



Universität Stuttgart

Modulhandbuch
Studiengang Master of Science Infrastructure Planning
Prüfungsordnung: 2012

Sommersemester 2015
Stand: 08. April 2015

Universität Stuttgart
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Präambel

Präambel (Preamble):

Nachhaltige Landnutzung und Siedlungsentwicklung für eine wachsende Weltbevölkerung, eine innovative Energieversorgung um den Klimawandel zu verlangsamen und angemessen auf seine weltweit zu erwartenden negativen Auswirkungen reagieren zu können sowie die Erhaltung der natürlichen Ressourcen als Basis terrestrischer und aquatischer Ökosysteme bei immer stärkerer Beanspruchung durch menschliche Nutzungen, stellen wichtige Aufgabenbereiche der Infrastrukturplanung dar. Hinzu kommen klassische Aufgaben im Bereich des Bauingenieurwesens für Verkehrswege, soziale Infrastruktur, Wasser- und Energieversorgung, etc.

Die vielfältigen Probleme der Abwägung von Ressourcenschutz einerseits und steigenden Entwicklungsansprüchen andererseits sowie den damit verbundenen politischen und sozialen Herausforderungen erfordern den Einsatz interdisziplinär ausgebildeter Planungsexperten, die im zunehmend regionen- und länderübergreifenden Kontext auch interkulturelle Aspekte ihrer Arbeit berücksichtigen müssen. Hier liegt der Schwerpunkt des Masterstudiengangs Infrastructure Planning.

Die im englischsprachigen internationalen Masterstudiengang Infrastructure Planning (MIP) ausgebildeten Ingenieurinnen und Ingenieure:

- haben Basiskenntnisse über alle maßgeblichen Teilbereiche der Infrastrukturplanung und verstehen deren grundlegende natur- und ingenieurwissenschaftliche Zusammenhänge,
- kennen die Methoden zur Entwicklung von raumplanerischen Konzepten, haben aber gleichzeitig die Fähigkeiten diese zu bewerten und sie durch geeignete technische Maßnahmen und Installationen zu implementieren
- können die Probleme durch und im Umgang mit Infrastrukturmaßnahmen abschätzen, erkennen und bewerten sowie dafür notwendige analytische, modellhafte und experimentelle Untersuchungen planen und durchführen,
- verfügen über die ingenieurwissenschaftliche Fertigkeit zur Entwicklung, zur Planung und zum Betrieb von Infrastrukturprojekten und kennen dabei auch die nicht-technischen Auswirkungen ihrer Tätigkeit,
- verfügen über die Kompetenzen zur organisatorischen und verwaltungsmäßigen Umsetzung von Infrastrukturmaßnahmen,
- können Aufgaben mit interdisziplinärem und internationalem Charakter vor dem Hintergrund kultureller, wirtschaftlicher und politischer Rahmenbedingungen im Team bearbeiten,
- verfügen über eine hohe wissenschaftliche Qualifikation.

100 Vertiefungsmodule

Zugeordnete Module:	15160	Water and Power Supply
	19120	Sanitary Engineering
	34420	Regional and Urban Planning II
	50330	Regional and Urban Planning I
	50500	General Aspects of Infrastructure Planning
	50510	Statistics and GIS
	50520	Environmental Aspects
	50540	Transport Planning and Modelling
	50550	Case Study

Modul: 50550 Case Study

2. Modulkürzel:	021320013	5. Moduldauer:	1 Semester
3. Leistungspunkte:	12.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	8.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Univ.-Prof. Markus Friedrich		
9. Dozenten:	<ul style="list-style-type: none"> • Manfred Wacker • Richard Junesch • Markus Friedrich • Marion Aschmann • Stefan Siedentop • Philipp Misselwitz 		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Vertiefungsmodule		
11. Empfohlene Voraussetzungen:			
12. Lernziele:	<p>The students will gain insight into an integrated approach to infrastructure planning, covering the following topics:</p> <ul style="list-style-type: none"> • Regional Development Planning • Urban Planning and Design • Transport • Ecology • Socio-Economic Aspects 		
13. Inhalt:	<p>The students practice integrated infrastructure planning skills and apply theoretical knowledge in a real life situation. They gain experience in data processing and analysis by developing a conceptual framework for use in an integrated planning process. The students will work in groups with data on the study area, which will be located in the Stuttgart Region. Topic specific planning guidelines will be developed, as well as scenario specific visions and land use plans. An interdisciplinary team of lecturers will be available for the students during the whole working period. The students have to fulfil the following deliverables:</p> <ul style="list-style-type: none"> • Mission statement, objectives and evaluation scheme (phase 1) • “Jobs and housing allocation scheme” and regional transport plan for the study area (phase 2) • Implementation plan and local transport plan (phase 3) • Final report, including several maps 		
14. Literatur:			
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 505501 Vorlesung Case Study • 505502 Übung Case Study • 505503 Präsentation Case Study 		
16. Abschätzung Arbeitsaufwand:	Sum 360h		
17. Prüfungsnummer/n und -name:	<ul style="list-style-type: none"> • 50551 Case Study (BSL), schriftlich und mündlich, Gewichtung: 1.0 • 50552 Case Study (USL), schriftlich, eventuell mündlich, Gewichtung: 1.0 		
18. Grundlage für ... :			
19. Medienform:			

20. Angeboten von:

Modul: 50520 Environmental Aspects

2. Modulkürzel:	011000801	5. Moduldauer:	2 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, SoSe
4. SWS:	6.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Hans-Georg Schwarz-von Raumer		
9. Dozenten:	<ul style="list-style-type: none"> • Hans-Georg Schwarz-von Raumer • Silke Wieprecht • Antje Stokman • Damian Vogt 		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Vertiefungsmodule		
11. Empfohlene Voraussetzungen:			
12. Lernziele:	<p>The students have basic knowledge of environmental aspects in infrastructure planning concerning soils, species and biotopes, air quality and hydro systems. They know how to include environmental aspects in spatial planning and to assess environmental impacts of strategies and projects. They are aware and have gained skills in</p> <ul style="list-style-type: none"> • ecological analysis methods (e.g. land suitability) • how to use Models, computer tools and geographical information systems (GIS) • and Environmental Impact Assessment <p>The students have first experiences in project exercises.</p>		
13. Inhalt:	<p>A: Lecture "Ecological aspects of infrastructure planning" Introduction to the environment factors and goods: geological resources, species and biotopes, ecosystem functioning, Air quality, hydrosystems, impact of land use systems (especially agriculture and urbanisation, ecological landscape design. B: Seminar "Environmental impact assessment" In the seminar students have the task to prepare a presentation and a paper about:</p> <ul style="list-style-type: none"> • Structuring and evaluation of environmental impacts of strategies and projects • Legislative aspects • Modelling and evaluation methods • Tools for impact modelling • Case study examples <p>Alternatively the students work on case study exercises covering strategic regional and urban planning as well as road, housing, industrial, water, sports, tourism and other infrastructure projects</p>		
14. Literatur:	Information will be provided during the lectures Additional material can be downloaded from ILIAS		
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 505201 Vorlesung Ecological aspects of infrastructure planning • 505202 Seminar Environmental impact assessment 		
16. Abschätzung Arbeitsaufwand:	Sum 204 h		
17. Prüfungsnummer/n und -name:	<ul style="list-style-type: none"> • 50521 Environmental Aspects (PL), schriftliche Prüfung, 120 Min., Gewichtung: 1.0 		

