Prüfungsnummer/n und -name:	19331 Industrial Waste Water (PL), Schriftlich, 120 Min., Gewichtung: 1
18. Grundlage für ... :	
19. Medienform:	power-point-presentation, blackboard and over-head projector
20. Angeboten von:	Siedlungswasserbau und Wassergütewirtschaft

Modul: 50090 Environmental Fluid Mechanics I

2. Modulkürzel:	021420012	5. Moduldauer:	Einsemestrig
3. Leistungspunkte:	6 LP	6. Turnus:	Wintersemester
4. SWS:	5	7. Sprache:	Englisch

8. Modulverantwortlicher:	apl. Prof. Dr.-Ing. Holger Class
9. Dozenten:	Holger Class Jürgen Braun Sergey Oladyshkin
10. Zuordnung zum Curriculum in diesem Studiengang:	
11. Empfohlene Voraussetzungen:	Technical Mechanics • Introduction to the statics of rigid bodies • Introduction to elastostatics • Introduction to the mechanics of incompressible fluids Higher Mathematics • Partial differential equations • Vector analysis • Numerical integration Fundamentals of Flow Mechanics • Conservation equations for mass, momentum, energy • Navier-Stokes, Euler, Reynolds, Bernoulli equation
12. Lernziele:	Students have fundamental knowledge of flow in various natural hydrosystems and its application in civil and environmental engineering.
13. Inhalt:	The lecture deals with flow in natural hydrosystems with particular emphasis on groundwater / seepage flow and on flow in surface water / open channels. Groundwater hydraulics includes flow in confined, semi-confined and unconfined groundwater aquifers, wells, pumping tests and other hydraulic investigation methods for exploring groundwater aquifers. In addition, questions concerning regional groundwater management (z.B. recharge, unsaturated zone, saltwater intrusion) are discussed. Using the example of groundwater flow, fundamentals of CFD (Computational Fluid Dynamics) are explained, particularly the numerical discretisation techniques finite volume und finite difference. The hydraulics of surface water deals with shallow water equations / Saint Venant equations, unstationary channel flow, turbulence und layered systems. Calculation methods such as the methods of characteisitcs are explained. The contents are: • Potential flow and groundwater flow • Computational Fluid Dynamics • Shallow water equations for surface water • Charakteristikenmethode • Examples from civil and environmental engineering
14. Literatur:	Lecture notes: Hydromechanics, Helmig and Class Lecture notes: Ausbreitungs- und Transportvorgänge in Strömungen, Cirpka White, F.M.: Fluid Mechanics, WCB/McGraw-Hill, New York, 1999

	Freeze, R.A. and Cherry J.A.: Groundwater, Prentice Hall, 1979
15. Lehrveranstaltungen und -formen:	• 500901 Lecture and Excercise Environmental Fluid Mechanics I
16. Abschätzung Arbeitsaufwand:	Sum 180 h
17. Prüfungsnummer/n und -name:	• 50091 Environmental Fluid Mechanics I (PL), Schriftlich, 120 Min., Gewichtung: 1 • V Vorleistung (USL-V), Schriftlich
18. Grundlage für ... :	Environmental Fluid Mechanics II
19. Medienform:	Fundamentals will be developed using the blackboard and presentation tools.
20. Angeboten von:	Hydromechanik und Hydrosystemmodellierung

Modul: 50110 Requirements of Professional Life and Engineering in Practise

2. Modulkürzel:	021410901	5. Moduldauer:	Dreisemestrig
3. Leistungspunkte:	3 LP	6. Turnus:	Wintersemester/ Sommersemester
4. SWS:	2	7. Sprache:	Englisch

8. Modulverantwortlicher:	Anne Weiß
9. Dozenten:	Anne Weiß, M.A., M.Sc.
10. Zuordnung zum Curriculum in diesem Studiengang:	
11. Empfohlene Voraussetzungen:	
12. Lernziele:	
13. Inhalt:	
14. Literatur:	Recent literature on water related topics/ scientific problems
15. Lehrveranstaltungen und -formen:	• 501101 Seminar Requirements of Professional Life and Engineering in Practise • 501102 Excursion Requirements of Professional Life and Engineering in Practise
16. Abschätzung Arbeitsaufwand:	
17. Prüfungsnummer/n und -name:	50111 Requirements of Professional Life and Engineering in Practise (USL), Sonstige, Gewichtung: 1
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Wasser- und Umweltsystemmodellierung

