

Module Handbook

Environmental Management and Urban Planning in Metropolitan Areas

(Umweltmanagement und Stadtplanung in Ballungsräumen – UMSB)

Faculty of Architecture and Civil Engineering
Hochschule **RheinMain** | University of Applied Sciences

Master of Engineering (M.Eng.)

IMPORTANT

Please note that this is an English translation of the German module handbook intended to give an overview of the degree program's curriculum and teaching contents. This document is for information purposes only and is not legally binding.

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Module Title	M1 – GIS / GIS-Analysis / Environmental Data
Module Title (German)	M1 – GIS / GIS-Analyse / Umweltdaten
Language of In- struction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Summer semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Knowing about the importance and possibilities of geographic in-formation systems (GIS) used to maintain infrastructure facilities in metropolitan areas • Researching and developing a practical GIS topic, summarizing it in writing, presenting it and discussing it in a group afterwards <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module.</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • GIS-Application • GIS-Project / GIS-Analysis

Course Title	GIS-Application
Course Title (German)	GIS-Anwendungen
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Course offered in	Summer semester only
Competencies/Learning Objectives	Knowing about the importance and possibilities of geographic information systems (GIS) used to maintain infrastructure facilities in metropolitan areas Researching and developing a practical GIS topic, summarizing it in writing, presenting it and discussing it in a group afterwards
Topics/Course Contents	GIS are used to plan, maintain and document infrastructure facilities in metropolitan areas. Using project examples as a basis, the possible applications of GIS are mapped out, presented and discussed afterwards.
Credit Points	3 CP
Module	M1 – GIS / GIS-Analysis / Environmental Data

Course Title	GIS-Project / GIS-Analysis
Course Title (German)	GIS-Projekt / GIS-Analysen
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Course offered in	Summer semester only
Competencies/Learning Objectives	Knowing about the importance and possibilities of geographic information systems (GIS) used to maintain infrastructure facilities in metropolitan areas
Topics/Course Contents	Based on a project, students either learn about data editing and GIS-data interfaces or they deepen their knowledge of the topic. With reference to the project, they use the basic GIS analysis tools to process and present spatial and environmental data. Furthermore, an overview of the currently available environmental data is given.
Credit Points	2 CP
Module	M1 – GIS / GIS-Analysis / Environmental Data

Module Title	M2 – Planning Law
Module Title (German)	M2 – Planungsrecht
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Winter semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Deepening knowledge of planning law • Deepening knowledge of land law <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Planning Law

Course Title	Planning Law
Course Title (German)	Planungsrecht
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Course offered in	Winter semester only
Competencies/Learning Objectives	Deepening knowledge of planning law Deepening knowledge of land law
Topics/Course Contents	<i>BauGB</i> (German Building Code) and basics of environmental protection in urban land-use planning Building law Spatial planning law Soil conservation law Land redevelopment planning and reorganisation of land holdings <i>BGB</i> (German Civil Code) and property transactions References to substantive environmental law and procedural environmental law
Credit Points	5 CP
Module	M2 – Planning Law

Module Title	M3 – Environmental Law and Administrative Law
Module Title (German)	M3 – Umweltrecht und Verwaltungsrecht
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Winter semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Applying procedural administrative law • Deepening knowledge of procedural environmental law • Acquiring basic knowledge of the scope of substantive environmental law • Deepening knowledge of nature conservation law • Deepening knowledge of water law <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Environmental Law and Administrative Law, Administrative Organization

Course Title	Environmental Law and Administrative Law, Administrative Organization
Course Title (German)	Umweltrecht und Verwaltungsrecht, Verwaltungsorganisation
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Course offered in	Winter semester only
Competencies/Learning Objectives	Applying procedural administrative law Deepening knowledge of procedural environmental law Acquiring basic knowledge of the scope of substantive environmental law Deepening knowledge of nature conservation law Deepening knowledge of water law
Topics/Course Contents	Administrative law, EU legislation, <i>Grundgesetz</i> (German Basic Law) Procedural environmental law Deepening knowledge of the <i>Gesetz über die Umweltverträglichkeitsprüfung (UVPG)</i> (German Law on Environmental Impact Assessment) The scope of substantive environmental law Deepening knowledge of the <i>Bundesnaturschutzgesetz (BNatSchG)</i> (German Law on the Protection of Nature) Deepening knowledge of the <i>Wasserhaushaltsgesetz (WHG)</i> (German Law on Water Resources Management)
Credit Points	5 CP
Module	M3 – Environmental Law and Administrative Law

Module Title	M4 – Project Management and Human Resource Management
Module Title (German)	M4 – Projektmanagement und Personalführung
Language of In- struction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Winter semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Knowing the most important organizational tasks of management in professional practice • Understanding tasks of operational and organizational structure • Putting the acquired knowledge on a scientific and methodological basis • Acquiring comprehensive skills for structuring project management • Understanding the main functions of project management and possibilities of implementation • Developing a more detailed understanding of project management as a possible contribution to administrative procedures • Knowing project management methods • Understanding examples taken from professional practice <p>Other competencies and skills (Communication and cooperation)</p> <ul style="list-style-type: none"> • Understanding leadership and awareness of leadership responsibilities • Reflecting own knowledge • Identifying personal strengths and weaknesses of own skills/qualification • Ability to work in teams and sense for critical situations and solutions to problems • Ability to make and implement decisions • Acquiring communication skills
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Human Resource Management • Project Management /Presentation

Course Title	Human Resource Management
Course Title (German)	Personalführung
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Course offered in	Winter semester only
Competencies/Learning Objectives	<p>Understanding leadership and having an awareness of leadership responsibilities</p> <p>Knowing the most important organizational tasks of management in professional practice</p> <p>Understanding tasks of operational and organizational structure</p> <p>Reflecting own knowledge</p> <p>Identifying personal strengths and weaknesses of own skills/qualification</p> <p>Ability to work in teams and sense for critical situations and solutions to problems</p> <p>Ability to make and implement decisions</p> <p>Acquiring communication skills</p> <p>Putting the acquired knowledge on a scientific and methodological basis</p>
Topics/Course Contents	<p>Organizational forms of the different institutions in the professional field</p> <p>Operational structure and personnel responsibility</p> <p>Organizational structure and personnel responsibility</p> <p>Leadership and managerial functions; delegation</p> <p>Social-psychological aspects in organizations</p> <p>Structuring tasks and defining goals</p> <p>Human resources management, team organization, decision-making responsibility</p> <p>Communication and conflict management</p> <p>Dealing with cultural differences</p> <p>Promotion of women</p> <p>Employment law, rights of disabled/handicapped persons</p> <p>Application situations</p>
Credit Points	1 CP
Module	M4 – Project Management and Human Resource Management

Course Title	Project Management /Presentation
Course Title (German)	Projektmanagement/Präsentation
Language of In- struction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Winter semester only
Competen- cies/Learning Objectives	Acquiring comprehensive skills for structuring project management, knowing the main functions of project management and possibilities of implementation, developing a more detailed understanding of project management as a possible contribution to administrative procedures, knowing project management methods, understanding examples taken from professional practice
Topics/Course Contents	Going into detail on and differentiating definitions, involved parties, tasks Clarifying examination/research scope and framework, offer Understanding the functions of project management: time management, cost management, personnel management, quality control Communicating with involved parties (coordinating with customers, with involved authorities), PR Going into detail on contributions of project management to administrative procedures Understanding the complex methods of project management: monitoring, evaluating Documentation, case examples Presentations and moderation techniques (proportional 1 SWS, i.e. 1 contact hour)
Credit Points	4 CP
Module	M4 – Project Management and Human Resource Management

Module Title	M5 – Business Administration and Management
Module Title (German)	M5 – Betriebswirtschaft und Managementwissen
Language of Instruction	German
Recom- mended Se- mester(s)	1, 2, 3
Module of- fered in	Every year
Competen- cies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Knowing the subject matter and methods of business administration as well as the basics of economic actions • Knowing the basics of cost theory and the common methods and procedures of cost accounting (in particular absorption costing and direct costing) and being able to apply this knowledge to costing objects • Being familiar with the problems of applying cost theory to planning issues • Knowing and being able to examine the theoretic basic assumptions of calculation methods • Being able to structure planning tasks and to apply methods suitable for a specific problem • Developing an awareness of problems in areas of responsibility related to labor planning in companies and institutions • Knowing the basics of marketing theory and the psychological and social factors determining consumer behavior • Knowing the fundamental market instruments and approaches to developing a marketing concept <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Business Administration • Management Skills and Business Control

