Course Handbook Environmental Technologies Bachelor

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Qualifikation Goals of Study Programme

Environmental Technologies Bachelor - mandatory courses (overview)

Module name (EN)	Code	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Applying for an Engineering Job	UI-AEJ	3	1SU	2	Prof. Dr. Christine Sick
Automation Technology in Process Engineering	UI-T-AUV	5	3V+1LU	5	Prof. Dr.-Ing. Michael Sauer, M.Sc.
Business English for Mechanical Engineers	UI-BEM	1	2S	2	Prof. Dr. Christine Sick
Construction Materials Technology II	UI-B-WST	6	4VU	4	Prof. Dr.-Ing. Stefan Jung
Engineering Mechanics I	UI-TM1	1	4VU	5	Prof. Dr.-Ing. Christian Lang
Engineering Mechanics II	UI-TM2	2	4VU	5	Prof. Dr.-Ing. Christian Lang
Environmental Process Technology and Circular Economies	UI-T-UVK	5	4V+1S	6	Prof. Dr. Matthias Brunner
Environmental and Bioprocess Engineering (with Lab Course)	UI-T-BUV	6	3V+1P	5	Prof. Dr. Matthias Brunner
Fundamentals of Chemistry (with Lab Course)	UI-GCL	1	3V+1P	5	Prof. Dr. Matthias Brunner
Geotechnical Engineering I	UI-B-GTE	7	4VU	5	Prof. Dr.-Ing. Stefan Jung
Hydraulic Engineering I	UI-B-WB1	5	4VU	5	Prof. Dr.-Ing. Alpaslan Yörük
Hydraulic Engineering II	UI-B-WB2	6	4VU	4	Prof. Dr.-Ing. Alpaslan Yörük
Hydraulic Engineering III	UI-B-WB3	7	2VU	2	Prof. Dr.-Ing. Alpaslan Yörük
Hydromechanics	UI-HYD	2	4VU	5	Prof. Dr.-Ing. Alpaslan Yörük

Physical Process Engineering with Practical Case Studies	UI-T-PVT	6	4V	5	Prof. Dr.-Ing. Klaus Kimmerle
Physics 2	UI-PH2	2	4V+1U	5	Prof. Dr.-Ing. Barbara Hippauf
Physics1	UI-PH1	1	4V+1U	5	Prof. Dr.-Ing. Barbara Hippauf
Sensor Technology 2	UI-T-SE2	7	2V+3PA	5	Prof. Dr. Martin Löffler-Mang
Technical Drawing and CAD I	UI-CAD	3	4VU	5	Prof. Dr.-Ing. Peter Böttcher
Technical English for Mechanical Engineers and Professional Presentations	UI-TEM	2	2S	2	Prof. Dr. Christine Sick
Urban Water Resource Management	UI-B-SWW	5	6VU	6	Prof. Dr.-Ing. Joachim Dettmar
Waste Management and Recycling I	UI-B-AK1	6	4VU	4	Prof. Dipl.-Ing. Frank Baur
Waste Management and Recycling II	UI-B-AK2	6	4VU	4	Prof. Dipl.-Ing. Frank Baur
Wastewater Treatment	UI-B-AR1	6	4VU	4	Prof. Dr.-Ing. Joachim Dettmar
Work Experience Phase	UI-PRA	4	-	22	Studienleitung

(25 modules)

Environmental Technologies Bachelor - optional courses (overview)

Module name (EN)	Code	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Environmental and Materials Flow Management	UI-B-USM	7	2SU	2	Prof. Dipl.-Ing. Frank Baur

(1 module)

Environmental Technologies Bachelor - mandatory courses

Applying for an Engineering Job

Module name (EN): Applying for an Engineering Job

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-AEJ

Hours per semester week / Teaching method: 1SU (1 hour per week)

ECTS credits: 2

Semester: 3

Mandatory course: yes

Language of instruction:
English/German

Assessment:
Written exam 70 min.

Curricular relevance:
MAB_19_A_3.03.AEJ Mechanical and Process Engineering, Bachelor, ASPO 01.10.2019, semester 3, mandatory course

Workload:
15 class hours (= 11.25 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 48.75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Christine Sick

Lecturer: Prof. Dr. Christine Sick

[*updated 07.08.2019*]

Learning outcomes:
The modules _Business English for Mechanical Engineers_, _Technical English for Mechanical Engineers and Professional Presentations_, _Applying for an Engineering Job_ and _Design / Manufacturing / Process Engineering Project in English_ should be seen in conjunction with one another. They offer students a framework to further develop their English language skills in a professionally related area from the desired entry level B1 to level B2.

The _Applying for an Engineering Job_ module focuses on the skills required for successfully applying for jobs in an international context.

After successfully completing this module, students will be familiar with the differences between application procedures in Germany and in the English speaking world. They will be able to describe the various professional fields that are suitable for them as graduates of the Bachelor´s program and will be able to write their own profile. They will be able to understand English-language job advertisements and will be able to apply for a job in English with an international company for the practical study phase or after graduation as an engineer. Students will be able to prepare appropriate application documents, i.e. CV and cover letter, and apply strategies for job interviews (face to face and on the phone). In doing so, they will be able to take cultural differences into account.

[*updated 05.10.2020*]

Module content:
- Describing typical occupational fields in mechanical and process engineering
- Describing one´s own profile, with professional background, professional knowledge and skills, as well as soft skills
- Reading and analyzing job advertisements
- Writing an application letter and tailoring it to the respective job advertisement
- Writing a resume
- Preparing for job interviews (face to face and on the phone) and training for them through role playing

[*updated 05.10.2020*]

Teaching methods/Media:
Learning objectives will be achieved through integrated training of the four basic skills (listening comprehension, reading comprehension, speaking and writing) in relevant communication situations supported by multimedia, as well as the repetition of basic grammar and vocabulary.

Target group-specific teaching/learning materials (print, audio, video), as well as multimedia CALL and e&mLearning materials will be used.

[*updated 05.10.2020*]

Recommended or required reading:
Students will receive a list of recommended teaching and learning materials.

The following materials are free of charge for students of the htw saar. We recommend their use for independent learning:

Christine Sick (2015): TechnoPlus Englisch VocabApp (Mobile-Learning-Angebot insbesondere zum Grundwortschatz, alle Niveaustufen), EUROKEY.

Christine Sick, unter Mitarbeit von Miriam Lange (2011): TechnoPlus Englisch 2.0 (Multimediales Sprachlernprogramm für Technisches und Business Englisch, Niveau B1-B2+), EUROKEY.

Christine Sick, unter Mitarbeit von Lisa Rauhoff und Miriam Wedig (seit 2016): Online Extensions zu TechnoPlus Englisch, EUROKEY.
m&eLanguageLearningPortal@CAS

[*updated 05.10.2020*]

Automation Technology in Process Engineering

Module name (EN): Automation Technology in Process Engineering

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-T-AUV

Hours per semester week / Teaching method: 3V+1LU (4 hours per week)

ECTS credits: 5

Semester: 5

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam 120 min. and lab evaluation (ungraded) (Report)

Curricular relevance:
MAB_19_V_5.16.AUV Mechanical and Process Engineering, Bachelor, ASPO 01.10.2019, semester 5, mandatory course, Specialization Process Engineering

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Michael Sauer, M.Sc.

Lecturer: Prof. Dr.-Ing. Michael Sauer, M.Sc.

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this course, students will be able to handle, use and apply programmable logic controllers as well as system-theoretical methods for solving practice-oriented control and regulation tasks in the field of process engineering. They will be able to select controllers and their settings in a practice-oriented manner. Students will be familiar with the problems involved in selecting and setting control loops. Introduction of modern tools for problem solving, modeling and simulating automation tasks.