Modul: 50120 Environmental Informatics

2. Modulkürzel:	021430002	5. Moduldauer:	Einsemestrig
3. Leistungspunkte:	6 LP	6. Turnus:	Wintersemester
4. SWS:	4	7. Sprache:	Englisch

8. Modulverantwortlicher:	Dr. Jochen Seidel
9. Dozenten:	Johannes Riegger
10. Zuordnung zum Curriculum in diesem Studiengang:	
11. Empfohlene Voraussetzungen:	
12. Lernziele:	Skills in Spreadsheet Calculations for Data Processing,Design, Creation, Handling and Application of Relational Database Management Systems for Environmental Issues, Creation and display of Environmental GIS data sets .Use of GIS functionalities to investigate spatial and attribute relationships
13. Inhalt:	**Information Processing und Environmental Data Management** (Excel und Access): Environmental Database Design, Relational Database Management, Data Normalization, Data Security **GIS Tools in Environmental Engineering (ArcGIS):** Basics of GIS, Data implementation, Spatial Structures and Attributes, Display of Environmental Information, Charts und Diagrams, Digitization, Spatial and Logical Queries, Data Links, Geo-Referencing, Field Calculations
14. Literatur:	Script: J. Riegger 'Environmental Informatics' User Handbooks for Excel, Access, ArcGIS **Getting to know ArcGIS Desktop ISBN: 9781589482609**
15. Lehrveranstaltungen und -formen:	• 501201 Lecture Environmental Data Management • 501202 Lecture GIS Tools in Environmental Engineering
16. Abschätzung Arbeitsaufwand:	Time of attendance: approx. 56 hours Private Study: approx. 124 hours during semester Sum: 180h
17. Prüfungsnummer/n und -name:	• 50121 Environmental Informatics (PL), Schriftlich, 120 Min., Gewichtung: 1 • V Vorleistung (USL-V), Schriftlich
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Hydrologie und Geohydrologie

Modul: 55990 German Language

2. Modulkürzel:	-	5. Moduldauer:	Einsemestrig
3. Leistungspunkte:	3 LP	6. Turnus:	Unregelmäßig
4. SWS:	0	7. Sprache:	Weitere Sprachen

8. Modulverantwortlicher:	John Nixon
9. Dozenten:	
10. Zuordnung zum Curriculum in diesem Studiengang:	
11. Empfohlene Voraussetzungen:	
12. Lernziele:	
13. Inhalt:	
14. Literatur:	
15. Lehrveranstaltungen und -formen:	
16. Abschätzung Arbeitsaufwand:	
17. Prüfungsnummer/n und -name:	55991 German Language (BSL), Schriftlich, Gewichtung: 1
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Sprachenzentrum

112 Elective Modules

Zugeordnete Module: 19100 Chemistry and Biology for Environmental Engineers

Modul: 19100 Chemistry and Biology for Environmental Engineers

2. Modulkürzel:	021230502	5. Moduldauer:	Einsemestrig
3. Leistungspunkte:	6 LP	6. Turnus:	Wintersemester
4. SWS:	6	7. Sprache:	Weitere Sprachen

8. Modulverantwortlicher:	Univ.-Prof. Dr. Jörg Metzger
9. Dozenten:	Karl Heinrich Engesser Brigitte Schwederski Jörg Metzger Bertram Kuch Daniel Dobslaw
10. Zuordnung zum Curriculum in diesem Studiengang:	
11. Empfohlene Voraussetzungen:	

12. Lernziele:

Lecture: Inorganic chem istry

The students

- 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.