Course Title	Business Administration
Course Title (German)	Betriebswirtschaft
Language of In- struction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Summer semester only
Competen- cies/Learning Objectives	Knowing the subject matter and methods of business administration as well as the basics of economic actions; knowing the basics of cost theory and the common methods and procedures of cost accounting (in particular absorption costing and direct costing) and being able to apply this knowledge to costing objects; being familiar with the problems of applying cost theory to planning issues; knowing and being able to examine the theoretic basic assumptions of calculation methods; being able to structure planning tasks and to apply methods suitable for a specific problem; developing an awareness of problems in areas of responsibility related to labor planning in companies and institutions; knowing the basics of marketing theory and the psychological and social factors determining consumer behavior; knowing the fundamental market instruments and approaches to developing a marketing concept
Topics/Course Contents	Introduction to the methods of business administration; basics of economic actions; basics of cost theory; methods and procedures of absorption costing and direct costing; work design (designing work organization and work environments, strategic planning, strategic marketing, positioning); overview of important market theories; marketing basics; important marketing theories; marketing instruments; marketing policies (product policy, price policy, distribution policy, communication policy); advertisement basics, important aspects of consumer behavior
Credit Points	3 CP
Module	M5 – Business Administration and Management

Course Title	Management Skills and Business Control
Course Title (German)	Managementwissen und betriebliche Steuerung
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Winter semester only
Competencies/Learning Objectives	<p>Understanding and mastering operational organization</p> <p>Mastering financial engineering instruments and business procedures</p> <p>Knowing the scientific and methodological foundations of practical tasks related to controlling and personnel management</p> <p>Knowing the basics of cost analysis and charge calculation in the field of environmental engineering</p> <p>Scrutinizing costing critically</p>
Topics/Course Contents	<p>Criteria for choosing the best location of enterprises</p> <p>Important tasks of operational human resource management (personnel resource planning, personnel selection, recruitment, personnel administration)</p> <p>Start-up financing and public support programs</p> <p>SWOT analysis, gap analysis, portfolio analysis</p> <p>Factors influencing investment costs and operational costs</p> <p>Public and private companies in the field of environmental engineering</p> <p>Repercussions of privatization on costs, goods and services</p> <p>Costs and project controlling in the field of environmental engineering</p> <p>Charge calculation and legal framework</p>
Credit Points	2 CP
Module	M5 – Business Administration and Management

Module Title	M6 – Environmental Assessments and Environmental Management Tools
Module Title (German)	M6 – Umweltprüfungen und Umweltmanagementinstrumente
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Summer semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Understanding environmental management systems and instruments • Knowing central foundations and aspects • Understanding methodological derivation and technical justification • Understanding application • Acquiring basic and more detailed knowledge of the contribution of environmental compatibility assessment to environmental reviews (environmental impact assessment of plans (strategic environmental assessment), environmental impact assessment of projects) • Acquiring and developing methodological competence for determining and describing environmental impacts • Acquiring and developing methodological competence for assessing environmental impacts and for finding alternatives, competence for monitoring/supporting administrative procedures <p>Other competencies and skills (Communication and cooperation) The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Environmental Assessment • Environmental Management Tools

Course Title	Environmental Assessment
Course Title (German)	Umweltprüfungen
Language of In- struction	German
Recommended Semester(s)	1, 2,3
Course offered in	Summer semester only
Competen- cies/Learning Objectives	Acquiring basic and more detailed knowledge of the contribution of envi- ronmental compatibility assessment to environmental reviews (environ- mental impact assessment of plans (strategic environmental assessment), environmental impact assessment of projects), methodological compe- tence for identifying and describing environmental impacts, methodologi- cal competence for assessing environmental impacts and for finding alter- natives, competence for monitoring/supporting administrative procedures
Topics/Course Contents	Assessment of the environmental impact of plans or projects/legal re- quirements, legal basis, environmental model (protected resources) Differentiated identification and description of environmental impacts (im- pact analysis; vulnerability to impacts, prognosis) Detailed evaluation of environmental impacts (assessing environmental impacts, observing for- mal protection) Complex examination of alternatives, identification of alternatives and op- tions for avoiding disadvantageous environmental impacts, comparative assessment Special services for assessing environmental impacts: floristic and faunis- tic surveys, N 2000; immission forecast Consolidation in the field of intervention provisions, compensation and im- pact assessment for natural habitats, wild fauna and flora Consolidation in the field of project management, strategic environmental assessment/environmental impact assessment as a dependent part of ad- ministrative procedures, integrating other technical reviews Scientific assessment, including controlling and monitoring, case exam- ples taken from subject literature and from planning processes
Credit Points	3 CP
Module	M6 – Environmental Assessments and Environmental Management Tools

Course Title	Environmental Management Tools
Course Title (German)	Umweltmanagementinstrumente
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Summer semester only
Competencies/Learning Objectives	<ul style="list-style-type: none"> • Understanding environmental management systems and instruments • Knowing their central foundations and aspects • Understanding the methodological derivation and technical justification of environmental management systems and instruments as well as their application
Topics/Course Contents	<p>Body of rules for environmental management, norms for environmental management systems, e.g. ISO14 000 series; DIN EN ISO 9 000 et seqq. Contrasting DIN EN ISO 14001 and EMAS Eco-profit, aspects relevant for the environment, environmental programs Project: developing and implementing an environmental management system Conducting environmental audits and eco-audits Quality management</p>
Credit Points	2 CP
Module	M6 – Environmental Assessments and Environmental Management Tools

Module Title	M7 – Spatial Planning Instruments
Module Title (German)	M7 – Räumliche Planungsinstrumente
Language of In- struction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Winter semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Deepening knowledge of legally effective spatial planning instruments, in particular of the system of general urban development planning in Germany • Ability to apply the rules and legal bases stipulated by the <i>Baugesetzbuch</i> (German Building Code) in practical planning processes • Ability to develop land-use plans and zoning maps in general <p>Other competencies and skills (Communication and cooperation)</p> <ul style="list-style-type: none"> • Understanding the relevance of laws and legislative provisions as a prerequisite for social order and social cohabitation • Knowing about the importance of weighing in political decision-making processes • Ability to reflect and argument critically • Ability to prepare complex topics systematically and to convey them in a structured way
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Urban Land-Use Planning

Course Title	Urban Land-use Planning
Course Title (German)	Räumliche Planungsinstrumente
Language of In- struction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Winter semester only
Competen- cies/Learning Objectives	The course contributes to the module's learning goals by developing the stated topics/content.
Topics/Course Contents	Emergence and development of planning law in Germany; actors in the planning process on different levels; the land-use plan as a preparatory general urban development plan; the zoning map as a binding general urban development plan; <i>Baunutzungsverordnung</i> (German Town Planning Regulations) and <i>Planzeichenverordnung</i> (German Graphic Representation Regulations); implementation of planning; special urban construction legislation; exercises related to zoning maps
Credit Points	5 CP
Module	M7 – Spatial Planning Instruments

Module Title	S1 – Urban History and Theory
Module Title (German)	S1 – Stadtbaugeschichte und Stadttheorie
Language of Instruction	German
Recom- mended Se- mester(s)	1, 2, 3
Module of- fered in	Winter semester only
Compen- encies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Acquiring detailed knowledge of the main epochs of urban history as well as of the theories on towns in the past and in the present • Knowing and understanding the development of contemporary towns, urban spaces and urban regions as well as the related terminology, theories and guiding principles as an instrument for discussing present development tendencies critically <p>Other competencies and skills (Communication and cooperation)</p> <ul style="list-style-type: none"> • Ability to use a structured and scientific approach when researching and developing a chosen technical topic independently • Ability to reflect and argument critically • Ability to present and communicate subject-specific content – re-searched and developed independently – in writing and orally
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Urban History and Theory

Course Title	Urban History and Theory
Course Title (German)	Stadtbaugeschichte und Stadttheorie
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Winter semester only
Competencies/Learning Objectives	The course contributes to the module's learning goals by developing the stated topics/content.
Topics/Course Contents	Overview of the foundations and developments of towns in the past and in the present; overview of urban theories and urban models in the past and in the present; concepts, guiding principles and theories of contemporary towns
Credit Points	5 CP
Module	S1 – Urban History and Theory

Module Title	S2 – Housing and Settlement Planning
Module Title (German)	S2 – Wohnungsbau und Siedlungsplanung
Language of Instruction	German
Recom- mended Se- mester(s)	1, 2, 3
Module of- fered in	Winter semester only
Competen- cies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Deepening knowledge of principal development paths and extraordinary examples of settlement history and housing construction as a basis for a critical analysis and discussion of contemporary settlement processes • Knowing and understanding current requirements for environmentally sustainable and socially compatible housing and settlement construction • Knowing the principal settlement components of towns and their spatial, functional and social purposes • Acquiring application-oriented knowledge of subject-specific methods, techniques, representation and conveyance forms of residential quarter planning <p>Other competencies and skills (Communication and cooperation)</p> <ul style="list-style-type: none"> • Ability to use a structured and scientific approach when researching and developing a chosen technical topic independently • Ability to reflect and argument critically • Ability to present and communicate subject-specific content – researched and developed independently – in writing and orally
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Housing and Settlement Planning