-
- V Vorleistung (USL-V), schriftliche Prüfung
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18. Grundlage für ... :

19. Medienform:

20. Angeboten von:

Modul: 50500 General Aspects of Infrastructure Planning

2. Modulkürzel:	021320010	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	6.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Univ.-Prof. Markus Friedrich		
9. Dozenten:	<ul style="list-style-type: none"> • Frank Clemens Englmann • Markus Friedrich • Antje Stokman 		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Vertiefungsmodule		
11. Empfohlene Voraussetzungen:			
12. Lernziele:	The students understand the general planning process and can apply it for the purpose of integrating land use planning, urban planning and transport planning. They are familiar with fundamental economic aspects of infrastructure planning.		
13. Inhalt:	<p>The lecture „Introduction to Integrated Planning“ addresses the problem of incorporating regional/ urban planning, water management, landscape planning, and transport planning in an integrated planning process. The challenges and methodologies of an integrated planning process are described from the perspective of different disciplines. External practitioners present approaches from their field of work. The students also learn how to write scientific reports and how to prepare and give a presentation. The lecture Economic Aspects of Infrastructure Planning covers the following topics:</p> <ul style="list-style-type: none"> • Ten Principles of Economics • Thinking like an Economist • The Market Forces of Supply and Demand • Elasticity and Its Application • Consumers, Producers, and the Efficiency of Markets • Externalities • Public Goods, Common Resources, Cost-Benefit Analysis and Economic Infrastructure • The Costs of Production • Firms in Competitive Markets • Monopoly • Externalities and Urban Planning • Employment and Commercial Centres • Location Requirements for Commercial Centres • Land Suitability Analysis for Commercial Centres 		
14. Literatur:			
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 505001 Vorlesung und Übung Introduction to Integrated Planning • 505002 Vorlesung Economic Aspects of Infrastructure Planning 		
16. Abschätzung Arbeitsaufwand:	Attendance time lecture: 40h Attendance time exercise: 14h Essay: 40h Self study time: 66h Total: 180h		

17. Prüfungsnummer/n und -name:

- 50501 General Aspects of Infrastructure Planning (PL), schriftliche Prüfung, 60 Min., Gewichtung: 1.0
- V Vorleistung (USL-V), schriftliche Prüfung

18. Grundlage für ... :

19. Medienform:

20. Angeboten von:

Modul: 50330 Regional and Urban Planning I

2. Modulkürzel:	021100010	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Univ.-Prof. Jörn Birkmann		
9. Dozenten:	<ul style="list-style-type: none"> • Jörn Birkmann • Astrid Ley 		
10. Zuordnung zum Curriculum in diesem Studiengang:	<p>M.Sc. Infrastructure Planning, PO 2012 → Vertiefungsmodule</p> <p>M.Sc. Infrastructure Planning, PO 2012 → Zusatzmodule</p>		
11. Empfohlene Voraussetzungen:			
12. Lernziele:	<p>The students understand the major challenges, objectives, strategies and instruments in spatial planning and urban development in Europe as well as in developing countries. The students are acquainted with the legal framework of comprehensive and sector planning and know the capabilities and limits of public planning as “positive” and “negative” planning.</p>		
13. Inhalt:	<p>The course Regional Planning I covers the following topics:</p> <ul style="list-style-type: none"> • Overview on current planning issues • Basic Terms of Spatial Planning • Strategies in Spatial Planning • Instruments of Spatial Planning • Performance of Plans, Assessing Plans <p>The course Urban Planning I provides an overview on the origin of planned urban development, starting in Greece and the Roman Empire, passing through all important periods up to the 21st century. The second part introduces urbanisation processes in third world countries, planned and unplanned urban conglomerations, including Mega Cities and Global Cities.</p>		
14. Literatur:	<p>Berke, P.R. et al. (2006): Urban Land Use Planning. Urbana/Chicago: University of Illinois Press</p> <p>Hall, P. (2002): Urban and Regional Planning. New York: Routledge</p>		
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 503301 Lecture Regional Planning I • 503302 Lecture Urban Planning I 		
16. Abschätzung Arbeitsaufwand:	<p>Time of attendance: approx. 45 hours</p> <p>Private Study: approx. 135 hours</p>		
17. Prüfungsnummer/n und -name:	<p>50331 Regional and Urban Planning I (PL), schriftliche Prüfung, 120 Min., Gewichtung: 1.0</p>		
18. Grundlage für ... :			
19. Medienform:			
20. Angeboten von:			

Modul: 34420 Regional and Urban Planning II

2. Modulkürzel:	-	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, SoSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Univ.-Prof. Jörn Birkmann		
9. Dozenten:	<ul style="list-style-type: none"> • Jörn Birkmann • Astrid Ley • Stefan Fina • Torsten Welle 		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Vertiefungsmodule		
11. Empfohlene Voraussetzungen:	prerequisite modules: Regional and Urban Planning I		
12. Lernziele:	<p>The students are acquainted with basic methods of analysis and assessment in spatial planning. The students are able to cope with function, prerequisites and methodical problems of the methods presented. The lectures demonstrate the usage of planning instruments and methods based on planning cases from Germany and other countries.</p>		
13. Inhalt:	<p>The course Regional Planning II deals with the following planning methods:</p> <ul style="list-style-type: none"> • Indicator-based monitoring and evaluation methods • Multi-criteria decision analysis (e.g. cost-benefit analysis, utility value analysis, analytic hierarchy process) • Methods of impact assessment • Techniques of demand forecast and land suitability analysis • Hazard and vulnerability analysis (climate change adaptation) <p>The course Urban Planning II gives an overview on:</p> <ul style="list-style-type: none"> • Levels of spatial planning in urban areas • Urban development planning • Urban analysis • Urban renewal • Urban planning instruments • Land use planning and implementation planning • Legal framework 		
14. Literatur:	Skript "Regional and Urban Planning II"		
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 344201 Vorlesung Regional Planning II • 344202 Vorlesung Urban Planning II 		
16. Abschätzung Arbeitsaufwand:	Time of attendance: approx. 45 hours Private Study: approx. 120 hours		
17. Prüfungsnummer/n und -name:	<ul style="list-style-type: none"> • 34421 Regional Planning II (PL), schriftliche Prüfung, 60 Min., Gewichtung: 1.0 • 34422 Urban Planning II (PL), schriftliche Prüfung, 60 Min., Gewichtung: 1.0 		
18. Grundlage für ... :			
19. Medienform:	Optional		