[*updated 05.11.2020*]

Module content:

_ Boolean algebra and switching functions
_ Implementing switching functions and their simplification
_ Sequential control systems
_ Design and functionality of control systems
_ introduction to control eingineering
_ Transfer functions
_ The static and dynamic behavior of control loops
_ Control loop elements and system behavior
_ PID controllers and derivable types
_ Tuning rules, optimization, experimental analysis
_ Modified control loop structures
_ Stability considerations
_ Introduction to simulation tools for control loop design

[*updated 05.11.2020*]

Teaching methods/Media:

Lecture with integrated exercises, lab experiments in small groups

[*updated 05.11.2020*]

Recommended or required reading:

Lutz/Wendt: Taschenbuch der Regelungstechnik,
Schneider: Praktische Regelungstechnik,
Wellenreuther/Zastrow: Automatisieren mit SPS - Theorie und Praxis

[*updated 05.11.2020*]

Business English for Mechanical Engineers

Module name (EN): Business English for Mechanical Engineers

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-BEM

Hours per semester week / Teaching method: 2S (2 hours per week)

ECTS credits: 2

Semester: 1

Mandatory course: yes

Language of instruction:
English/German

Assessment:
Written exam 120 min.

Curricular relevance:
MAB_19_A_1.05.BEM Mechanical and Process Engineering, Bachelor, ASPO 01.10.2019, semester 1, mandatory course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Christine Sick

Lecturer: Prof. Dr. Christine Sick

[*updated 07.08.2019*]

Learning outcomes:
The modules _Business English for Mechanical Engineers_, _Technical English for Mechanical Engineers and Professional Presentations_, _Applying for an Engineering Job_ and "Design / Manufacturing / Process Engineering Project in English" should be seen in conjunction with one another. They offer students a framework to further develop their English language skills in a professionally related area from the desired entry level B1 to level B2.

The focus of the _Business English for Mechanical Engineers_ module is to provide students with business English skills that will enable them to master basic business situations in an intercultural environment.

After successfully completing this module, students will possess the communicative means of speech and behavior required for basic business situations and will be able to apply them appropriately in given oral communication situations. They will be able to understand and write various business documents. They will be sensitized to different language registers and can apply them adequately within the framework of written communication situations with international business partners. They will be able to recognize potential difficulties and conflicts in intercultural communication situations and can draw conclusions for their own behaviour in international contexts.

[*updated 05.10.2020*]

Module content:
- Socializing: Greetings, introductions and small talk
- Business travel: Business trips
- Talking about work: Describing a company, their field of activity and professional career
- Making appointments: Arranging an appointment
- Telephoning: Making phone calls in a professional context and taking telephone messages
- Types of business documents: Different types of business documents
- Business correspondence: Understanding business correspondence and corresponding with business partners (emails and letters)

In addition, we will work on:
- Independent repetition of standard vocabulary
- Expanding the Business English vocabulary relevant for the students
- Repetition of relevant grammatical structures (especially questions and the use of tenses)
- Raising awareness for functional language use and registers
- Intercultural aspects

[*updated 05.10.2020*]

Teaching methods/Media:
Learning objectives will be achieved through integrated training of the four basic skills (listening comprehension, reading comprehension, speaking and writing) in relevant communication situations supported by multimedia, as well as the repetition of basic grammar and vocabulary.

Target group-specific teaching/learning materials (print, audio, video), as well as multimedia CALL and e&mLearning materials will be used.

[*updated 05.10.2020*]

Recommended or required reading:
Students will receive a list of recommended teaching and learning materials.

The following materials are free of charge for students of the htw saar. We recommend their use for independent learning:

Susanne Ley, Christine Sick: prep course English m&eLanguageLearningPortal@CAS (e&m-Learning-Angebot zur Unterstützung der Studierenden beim Englischlernen am Campus Alt-Saarbrücken der htw saar)
Christine Sick (2015): htw saar TechnoPlus Englisch VocabApp (Mobile-Learning-Angebot insbesondere zum Grundwortschatz, alle Niveaustufen), EUROKEY.

Christine Sick, unter Mitarbeit von Miriam Lange (2011): TechnoPlus Englisch 2.0 (Multimediales Sprachlernprogramm für Technisches und Business Englisch, Niveau B1-B2+), EUROKEY.

[*updated 05.10.2020*]

Construction Materials Technology II

Module name (EN): Construction Materials Technology II

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-B-WST

Hours per semester week / Teaching method: 4VU (4 hours per week)

ECTS credits: 4

Semester: 6

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
BIBA230 Civil and structural engineering, Bachelor, ASPO 01.04.2009, semester 2, mandatory course
BIBA230 Civil and structural engineering, Bachelor, ASPO 01.10.2011, semester 2, mandatory course
BIBA230 Civil and structural engineering, Bachelor, ASPO 01.10.2017, semester 2, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Stefan Jung

Lecturer: Prof. Dr.-Ing. Stefan Jung

[*updated 16.09.2020*]

Learning outcomes:
After successfully completing this module, students will:
- have acquired in-depth knowledge about building materials, their chemical and mechanical behavior,
- have comprehensive knowledge about the most essential building materials,
- be able to classify and apply interdisciplinary references to building materials technology,
- be able to process and apply subject-related content independently,

[*updated 28.09.2020*]

Module content:
- Advanced study of physical and chemical building material properties
- Iron and steel
- Non-ferrous metals
- Wood and wood building materials
- Ceramic building materials
- Mineral-bound building materials
- Inorganic binder materials
- Mortar and screed
- Glass
- Plastics, geosynthetics

[*updated 28.09.2020*]

Recommended or required reading:
Lecture notes (will be passed out at the beginning of the semester)
Internet research
Backe/Hiese/Möhring: Baustoffkunde; Werner-Verlag
Schäffler/Bruy/Schelling: Baustoffkunde; Vogel-Verlag
Scholz/Hiese: Baustoffkenntnis; Werner-Verlag

[*updated 28.09.2020*]

Engineering Mechanics I

Module name (EN): Engineering Mechanics I

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-TM1

Hours per semester week / Teaching method: 4VU (4 hours per week)

ECTS credits: 5

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written examination

Curricular relevance:
BIBA130-17 Civil and structural engineering, Bachelor, ASPO 01.10.2017, semester 1, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Christian Lang

Lecturer: Prof. Dr.-Ing. Christian Lang

[*updated 16.09.2020*]

Learning outcomes:
_ After successfully completing this module, students will understand the importance of structural analyses and be familiar with the corresponding basic terminology.
_ They will be able to define load-bearing systems, determine loads and calculate support forces and internal forces for simple systems.

[*updated 28.09.2020*]

Module content:
_ Loads (DIN 1055)
_ Structural systems, load-bearing systems
_ Force-vector components, addition, decomposition, force polygon
_ Equilibrium condition, support forces, internal forces, internal force principle
_ The following structural systems will be discussed: single-span beam, folded beam, articulated beam, three-hinged arch, frame, truss

[*updated 28.09.2020*]

Recommended or required reading:
_ Schneider: Bautabellen; Schneider: Baustatik _ Zahlenbeispiele;
_ Wagner/Erlhof: Praktische Baustatik 1; Kraus/Führer: Grundlagen der Tragwerkslehre

[*updated 28.09.2020*]

Engineering Mechanics II

Module name (EN): Engineering Mechanics II

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-TM2

Hours per semester week / Teaching method: 4VU (4 hours per week)

ECTS credits: 5

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
BIBA250-17 Civil and structural engineering, Bachelor, ASPO 01.10.2017, semester 2, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Christian Lang

Lecturer: Prof. Dr.-Ing. Christian Lang

[*updated 16.09.2020*]

Learning outcomes:
After successfully completing this module, students will:
_ understand the terms stress (normal stress, shear stress) and cross-sectional values.
_ be able to calculate stress for standard cross-sections and loads reliably.
_ understand the concept of the verification of load-bearing capacity and be able to apply it.