Course Title	Housing and Settlement Planning
Course Title (German)	Wohnungsbau und Siedlungsplanung
Language of In- struction	German
Recommended Semester(s)	1, 2,3
Course offered in	Winter semester only
Competen- cies/Learning Objectives	The course contributes to the module's learning goals by developing the stated topics/content.
Topics/Course Contents	Overview of current and historic forms and models of habitation; social, cultural, physiological and economic requirements for habitations; spatial components of towns and of settlement planning; importance of residential environments and residential environment design; typologies of housing construction and layout designs; best practices in housing construction and in settlement planning; mixed town-planning and settlement-related variants of habitats, work, education, supply and recreational facilities (among others culture, games and sports) in urban quarters; concept, representation (textual/graphical) and conveyance of residential quarter planning concepts
Credit Points	5 CP
Module	S2 – Housing and Settlement Planning

Module Title	S3 – Urban Development and District Planning
Module Title (German)	S3 – Stadtentwicklung und Quartiersplanung
Language of Instruction	German
Recom- mended Se- mester(s)	1, 2, 3
Module of- fered in	Summer semester only
Compen- encies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Acquiring comprehensive theoretical and practical knowledge of the planning process on the overall urban level and in parts of towns • Acquiring knowledge and developing understanding of the substantial demographic, socio-cultural, economic and ecological determining factors and challenges of contemporary urban development • Acquiring application-oriented knowledge of subject-specific methods, procedures, representation and conveyance forms of town and district development planning <p>Other competencies and skills (Communication and cooperation)</p> <ul style="list-style-type: none"> • Ability to use a structured and scientific approach when researching and developing a chosen technical topic independently • Ability to reflect and argument critically • Ability to present and communicate subject-specific content – researched and developed independently – in writing and orally
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Urban Development and District Planning

Course Title	Urban Development and District Planning
Course Title (German)	Wohnungsbau und Siedlungsplanung
Language of In- struction	German
Recommended Semester(s)	1, 2, 3
Course offered in	Summer semester only
Competen- cies/Learning Objectives	The course contributes to the module's learning goals by developing the stated topics/content.
Topics/Course Contents	Concepts of and models for town development since the epoch of industrialization; demographic, social, economic, ecological and cultural determining factors and challenges of current town development; domestic development, quarter planning and "town of short distances"; urban regions and urban agglomerations as a contemporary type of urbanization; current concepts of and projects for an environmentally sustainable, energy- and traffic-saving town and settlement planning; creating and securing public quality spaces; enhancement strategies of town planning; planning strategy mechanisms of town planning; concept, representation (textual/graphical) and conveyance of town/district development concepts
Credit Points	5 CP
Module	S3 – Urban Development and District Planning

Module Title	S4 – Urban Renewal and Redevelopment
Module Title (German)	S4 – Stadterneuerung und Stadtumbau
Language of Instruction	German
Recom- mended Se- mester(s)	1, 2, 3
Module of- fered in	Winter semester only
Compen- encies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Acquiring comprehensive theoretical and practical knowledge of contemporary urban renewal and redevelopment processes • Acquiring knowledge and developing understanding of the substantial spatial, social, economic and ecological determining factors and challenges of urban renewal and redevelopment • Acquiring application-oriented knowledge of subject-specific methods, techniques, representation and conveyance forms of urban renewal and redevelopment <p>Other competencies and skills (Communication and cooperation)</p> <ul style="list-style-type: none"> • Ability to use a structured and scientific approach when researching and developing a chosen technical topic independently • Ability to reflect and argument critically • Ability to present and communicate subject-specific content – re-searched and developed independently – in writing and orally
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Urban Renewal and Redevelopment

Course Title	Urban Renewal and Redevelopment
Course Title (German)	Stadterneuerung und Stadtumbau
Language of In- struction	German
Recommended Semester(s)	1, 2,3
Course offered in	Winter semester only
Competen- cies/Learning Objectives	The course contributes to the module's learning goals by developing the stated topics/content.
Topics/Course Contents	Inner urban development and fallow land conversion as current tasks of urban development; methods, instruments and actors/stakeholders in urban redevelopment and renewal; importance and design concepts of public spaces in urban redevelopment projects; national and international models, concepts of and projects for urban renewal and redevelopment; concept, representation (textual/graphical) and conveyance of urban redevelopment and renewal projects
Credit Points	5 CP
Module	S4 – Urban Renewal and Redevelopment

Module Title	S5 – Social and Cultural Aspects of Urban Development
Module Title (German)	S5 – Soziale und kulturelle Aspekte der Stadtentwicklung
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Summer semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Acquiring more detailed knowledge of the interactions between urban spaces and society in European urban construction • Knowing and understanding the segregation and marginalization processes observed in towns and their social, cultural and economic implications • Acquiring knowledge of the importance of space as a site- and identity-establishing field of action • Acquiring knowledge of the importance and change of the public and the private sphere as structural elements of urban spaces, insight into the practices of formal and informal space appropriation • Acquiring more detailed knowledge of the expected socio-cultural changes due to the predicted demographic change, the medialization of society and the telematic pervasion of nearly all areas of life <p>Other competencies and skills (Communication and cooperation) Ability to use a structured and scientific approach when researching and developing a chosen technical topic independently; Ability to reflect and argument critically; Ability to present and communicate subject-specific content – researched and developed independently – in writing and orally</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Social and Cultural Aspects of Urban Development

Course Title	Social and Cultural Aspects of Urban Development
Course Title (German)	Soziale und kulturelle Aspekte der Stadtentwicklung
Language of In- struction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Summer semester only
Competen- cies/Learning Objectives	The course contributes to the module's learning goals by developing the stated topics/content.
Topics/Course Contents	Social and cultural conditions of urban development; social and cultural importance of the European town; public and private sphere as structural elements of urban construction; urban identity and cultural diversity; urban segregation and marginalization processes; formal and informal urban spaces; challenges of demographic change; media society, telematic revolution and its impact on urban development
Credit Points	5 CP
Module	S5 – Social and Cultural Aspects of Urban Development

Module Title	S6 – Urban Design Project
Module Title (German)	S6 – Projekt Städtebauliches Entwerfen
Language of Instruction	German
Recom- mended Se- mester(s)	1, 2, 3
Module of- fered in	Summer semester only
Compen- encies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Acquiring more detailed knowledge of methods of urban design and applying them in realistic design projects; acquiring application-oriented knowledge of spatial, functional and open space components of towns and their development • Developing comprehensive skills for graphic and textual representation as well as for oral presentations on urban planning <p>Other competencies and skills (Communication and cooperation)</p> <ul style="list-style-type: none"> • Ability to take a methodically structured approach when working on and developing a project • Ability to represent content in writing and graphically as well as in oral presentations, ability to communicate an independently developed project • Ability to work in teams • Knowledge of relevant drawing and CAD software
Credit Points	10 CP
Module Courses	<ul style="list-style-type: none"> • Urban Design Project

Course Title	Urban Design Project
Course Title (German)	Stadterneuerung und Stadtumbau
Language of In- struction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Summer semester only
Competen- cies/Learning Objectives	The course contributes to the module's learning goals by developing the stated topics/content.
Topics/Course Contents	Methods of taking an urban inventory, analysis and evaluation; formulating planning targets and urban program development; developing functional and creative planning alternatives and evaluating them; urban framework development planning in drawings, texts and models; going into detail on design in the context of town planning, building typologies in town planning
Credit Points	10 CP
Module	S6 – Urban Design Project

Module Title	L1 - Urban Ecology
Module Title (German)	L1 - Stadtökologie
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Winter semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Knowing environmental conditions in urban areas • Understanding the tasks of open space management in towns and cities • Understanding planning-related requirements in urban development <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Urban Ecology

Course Title	Urban Ecology
Course Title (German)	Stadtökologie
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Winter semester only
Competencies/Learning Objectives	<p>Ability to analyze based on scientific principles</p> <p>Understanding the relevant landscape and urban ecology basics</p> <p>Understanding complex spatial development tendencies and related environmental issues</p> <p>Making analyses and predictions, applying and deepening knowledge of the technical basics</p> <p>Deepening knowledge of and understanding the interactions between different ecological parameters and disciplines</p> <p>Reflecting problems in order to find suitable solution strategies, instruments and action approaches</p> <p>Understanding the relevance of targets and approaches for planning tasks</p>
Topics/Course Contents	<p>(1) Perception of landscape balance and landscape structure (1 SWS, i.e. 1 contact hour)</p> <p>Perception of vegetation, biotope types</p> <p>Excursions in the Rhine-Main area – forerunning -</p> <p>(2) Town and landscape</p> <p>Relationship between nature – environment – humans</p> <p>Ecological basics</p> <p>Concept of landscape, visual landscape/natural scenery, particularities and characteristics of man-made landscapes</p> <p>Diversity, particularities and manifestations of visual landscapes/natural scenery and overall appearances of townscapes</p> <p>Climate change and climate protection</p> <p>Biological diversity – basics, protection and development</p> <p>Ecosystem connectivity in urban areas, open space retention and ecosystem connectivity</p> <p>Water budget, land consumption, soil protection in urban areas, soil hygiene and preventive health care</p> <p>Location factor soil and geology, location factor climate and climate change, location factor water and water bodies</p> <p>Vegetation in open landscapes and towns, fauna in open landscapes and towns, agriculture in urban areas, functions of forests and forestry in urban areas</p>
Credit Points	5 CP
Module	L1 - Urban Ecology