20. Angeboten von:

Modul: 19120 Sanitary Engineering

2. Modulkürzel:	021220012	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Klaus Fischer		
9. Dozenten:	<ul style="list-style-type: none"> • Klaus Fischer • Heidrun Steinmetz 		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012, 1. Semester → Vertiefungsmodule		
11. Empfohlene Voraussetzungen:			
12. Lernziele:	<p>The students have detailed knowledge about waste avoidance procedures in household and industry. Waste avoidance includes the ecology - oriented daily shopping, the substitution of contaminated materials in the industrial production as well as the Zero Emission Society. In the case of unavoidable waste fractions, the students acquire the competence to establish collection and transportation systems for these wastes, within the logistic, economic and legal frame. Main emphasis is given to the collection of recyclables. The students know the relevant factors which influence the waste amount and waste composition in general and in particular within the separate collection of recyclables. The students are acquainted with the state of the art of recycling technologies for separate collected paper, glass, metal and plastic including the pretreatment process.</p> <p>They have knowledge of the aerobic and anaerobic treatment and utilization of separate collected biowaste. Not avoided and recycled waste has to be treated before disposing off e.g. in a landfill site. The students possess a general knowledge of the mechanical and biological treatment technology as well as of the thermal waste treatment. They are able to evaluate the different treatment and recycling processes from an ecological and economic point of view. The students have knowledge about the most important components of the urban drainage and the basic treatment processes of wastewater. Thus they are able to compare different systems in dependence of changing boundary conditions and assess the effectiveness and pros and cons of the systems, e.g. concerning impacts on the environment, economical and operational aspects. They obtain an understanding for system connections between the urban drainage system and the wastewater treatment system as well as between the urban water system and the environment.</p>		
13. Inhalt:	<p>Solid Waste Management:</p> <ul style="list-style-type: none"> • Waste generation and waste composition • National and international regulations for waste • Waste avoidance • Collection and transport of waste • Separate collection of recyclables • Sorting of recyclables • Recycling technologies for paper, glass, metal, plastic • Biological treatment of waste • Waste Disposal • Ecological indicator systems <p>Waste Water Technology:</p>		

- Basics of urban drainage and municipal wastewater treatment
- Quantity and Composition of Wastewater
- Urban drainage systems
- stormwater treatment
- mechanical wastewater treatment
- biological wastewater treatment
- sludge treatment
- natural close and ECOSAN systems

14. Literatur:	Lecture Manuscripts Solid Waste Management G. Tchobanoglous et. Al.: Handbook of solid waste management; Biliteski, B. et.al.: Waste Management, Springer 1994 ISBN: 3-540-59210-5 Butler, D., Davies, J.W: .Urban drainage, Spon press London, Henze, M., Harremoes, J., la Coour Jansen, J., Arvin, E: Wastewater treatment. Springer Verlag Berlin
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 191201 Vorlesung Solid Waste Management • 191202 Vorlesung Waste Water • 191203 Exkursion Sanitary Engineering
16. Abschätzung Arbeitsaufwand:	Time of attendance: I Solid Waste Management, lecture: 2.0 SWS = 28 hours II Waste Water: 2 SWS = 28 hours excursion: 12 hours exam: 2 hours sum of attendance: 70 hours self-study: 110 hours total: 180 hours
17. Prüfungsnummer/n und -name:	<ul style="list-style-type: none"> • 19121 Solid Waste Management and Waste Water Technology (PL), schriftliche Prüfung, 120 Min., Gewichtung: 1.0 • V Vorleistung (USL-V), schriftlich, eventuell mündlich
18. Grundlage für ... :	<ul style="list-style-type: none"> • 19310 Urban Drainage and Design of Wastewater Treatment Plants • 19330 Industrial Waste Water
19. Medienform:	
20. Angeboten von:	

Modul: 50510 Statistics and GIS

2. Modulkürzel:	021430002	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	6.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Johannes Riegger		
9. Dozenten:	<ul style="list-style-type: none"> • Johannes Riegger • Volker Walter 		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Vertiefungsmodule		
11. Empfohlene Voraussetzungen:	Basic computer knowledge		
12. Lernziele:	<p>Lecture/Exercises A: „Statistics and Information Processing“ Basic knowledge in descriptive statistics and their applications. Skills in information processing like data base management and spreadsheet calculations. This comprises design and handling of relational databases as well as spreadsheet calculations for statistical analyses and simulations.</p> <p>Lecture/Exercises B: „Introduction to GIS“</p>		
13. Inhalt:	<p>Content Lecture/Exercises A: „Statistics and Information Processing“</p> <ul style="list-style-type: none"> • Database design, generation and management • Use of database operations for statistics • Descriptive statistics • Random variables, probability distributions • Discrete distributions • Continuous distributions • Spreadsheet calculations for statistical analyses and simulations <p>Content Lecture/Exercises B: „Introduction to GIS“</p> <ul style="list-style-type: none"> • Definition and Examples • GIS Components • Data Acquisition Techniques Overview • Photogrammetry and Remote Sensing • Secondary Data Acquisition • Data Modelling • Data Analysis • GIS Data Presentation / Cartography 		
14. Literatur:	<ul style="list-style-type: none"> • J. Riegger: Script of the Lecture, Manuals: Excel, Access • Volker Walter: <p>Script of the Lecture, Podcasts</p>		
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 505101 Vorlesung Statistics and Information Processing • 505102 Vorlesung Introduction to GIS 		
16. Abschätzung Arbeitsaufwand:	Sum 180h		
17. Prüfungsnummer/n und -name:	50511 Statistics and GIS (PL), schriftliche Prüfung, 150 Min., Gewichtung: 1.0		
18. Grundlage für ... :			