[*updated 28.09.2020*]

Module content:
_ Safety concept, partial safety coefficients
_ Stress, strain, E-Modul, Hooke´s law, Euler-Bernoulli beam theory, structural robustness
_ Cross-section properties: Moment of inertia, moment of resistance, static moment
_ Normal stress due to normal force and bending (including double bending)
_ Shear stress due to shear force
_ Principal stresses
_ Stress on building components without tensile strength (gaping joint)

[*updated 28.09.2020*]

Recommended or required reading:
_ Schneider, Bautabellen für Ingenieure, Werner Verlag
_ Schweda: Baustatik/Festigkeitslehre
_ Göttsche, Petersen: Festigkeitslehre _ klipp und klar

[*updated 28.09.2020*]

Environmental Process Technology and Circular Economies

Module name (EN): Environmental Process Technology and Circular Economies

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-T-UVK

Hours per semester week / Teaching method: 4V+1S (5 hours per week)

ECTS credits: 6

Semester: 5

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam (80%) 180 min. and PA (L) (20%)

Curricular relevance:
MAB_19_V_5.13.UVK Mechanical and Process Engineering, Bachelor, ASPO 01.10.2019, semester 5, mandatory course, Specialization Process Engineering

Workload:
75 class hours (= 56.25 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 123.75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Matthias Brunner

Lecturer: Prof. Dr. Matthias Brunner

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this course, students will be familiar with and be able to explain how plants for biological wastewater treatment and water purification work, as well as the role of the main microorganisms involved. They will be able to design the main parts of plants for waste water treatment and water purification. They will be able to explain how anaerobic plants (biogas plants, anaerobic wastewater treatment, etc.) and dimension them. Students will, in addition, be able to explain and compare current sustainable processes. They will be able to handle microorganisms in theory and practice. Students will be familiar with and be able to handle analytical instruments. They will be able to apply laboratory measuring methods in water and wastewater technology.

[*updated 05.11.2020*]

Module content:
Importance of microorganisms in the ecosystem, basics of limnology and soil ecology, stratification of lakes, self-purification of water systems
Chemolithoautotrophy, nitrification, sulfur bacteria, anoxic and oxigenic photosynthesis, anaerobic respiration, denitrification
Water and drinking water treatment,
Designing and dimensioning biological wastewater treatment plants, BOD5, COD, TOC, AOX, ISV, nitrification, denitrification, phosphate removal, sludge treatment, exhaust air purification, flue gas purification, flocculation, water treatment, drinking water production, water treatment, anaerobic digestion chain, sulfate reducing microorganisms, methane bacteria, sludge digestion, sewage sludge treatmentsewage sludge utilization routes routes, biogas plants, anaerobic wastewater treatment, biogas desulfurization, flue gas cleaning, composting, soil remediation, sludge treatment, air pollution control,
Current sustainable processes for environmental, climate and resource protection, sustainable production processes for fuels, food and recyclable materials, Power to X, recycling management, bio-economy.
Practical lab experiments in small groups with supervision.
Lab safety/working techniques; selected experiments in environmental biotechnology and environmental metrology

[*updated 05.11.2020*]

Recommended or required reading:
DWA and DVGW Arbeitsblätter: A131 etc.
ATV Handbuch: Biologische Abwassernigung
Brock et.al.: Mikrobiologie
Ottow et.al.: Umweltbiotechnologie;
Fleischhauer et.al.: Angewandte Umwelttechnik;

[*updated 05.11.2020*]

Environmental and Bioprocess Engineering (with Lab Course)

Module name (EN): Environmental and Bioprocess Engineering (with Lab Course)

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-T-BUV

Hours per semester week / Teaching method: 3V+1P (4 hours per week)

ECTS credits: 5

Semester: 6

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam 180 min., graded report for practical course

Curricular relevance:
MAB_19_V_4.08.BUV Mechanical and Process Engineering, Bachelor, ASPO 01.10.2019, semester 4, mandatory course, Specialization Process Engineering

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Matthias Brunner

Lecturer: Prof. Dr. Matthias Brunner

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this course, students will be familiar with and be able to understand and explain the basic principles of genetic engineering and the microbial production of valuable substances. They will have an overview of the potential of microorganisms and their possible uses and be able to explain them. They will be familiar with and be able to explain methods for handling, preventing and mass producing microorganisms. Students will be familiar with and be able to explain essential methods of up- and downstream processing.

[*updated 05.11.2020*]

Module content:

Upstream processing, bioreactors, ideal and real stirred tank and tube reactors, CSTR, Q/D diagram, continuous reactors, batch reactors, methods of downstream processing; protein as a product

Gene expression, gene regulation, plasmids, vectors, introduction to genetic engineering, genetic fingerprint, PCR, Southern and Northern blot, sequencing according to Sanger, restiction enzymes, expression vectors, expression of eukaryotic genes in prokaryotes, introduction to virology, production of monoclonal antibodies

Lab exercises on selected topics in biotechnology,
Presentations on selected topics from food biotechnology, biotechnology and environmental technology

[*updated 05.11.2020*]

Teaching methods/Media:
Lecture mit blackboard and transparencies; practical lab exercises, class presentations, talks by external guests, study trip

[*updated 05.11.2020*]

Recommended or required reading:
Brock et.al.: Biology of Microorganisms, Prentice Hall
Forst et al.: Chemie für Ingenieure
Löwe: Biochemie, Benke
Thiemann und Palladino: Biotechnologie, Pearson

[*updated 05.11.2020*]

Fundamentals of Chemistry (with Lab Course)

Module name (EN): Fundamentals of Chemistry (with Lab Course)

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-GCL

Hours per semester week / Teaching method: 3V+1P (4 hours per week)

ECTS credits: 5

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam 180 min., practical training (graded)

Curricular relevance:
MAB_19_V_3.09.GCL Mechanical and Process Engineering, Bachelor, ASPO 01.10.2019, semester 3, mandatory course, Specialization Process Engineering

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Matthias Brunner

Lecturer: Prof. Dr. Matthias Brunner

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this part of the module, students will be familiar with the basics of chemistry and applications relevant to process engineering.
They will understand elementary chemical processes and material properties.
They will know how to deal with hazardous substances both theoretically and practically and will be familiar with the relevant legal regulations.
In addition, students will have improved their independent, methodical, goal-oriented learning and study skills.

The practical training component will help students understand the content of the course, consolidate their knowledge and promote transferability by applying their acquired knowledge in practice.
1.

[*updated 05.11.2020*]

Module content:
Introduction (substances and mixtures of substances, separation methods, units of measurement, measurands, dose)

2. Atom theory (atom theory/atomic structure, atom symbols, isotopes, atomic masses)

3. Stoichiometry (molecules and ions, mol/molar mass, reaction equations)

4. Energy conversion in chemical reactions (energy measures, temperature and heat, enthalpy of reaction, reaction energy, Hess´s law, binding enthalpies, binding energies)

5. Atomic structure, atomic properties, periodic table

6. Bonds (ionic bond, covalent bond, molecular structure, metal bond)

7. Material classes (gases, liquids, solids, solutions)

8. Reactions in aqueous solutions (ion reactions (metathesis reactions), reduction-oxidation reactions (redox reactions), acid-base reactions
9.

Chemical kinetics and the chemical equilibrium (chemical kinetics, catalysis, chemical equilibrium, the principle of least constraint)
10.

Acid - base equilibria (acid-base definition according to Brönsted, acid-base equilibria, pH value calculations, acid-base titration)
11.

Electrochemistry (electrolytic conduction, electrolysis, Faraday´s law and electroplating, galvanic cell, Nernst equation, potentiometry, battery types, corrosion)
12.

Organic chemistry (alkanes, alkenes and alkynes, aromatics, functional groups)

13. Plastics (manufacturing process for plastics: polymerization, polyaddition, polycondensation, material properties of polymers, plastic processing)
14.