Module Title	L2 - Practice and Application of Environmental Tools
Module Title (German)	L2 - Anwendung umwelt- und naturschutzrelevanter Instrumentarien
Language of Instruction	German
Recom- mended Se- mester(s)	1, 2, 3
Module of- fered in	Winter semester only
Competen- cies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Knowing, deepening knowledge of and applying methodological-scientific basics of instruments relevant for environmental planning and environmental protection in complex tasks • Meeting the challenges of working in groups of maximum 12 students • Understanding methods, instruments and relevant standards in landscape and environmental planning, with examples of practical projects, e.g. infrastructure planning • Knowing and interpreting technical contributions relevant for environmental protection and integrating them in further planning • Recognizing acquired skills and identifying own deficits; understanding relationships and coherences • Cross-sectional orientation and interdisciplinarity based on planning examples; challenging planning approaches critically • Planning methods and instruments <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Practice and Application of Environmental Tools

Course Title	Practice and Application of Environmental Tools
Course Title (German)	Anwendung umwelt- und naturschutzrelevanter Instrumentarien
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Winter semester only
Competencies/Learning Objectives	<p>Understanding and mastering the requirements and tasks in the field of environmental protection and current challenges</p> <p>Mastering the challenges of and skills for drafting landscape plans, landscape conservation plans and management plans</p> <p>Mastering planning instruments and process management</p> <p>Knowing relevant technical concepts, knowing central functions and mastering technical components and their justification</p> <p>Developing design- and planning-related solutions for specific examples</p> <p>Acquiring more detailed knowledge of task execution organization, expertise</p> <p>Understanding based on specific examples and scenarios from the Rhine-Main area, challenging the acquired knowledge critically, reflecting planning processes and issues to be taken into account</p>
Topics/Course Contents	<p>Targets and issues of environmental protection and landscape planning, biodiversity protection and climate change, man-made landscapes and recreational resources</p> <p>Future tasks of environmental protection and tasks in metropolitan areas</p> <p>Discussing instruments based on planning cases taken from professional practice and research, if possible with visualization on site:</p> <p>1) Landscape planning (system, landscape structure plan, landscape plan) (strategic environmental assessment), recreational resources and open space retention, service phases according to the HOAI (German Official Scale of Fees for Services Provided by Architects and Engineers)</p> <p>2) Intervention provisions and authorization processes, landscape conservation plan and execution plan, relations to environmental impact assessment, service phases according to the HOAI (German Official Scale of Fees for Services Provided by Architects and Engineers)</p> <p>3) Ecosystem connectivity, protected areas and management planning, NATURA 2000, species protection and procedural rules</p> <p>Elaboration of plans, examinations and examination principles, plan draft and plan version, decision and responsibility, implementation and execution</p> <p>Illustration of plan examples and excursion (landscape conservation plan)</p> <p>Excursus: good professional practice (agriculture, forestry), funding instruments and financing</p> <p>Research approaches and research projects in environmental protection</p>
Credit Points	5 CP
Module	L2 - Practice and Application of Environmental Tools

Module Title	L3 - Ecological Basics of Open Space Planning
Module Title (German)	L3 - Ökologische Grundlagen der Freiraumplanung
Language of Instruction	German
Recom- mended Se- mester(s)	1, 2, 3
Module of- fered in	Winter semester only
Competen- cies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Importance of public and private green systems in towns and in metropolitan areas for climate, surface water, ground water, fauna, flora, biodiversity, human health and preventive health care • Synergies between different requirements of modern cities, e.g. flood protection, securing recreational areas, systems of ecosystem connectivity and other issues • National and international examples of sustainable development in towns and metropolitan areas • Critical discourse on the topic of postcompaction and destruction of ecological potential areas in current town development and on the contradictions related to sustainability • Legal and normative bases • Surface water management <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Ecological Basics of Open Space Planning

Course Title	Ecological Basics of Open Space Planning
Course Title (German)	Ökologische Grundlagen der Freiraumplanung
Language of In- struction	German
Recommended Semester(s)	1, 2,3
Course offered in	Winter semester only
Competen- cies/Learning Objectives	Understanding the tasks of open space planning and open space retention in metropolitan areas and urban centers; mastering the specific planning instruments; mastering the requirements and the management of open space planning and open space retention; knowing the relevant technical concepts; knowing central functions of green areas and mastering the technical components and their justification; going into detail on social, functional, aesthetic, ecological, economic and historical importance of urban open spaces; understanding based on a specific example and regional cases; challenging the acquired knowledge critically; reflecting planning processes and complex issues to be taken into account; mastering the requirements of and skills for drafting plans in open space planning
Topics/Course Contents	Public and private green systems in towns and metropolitan areas, greenway, green link, types of open spaces, e.g. parks, cemeteries, residential environment and sport areas National and international projects and examples in the Rhine-Main area: open space development and open space retention in metropolitan areas, e.g. regional parks, district parks, national urban parks Demographic development and usage requirements of different age groups, including gender aspects in open spaces, participation and communication in project development, participation Aesthetic aspects of open space development, design principles, quality of urban open spaces Examples of open space design and planning, replanning, planning in existing contexts, relationship between open space structures, development and buildings structures, woody plants in towns Historical green in cities and garden facilities and their categorization, development and treatment based on examples in the Rhine-Main area and on a national level Green systems and green maintenance, tasks and types of green space maintenance, facility management, choosing materials Organizing green in municipal administration, award of contracts and self-responsibility, execution, maintenance costs Service phases in open space planning according to the HOAI (German Official Scale of Fees for Services Provided by Architects and Engineers), VOL (German Award and Contract Regulations for Services) and VOF (German Award and Contract Regulations for Freelance Services) Current research approaches and subject literature Examples of urban open spaces in excursions in the Rhine-Main area
Credit Points	5 CP

Module	L3 - Ecological Basics of Open Space Planning
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Module Title	L4 – Development of Man-Made Landscapes
Module Title (German)	L4 – Kulturlandschaftsentwicklung
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Summer semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Understanding modern issues in the development of man-made landscapes • Understanding the function of land use systems • Understanding the history of man-made landscapes and their relevance in landscape perception • Understanding the different project development requirements <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Development of Man-Made Landscapes

Course Title	Development of Man-Made Landscapes
Course Title (German)	Kulturlandschaftsentwicklung
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Summer semester only
Competencies/Learning Objectives	Understanding modern issues in the development of man-made landscapes Understanding the function of land use systems Understanding the history of man-made landscapes and their relevance in landscape perception Understanding the different project development requirements
Topics/Course Contents	History of man-made landscapes Concepts and compartments in landscapes Landscape analysis and evaluation Perception basics Heritage landscapes Securing and developing man-made landscapes Funding and planning instruments
Credit Points	5 CP
Module	L4 - Development of Man-Made Landscapes

Module Title	L5 – Biodiversity and Nature Conservation
Module Title (German)	L5 – Biodiversität und Naturschutz
Language of In- struction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Winter semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Acquiring profound knowledge of ecological processes and biodiversity in man-made landscapes • Understanding ecological changes caused by land use and climate change • Ability to carry out technical nature conservation analyses and to develop measures for preserving and restoring populations, biocenoses and habitats • Deepening practical knowledge of presenting, visualizing/explaining and discussing scientific work in the areas of ecology, biodiversity and nature conservation <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Biodiversity and Nature Conservation 1 • Biodiversity and Nature Conservation 2

Course Title	Biodiversity and Nature Conservation 1
Course Title (German)	Biodiversität und Naturschutz 1
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Course offered in	Winter semester only
Competencies/Learning Objectives	The learning goals of the lecture cover the theoretically-oriented part of the module's goals.
Topics/Course Contents	Ecological processes and their connection to preserving all levels of biodiversity (genes, populations, species, ecosystems) Biodiversity models through space and time Impact of land use and climate change on ecological processes and biodiversity Possibilities of nature conservation management for preserving biodiversity Lecture, seminar, excursion
Credit Points	3 CP
Module	L5 – Biodiversity and Nature Conservation

Course Title	Biodiversity and Nature Conservation 2
Course Title (German)	Biodiversität und Naturschutz 2
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Course offered in	Winter semester only
Competencies/Learning Objectives	The learning goals of the seminar cover the practically-oriented part of the module's goals.
Topics/Course Contents	Ecological processes and their connection to preserving all levels of biodiversity (genes, populations, species, ecosystems) Biodiversity models through space and time Impact of land use and climate change on ecological processes and biodiversity Possibilities of nature conservation management for preserving biodiversity Lecture, seminar, excursion
Credit Points	2 CP
Module	L5 – Biodiversity and Nature Conservation