19. Medienform:

20. Angeboten von:

Modul: 50540 Transport Planning and Modelling

2. Modulkürzel:	021320011	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, SoSe
4. SWS:	4.5	7. Sprache:	Englisch
8. Modulverantwortlicher:	Univ.-Prof. Markus Friedrich		
9. Dozenten:	<ul style="list-style-type: none"> • Markus Friedrich • Ullrich Martin 		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Vertiefungsmodule		
11. Empfohlene Voraussetzungen:			
12. Lernziele:	<p>The students understand the main characteristics of various transport systems and modes, including slow modes, car, public transport, inland waterways and air transport. They are familiar with the fundamental concepts of transport planning and modelling considering the specific situation in developing countries.</p>		
13. Inhalt:	<p>The lectures and exercises cover the following topics:</p> <ul style="list-style-type: none"> • introduction to transportation planning • transportation planning process • data collection and surveys • land use and travel demand# • travel demand forecasts • trip distribution and mode choice • traffic assignment and supply analysis • road network planning • public transport planning • railway planning (special aspects of railway transport, structure of tracks, planning of routes) • railway operation (basic terms of railway operation, basics of spacing trains, determination of capacity, aspects of scheduling) • inland waterways (special aspects of inland navigation, structure of waterways, planning of waterways) • airports (special aspects of aviation, structure of aerodromes, planning of airports) • transport policy concepts <p>The exercises on transport modelling introduce the students to software for travel demand forecasting models:</p> <ul style="list-style-type: none"> • building a network model (nodes, links, public transport lines, centroids), calculating indicator matrices (skims) describing the service quality • trip generation from land-use data, • trip distribution and mode choice, • assignment for private and public transport, • methods to analyse a transport network (node flows, selected link analysis), • data transfer to and from GIS via shapefiles. 		
14. Literatur:	<ul style="list-style-type: none"> • Friedrich, M.: Transport Planning and Modelling, Reader • Martin, U: Script of the Lecture 		

	<ul style="list-style-type: none"> • Ben-Akiva, M., Lerman, St.: Discrete Choice Analysis: Theory and Application to Travel Demand. The MIT Press, Cambridge Massachusetts, London, 1987. • Ortúzar, J. D., Willumsen, L. G: Modelling Transport, Wiley, Chichester, 1990. • Armstrong, J. H.: Railroad - What it is, what it does • Cescotti, R.: Aerospace Dictionary with Aerospace Definitions • Elms, C. P.(ed.): Dictionary of Public Transport • Mehlhorn, G. (ed.): Verkehr - Straße, Schiene, Luft • Pacht, J: Railway Operation and Control • Lattermann, E.: Wasserbau-Praxis Band 2 • Vuchic, V.: Urban Public Transportation
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 505401 Vorlesung Transport Planning and Modelling • 505402 Übung Transport Planning • 505403 Übung Transport Modelling
16. Abschätzung Arbeitsaufwand:	Attendance time lecture: 28h Attendance time exercise: 28h Excursion: 32h Self study time: 92h Total: 180h
17. Prüfungsnummer/n und -name:	50541 Transport Planning and Modelling (PL), schriftliche Prüfung, 120 Min., Gewichtung: 1.0
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Verkehrsplanung und Verkehrsleittechnik

Modul: 15160 Water and Power Supply

2. Modulkürzel:	021410105	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	0.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Markus Noack		
9. Dozenten:	<ul style="list-style-type: none"> • Ralf Minke • Markus Noack 		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Vertiefungsmodule		
11. Empfohlene Voraussetzungen:	None		
12. Lernziele:	<p>Power Demand, Supply and Distribution:</p> <p>The students...</p> <ul style="list-style-type: none"> • know the German, European and worldwide energy markets related to demand, supply and its distribution capabilities • are aware of that non-renewable energy sources are strictly limited and time-scales for conversion of energy markets long • have an idea about the relations between energy, politics, social changes and influences on environment • have a basic knowledge about present energy conversion systems, theoretical limits of efficiencies, and the potential to enhance applied technology • have a basic understanding about where and how energy is provided and distributed • comprehend the balance between load and supply in electrical grids and the resulting necessity for control energy. <p>Water Demand, Supply and Distribution:</p> <p>The students...</p> <ul style="list-style-type: none"> • know the German and worldwide water systems related to demand, supply and its distribution capabilities • have an overview on the water supply situation all over the world. • recognize the different possibilities and levels of water supply • have an idea of the relations between water, politics, social changes and influences on environment. 		
13. Inhalt:	<p>Power Demand, Supply and Distribution:</p> <ul style="list-style-type: none"> • Energy demand, energy supply • Energy generation <ul style="list-style-type: none"> - overview of different types of power plants - renewable energy - thermal power plants (conventional and nuclear) • Areas of application of different power plants • Emission control techniques • Cooling of thermal power plants <ul style="list-style-type: none"> - methods - water resources aspects • Energy transport and energy storage 		

- Net techniques
- Energy market
 - trade
 - politics
 - law
- social changes due to energy supply

Water Demand, Supply and Distribution:

- Water supply and water distribution: necessity, basic requirements, elements, hydrological cycle
- Water demand calculation: water consumption, water demand, consumer groups, losses, forecasting, design periods
- Water collection: Selection of source, groundwater withdrawal, springwater tapping, surface water intakes, rainwater harvesting, seawater desalination, recycling of treated sewage, drinking water protection areas
- Water transmission and distribution: necessity, hydraulic basics, dimensioning and calculation of branched and closed loop systems.
- Pumps and pumping stations: necessity, types, hydraulics for pumping design, pumping stations and pressure boosters
- Water storage: necessity, types and functions of tanks and reservoirs
- Case study: planning and design of a water supply system for a small town

14. Literatur:	Lecture notes can be downloaded from the internet. Hints are given for additional literature from the internet as well as libraries.				
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 151601 Vorlesung Energy Demand, Supply and Distribution • 151602 Vorlesung Water Demand, Supply and Distribution 				
16. Abschätzung Arbeitsaufwand:	<table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">Time of attendance:</td> <td style="text-align: right;">45 h</td> </tr> <tr> <td>Private Study:</td> <td style="text-align: right;">135 h</td> </tr> </table>	Time of attendance:	45 h	Private Study:	135 h
Time of attendance:	45 h				
Private Study:	135 h				
17. Prüfungsnummer/n und -name:	15161 Water and Power Supply (PL), schriftliche Prüfung, 120 Min., Gewichtung: 1.0				
18. Grundlage für ... :					
19. Medienform:					
20. Angeboten von:					