Hazardous Substances Ordinance, working safely in a lab

[*updated 05.11.2020*]

Teaching methods/Media:
Lecture: Video projector, experiments, blackboard
Lab course

[*updated 05.11.2020*]

Recommended or required reading:
C. E. Mortimer, U. Müller and J. Beck, Chemie: das Basiswissen der Chemie, Thieme, 2014.

Additional literature:

W. D. Callister, D. G. Rethwisch, M. Krüger and H. J. Möhring, Materialwissenschaften und Werkstofftechnik: Eine Einführung, VCH, 2012.
K. P. C. Vollhardt, H. Butenschön and N. E. Schore, Organische Chemie, VCH, 2011.

H. R. Horton, Biochemistry Pearson Studium, 2008.
A. F. Holleman, E. Wiberg and N. Wiberg, Lehrbuch der anorganischen Chemie, de Gruyter, 2007.
P. W. Atkins, J. de Paula, M. Bär, A. Schleitzer and C. Heinisch, Physikalische Chemie, Wiley, 2006.
C. H. Hamann and W. Vielstich, Electrochemistry, Wiley, 2005.

[*updated 05.11.2020*]

Geotechnical Engineering I

Module name (EN): Geotechnical Engineering I

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-B-GTE

Hours per semester week / Teaching method: 4VU (4 hours per week)

ECTS credits: 5

Semester: 7

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
BIBA340 Civil and structural engineering, Bachelor, ASPO 01.04.2009, semester 3, mandatory course
BIBA340 Civil and structural engineering, Bachelor, ASPO 01.10.2011, semester 3, mandatory course
BIBA340 Civil and structural engineering, Bachelor, ASPO 01.10.2017, semester 3, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Stefan Jung

Lecturer: Prof. Dr.-Ing. Stefan Jung

[*updated 17.09.2020*]

Learning outcomes:
After successfully completing this module, students will:
- have basic knowledge in (engineering) geology, in the description and classification of soils and in ground investigation
- be able to classify the variable that influence soil-mechanical parameters with regard to their interaction on the system structure/building ground
- be able to "read" geotechnical reports resp. apply their results to the design of structures
- be able to identify and implement issues specific to respective building sites

[*updated 28.09.2020*]

Module content:
Basics:
Geology, minerals, rock/rock types, naming and describing soils, classification, water in subsoil, ground investigation, geotechnical report

Soil mechanics:
Physical properties of soil and how to determine them, effective stresses, compressibility, water permeability, shear strength

Foundation engineering:
Stability analysis for shallow foundations

[*updated 05.02.2020*]

Recommended or required reading:
Lecture notes (will be passed out at the beginning of the semester), Internet research
Dörken/Dehne: Grundbau in Beispielen Teil 1
Möller: Geotechnik _ Bodenmechanik

[*updated 05.02.2020*]

Hydraulic Engineering I

Module name (EN): Hydraulic Engineering I

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-B-WB1

Hours per semester week / Teaching method: 4VU (4 hours per week)

ECTS credits: 5

Semester: 5

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
BIBA380 Civil and structural engineering, Bachelor, ASPO 01.04.2009, semester 3, mandatory course
BIBA380 Civil and structural engineering, Bachelor, ASPO 01.10.2011, semester 3, mandatory course
BIBA380 Civil and structural engineering, Bachelor, ASPO 01.10.2017, semester 3, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Alpaslan Yörük

Lecturer: Prof. Dr.-Ing. Alpaslan Yörük

[*updated 16.09.2020*]

Learning outcomes:
After successfully completing this module, students will be able to recognize and understand the relationships between hydrological processes, water management requirements and hydrology. They will be able to use their knowledge to design simple measures for watercourse regulation, as well as simple structural facilities on bodies of water.

[*updated 28.09.2020*]

Module content:
- Hydrology and water management,
- Hydraulics,
- Water science and water regulation,
- Hydraulic engineering plants

[*updated 28.09.2020*]

Recommended or required reading:
Lange, Lecher: Gewässerregelung-Gewässerpflege
Lattermann: Wasserbau-Praxis, Wasserbau in Beispielen
Maniak: Hydrologie und Wasserwirtschaft
Patt, Jürging, Knaus: Naturnaher Wasserbau
Schröder (Hrsg.): Grundlagen des Wasserbaus
DIN-standards etc.

[*updated 28.09.2020*]

Hydraulic Engineering II

Module name (EN): Hydraulic Engineering II

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-B-WB2

Hours per semester week / Teaching method: 4VU (4 hours per week)

ECTS credits: 4

Semester: 6

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
BIBA685 Civil and structural engineering, Bachelor, ASPO 01.04.2009, semester 6, mandatory course
BIBA685 Civil and structural engineering, Bachelor, ASPO 01.10.2011, semester 6, mandatory course
BIBA685 Civil and structural engineering, Bachelor, ASPO 01.10.2017, semester 6, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Alpaslan Yörük

Lecturer: Prof. Dr.-Ing. Alpaslan Yörük

[*updated 16.09.2020*]

Learning outcomes:
After successfully completing this module, students will be familiar with and understand hydrological and hydraulic processes. They will be able to apply their knowledge and skills, as well as the knowledge gained in applying hydrological and hydraulic calculation and design methods as a basis for hydraulic engineering design.

[*updated 28.09.2020*]

Module content:
- Hydrology and water management
- Hydraulic calculations
- Conveyance of solids
- Flood protection

[*updated 05.02.2020*]

Recommended or required reading:
BWK: Hydraulische Berechnung naturnaher Fließgewässer
DVWK: Hydraulische Berechnung von Fließgewässern
DVWK: Hydraulisch-sedimentologische Berechnungen naturnah gestalteter Gewässer
LfU BW: Hydraulik naturnaher Fließgewässer
Maniak: Hydrologie und Wasserwirtschaft
Schröder (Hrsg.): Grundlagen des Wasserbaus

[*updated 05.02.2020*]

Hydraulic Engineering III

Module name (EN): Hydraulic Engineering III

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-B-WB3

Hours per semester week / Teaching method: 2VU (2 hours per week)

ECTS credits: 2

Semester: 7

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
BIBA785 Civil and structural engineering, Bachelor, ASPO 01.04.2009, semester 7, mandatory course
BIBA785 Civil and structural engineering, Bachelor, ASPO 01.10.2011, semester 7, mandatory course
BIBA785 Civil and structural engineering, Bachelor, ASPO 01.10.2017, semester 7, mandatory course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Alpaslan Yörük

Lecturer: Prof. Dr.-Ing. Alpaslan Yörük

[*updated 17.09.2020*]

Learning outcomes:
After successfully completing this module, students will have comprehensive knowledge about hydraulic engineering systems. They will be able to appyl the knowledge gained in the dimensioning and design of hydraulic engineering facilities.

[*updated 28.09.2020*]

Module content:
- Water regulation structures,
- Inland waterway construction,
- Regulatory structures and bodies,
- Dams,
- Groundwater hydraulics,
- Hydropower plants

[*updated 28.09.2020*]

Recommended or required reading:
Giesecke, Mosonyi: Wasserkraftanlagen _ Planung, Bau und Betrieb
Muth: Hochwasserrückhaltebecken
Kaczynski: Stauanlagen _ Wasserkraftanlagen
Kuhn: Binnenverkehrswasserbau
Schröder, Römisch: Gewässerregelung _ Binnenverkehrswasserbau
DIN, etc.

[*updated 28.09.2020*]

Hydromechanics

Module name (EN): Hydromechanics

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-HYD

Hours per semester week / Teaching method: 4VU (4 hours per week)

ECTS credits: 5

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
BIBA260-17 Civil and structural engineering, Bachelor, ASPO 01.10.2017, semester 2, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Alpaslan Yörük

Lecturer: Prof. Dr.-Ing. Alpaslan Yörük

[*updated 16.09.2020*]

Learning outcomes:
After successfully completing this module, students will be familiar with and understand the principles of hydrostatics, as well as pipe flow and open-channel flow.
_ They are able to apply their knowledge and understanding, in order to carry out simple calculations and standard measurements in these fields.