Module Title	L6 – Project Planning in Landscape Architecture
Module Title (German)	L6 – Projekt Planung Landschaftsarchitektur
Language of Instruction	German
Recom- mended Se- mester(s)	1, 2, 3
Module of- fered in	Winter semester only
Competen- cies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <p>Open spaces:</p> <ul style="list-style-type: none"> • Conceptual open space planning and more detailed object/building planning based on findings of exemplary project developments and research results in the area of urban open space development (in quarters, etc.) • Developing methods for researching comprehensive planning bases in order to ensure that current planning and implementation requirements are met (as-completed drawings, framework concepts, social data, results of participation, financing, research-based knowledge of planning participation and participation procedures) • Developing planning goals based on the analysis of planning bases and developing creative and innovative concepts, drafts with different planning scales meeting the high demands of social, aesthetic, functional and economic aspects, planning law aspects as well as sustainability aspects <p>Landscape:</p> <ul style="list-style-type: none"> • Intensifying methodological scientific work on complex tasks of landscape and environmental planning and managing the challenges of working in groups of maximum 12 students • Acquiring and deepening theoretical knowledge, knowledge of environmental planning methods and instruments and system competencies, exemplary practical application • Working on a planning task independently, recognizing skills developed and still existing lack of skills, understanding links and correlations based on planning examples, doing and understanding interdisciplinary work, challenging planning goals and planning approaches critically and developing them further, knowing planning methods and instruments <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	10 CP
Module Courses	<ul style="list-style-type: none"> • Project in Landscape Architecture, Development of Man-made Landscapes

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- Project in Landscape Architecture, Open Space Development
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Course Title	Project in Landscape Architecture, Development of Man-Made Landscapes
Course Title (German)	Projekt Landschaftsarchitektur Kulturlandschaftsentwicklung
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Course offered in	Winter semester only
Competencies/Learning Objectives	<ul style="list-style-type: none"> • Intensifying methodological scientific work on complex tasks of landscape and environmental planning and managing the challenges of working in groups of maximum 12 students • Acquiring and deepening theoretical knowledge, knowledge of environmental planning methods and instruments and system competencies, exemplary practical application • Working on a planning task independently, recognizing skills developed and still existing lack of skills, understanding links and correlations based on planning examples, doing and understanding interdisciplinary work, challenging planning goals and planning approaches critically and developing them further, knowing planning methods and instruments
Topics/Course Contents	<ul style="list-style-type: none"> • Using the already acquired basic knowledge of environmental planning, an environmental planning task is worked on in a foundation- and method-oriented as well as scientifically sound way. Especially while working on the topic, current research projects are to be taken into account, and real planning and analysis instruments should be challenged critically with regards to their project-specific applicability. • In a report, the result and process of the project work as well as a methodological reflection are explained/visualized and presented in a scientific way. The report is the central part of the work results. The presentation of the results takes place in front of peers, in public or in front of the target audience.
Credit Points	10 CP
Module	L6 – Project Planning in Landscape Architecture

Course Title	Project in Landscape Architecture, Open Space Development
Course Title (German)	Projekt Landschaftsarchitektur Freiraumentwicklung
Language of In- struction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Winter semester only
Competen- cies/Learning Objectives	<ul style="list-style-type: none"> • Conceptual open-space planning and more detailed object/building planning based on findings of exemplary project developments and research results in the area of urban open space development (in quarters, etc.) • Developing methods for researching comprehensive planning bases in order to ensure that current planning and implementation requirements are met (as-completed drawings, framework concepts, social data, results of participation, financing, research-based knowledge of planning participation and participation procedures) • Developing planning goals based on the analysis of planning bases and developing creative and innovative concepts, drafts with different planning scales meeting the high demands of social, aesthetic, functional and economic aspects, planning law aspects as well as sustainability aspects
Topics/Course Contents	<ul style="list-style-type: none"> • Approaching conceptual open-space planning based on exemplary project developments • Showing approaches and methods for researching comprehensive planning bases • Applying scientific planning methods • Giving an overview of different approaches to controlling project processes and project models • Encouraging independent and self-responsible work including team-oriented planning • Workshops, future workshops, impromptu, excursions to the planning area, exemplary projects, authorities, institutions, citizens (possible joint projects with other modules of the degree program) • Presenting planning results in public and evaluating planning results
Credit Points	10 CP
Module	L6 – Project Planning in Landscape Architecture

Module Title	R1 – Resource Management
Module Title (German)	R1 – Ressourcenwirtschaft
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Every year
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Energy supply systems on a local, national and European level • Gaining an insight into the technical prerequisites and realities based on existing networks • Discussing terms from the fields of power supply, gas and district heating. Energetic designs <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Energy Management • Matter Cycles / Waste Management

Course Title	Energy Management
Course Title (German)	Energiewirtschaft
Language of In- struction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Winter semester only
Competen- cies/Learning Objectives	Discussing (political and economic) framework conditions, possibilities, de- velopments and influencing factors of energy supply and usage; making simple profitability calculations; knowing energy-economic dependencies and possibilities on a municipal/regional level
Topics/Course Contents	Introduction to energy economics: * basic terms of energy supply and us- age * Involved parties and market structures of the energy industry in Ger- many * Economic particularities of net-bound energy supply * Basic prob- lems concerning the sustainability of energy supply and usage, future challenges – resources and reserves: * fossil, nuclear and renewable sources of energy * energy efficiency/final energy saving * supply security and dependency on imports * Links in the overall system: medium- and long-term forecasts, scenarios and strategies for sustainable energy sup- ply (locally/regionally, nationwide, EU-wide, globally) Market behavior, competition, added value and employment: * pricing, competition and subsidization in the energy and energy services market * energy procurement in municipalities * efficiency analysis and economical optimization * contributions of the energy sector to regional economic de- velopment: investments, gross value added and employment Policies and measures: * necessity of governmental frameworks * over- view of the regulatory framework for the energy industry * liberalization, deregulation, re-regulation and re-municipalization * guiding principles for an efficient solar industry * possibilities on a municipal/regional level * monitoring and evaluating policies and measures * current issues in en- ergy policy and the energy industry
Credit Points	3 CP
Module	R1 – Resource Management

Course Title	Matter Cycles / Waste Management
Course Title (German)	Stoffkreisläufe
Language of In- struction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Summer semester only
Compenten- cies/Learning Objectives	Acquiring detailed knowledge of important industrial resource cycles, competence for assessing environmental impacts, developing an orientation for taking on product responsibility
Topics/Course Contents	Resource cycles – resource cycle of mineral building materials, resource cycle of metal, resource cycle of wood, resource cycle of plastic, re- source cycle of paper, paperboard and cardboard, resource cycle of or- ganic materials Environmental impacts, eco-balance, LCA; environmental management – product responsibility, environmental management, avoidance and recy- cling technologies (recycling of materials), quality requirements for ener- getic recycling, costs, environmental reviews
Credit Points	2 CP
Module	R1 – Resource Management

Module Title	R2 – Energy Supply
Module Title (German)	R2 – Energieversorgung
Language of Instruction	German
Recom- mended Se- mester(s)	1, 2, 3
Module of- fered in	Every year
Compen- encies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Acquiring detailed knowledge of important energy generation systems • Developing competence for judging technical efforts, risks (land use, environmental burden, etc.) and cost aspects; understanding the advantages and disadvantages of the respective generation paths • Energy supply systems on a local, national and European level • Gaining an insight into the technical prerequisites and realities based on existing networks • Discussing terms from the fields of power supply, gas and district heating. Energetic designs <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Cable Based Energy Production and Supply • Cable Based Energy Systems

Course Title	Cable Based Energy Production and Supply
Course Title (German)	Leitungsgebundene Energieerzeugung und Bereitstellung
Language of In- struction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Winter semester only
Competen- cies/Learning Objectives	Acquiring detailed knowledge of important energy generation systems; developing competence for judging technical efforts, risks (land use, environmental burden, etc.) and cost aspects; understanding the advantages and disadvantages of the respective generation types
Topics/Course Contents	"Combined conventional and sustainable energy systems" Load profiles, supply paths via regenerative energy generation systems, securing electricity supply, technical generation of electricity and heat – comparison conventional/regenerative, combined heat and power generation, energy availability systems and energy storage, reaction to malfunction, planning energy-efficient energy supply systems, centralized/decentralized networks
Credit Points	2 CP
Module	R2 – Energy Supply

Course Title	Cable Based Energy Systems
Course Title (German)	Leitungsgebundene Energiesysteme
Language of In- struction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Summer semester only
Competen- cies/Learning Objectives	Energy supply systems on a local, national and European level; gaining an insight into the technical prerequisites and realities based on existing networks; discussing terms from the fields of power supply, gas and district heating; energetic designs
Topics/Course Contents	Explanation of energy supply systems (electricity, gas, district heating) in and for urban metropolitan areas. Technical links in the field of energy generation, redirection and usage, energy balances. Networks for the respective type of energy in Germany and integration into the European overall network. Load management
Credit Points	3 CP
Module	R2 – Energy Supply