200 Spezialisierungsmodule

Zugeordnete Module:	19310	Urban Drainage and Design of Wastewater Treatment Plants
	19360	Water Quality and Treatment
	23870	Building Materials
	36450	Special Aspects of Urban Water Management
	50160	Applied GIS
	50560	Project Planning and Financing
	50580	Methodological Aspects of Infrastructure Planning
	50590	Regional and Urban Planning III
	50600	Traffic Engineering and Road Construction
	50610	Public Transport & Railway Operation
	50620	Hydraulic Structures
	50630	Tendering, Contracting and Project Management
	50640	Ecological Design and Landscape Planning
	50650	Planning and Design of Water Supply Facilities

Modul: 50160 Applied GIS

2. Modulkürzel:	062300071	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, SoSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Univ.-Prof. Volker Schwieger		
9. Dozenten:	<ul style="list-style-type: none"> • Stefan Fina • Hans-Georg Schwarz-von Raumer • Li Zhang • Annette Schmitt 		
10. Zuordnung zum Curriculum in diesem Studiengang:	<p>M.Sc. Infrastructure Planning, PO 2012, 4. Semester → Spezialisierungsmodule</p> <p>M.Sc. Infrastructure Planning, PO 2012, 4. Semester → Zusatzmodule</p>		
11. Empfohlene Voraussetzungen:	Modul „Statistics and GIS“		
12. Lernziele:	<p>The students are able to evaluate different data sources, to carry through basic data acquisition and integrate different data into field and office GIS. They are able to apply spatial analysis techniques to real world GIS problems in environmental and regional planning (GIS-based modeling, network-, raster- and 3D-analysis). The students have the expertise and ability to manage small-scale GIS projects (data mining, analysis design, output delivery) within the planning workflow, from project definition to product delivery.</p>		
13. Inhalt:	<p>GIS-based Data Acquisition Lecture:</p> <ul style="list-style-type: none"> • introduction • GIS hard- and software for primary data acquisition • coordinate systems, geodetic datum and projections • coordinate transformations and conversions • terrestrial positioning and laser scanning • satellite-based positioning (GNSS) • overview of other acquisition methods • additional topics of mapping • data import from various sources (e.g. Web) • Web-GIS (e.g. Open Street Map) integration of data into GIS <p>Exercices :</p> <ul style="list-style-type: none"> • terrestrial and satellite-based data acquisition (field project) • integration of measured data into GIS (computer lab) • integration of web-data into GIS (computer lab) <p>GIS in Environmental and Regional Planning Application cases:</p> <ul style="list-style-type: none"> • land suitability analysis for urban development • accessibility of infrastructure facilities • Evaluation of soil functions • Urban Heat Island modelling • Biotope Networks and animal movement • Flood risk 		

- Development capacity studies
- Site analysis for wind power
- GIS-based E-government and community participation

Tools and methods:

- Model builder
- Spatial Analyst
- Network Analyst
- Map Algebra
- Neighbourhood Analysis
- Regression Modelling
- Multi Criteria Evaluation
- analysis design
- project management

Workflow:

- Geoprocessing,
- remote sensing data integration,
- advanced visual communication

14. Literatur: GIS-based Data Acquisition : ILIAS - Elearning Modules, Chen, Y., Lee, Y.: Geographical Data Acquisition, Springer, Wien - New York, 2001. GIS in Environmental and Regional Planning: ILIAS-Material; Exercise sheets; onlins-tutorial

15. Lehrveranstaltungen und -formen:

- 501601 Lecture GIS-based Data Acquisition
- 501602 Laboratory and Practical Training GIS-based Data Acquisition
- 501603 Lecture GIS in Environmental and Regional Planning
- 501604 Practical Training GIS in Environmental and Regional Planning

16. Abschätzung Arbeitsaufwand: Summe: 180 h

17. Prüfungsnummer/n und -name: 50161 Applied GIS (PL), schriftliche Prüfung, 120 Min., Gewichtung: 1.0

18. Grundlage für ... :

19. Medienform:

20. Angeboten von:

Modul: 23870 Building Materials

2. Modulkürzel:	021500235	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Univ.-Prof. Jan Hofmann		
9. Dozenten:	Jan Hofmann		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Spezialisierungsmodule M.Sc. Infrastructure Planning, PO 2012 → Zusatzmodule		
11. Empfohlene Voraussetzungen:	None		
12. Lernziele:	The Student will know the properties of building materials and their proper application in practice.		
13. Inhalt:	The following topics will be covered: <ul style="list-style-type: none"> • Mineral binding materials and mortars & plasters • Stones • Masonry • Concrete • Durability of concrete • Timber • Polymers • Steel • Corrosion of metals 		
14. Literatur:	<ul style="list-style-type: none"> • Lecture notes • Transparencies 		
15. Lehrveranstaltungen und -formen:	238701 Vorlesung Building Materials		
16. Abschätzung Arbeitsaufwand:	Attendance time: 56 h Private study: 124 h (including a presentation - 20 minutes)		
17. Prüfungsnummer/n und -name:	23871 Building Materials (PL), schriftliche Prüfung, 120 Min., Gewichtung: 1.0		
18. Grundlage für ... :			
19. Medienform:	-		
20. Angeboten von:	Institut für Werkstoffe im Bauwesen		

Modul: 50640 Ecological Design and Landscape Planning

2. Modulkürzel:	-	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Univ.-Prof. Antje Stokman		
9. Dozenten:	Antje Stokman		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Spezialisierungsmodule M.Sc. Infrastructure Planning, PO 2012 → Zusatzmodule		
11. Empfohlene Voraussetzungen:			
12. Lernziele:	Students understand the major challenges, objectives, strategies and instruments for planning and designing urban landscapes in Europe as well as in developing countries. Basic notions of ecological infrastructure systems and their role for the urban landscape. Innovative and interdisciplinary approaches to ecological design and landscape planning are introduced, contextualized and considered in their application through selected international best practice examples.		
13. Inhalt:	This course presents the basic principles of landscape ecological theory applied to urban environments as well as the basic principles of landscape planning. The course will give an overview on actual environmental challenges related to the urban environment and explores the concepts and themes important to the contemporary practice of ecological design and planning - drawing on knowledge from the fields of ecology, engineering and landscape architecture. It will introduce different theories that try to re-center landscape planning and design around the goal of creating sustainable urban environments and cultural landscapes. Responding to contemporary urban and infrastructure development challenges, this course brings together a series of innovative concepts and theories to discuss different methods, models and measures of ecological design of combined landscape and infrastructure systems for the 21st century.		
14. Literatur:	<ul style="list-style-type: none"> • Von Seggern, H.; Werner, J.; Grosse-Bächle, L. 2008: Creating knowledge. Innovation strategies in designing urban landscapes. Jovis Berlin • Margolis, L., Alexander, R. 2007: Living Systems. Birkhäuser, Basel. • Rottle, N.; Yocom, K. 2011: Ecological Design. Basics Landscape Architecture. Ava Acedemia, Lausanne • Steiner, F. R. 2008: The Living Landscape: An Ecological Approach to Land-scape Planning. Island Press, New York. • Waldheim, C. 2006: The Landscape Urbanism Reader. Princeton Architectural Press, New York. 		
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 506401 Lecture Introduction urban ecology and design • 506402 Seminar Ecosystem Design and ecological engineering 		
16. Abschätzung Arbeitsaufwand:	Sum 180h		
17. Prüfungsnummer/n und -name:	50641 Ecological Design and Landscape Planning (LBP), schriftliche Prüfung, Gewichtung: 1.0		