[*updated 28.09.2020*]

Module content:
_ Introduction
_ Hydrostatics
_ Hydrodynamics: Basics, pipe flow (pressure discharge), open-channel flow (open channel discharge)

[*updated 28.09.2020*]

Teaching methods/Media:
_ Carrying out and computing experiments

[*updated 28.09.2020*]

Recommended or required reading:
_ Aigner & Bollrich: Handbuch der Hydraulik
_ Freimann: Hydraulik für Bauingenieure
_ Heinemann, Feldhaus: Hydraulik für Bauingenieure
_ Schröder: Technische Hydraulik
_ Zanke: Wasserbau
_ Schneider, Bautabellen für Ingenieure, Werner Verlag

[*updated 28.09.2020*]

Physical Process Engineering with Practical Case Studies

Module name (EN): Physical Process Engineering with Practical Case Studies

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-T-PVT

Hours per semester week / Teaching method: 4V (4 hours per week)

ECTS credits: 5

Semester: 6

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam 90 min. + ungraded presentation

Curricular relevance:
MAB_19_V_4.10.PVT Mechanical and Process Engineering, Bachelor, ASPO 01.10.2019, semester 4, mandatory course, Specialization Process Engineering

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Klaus Kimmerle

Lecturer: Prof. Dr.-Ing. Klaus Kimmerle

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this course, students will be able to draw up and calculate energy balances and material balances, know, understand, explain and calculate basic operations of mechanical process engineering, know, understand, explain and calculate selected basic operations of thermal and interface process engineering.

[*updated 05.11.2020*]

Module content:

General basics:

_ Principle of basic operations
_ Balances and the transport of material, energy and impulse
_ Process evaluation
o Parameters for process performance
o Parameters for the quality of material separation

Fundamentals of mechanical process engineering:

_ Introduction and basic terms
_ Disperse systems
_ Properties of solids, liquids and gases

Fundamentals of thermal process engineering:

_ Introduction and basic terms
_ Dalton´s, Raoult´s and Henry´s laws

Fundamentals of interfacial process engineering:

_ Introduction and basic terms
_ Fick´s, Nernst´s and Henry´s laws

Basic operations of mechanical process engineering, e.g.

_ Storage, transport, fluid bed technology
_ Sedimentation
_ Centrifugation
_ Elutriation
_ Filtration
_ Mixing
_ Comminution

Basic operations of thermal process engineering, e.g.

_ Evaporation
_ Crystallization
_ Sublimation

Basic operations of interfacial process engineering, e.g.

_ Gas separation
_ Extraction from solids
_ Ion exchange

[*updated 05.11.2020*]

Teaching methods/Media:

Lecture with exercises and assignments, student presentations, lecture guide, formula collection, exercises for lecture, exercises for worksheets and presentation

[*updated 05.11.2020*]

Recommended or required reading:

_ Vauk, Müller: Grundoperationen chemischer Verfahrenstechnik 1994;
_ Bockhardt, Güntzschel, Poetschukat: Grundlagen der Verfahrenstechnik für Ingenieure 1997;
_ Löffler, Raasch: Grundlagen der mechanischen Verfahrenstechnik 1992; Hemming: Verfahrenstechnik, 1993;
_ Sattler: Thermische Trennverfahren, 2001;
_ Cussler: Diffusion, mass transfer in fluid systems 1984;
_ Mulder: Basic Principles of Membrane Technology 1997

[*updated 05.11.2020*]

Physics 2

Module name (EN): Physics 2

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-PH2

Hours per semester week / Teaching method: 4V+1U (5 hours per week)

ECTS credits: 5

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
E2202 Electrical Engineering and Information Technology, Bachelor, ASPO 01.10.2018, semester 2, mandatory course, technical

Workload:
75 class hours (= 56.25 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 93.75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Barbara Hippauf

Lecturer: Prof. Dr.-Ing. Barbara Hippauf

[*updated 13.07.2020*]

Learning outcomes:
After successfully completing this course, students will: be able to set up differential equations for second-order systems, explain their solutions and carry them out using examples. They will be familiar with analogy systems from mechanics and electrical engineering. - Students will have learned how the methods can be transferred to coupled and higher order systems. - They will have learned about the propagation of different physical quantities over waves. They will be familiar with the general wave equation as a differential equation and be able to apply it. Students will understand the superposition of waves and its effects. - They will be familiar with the propagation of light as a beam and understand the terms reflection, total internal reflection and refraction. They will be able to describe and calculate images on mirrors, lenses and lens combinations geometrically and mathematically. They will be able to explain the structure of optical devices and how they work. - Students will be familiar with the limits of ray optics. They will be able to use the wave-like nature of light to explain and apply interference and diffraction phenomena such as, for example, limiting the resolving power of optical devices. - Students will be familiar with the structure of the hydrogen atom in the Bohr model via classical physics. And using this knowledge, be able to explain the shell model, energy levels and spectra. Students will know how X-rays are generated and applied. They will be able to explain the photoelectric effect with light as particles.

[*updated 08.01.2020*]

Module content:
Oscillations Setting up differential equations for different types of oscillations using examples in different mechanical and electronic systems, Solutions in the undamped and damped spring-mass-system, Forced oscillation in the spring-mass system, Solution using a complex approach, Amplitude response and phase response, Higher order systems, Two coupled oscillators, Differential equations, Beat, In-phase and out-of-phase oscillations, couplings of more than two oscillators Waves Propagating waves of different physical quantities, General wave equation, Superposition of waves, Standing wave, Interference, Amplitude modulation, Frequency modulation, Optics Propagation of light in a medium, Laws of reflection and refraction, Mirrors, Lenses in geometric optics, Newton´s lens equation, Combination of lenses, Structure of the eye, Magnifying glass, Microscope, Telescope, Analog and digital camera, Light as waves, Phase and group velocity, Polarization, Huygens´ principle, Diffraction at a slit, Interference at double slit and grating, Newtonian rings, Resolution of optical instruments Atomic physics Bohr model, Energy levels in hydrogen atom, Generating X-rays, Applying X-rays, in particular Bragg reflection in X-ray diffraction and scanning electron microscope, Photoelectric effect, Photons, Quantum of action Thermally generated emission of electrons, Heat transfer via radiation

[*updated 08.01.2020*]

Teaching methods/Media:
Blackboard, lecture notes, presentations

[*updated 08.01.2020*]

Recommended or required reading:
Hering, Ekbert; Martin, Rolf; Stohrer, Martin: Physik für Ingenieure, Springer Vieweg, (latest edition)
Hering, Ekbert; Martin, Rolf; Stohrer, Martin: Taschenbuch der Mathematik und Physik, Springer Vieweg Turtur, Claus Wilhelm: Prüfungstrainer Physik, Springer Spektrum

[*updated 08.01.2020*]

Physics1

Module name (EN): Physics1

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-PH1

Hours per semester week / Teaching method: 4V+1U (5 hours per week)

ECTS credits: 5

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
E2102 Electrical Engineering and Information Technology, Bachelor, ASPO 01.10.2018, semester 1, mandatory course, technical

Workload:
75 class hours (= 56.25 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 93.75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Barbara Hippauf

Lecturer: Prof. Dr.-Ing. Barbara Hippauf

[*updated 13.07.2020*]

Learning outcomes:
- After successfully completing this course, students will be familiar with kinematic quantities and how they are connected. They will be able to set up equations of motion for different movements and, with regard to different reference systems, use them to find solutions. Students will learn to split complex movements into partial, simple movements by applying superposition. - They will be familiar with force and impulse as physical variables and using them, be able to grasp the cause, state and effect of a movement. They will be familiar with and able to apply models that describe friction between bodies and bodies in liquids and gases. - Students will be familiar with the terms torque and angular momentum and be able to use them for the dynamics of rotation. They will be familiar with and be able to explain the analogies and differences between translation and rotation. They will have learned how those principles can be transferred from the center of mass to rigid bodies. - Students will be familiar with the definitions for work, power and energy and know the different units for these dimensions. They will be familiar with the concept of conservative force and how it is used to define potential energy. - Students will be familiar with gravitational force as a fundamental interaction and be able to explain conclusions from it such as, for example, Kepler´s laws of planetary motion. - They will have mastered conservation of momentum, conservation of angular momentum and the conservation of energy as methods and be able to apply them to examples such as multidimensional collisions. - They will be familiar with the causes of gravitational pressure and buoyancy in liquids and gases and be able to explain the consequences thereof. Students will know which types of flow there are and how to record them. They will be able to describe and determine flows without turbulences using equations. - They will be familiar with temperature and heat quantity as basic parameters. They will be able to explain the principles and conclusions of the kinetic theory of gases. Students will know and be able to explain the main principles of thermodynamics and know and explain applications. - They will have gained insights and know where physical laws and methods are applied in everyday life, in technology and especially in sensors.