Module Title	R3 – Recycling Management
Module Title (German)	R3 – Kreislaufwirtschaft
Language of In- struction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Summer semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Implementing the targets of recycling and waste management • Developing inventories and forecasts; conflict analyses and developing solutions in waste management for the German Laender and municipalities <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Waste Management • Corporate Resource Management

Course Title	Waste Management
Course Title (German)	Abfallwirtschaft
Language of In- struction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Summer semester only
Compenten- cies/Learning Objectives	Implementing the targets of recycling and waste management Developing inventories, forecasts Conflict analyses and developing solutions in waste management for the German Laender and municipalities
Topics/Course Contents	Targets and tasks of recycling and waste management – product responsi- bility, waste prevention, waste recycling, environmentally sustainable waste disposal, parties responsible for disposal, waste balances – legal definition, European Waste Catalogue, waste identification, waste analyt- ics and identification methods, waste statistics, company waste balances, waste management planning of the German Laender – legislation, quanti- tative balances and forecasting methods, waste management plans, au- thorization procedures, environmental reviews, quantitative balances and forecasting methods, waste disposal concepts, location search techniques, municipal cooperation, public private partnership, costs, municipal stat- utes, decision-making bases for choosing disposal plants (disposal provid- ers subject to public law) – material flow balances, emission balances, im- mission protection, water body protection, environmental impact assess- ment, evaluation
Credit Points	3 CP
Module	R3 – Recycling Management

Course Title	Corporate Resource Management
Course Title (German)	Betriebliches Ressourcenmanagement
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Summer semester only
Competencies/Learning Objectives	Implementing the targets of recycling and waste management Developing inventories and forecasts Conflict analyses and developing solutions in waste management for the German Laender and municipalities
Topics/Course Contents	Targets and tasks of corporate recycling management and waste disposal – product responsibility Resource efficiency, material flow management, environmental management, eco-audit Disposal obligations, environmentally sustainable disposal, market, specialist disposal firms Waste balances – legal definition, European Waste Catalogue, waste analytics and identification methods, Corporate waste balances, proof of waste disposal Corporate waste disposal concepts – quantitative balances and forecasting methods, disposal responsibility, costs, disposal concepts Choosing disposal plants of private disposal providers – material flow balances, emission balances, immission protection, water body protection, eco-audit, environmental impact assessment, evaluation Example cases
Credit Points	2 CP
Module	R3 – Recycling Management

Module Title	V1 – Traffic in Metropolitan Areas
Module Title (German)	V1 – Verkehr im Ballungsraum
Language of Instruction	German
Recom- mended Se- mester(s)	1, 2, 3
Module of- fered in	Winter semester only
Competen- cies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Understanding the complex relationships between the different types of traffic, politics and the needs of traffic participants • Understanding environmental impacts of traffic • Taking environmental issues into account in the different traffic planning phases • Knowing the methods for determining impacts: immission forecast air pollutants, immission forecast sound • Identifying the steps necessary for determination • Describing and evaluating environmental impacts: geographical barrier analysis/regional planning procedure, environmental reviews • Knowing environmental review processes • Evaluating the environmental impacts in the <i>Bundesverkehrswegeplan</i> (German Federal Transport Infrastructure Plan), when defining lines, during authorization and regional planning processes <p>Other competencies and skills (Communication and cooperation)</p> <p>Working in teams, presenting own results, weighing different targets</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Traffic Planning in Metropolitan Areas • Traffic and Environment

Course Title	Traffic Planning in Metropolitan Areas
Course Title (German)	Verkehrsplanung im Ballungsraum
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Winter semester only
Competencies/Learning Objectives	Understanding the complex relationships between the different types of traffic, politics and the needs of traffic participants Working in teams, presenting own results, weighing different targets
Topics/Course Contents	Interdependencies between local public transport and private transport, acceleration of local public transport, measures for reducing traffic emissions, integrated traffic concepts in metropolitan areas, urban design and traffic
Credit Points	3 CP
Module	V1 – Traffic in Metropolitan Areas

Course Title	Traffic and Environment
Course Title (German)	Verkehr und Umwelt
Language of In- struction	German
Recommended Semester(s)	1, 2, 3
Course offered in	Winter semester only
Competen- cies/Learning Objectives	Understanding the environmental impacts of traffic (in particular noise, ex- haust fumes, land use, barrier effects); taking environmental issues into account in the different traffic planning phases; knowing the methods for determining impacts: immission forecast air pollutants, immission forecast sound; identifying the steps necessary for determination; describing and evaluating environmental impacts: geographical barrier analysis/regional planning procedure, environmental reviews (among others strategic envi- ronmental assessment, environmental impact assessment, impact assess- ment for natural habitats, fauna and flora, impact regulation); knowing environmental review procedures; evaluating the environmental impacts in the <i>Bundesverkehrswegeplan</i> (German Federal Transport Infrastructure Plan), when defining lines, during authorization and regional planning pro- cesses
Topics/Course Contents	Seminar with orientation presentations, literature research, Internet re- search and example cases (projects, immission forecasts, investigation re- ports)/developing student contributions (presentation)/German
Credit Points	2 CP
Module	V1 – Traffic in Metropolitan Areas

Module Title	V2 – Transport and Traffic Demand Management
Module Title (German)	V2 – Management von Verkehr und Mobilität
Language of Instruction	German or English
Recommended Semester(s)	1, 2, 3
Module offered in	Winter semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Students develop comprehensive and integrated knowledge and understanding of the causes of mobility, of the emergence of traffic as well as of the repertoire of action in the field of traffic planning in order to influence mobility behavior and traffic streams. • Students are able to design complex transport services, e.g. local public transport, intermodal and multimodal services and road traffic installations, target-oriented and independently, taking into account the different perspectives and interests of operators, users and society. • Thereby, students apply the relevant technical methods (e.g. timetable scheduling, performance assessment, mobility management) and are able to apply them in unknown situations. <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Transport and Traffic Demand Management

Course Title	Transport and Traffic Demand Management
Course Title (German)	Management von Verkehr und Mobilität
Language of Instruction	German, English
Recommended Semester(s)	1, 2 ,3
Course offered in	Winter semester only
Competencies/Learning Objectives	The course contributes to the module's learning goals by developing the stated topics/content.
Topics/Course Contents	<ul style="list-style-type: none"> • Timetable scheduling for local public transport • Performance of road traffic installations • Traffic management strategies and instruments • Intermodal and multimodal services • Mobility management
Credit Points	5 CP
Module	V2 – Transport and Traffic Demand Management

Module Title	V3 – Urban Mobility Planning
Module Title (German)	V3 – Verkehrsentwicklungsplanung
Language of In- struction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Summer semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Understanding the interdisciplinary tasks and approaches in traffic planning • Knowing the fundamental procedures • Identifying the necessary courses of action for target-oriented application • Knowing basic data related to traffic planning • Knowing data analysis methods, traffic census methods, traffic calculation methods and methods for designing partial and overall transport schemes • Understanding the need for organizing traffic involving different means of transport • Having knowledge of data bases, calculation methods and interpretation of results for estimating the amount of traffic caused by planned types of usage • Understanding the connections between traffic planning and logistics parameters and processes <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Urban Mobility Planning

Course Title	Urban Mobility Planning
Course Title (German)	Verkehrsentwicklungsplanung
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Summer semester only
Competencies/Learning Objectives	The course contributes to the module's learning goals by developing the stated topics/content.
Topics/Course Contents	<ul style="list-style-type: none"> • Basic terms in mobility and traffic • Surveying and analyzing mobility parameters • Organizational and methodological basics of traffic planning • Analysis of transport services and travel demand • Development of targets and guiding principles in the field of traffic and mobility • Basics of macroscopic travel demand models • Participation procedures
Credit Points	5 CP
Module	V3 – Urban Mobility Planning

Module Title	I1 – Water Supply and Disposal
Module Title (German)	I1 – Wasserversorgung und -entsorgung
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Summer semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> Obtaining an overview of modern and sustainable infrastructure facilities for water supply and disposal <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> Water Supply and Disposal

Course Title	Water Supply and Disposal
Course Title (German)	Wasserversorgung und -entsorgung
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Summer semester only
Competencies/Learning Objectives	Acquiring a more detailed knowledge of infrastructure facilities for water supply and disposal with a solid understanding of their design, dimensioning, construction, operation and maintenance
Topics/Course Contents	Overview of infrastructure facilities for water supply, sewage disposal, rainwater treatment, sewage treatment and sludge treatment Basics of water volumes, water balances and water qualities Water saving measures and reuse of water in private and public households as well as in the industry Current methods of ground water management Comparing different concepts of sewage disposal Issues and technologies in emerging and developing countries
Credit Points	5 CP
Module	I1 – Water Supply and Disposal