18. Grundlage für ... :

19. Medienform:

20. Angeboten von:

Modul: 50620 Hydraulic Structures

2. Modulkürzel:	021410106	5. Moduldauer:	2 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Univ.-Prof. Silke Wieprecht		
9. Dozenten:	<ul style="list-style-type: none"> • Silke Wieprecht • Kristina Terheiden • Daniel Stolz 		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Spezialisierungsmodule M.Sc. Infrastructure Planning, PO 2012 → Zusatzmodule		
11. Empfohlene Voraussetzungen:			
12. Lernziele:	<p>Advanced Studies in Hydraulic Structures: The students...</p> <ul style="list-style-type: none"> • Know about the basic features of hydraulic structures • have an overview what are the main components and know how to arrange them in order to ensure a satisfying operation • are able to dimension all parts of different hydraulic structures • are aware of implicating river works into an overall context of a fluvial system and know how to act and to evaluate in spatial and temporal interrelation • are able to realize the economic and ecologic significance of hydraulic structures as dams, reservoirs and hydro power plants <p>Case Study in Hydraulic Structures : The students...</p> <ul style="list-style-type: none"> • are able to use of the gained theoretical knowledge with the help of a practical example • are aware of the technical relations and their effects on non-technical areas of interest • can give a well-founded argumentation of chosen estimations and are able to present their own results • can give a convincing presentation • are able to assess objectively different planning alternatives 		
13. Inhalt:	<p>Advanced Studies in Hydraulic Structures : The course deals with main structural components of hydraulic engineering schemes such as weirs, dams, hydro power plants, pipelines and ancillary works. The main features as hydraulic and structural dimensioning are treated. The application of structural power plants, reservoirs and river development works is discussed. Conventional engineering methods as well as approaches with improved environmental compatibility are taken into consideration.</p> <p>Case Study in Hydraulic Structures : The case study uses the content of the lecture „Advanced Studies in Hydraulic Structures“. In working groups of 3 to five students a real hydraulic structures will be planned and completely dimensioned. There are hydraulic calculations to be carried out as hydraulic capacity of spillway, dimensioning of stilling basin, hydrological and sedimentological calculations. As well the stabilities of the structures itself has to be checked. Additionally an analysis of the</p>		

demand of potentially provided electricity, drinking water or irrigation water, resp. is required. The intermediate results will be presented by the groups. Every student has to deliver at least one presentation. Finally a poster for the final presentation and assessment has to be designed. This is the basis for the development of the assessment criteria for the different alternatives.

14. Literatur:	Lecture notes can be downloaded from the internet. Additional detailed information for the case study will be provided during the lectures.
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 506201 Lecture and Practice Advanced Studies in Hydraulic Structures • 506202 Lecture and Presentation Case Study in Hydraulic Structures,
16. Abschätzung Arbeitsaufwand:	Sum 180h
17. Prüfungsnummer/n und -name:	50621 Hydraulic Structures (LBP), schriftlich oder mündlich, 90 Min., Gewichtung: 1.0
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	

Modul: 50580 Methodological Aspects of Infrastructure Planning

2. Modulkürzel:	021100013	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, SoSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Richard Junesch		
9. Dozenten:	<ul style="list-style-type: none"> • Ortwin Renn • Richard Junesch • Marion Aschmann 		
10. Zuordnung zum Curriculum in diesem Studiengang:	<p>M.Sc. Infrastructure Planning, PO 2012 → Spezialisierungsmodule</p> <p>M.Sc. Infrastructure Planning, PO 2012 → Zusatzmodule</p>		
11. Empfohlene Voraussetzungen:			
12. Lernziele:	<p>The students understand techniques for dealing with complex decision situations and gain insights in the decision-analysis process for both public and private decision-making with all related steps. Social aspects that may influence planning process or outcome will also be discussed. The students are acquainted with fundamental notions of demography as far as urban and regional planning is concerned. The students are able to apply basic methods of demographic analysis and forecasting.</p>		
13. Inhalt:	<p>The module consists of two courses: The lecture "Decision Analysis" will cover the following subjects:</p> <ul style="list-style-type: none"> • Elements of Decision Problems • Structuring Decisions • Generating Objectives and Hierarchies • Generating Alternatives • Decision Making with Multiple Objectives • Risk and Uncertainty in Decision Situations • Collective Decision Making • Application to Infrastructure Planning <p>The course "Demographic Analysis and Forecasting" will provide an overview of the most frequently appearing issues of demographic analysis and forecasting. It will consist of three main parts: Fundamental notions of (applied) demography and some of the methodical/conceptual problems linked with these notions. Selected fundamental approaches to analysing and forecasting natural growth (or decline) of population, will be presented and discussed critically. Examples of such analyses and forecasts will be calculated. Migration, as the most critical and most important aspect of population development under regional aspects, will constitute the main topic of the third part. Basic methods of analysing and forecasting migration will be presented and discussed with regard to their application on concrete cases.</p>		
14. Literatur:	<p>Lecture notes, see http://www.ivr.uni-tuttgart.de/vwl/studium_und_lehre/sommer/Decision_Analysis.html as well as the literature listed (see website)</p> <ul style="list-style-type: none"> • Hinde, Andrew (1998): Demographic Methods. London, Sydney, New York, Arnold Publishers 		

	<ul style="list-style-type: none">• Davis, H. Craig (1994): Demographic projection techniques for regions and smaller areas, Vancouver, University of British Columbia Press
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none">• 505801 Lecture Decision Analysis• 505802 Lecture Demographic Analysis and Forecasting• 505803 Exercise Demographic Analysis and Forecasting
16. Abschätzung Arbeitsaufwand:	Time of attendance: approx. 45 hours Private Study: approx. 135 hours
17. Prüfungsnummer/n und -name:	50581 Methodological Aspects of Infrastructure Planning (PL), schriftliche Prüfung, 120 Min., Gewichtung: 1.0
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	