Lecture: Organic chemistry

The students

- 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

Lecture: Biology and ecology of water, soil and air systems

The students

- know about the relation between water, soil and air compartments and many diseases, happening especially in developing countries

- 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

Lecture: Technical and medical microbiology for engineers

The students

- 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:

Lecture: Inorganic chemistry

- 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

Lecture: Organic chemistry

- 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

Lecture: Biology and ecology of water, soil and air systems

The following topics are presented within the lecture:

- 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

- 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:	Lecture notes pdf download of powerpoint slides for lectures Exercises as hand-out or download (pdf)
15. Lehrveranstaltungen und -formen:	• 191001 Lecture Inorganic chemistry • 191002 Lecture Organic chemistry • 191003 Lecture Biology and ecology of water, soil and air systems • 191004 Lecture Technical and medical microbiology for engineers
16. Abschätzung Arbeitsaufwand:	Time of attendance: Inorganic chemistry (Schwederski): Lecture, 1 SWS = 14 hours Organic chemistry (Metzger/Kuch): Lecture, 1 SWS = 14 hours

	Biology and ecology of water, soil and air systems (Engesser): Lecture, 1 SWS = 14 hours Technical and medical microbiology for engineers (Engesser): Lecture, 1 SWS = 14 hours Exercises for Chemistry and Biology for environmental engineers, 2 SWS = 28 hours Exam: 2 hours Sum of attendance: 86 hours Exercises (group work with presentations): 28 hours Self -study: 94 hours:
17. Prüfungsnummer/n und -name:	19101 Chemistry and Biology for Environmental Engineers (PL), Schriftlich oder Mündlich, 120 Min., Gewichtung: 1
18. Grundlage für ... :	
19. Medienform:	Video projector (powerpoint) presentation explanations on blackboard, group work with presentations
20. Angeboten von:	Hydrochemie und Hydrobiologie in der Siedlungswasserwirtschaft

Modul: 72080 Module Mara University of Technology

2. Modulkürzel:	-	5. Moduldauer:	-
3. Leistungspunkte:	60 LP	6. Turnus:	-
4. SWS:	-	7. Sprache:	-

8. Modulverantwortlicher:		
9. Dozenten:		
10. Zuordnung zum Curriculum in diesem Studiengang:		
11. Empfohlene Voraussetzungen:		
12. Lernziele:		
13. Inhalt:		
14. Literatur:		
15. Lehrveranstaltungen und -formen:		
16. Abschätzung Arbeitsaufwand:		
17. Prüfungsnummer/n und -name:	72081	Module Mara University of Technology (PL), , Gewichtung: 1
18. Grundlage für ... :		
19. Medienform:		
20. Angeboten von:		

Modul: 80990 Master's Thesis WAREM

2. Modulkürzel:	-	5. Moduldauer:	Einsemestrig
3. Leistungspunkte:	30 LP	6. Turnus:	Wintersemester/ Sommersemester
4. SWS:	20	7. Sprache:	Englisch

8. Modulverantwortlicher:	Univ.-Prof. Dr. Silke Wieprecht
9. Dozenten:	Depending on the topic. The first examiner has to be a full professor of the University of Stuttgart or a member of the senior academic staff who is an authorized examiner according to the legal statutes.
10. Zuordnung zum Curriculum in diesem Studiengang:	
11. Empfohlene Voraussetzungen:	The topic of the Master Thesis can be handed out only the moment at least 72 ECTS have been acquired already by the candidate.
12. Lernziele:	Capability to implement an independently composed project schedule for the treatment of a recent scientific problem in an international research environment. Effective scientific work in a team, enforcement of strategies internally and particularly externally. Acquire the necessary stamina to not be discouraged by unexpected problems and throwbacks in scientific projects and to finally be successful by the formulation of alternative methods of resolution. Multidisciplinarity through contacts with representatives of other fields like Chemistry, Mathematics, Informatics, etc. Obtaining the capability to discuss the own results of research in the environment of the recent international research comprehensively and to represent them in written (Master's Thesis) and oral (talk) form.
13. Inhalt:	Treatment of a recent scientific problem in an international research environment. The successful treatment of the scientific problem requires the specialisation in the related field of research and the acquisition of the necessary knowledge.
14. Literatur:	Recent literature on the topic of the scientific problem
15. Lehrveranstaltungen und -formen:	
16. Abschätzung Arbeitsaufwand:	900 h (Contact time: 900 h)
17. Prüfungsnummer/n und -name:	
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Wasserbau und Wassermengenwirtschaft