[*updated 08.01.2020*]

Module content:
Kinematics Definition of kinematic quantities for linear motion, Uniform linear motion, uniformly accelerated linear motion, free fall, Non-linear motions, in particular circular motion, non-horizontally launched projectiles, oscillations Dynamics of the mass point Force and momentum, conservation of momentum, especially elastic and inelastic collision, Newton´s laws of motion, Friction, Dynamics with curvilinear motion, especially circular motion, torque and angular momentum, conservation of angular momentum, Work, power, potential and kinetic energy, conservation of energy by conservative force, Gravitational force Dynamics of rigid bodies Center of gravity and moment of inertia of a rigid body, equations of rotational motion, physical pendulum, torsion pendulum, Rotational energy, gyroscope Mechanics of liquids and gases Gravitational pressure and buoyancy in liquids, Archimedes´ principle and Boyle´s law, Gravitational pressure and buoyancy in gases, in particular the atmosphere, laminar flow, in particular the continuity equation and Bernoulli´s principle, the Hagen-Poisuellle equation Turbulent flow, Reynolds number Thermodynamics Temperature as a concept, temperature measurement, heat capacity, Phase transitions, the kinetic theory of gases, the ideal gas law, the van der Waals equation, changes in states, Laws of thermodynamics, entropy, thermodynamic processes, heat engines, thermal conduction, laws of thermal radiation

[*updated 08.01.2020*]

Teaching methods/Media:
Board, lecture notes, presentations

[*updated 08.01.2020*]

Recommended or required reading:
Hering, Ekbert; Martin, Rolf; Stohrer, Martin: Physik für Ingenieure, Springer Vieweg, (latest edition)
Hering, Ekbert; Martin, Rolf; Stohrer, Martin: Taschenbuch der Mathematik und Physik, Springer Vieweg Turtur, Claus Wilhelm: Prüfungstrainer Physik, Springer Spektrum

[*updated 08.01.2020*]

Sensor Technology 2

Module name (EN): Sensor Technology 2

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-T-SE2

Hours per semester week / Teaching method: 2V+3PA (5 hours per week)

ECTS credits: 5

Semester: 7

Mandatory course: yes

Language of instruction:
German

Assessment:
Project work

Curricular relevance:
MST2.SE2 Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2019, semester 5, mandatory course

Workload:
75 class hours (= 56.25 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 93.75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Martin Löffler-Mang

Lecturer: Prof. Dr. Martin Löffler-Mang

[*updated 13.07.2020*]

Learning outcomes:
This goal of this module is to establish a link to the real and practical applications of sensor technology. Students will create short presentations on the most important elements of optical sensor technology. During the course of the project, a sensor system will be built and tested in a given application.
After successfully completing this module, students will be able to combine elements to create more complex sensor systems. They will be able to independently develop, set up systems and carry out projects, if necessary in interdisciplinary teams with members of different study programs from the IngWi department.
After completing the course, students will be able to test a self-developed measurement system, use it in a defined application and use the measurement results obtained to optimize the system.

[*updated 06.11.2020*]

Module content:
The course focuses on optical sensor technology, but not exclusively. Sensor principles that were discussed in Sensor Technology 1 may also be of use in the project part of the course.

Module content in the lecture:
Optical mice, fiber optic sensors, spectrometers, particle measurement technology, flow measurement technology, chemical sensors, hydrauic sensors, IR measurement technology

The students´ short presentations will focus on the following elements: LED, laser, laser diode, photodiode, CCD sensor, photomultiplier, fiber optics, coupler, photoelectric sensors, triangulation.

[*updated 06.11.2020*]

Teaching methods/Media:
This course consists of an introductory lecture part, followed by short presentations by the students on given topics (see content), rounded off by more independent project work in teams.

[*updated 06.11.2020*]

Recommended or required reading:
Jansen: Optoelektronik. Vieweg
Eichler, Eichler: Laser. Springer
Young: Optik, Laser, Wellenleiter. Springer
Litfin: Technische Optik. Springer
Ruck: Lasermethoden in der Strömungsmesstechnik. at-Fachverlag
Löffler-Mang: Optische Sensoren. Vieweg + Teubner
Hering, Steinhart: Taschenbuch der Mechatronik. Fachbuchverlag Leipzig
Heimann, Gerth, Popp: Mechatronik. Hanser
Weichert, Wülker: Messtechnik und Messdatenerfassung. Oldenbourg

[*updated 06.11.2020*]

Technical Drawing and CAD I

Module name (EN): Technical Drawing and CAD I

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-CAD

Hours per semester week / Teaching method: 4VU (4 hours per week)

ECTS credits: 5

Semester: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Technical Drawing: Written exam (50%)
CAD I: Term paper (50%)
(Exam components can be completed individually and must each be passed separately)

Curricular relevance:
BIBA170 Civil and structural engineering, Bachelor, ASPO 01.04.2009, semester 1, mandatory course
BIBA170 Civil and structural engineering, Bachelor, ASPO 01.10.2011, semester 1, mandatory course
BIBA170 Civil and structural engineering, Bachelor, ASPO 01.10.2017, semester 1, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Peter Böttcher

Lecturer: Prof. Dr.-Ing. Peter Böttcher

[*updated 16.09.2020*]

Learning outcomes:
After successfully completing this module, students will be able to create construction drawings that conform to standards by hand and using a CAD system.

They will be able to create standard-compliant views and sections of all kinds of components, buildings and objects and draw up structured plans by hand or using a CAD system.

[*updated 28.09.2020*]

Module content:
Technical Drawing

_ Drawing standards, types and content of construction drawings, paper formats and drawing margins, labeling construction drawings, dimensioning construction drawings,
_ Line types and widths, drawing scales, three-panel projection
_ Perspectives (isometry, dimetry), views and sections through bodies and buildings,
_ Dimensions in building construction, representations and symbols

CAD I

_ Simple, object-oriented 3D design of components and their interaction (e.g. floor slab-wall) taking into account CAD techniques,
_ Forming the structure of buildings with height nodes, labeling and dimensioning
_ Drawing organization: Floor plans, views, sections, border lines, title block, 3D model

[*updated 28.09.2020*]

Recommended or required reading:
Ridder D.: Autodesk Revit Architecture 2017, Mitp-Verlag
Hiermer M.: Autodesk REvit Architecture 2016, Tredition

[*updated 28.09.2020*]

Technical English for Mechanical Engineers and Professional Presentations

Module name (EN): Technical English for Mechanical Engineers and Professional Presentations

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-TEM

Hours per semester week / Teaching method: 2S (2 hours per week)

ECTS credits: 2

Semester: 2

Mandatory course: yes

Language of instruction:
English/German

Assessment:
Written exam 120 min.