Modul: 50650 Planning and Design of Water Supply Facilities

2. Modulkürzel:	021210052	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, SoSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Ralf Minke		
9. Dozenten:	Ralf Minke		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Spezialisierungsmodule M.Sc. Infrastructure Planning, PO 2012 → Zusatzmodule		
11. Empfohlene Voraussetzungen:	Knowledge in Sanitary Engineering, Water Supply and Hydraulics Contents of Water and Power Supply		
12. Lernziele:	The students... <ul style="list-style-type: none"> • Are able to plan and design centralised water supply systems as a part of rural and urban infrastructure. • Are able to calculate dimensions of all elements of centralised water supply systems. • Are able to calculate costs of all elements of centralised water supply systems. • have an idea of the relations between water, politics, social changes and influences on environment and on planning process. • Are able to design in detail all elements of centralised water supply systems. 		
13. Inhalt:	<ul style="list-style-type: none"> • Planning process as function of topographical, economical, social, environmental boundaries. • Water demand calculation: water consumption, water demand, consumer groups, losses, forecasting, design periods. • Water collection: Selection of source, groundwater withdrawal, springwater tapping, surface water intakes, rainwater harvesting, seawater desalination, recycling of treated sewage, drinking water protection areas, details of planning and design. • Water transmission and distribution: necessity, hydraulic basics, dimensioning and calculation of branched and closed loop systems, details of planning and design. • Pumps and pumping stations: necessity, types, hydraulics for pumping design, pumping stations and pressure boosters, details of planning and design. • Water storage: necessity, types and functions of tanks, water towers and reservoirs, details of planning and design. • Cost calculation: Cost functions for different facilities, Calculation process, calculation of water tariff. 		
14. Literatur:	Lecture notes can be downloaded from the internet. <ul style="list-style-type: none"> • Karamouz, Mohammad et al.: Urban Water Engineering and Management. Boca Raton: CRC Press, 2010. ISBN 978-1-4398-1310-2 • Mutschmann, J; Stimmelmayer, F.: Taschenbuch der Wasserversorgung, Vieweg-Verlag 		

Hints are given for additional literature from the internet as well as libraries.

15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none">• 506501 Lecture Planning and design of water supply facilities• 506502 Case Study Planning and design of water supply facilities• 506503 Excursions to planning area and water supply company
16. Abschätzung Arbeitsaufwand:	Sum180h
17. Prüfungsnummer/n und -name:	50651 Planning and Design of Water Supply Facilities (LBP), schriftliche Prüfung, Gewichtung: 1.0
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Siedlungswasserwirtschaft und Wasserrecycling

Modul: 50560 Project Planning and Financing

2. Modulkürzel:	240903002	5. Moduldauer:	2 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, SoSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Elke Schneider		
9. Dozenten:	Klaus-Peter Pischke		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Spezialisierungsmodule M.Sc. Infrastructure Planning, PO 2012 → Zusatzmodule		
11. Empfohlene Voraussetzungen:			
12. Lernziele:	Students know critical phases of a typical project cycle; they know how to plan, appraise, and evaluate infrastructure projects from the economic and financial point of view; they know different measures to calculate the return of a project in order to evaluate its worth; they know pros and cons of different ways to finance and operate infrastructure projects; solving problems based on real world case studies enhances their ability to evaluate projects themselves or to assess project proposals (e.g. feasibility studies) prepared by consultants.		
13. Inhalt:	A: Project Planning and Appraisal (SS) <ul style="list-style-type: none"> • Comprehensive introduction into planning and appraisal of infrastructure projects • Subject description • the project cycle: major aspects of the different phases • project planning • LogFrame analysis as a project planning tool • project appraisal (financial and economic analysis) • evaluation of project alternatives • case studies B: Project Financing, Implementation and Advanced Issues of Economic Analysis (WS) <ul style="list-style-type: none"> • Comprehensive introduction into financing, implementation, monitoring and ex-post evaluation of infrastructure projects; selected issues of advanced economic analysis of projects • Subject Description: • external and internal sources of financing • private sector participation for project financing and operation (BOT models) • selected issues in project implementation (implementation consultant, terms of reference, bidding procedures, contract of goods and services) project supervision, monitoring and ex-post evaluation • advanced issues of economic analysis of projects including case studies 		
14. Literatur:	<ul style="list-style-type: none"> • Script, • Damodaran, Aswath: Corporate Finance -Theory and Practice 		
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 505601 Lecture A: Project Planning and Appraisal 		

- 505602 Lecture B: Project Financing, Implementation and Final Evaluation

16. Abschätzung Arbeitsaufwand:

Sum 180h

Time of attendance: 56 h

Private Study: 124 h

<i>Pos</i>	<i>unit</i>	<i>presence time</i>	<i>self study</i>	<i>project</i>	<i>Sum</i>
1	Lecture A	28,0	62,0	0,0	90,0
2	Lecture B	28,0	62,0	0,0	90,0
	<i>Sum:</i>				180,0

17. Prüfungsnummer/n und -name:

50561 Project Planning and Financing (PL), schriftliche Prüfung, 120 Min., Gewichtung: 1.0

18. Grundlage für ... :

19. Medienform:

Power Point Presentations, Black Board, Case Studies, Group Discussions

20. Angeboten von:

Infrastructure Planning (MIP)

Modul: 50610 Public Transport & Railway Operation

2. Modulkürzel:	020400734	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Univ.-Prof. Ullrich Martin		
9. Dozenten:	<ul style="list-style-type: none"> • Ullrich Martin • Martin Will 		
10. Zuordnung zum Curriculum in diesem Studiengang:	<p>M.Sc. Infrastructure Planning, PO 2012 → Spezialisierungsmodule</p> <p>M.Sc. Infrastructure Planning, PO 2012 → Zusatzmodule</p>		
11. Empfohlene Voraussetzungen:			
12. Lernziele:	<p>Part 1: To get to know the role of rail-bounded transport, the development of railway and public transport, the planning and decision-making process for infrastructure investment, basic principles of vehicle movements, and railway operation and control. In addition, students can deepen the understanding in practice from the concrete cases.</p> <p>Part 2: The student will be acquainted with the basic knowledge of railway infrastructure and vehicles, including also the maintenance of rails, accessories and rolling stocks. They will get to know the manifoldness of construction of railways in developed and developing countries, and will be able to compare different transport systems and their variants. The advantages and the disadvantages of them will be concluded as well.</p>		
13. Inhalt:	<p>Part 1 : Introduction</p> <ul style="list-style-type: none"> • Historical Development of Railways • Public Transportation System • General Aspects of Safety <p>Evaluation of Projects</p> <ul style="list-style-type: none"> • Necessity • Methods • Example (with Exercise) <p>Dynamics of Vehicle Movements</p> <ul style="list-style-type: none"> • Physical Basics • Resistances • Grade-Speed Diagram • Running Time Calculation (with Exercise) <p>Operation and Control</p> <ul style="list-style-type: none"> • Interlocking Principles • Design of Schedules (with Exercise) • Capacity Research (with Exercise) • Traffic Control (with Exercise) <p>Part 2: Infrastructure</p>		