Module Title	I2 – Risk Defence in Urban Areas
Module Title (German)	I2 – Gefahrenabwehr im Ballungsraum
Language of In- struction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Every year
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Knowing the legal basics and methods of and having the expert knowledge for drawing up and updating alarm and operation plans • Gaining detailed insights into the causes and effect mechanisms of natural disasters: storms, floods and earthquakes in metropolitan areas <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Warning Systems and Risk Defence • Risk Management / Natural Disasters

Course Title	Warning Systems and Risk Defence
Course Title (German)	Alarmpläne und Gefahrenabwehr
Language of In- struction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Every year
Competen- cies/Learning Objectives	Knowing the legal basics and methods of and having the expert knowledge for drawing up and updating alarm and operation plans
Topics/Course Contents	<p>According to the applicable disaster law of the German Laender, civil protection authorities are supposed to draw up and update disaster alarm and operation plans as a preparatory measure. Likewise, towns and municipalities are obliged to draw up their own plans that outline their contribution to combating disasters. The municipal plans have to be synchronized with the alarm and operation plans of the civil protection authorities.</p> <p>Alarm planning means that certain measures are planned and outlined in such a way that they can be triggered automatically and that no additional call for action on the side of operational command is needed. In particular, this includes alerting disaster relief forces quickly.</p> <p>The plans of action must prepare the tactical decisions of the operational command and their translation into mission orders. Therefore, these plans of action should regularly prepare and determine measures that are to be ordered and taken when combating disasters. They come into consideration if the sequence of events can be more or less foreseen in case of a disaster (e.g. in case of a flood).</p>
Credit Points	2 CP
Module	I2 – Risk Defence in Urban Areas

Course Title	Risk Management / Natural Disasters
Course Title (German)	Gefahrenabwehr / Naturkatastrophen
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Every year
Competencies/Learning Objectives	Gaining detailed insights into the causes and effect mechanisms of natural disasters: storms, floods and earthquakes in metropolitan areas
Topics/Course Contents	<p>Identifying natural disasters in metropolitan areas: storms, water (floods), earthquakes</p> <p>Methods for describing the effects and effect mechanisms of natural disasters:</p> <ul style="list-style-type: none"> • Global wind currents, global weather developments, global and local weather models, manifestations of storms, storm measuring scales, decisive parameters • Precipitation runoff processes, flood generation in drainage areas, extreme precipitation • Geological tectonics, earthquake measuring scales, decisive effect parameters <p>Methods for describing/quantifying/assessing natural disasters:</p> <ul style="list-style-type: none"> • Damage analysis in case of storms • Damage analysis in case of floods • Damage analysis in case of earthquakes • Methods for determining and evaluating damage potentials <p>Precautionary measures for surface areas, precautions against natural disasters taken in construction:</p> <ul style="list-style-type: none"> • Construction precautions against storms • Construction precautions against floods • Construction precautions against earthquakes <p>Principles of hazard prevention and behavioral precaution</p>
Credit Points	3 CP
Module	I2 – Risk Defence in Urban Areas

Module Title	I3 - Immission Protection / Natural Hazard Risks
Module Title (German)	I3 - Immissionsschutz / Umweltrisiken
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Every year
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Obtaining an overview of: • Significant risks for humans and the environment • Legal requirements and technical basics • Methods for identifying, describing and assessing natural hazards, protective measures, programs and projects • Acquiring specialized knowledge of: • Emission and immission technology • Air quality management <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Immission Protection • Valuation of Natural Hazard Risks

Course Title	Imission Protection
Course Title (German)	Immissionsschutz
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Every year
Competencies/Learning Objectives	Acquiring specialized knowledge of emission and immission technology Acquiring specialized knowledge of air quality management
Topics/Course Contents	Basics of air quality management, waste gas cleaning Basics of emission and immission technology State of the art measurement technology for inner-city air monitoring
Credit Points	2 CP
Module	I3 – Imission Protection / Natural Hazard Risks

Course Title	Valuation of Natural Hazard Risks
Course Title (German)	Bewertung von Risiken für Mensch und Umwelt
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Every year
Competencies/Learning Objectives	Obtaining an overview of - Significant risks for humans and the environment - Legal requirements and technical basics - Methods for identifying, describing and assessing natural hazards, protective measures, programs and projects
Topics/Course Contents	<ul style="list-style-type: none"> • Identifying, quantifying and assessing risks for humans and the environment, in particular in metropolitan areas and in particular risks related to water, soil and air: search grids and systematization, data requirements, evaluation approaches • Uncertainty and risk, estimation of risks and estimation of risk consequences: concepts and figures • State of knowledge of dangers to humans and the environment: <ul style="list-style-type: none"> ○ Water: extreme events (floods, storms, heavy rainfall) – definition of vulnerability, effects, damages ○ Soil: land use, land consumption, soil protection – goals, concepts, measuring efficacy ○ Air: damage categories, focal points of climate change policy, efficacy, implementation problems • Adaptation measures: political decision-making based on uncertain knowledge, adaptation costs and benefits • Sustainability concept and sustainability assessment • Evaluating projects and programs: legal basis, requirements, evaluation methodology, evaluation procedures: Comparative cost method, methods for cost-utility analysis, cost-benefit analysis, and combined methods
Credit Points	3 CP
Module	I3 – Immission Protection / Natural Hazard Risks

Module Title	W1 – Water Management
Module Title (German)	W1 – Wasserwirtschaft
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Winter semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Understanding environmental management systems and instruments; knowing central foundations and aspects; understanding methodological derivation and technical scientific justification; understanding application • Acquiring basic and more detailed knowledge of the contribution of environmental compatibility assessment to environmental reviews (environmental impact assessment of plans (strategic environmental assessment), environmental impact assessment of projects) • Acquiring and developing methodological competence for determining and describing environmental impacts • Acquiring and developing methodological competence for assessing environmental impacts and for finding alternatives • Having the competence for monitoring/supporting administrative procedures <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Catchment Area Management • Environmental Chemistry

Course Title	Catchment Area Management
Course Title (German)	Flussgebietsmanagement
Language of In- struction	German
Recommended Semester(s)	1, 2, 3
Course offered in	Winter semester only
Competen- cies/Learning Objectives	Ability to derive objectives, consequences and measures from manage- ment and action plans for urban spaces in the respective sphere of activity. Ability to co-create management and action plans as well as flood risk management plans for urban spaces.
Topics/Course Contents	The importance of the European Water Framework Directive and of the Eu- ropean Directive on the Assessment and Management of Flood Risks for water management in urban areas is illustrated. Different methods and ef- forts for taking inventories (e.g. threat assessment/conflict analysis) are presented. The structure and content of management plans (water supply, wastewater concepts, water energy usage and agriculture) as well as ac- tion plans/flood risk management plans are developed.
Credit Points	2 CP
Module	W1 – Water Management

Course Title	Environmental Chemistry
Course Title (German)	Umweltchemie
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Winter semester only
Competencies/Learning Objectives	Acquiring state-of-the art knowledge of substances relevant for the environment, gaining an overview of classical compounds in environmental media Knowing current determination methods including sampling, sample preparation, analytics and validity of results
Topics/Course Contents	Overview of current environmentally relevant chemicals in environmental media (water, soil, air), e.g. perfluorinated tensides, organotin compounds, human medicine and veterinary medicine pharmaceuticals, antibiotics, etc. Environmentally relevant impacts of organic and inorganic pollutants, e.g. smoke, plant treatment products and pesticides, organic solvents, halogenated compounds, fine dust, radioactive substances, etc. Determining selected parameters in the water engineering laboratory of the faculty and conducting monitoring at the <i>Wellritzbach</i> (Wellritz creek); Overview of antibiotic resistances, food intolerances, illnesses and environmental phenomena (WHO)
Credit Points	3 CP
Module	W1 – Water Management

Module Title	W2 – Sustainable Water Management in Settlements
Module Title (German)	W2 – Nachhaltige Siedlungswasserwirtschaft
Language of Instruction	German or English
Recommended Semester(s)	1, 2, 3
Module offered in	Summer semester only
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> Gaining an overview of ecological and social aspects of water management in settlements <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> Sustainable Water Management in Settlements