Curricular relevance:
MAB_19_A_2.06.TEM Mechanical and Process Engineering, Bachelor, ASPO 01.10.2019, semester 2, mandatory course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Christine Sick

Lecturer: Prof. Dr. Christine Sick

[*updated 07.08.2019*]

Learning outcomes:
The modules _Business English for Mechanical Engineers_, _Technical English for Mechanical Engineers and Professional Presentations_, _Applying for an Engineering Job_ and _Design / Manufacturing / Process Engineering Project in English_ should be seen in conjunction with one another. They offer students a framework to further develop their English language skills in a professionally related area from the desired entry level B1 to level B2.

The module _Technical English for Mechanical Engineers and Professional Presentations_ focuses on developing listening and reading comprehension skills in the area of technical English relevant to the students´ study program, as well as business English presentation skills.

After successfully completing this module, students will be familiar with different reading strategies and will be able to apply them to course-specific specialist texts. They will also be able to follow technical lectures, presentations or lectures in English and organize the content of those lectures in notes.

In addition to training their listening and reading comprehension skills, students will repeat relevant grammatical structures and expand their technical vocabulary in selected areas of mechanical engineering and will be able to apply that vocabulary adequately.

After successfully completing this module, students will understand strategies for the creation of professional, subject-specific presentations in English. They will be able to structure English-language presentations and use typical verbal expressions in them.

[*updated 05.10.2020*]

Module content:
Technical English:
- Mechanical engineering studies and subjects
- Understanding course-specific technical texts in general and in detail (e.g. Engineering Materials, Materials in the Automotive Industry, Aluminium, Energy, Heat and Work)
- Understanding course-specific presentations, talks, lectures, videos in general and in detail (incl. note-taking techniques) (e.g. Mechanical Science, Shape Memory Alloys, Nickel Titanium, Wind Energy)
- Oral and written definition of technical terms
- Describing cause-and-effect relationships

Business English: Presentations
- Strategic knowledge
- Structure of a presentation in English
- Typical language of English presentations
- Structures for linguistic implementation
- Describing cause-and-effect relationships
- Describing trends
- Preparation and short presentation on a material science topic

In addition, we will work on:
- Building a technical vocabulary for technical English and presentations
- Repeating relevant grammatical structures (passive voice, relative clauses, adjectives and adverbs, cause and effect)

[*updated 05.10.2020*]

Teaching methods/Media:
Learning objectives will be achieved through integrated training of the four basic skills (listening comprehension, reading comprehension, speaking and writing) in relevant communication situations supported by multimedia, as well as the repetition of basic grammar and vocabulary.

Target group-specific teaching/learning materials (print, audio, video), as well as multimedia CALL and e&mLearning materials will be used.

[*updated 05.10.2020*]

Recommended or required reading:
Students will receive a list of recommended teaching and learning materials.

The following materials are free of charge for students of the htw saar. We recommend their use for independent learning:

Susanne Ley, Christine Sick: prep course English m&eLanguageLearningPortal@CAS (e&m-Learning-Angebot zur Unterstützung der Studierenden beim Englischlernen am Campus Alt-Saarbrücken der htw saar, Niveau A1-B1)
Christine Sick (2015): TechnoPlus Englisch VocabApp (Mobile-Learning-Angebot insbesondere zum Grundwortschatz, alle Niveaustufen), EUROKEY.

Christine Sick, unter Mitarbeit von Miriam Lange (2011): TechnoPlus Englisch 2.0 (Multimediales Sprachlernprogramm für Technisches und Business Englisch, Niveau B1-B2+), EUROKEY.

Christine Sick, unter Mitarbeit von Lisa Rauhoff und Miriam Wedig (seit 2016): Online Extensions zu TechnoPlus Englisch, EUROKEY.
m&eLanguageLearningPortal@CAS

[*updated 05.10.2020*]

Urban Water Resource Management

Module name (EN): Urban Water Resource Management

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-B-SWW

Hours per semester week / Teaching method: 6VU (6 hours per week)

ECTS credits: 6

Semester: 5

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
BIBA311 Civil and structural engineering, Bachelor, ASPO 01.10.2011, semester 3, mandatory course
BIBA311 Civil and structural engineering, Bachelor, ASPO 01.10.2017, semester 3, mandatory course

Workload:
90 class hours (= 67.5 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 112.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Joachim Dettmar

Lecturer: Prof. Dr.-Ing. Joachim Dettmar

[*updated 16.09.2020*]

Learning outcomes:
After successfully completing this module, students will recognize and understand the principles of urban water management, in particular the interaction of hydraulic and material parameters. They will be able to apply this knowledge using both simple and complex procedures to solve practice-relevant problems of wastewater discharge, central rainwater treatment in separate and combined sewer systems, as well as rainwater management.
Students will recognize and understand the importance of ensuring the quality of drinking water. They will be able forecast drinking water demand, check the suitability of the various resources on the basis of these forecasts, and then carry out calculations to meet demand by pumping groundwater from wells. They will also be able to implement these calculations in planning. Students will also know how to carry out groundwater recharge measures in the event of water shortages.

[*updated 28.09.2020*]

Module content:
Principles of wastewater disposal
- The composition of wastewater
- Wastewater flows and their patterns over the course of a day
- Land drainage (definitions, symbols, cross-sections)
- Pipe materials (stoneware, concrete, masonry, plastic, steel)
- Drainage systems
- Rain statistics, rain models
- Methods for calculating sewer systems
- Central rainwater treatment and retention in separate and combined sewer systems

Principles of water supply
Based on a comprehensive overview of the water resources available in Germany and their qualitative assessment, the principles of securing and retaining these resources will be presented.
The procedures for extracting groundwater will be discussed in greater depth.
- Significance of and requirements for drinking water

- European Water Charta
- WHG (Water Management Act); Water Framework Directive, Drinking Water Ordinance, DIN 2000
- Components of water supply: Extraction, retention, peak values, water loss
- Water balance equation
- Principles of groundwater flow: Darcy´s law, determining the kf-value
- Calculating wells according to Sichardt and considering groundwater recharge
- Methods for recharging groundwater

[*updated 28.09.2020*]

Recommended or required reading:
ATV-Handbuch, Bau und Betrieb der Kanalisation, Berlin
DWA-ragelwerk (Arbeits- und Merkblätter): A102, A105, A110, A111, A112, A117, A118, A121, A125, A128, A138, A166, M153, M176, M178, M182
Imhoff: Taschenbuch der Stadtentwässerung, München, Wien
Siedlungswasserbau Teil2: Kanalisation, Düsseldorf
BMI: Künstl. Grundwasseranreicherung, Damrath/ Cord-Landwehr: Wasserversorgung
DVGW: Fortbildungskurse Wasserversorgungstechnik für Ingenieure und Naturwissenschaftler Lehr- und Handbuch der Wasserversorgung
Grombach/ Haberer/ Merkl/ Trueb: handbuch der Wasserversorgungstechnik
Handtke: Vergleichende Bewertung von Anlagen zur Grundwasseranreicherung

[*updated 28.09.2020*]

Waste Management and Recycling I

Module name (EN): Waste Management and Recycling I

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-B-AK1

Hours per semester week / Teaching method: 4VU (4 hours per week)

ECTS credits: 4

Semester: 6

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
BIBA410 Civil and structural engineering, Bachelor, ASPO 01.04.2009, semester 4, mandatory course
BIBA410 Civil and structural engineering, Bachelor, ASPO 01.10.2011, semester 4, mandatory course
BIBA410 Civil and structural engineering, Bachelor, ASPO 01.10.2017, semester 4, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dipl.-Ing. Frank Baur

Lecturer: Prof. Dipl.-Ing. Frank Baur

[*updated 16.09.2020*]

Learning outcomes:
After successfully completing this module, students will have a basic understanding of the processes, responsibilities and (legal) framework conditions in the field of waste management, as well as the technical design of waste management facilities. In addition, they will become familiar with the concepts of sustainability and responsibility in connection with environmental protection issues. Students will receive insight into the problem of contaminated sites.

[*updated 28.09.2020*]

Module content:
Basics from the following areas will be taught:
- Definition of terms _ Waste classification
- Legal framework for waste management
- Quantities and composition of waste
- Collection and transport/logistics
- Waste management approaches in terms of avoidance/recycling
- Mechanical, biological and thermal waste treatment
- Basics of landfill technology
- Waste from the building industry/contaminated sites

[*updated 28.09.2020*]

Recommended or required reading:
Bilitewski, Härdtle, Marek: Abfallwirtschaft
Cord-Landwehr: Einführung in die Abfallwirtschaft

[*updated 28.09.2020*]

Waste Management and Recycling II

Module name (EN): Waste Management and Recycling II

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-B-AK2

Hours per semester week / Teaching method: 4VU (4 hours per week)

ECTS credits: 4

Semester: 6

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
BIBA680 Civil and structural engineering, Bachelor, ASPO 01.04.2009, semester 6, mandatory course
BIBA680 Civil and structural engineering, Bachelor, ASPO 01.10.2011, semester 6, mandatory course
BIBA680 Civil and structural engineering, Bachelor, ASPO 01.10.2017, semester 6, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dipl.-Ing. Frank Baur

Lecturer: Prof. Dipl.-Ing. Frank Baur

[*updated 16.09.2020*]

Learning outcomes:
After successfully completing this module, students will be able to develop waste management concepts and strategies for the municipal/regional sector. Students will have gained in-depth insight into logistical processes and mechanical/biological treatment plants and be familiar with the corresponding mechanisms of action and material-flow-oriented relationships (including mass balances). Students will be familair with technical and planning issues with regard to the operation and implementation of appropriate waste management facilities in connection with their ecological (emissions) and economic effects.

[*updated 28.09.2020*]

Module content:
This module provides in-depth knowledge from the following areas:
- Waste management approaches with regard to the implementation of waste prevention and recycling measures
- Waste management and sustainability/climate protection
- Performance data and cost accounting in the field of waste disposal logistics
- Development of waste management concepts for the public sector; general conditions
- Mechanical treatment/sorting technology
- Biological treatment (aerobic/anaerobic) associated with the recovery of resulting residues (substrates, biogas)
- Mechanical-biological residual waste treatment in connection with the disposal of the corresponding residues
- Material flow balances/mass balances/economic feasibility studies

[*updated 28.09.2020*]

Recommended or required reading:
Bilitewski, Härdtle, Marek:, Abfallwirtschaft
Bidlingmaier: Biologische Abfallbehandlung
Bilitewski, Stegmann: Mechanisch-biologische Verfahren zur stoffspezifischen Abfallbeseitigung
Gallenkemper, Doedens: Getrennte Sammlung von Wertstoffen aus Hausmüll

[*updated 28.09.2020*]

Wastewater Treatment

Module name (EN): Wastewater Treatment

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-B-AR1

Hours per semester week / Teaching method: 4VU (4 hours per week)

ECTS credits: 4

Semester: 6

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

Curricular relevance:
BIBA681-17 Civil and structural engineering, Bachelor, ASPO 01.10.2017, semester 6, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Joachim Dettmar

Lecturer: Prof. Dr.-Ing. Joachim Dettmar

[*updated 16.09.2020*]

Learning outcomes:
After successfully completing this module, students will understand the physical, biological and chemical basics of municipal wastewater treatment, especially with regard to calculation methods for the oxidation of carbon and nitrogen compounds in municipal wastewater.
Students will understand the fundamental necessity of wastewater treatment for the ecological protection of our environment. They will have basic knowledge of methods for dimensioning municipal wastewater treatment plants and will be able to apply this knowledge, as well as to recognize and evaluate new ideas and concepts.

[*updated 05.02.2020*]

Module content:
Parameters for the characterization of wastewater, wastewater composition, wastewater quantities including temporal distribution of wastewater production; mechanical treatment processes (pumping stations, rakes, grit chambers, grease traps, preliminary sedimentation), basics of biological wastewater treatment, carbon and nitrogen oxidation, single- and multi-stage processes for wastewater treatment (oxidation of carbon and nitrogen compounds with activated sludge processes)

[*updated 28.09.2020*]

Recommended or required reading:
Lehr- und Handbuch der Abwassertechnik
Imhoff: Taschenbuch der Stadtentwässerung; München, Wien
ATV/DVWK/DWA-Arbeitsblätter A 106, 122, 126, 131, 202, 257, 262, 281
Hartmann: Biologische Abwasserreinigung; Springer-Lehrbuch
Mudrack/Kunst: Biologie der Abwasserreinigung; G. Fischer Verlag
Hosang/Bischof: Abwassertechnik, B.G. Teubner Verlag
Lehr- und Handbuch der Abwassertechnik: Biologische und weitergehende Abwasserreinigung

[*updated 05.02.2020*]

Work Experience Phase

Module name (EN): Work Experience Phase

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-PRA

Hours per semester week / Teaching method: -

ECTS credits: 22

Semester: 4

Mandatory course: yes

Language of instruction:
German

Assessment:
Colloquium

Curricular relevance:
MAB_19_A_6.01.PRA Mechanical and Process Engineering, Bachelor, ASPO 01.10.2019, semester 6, mandatory course

Workload:
The total student study time for this course is 660 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Studienleitung

Lecturer: Studienleitung

[*updated 07.08.2019*]

Learning outcomes:

After successfully completing this module, students will have experienced the practical working methods used in engineering professions by carrying out work independently and actively participating in various tasks.
In doing so, they will apply the theoretical and practical experience gained thus far and mirror it with their experience in concrete project work.
They will be able to present their approach, solutions and results in a colloquium.
They will get to know the many diferent interdependencies of the individual specialist areas and be able to integrate themselves into a team.

[*updated 05.10.2020*]

Module content:
Depends on the topic and institution in which the practical phase is completed.

[*updated 05.10.2020*]

Recommended or required reading:
Depends on topic

[*updated 05.10.2020*]

Environmental Technologies Bachelor – optional courses

Environmental and Materials Flow Management

Module name (EN): Environmental and Materials Flow Management

Degree programme: Environmental Technologies, Bachelor, ASPO 01.10.2021

Module code: UI-B-USM

Hours per semester week / Teaching method: 2SU (2 hours per week)

ECTS credits: 2

Semester: 7

Mandatory course: no

Language of instruction:
German

Assessment:
Project work

Curricular relevance:
BIBA786 Civil and structural engineering, Bachelor, ASPO 01.04.2009, semester 7, optional course
BIBA786 Civil and structural engineering, Bachelor, ASPO 01.10.2011, semester 7, optional course
BIBA786 Civil and structural engineering, Bachelor, ASPO 01.10.2017, semester 7, optional course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dipl.-Ing. Frank Baur

Lecturer: Prof. Dipl.-Ing. Frank Baur

[*updated 17.09.2020*]

Learning outcomes:
After successfully completing this module, students will be able to assess the concerns of corporate environmental protection/environmental management, as well as regional material flow management based on the example of municipalities. We will discuss interfaces and connections between relevant environmental areas, e.g. immission control, water/waste management, soil protection, energy management, etc. In the context of regional considerations, special emphasis will be placed on the field of renewable energies.

[*updated 28.09.2020*]

Module content:
- Technical fields of operational environmental protection (waste management, immission control, water protection, soil protection,)
- Operational responsibilities
- Liability issues
- Corporate environmental management (standardization systems, structural/process organization, functions, implementation, certification procedure)
- Approaches to regional material flow management (MFM)
- Players and networks
- Material flow management (MFM) and energy with focus on renewable energy sources

[*updated 05.02.2020*]

Recommended or required reading:
Bemmann, Heck: Handbuch Stoffstrommanagement

[*updated 05.02.2020*]