Course Title	Sustainable Water Management in Settlements
Course Title (German)	Nachhaltige Siedlungswasserwirtschaft
Language of Instruction	German, English
Recommended Semester(s)	1, 2,3
Course offered in	Summer semester only
Competencies/Learning Objectives	<p>Skills/learning goals in part "Industrial Pollution Control": Gaining an overview of industrial pollutions and strategies against them, knowing the common management concepts Gaining an insight into industrial wastewater treatment Excursion to INFRASERVE industrial wastewater treatment plant</p> <p>Skills/learning goals in part "Water-Sensitive Planning": Gaining an overview of rehabilitation reasons and methods</p>
Topics/Course Contents	<p>Topics/content in part "Industrial Pollution Control": Overview of classical environmental impacts of industrial activities Introduction to organic and inorganic industrial pollutions and their impact on environmental media (water, soil, air) Legal bases on different levels (EU, Germany, German Laender, etc.) Overview of mechanical, biological and chemical treatment stages during the treatment of industrial wastewater both of direct dischargers and indirect dischargers Management concepts in industrial enterprises</p> <p>Topics/content in part "Water-Sensitive Planning": Water consumption and saving measures, influence of climate change on water management Flood protection and hydraulic spillways in towns Legal bases connected to necessary rehabilitation measures in environmental engineering, e.g. water management in settlements, drinking water pipelines, sewage ducts Reasons for rehabilitation facilities Overview of rehabilitation technologies and more detailed discussion of selected areas, e.g. losses in high-pressure pipelines, damage patterns in ducts, etc.</p>
Credit Points	5 CP
Module	W2 – Sustainable Water Management in Settlements

Module Title	W3 – Water Management Models
Module Title (German)	W3 – Wasserwirtschaftliche Modelle
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Only on demand
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Simulation models: gaining an overview of theoretical basics, knowing possible applications, knowing application limits • Knowing the basics of hydrometry and hydraulic research, model laws, uncertainty analysis <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> • Water Management Models

Course Title	Water Management Models
Course Title (German)	Wasserwirtschaftliche Modelle
Language of Instruction	German
Recommended Semester(s)	1, 2 ,3
Course offered in	Only on demand
Competencies/Learning Objectives	Gaining an overview of the theoretical basics of simulation models, knowing possible applications of simulation models, knowing the application limits of simulation models Knowing the basics of hydrometry and hydraulic research, model laws, uncertainty analysis
Topics/Course Contents	Complex natural processes are more and more often reproduced with the help of simulation models. A large number of early warning and forecasting systems (flood, storm, fire) make use of these tools for extrapolating natural events. In case of a large number of natural processes, the simulation using models cannot be replaced despite the application of numerical models; numerical and physical models complement each other.
Credit Points	5 CP
Module	W3 – Water Management Models

Module Title	W4 – Watercourse Development for Implementing Water Framework Directive
Module Title (German)	W4 – Gewässerentwicklung zur Umsetzung der Wasserrahmenrichtlinie
Language of Instruction	German
Recommended Semester(s)	1, 2, 3
Module offered in	Every year
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> Knowing the different methods and measures for near-natural water body management and development <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	5 CP
Module Courses	<ul style="list-style-type: none"> Watercourse Development for Implementing Water Framework Directive

Course Title	Watercourse Development for Implementing Water Framework Directive
Course Title (German)	Gewässerentwicklung zur Umsetzung der Wasserrahmenrichtlinie
Language of Instruction	German
Recommended Semester(s)	1, 2,3
Course offered in	Winter semester only
Competencies/Learning Objectives	Knowing the different methods and measures for near-natural water body management and development
Topics/Course Contents	<ul style="list-style-type: none"> • Principles of water body maintenance and development, legal framework for an ecologically-oriented water body management and maintenance • Bed and gully erosion in flowing waters • Water body maintenance and development in urban areas • Dead wood in flowing water – ecological importance and significance for water management • Using dead wood in water body development, practical examples • Practice – dealing with dead wood • Ecologically-oriented maintenance of trenches with exercise examples • Neophytes, alien plants at water bodies, handling, regulation options and consequences for maintenance • Damage of water bodies caused by animals and consequences for maintenance, based on the examples of beavers, musks and nutrias • Principles for restoring linear patency in flowing waters • Structural improvement of flowing waters for fish, mode of life of local fish, endangerments and measures for developing habitats • Exemplary ecomorphological measures for improving the habitat quality of water bodies for fish • Alder decline caused by Phytophthora at flowing waters • Shoulders (water body development corridors) at water bodies, definition, functions, planning principles, implementation, maintenance, practice examples • Significance and function of native streamside trees at water bodies • Wood planting and maintenance work at water bodies • The biology of pastures for water body maintenance • Particularities of water body maintenance in protected areas, with examples • Intersection constructions – small flowing waters crossing forest and field paths • Exemplary water body inspection

Credit Points	5 CP
Module	W4 – Watercourse Development for Implementing Water Framework Directive

Module Title	IP – Interdisciplinary Project
Module Title (German)	IP – Interdisziplinäres Projekt
Language of Instruction	German or English
Recom- mended Se- mester(s)	3
Module of- fered in	Every semester
Competen- cies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Cooperating across disciplines • Analyzing and differentiating environmental concerns, quality targets and standards • Gaining insights into independent scientific and methodological work • Inferring science-based criteria and norms • Acquiring methodological skills • Conducting scientific research • Assessing specific cases • Analyzing problems • Diagnosing and developing targets • Analyzing processes • Developing individual planning statements • Reviewing acquired knowledge • Connecting technical knowledge, methodological skills and process control • Classifying and comparing instruments related to and relevant for environmental protection and open spaces as well as strategic environmental assessment and environmental impact assessment • Reflecting a planning process • Discursive practices • Qualifying for managerial positions • Qualifying for process control <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	10 CP
Module Courses	<ul style="list-style-type: none"> • Interdisciplinary Project

Course Title	Interdisciplinary Project
Course Title (German)	Interdisziplinäres Projekt
Language of Instruction	German, English
Recommended Semester(s)	3
Course offered in	Every semester
Competencies/Learning Objectives	Cooperating across disciplines; analyzing and differentiating environmental concerns, quality targets and standards; gaining insights from personal scientific and methodological work; inferring science-based criteria and norms; acquiring methodological skills; conducting scientific research; assessing specific cases; analyzing problems; diagnosing and developing targets; analyzing processes; developing own planning statements; reviewing acquired knowledge; connecting technical knowledge, methodological skills and process control; classifying and comparing instruments related to and relevant for environmental protection and open spaces as well as strategic environmental assessment and environmental impact assessment; reflecting a planning process; discursive practices; qualifying for managerial positions; qualifying for process control
Topics/Course Contents	<ul style="list-style-type: none"> Analyzing interdisciplinary targets and tasks in a multi-functional and complex way; differentiating concerns, functions and tasks; developing different technical targets and subtasks; synthesizing common tasks and concerns; singling out environmental issues and environmental quality targets; taking artistic and aesthetic aspects into account; recognizing different user requirements; working on a specific planning case in the Rhine-Main metropolitan area; examining tasks throughout all planning stages; cooperating with institutions and project initiators; planning law and environmental law relevant for the project; planning landscapes and open spaces as well as environmental review and landscape conservation plan/impact regulation; responsibilities and decision-making; defining targets and assessment criteria; planning process, procedural management, partnerships and participation; assessing projects; conducting research; implementation; economic framework conditions; social aspects; moderation/mediation tasks; modularization; environmental management; controlling; evaluation; property rights; public law and private law relevant for the project Usually with environmental review case illustrations
Credit Points	10 CP
Module	IP – Interdisciplinary Project

Module Title	T – Master’s Thesis
Module Title (German)	T – Master-Thesis
Language of Instruction	German or English
Recommended Semester(s)	4
Module offered in	Every semester
Competencies	<p>Subject-specific and methodological competencies and skills (Knowledge and understanding as well as applying and generating knowledge)</p> <ul style="list-style-type: none"> • Working in a scientifically sound way • Structuring a defined topic • Solving problems based on science and methodological deduction • Researching and learning about a profound subject-specific topic independently, reflecting the topic in detail • Systematizing a given topic • Thinking creatively and productively • Problem orientation and science-based problem solving • Researching necessary subject literature • Ability to analyze and synthesize • Challenging facts, methods and backgrounds critically • Ability to conduct research <p>Other competencies and skills (Communication and cooperation)</p> <p>The acquisition of other competencies and skills is integrated into the module</p>
Credit Points	30 CP
Module Courses	<ul style="list-style-type: none"> • Master’s Thesis

Course Title	Master's Thesis
Course Title (German)	Master-Thesis
Language of Instruction	German, English
Recommended Semester(s)	4
Course offered in	Every semester
Competencies/Learning Objectives	<p>Working in a scientifically sound way</p> <p>Structuring a defined topic</p> <p>Solving problems based on science and methodological deduction</p> <p>Researching and learning about a profound subject-specific topic independently, reflecting the topic in detail</p> <p>Systematizing a given topic</p> <p>Thinking creatively and productively</p> <p>Problem orientation and science-based problem solving</p> <p>Researching necessary subject literature</p> <p>Ability to analyze and synthesize</p> <p>Challenging facts, methods and backgrounds critically</p> <p>Ability to conduct research</p>
Topics/Course Contents	<p>Determined by the thesis topic and task</p> <p>Theme determined by focus of curriculum</p>
Credit Points	30 CP
Module	T – Master's Thesis