- Components of Infrastructure
- Construction of Tracks
- Construction of Routes
- Construction of Facilities
- Electrification
- Infrastructure Maintenance
- Route Study (Exercise)

Rolling Stock

- Types of Vehicles
- Elements of Vehicles
- Arrange Trains
- Maintenance

Special Aspects and Comparison

- High Speed Railway Systems
- Specific of Body-Tilting Technique
- Specific of Maglev Systems
- Comparison

14. Literatur:	<ul style="list-style-type: none"> • Script of the Lecture • Armstrong, J. H.: Railroad - What it is, what it does • Bonnett, D. F.: Practical Railway Engineering • Eisenbahn- Bau- und Betriebsordnung (EBO) - German law • Elms, C. P.(ed.): Dictionary of Public Transport • Pachl, J.: Railway Operation and Control (Overview) • Pachl, J.: Glossary of Railroad Operatin and Control
15. Lehrveranstaltungen und -formen:	506101 Lecture Public Transport & Railway Operation
16. Abschätzung Arbeitsaufwand:	Sum 180h
17. Prüfungsnummer/n und -name:	50611 Public Transport & Railway Operation (PL), schriftliche Prüfung, 120 Min., Gewichtung: 1.0
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	

Modul: 50590 Regional and Urban Planning III

2. Modulkürzel:	021100012	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, SoSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Prof.Dr.-Ing. Stefan Siedentop		
9. Dozenten:	<ul style="list-style-type: none"> • Anette Gangler • Stefan Fina • Philipp Misselwitz • Angelika Cornelia Krehl 		
10. Zuordnung zum Curriculum in diesem Studiengang:	<p>M.Sc. Infrastructure Planning, PO 2012 → Spezialisierungsmodule</p> <p>M.Sc. Infrastructure Planning, PO 2012 → Zusatzmodule</p>		
11. Empfohlene Voraussetzungen:			
12. Lernziele:	<p>Students are able to develop a research topic in issues related to development policy and planning. They gain experience in the self-study of a chosen topic, the formulation and scientific elaboration of a hypothesis, and in the presentation and discussion of research results within the forum of a seminar conference, both as an author and as a peer. The students are able to investigate housing standards and typologies and the housing demand and supply.</p>		
13. Inhalt:	<p>The course “Development Policy and Planning: A Seminar Conference” will be conducted as a series of (a) lectures, (b) consultations and (c) seminar meetings.</p> <p>a) Lectures provide an overview of development history and current issues concerning development policy and planning. Students will choose a topic of interest within this context and propose an agenda and outline for the self-study of this topic.</p> <p>b) Additional lectures on academic writing and presentation techniques as well as consultation hours will provide assistance for the preparation of a scientific paper on this topic.</p> <p>c) A conference program for seminar meetings will be set up for authors to present their work in smaller groups (plenary sessions). Students participating in a plenary session peer-review papers of presenters and participate in the discussion.</p> <p>The first part of the seminar Housing introduces housing typologies in Europe and Middle East. In the second part, participants portray the housing situation of their home countries with respect to typology, supply and demand, self-help models and spontaneous settlement patterns.</p>		
14. Literatur:	<p>OECD: Perspectives of global development, Paris, 2010 Northey, M. and Jewinsky, J.: Making sense: A student,s guide to research and writing. Don Mills, Ontario, 2007</p>		
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 505901 Lecture Development Policy and Planning: A Seminar Conference • 505902 Seminar Housing 		
16. Abschätzung Arbeitsaufwand:	Sum 180h		

17. Prüfungsnummer/n und -name:

- 50591 Regional and Urban Planning III (PL), schriftliche Prüfung, Gewichtung: 1.0
- V Vorleistung (USL-V), schriftliche Prüfung

18. Grundlage für ... :

19. Medienform:

20. Angeboten von:

Modul: 36450 Special Aspects of Urban Water Management

2. Modulkürzel:	021210006	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Ralf Minke		
9. Dozenten:	<ul style="list-style-type: none"> • Ralf Minke • Ulrich Dittmer • Klaus Werner König 		
10. Zuordnung zum Curriculum in diesem Studiengang:	<p>M.Sc. Infrastructure Planning, PO 2012 → Spezialisierungsmodule</p> <p>M.Sc. Infrastructure Planning, PO 2012 → Zusatzmodule</p>		
11. Empfohlene Voraussetzungen:	<p>Inhaltlich: Grundlegende Kenntnisse der Gesamt-zusammenhänge der Siedlungswasser- und Wasserwirtschaft. Vertiefte Kenntnisse der Abwassertechnik, der Wassergütwirtschaft, der Wasserversorgung oder des allgemeinen Managements von Wasserressourcen.</p> <p>Formal: Wasserversorgungstechnik I oder Abwassertechnik I oder Waste Water Technology oder Water Quality and Treatment</p>		
12. Lernziele:	<p>Fachlich: Die Studierenden entwickeln ein Verständnis für Zusammenhänge über ihre Teildisziplin hinaus. Sie können bei Entscheidungen und Planungen zwischen konkurrierenden Belangen der Siedlungswasserwirtschaft, Wasserwirtschaft und anderer Infrastrukturbereiche fachlich fundiert abwägen.</p> <p>Methodisch: Die Studierenden können selbständig mit internationaler wissenschaftlicher Literatur zu ihrem jeweiligen Fachgebiet umgehen, Ergebnisse kritisch bewerten und so ein eigenes Bild des Standes der Wissenschaft erarbeiten und präsentieren.</p>		
13. Inhalt:	<p>- Wechselwirkungen zwischen Teilbereichen der Siedlungswasserwirtschaft am Beispiel des Umgangs mit Regenwasser - Jährlich wechselnde Spezialthemen entsprechend dem wissenschaftlichen und technischen Fortschritt</p>		
14. Literatur:	<p>Gujer, W. Siedlungswasserwirtschaft, Springer Verlag GmbH Mutschmann, J; Stimmelmayer, F.: Taschenbuch der Wasserversorgung, Vieweg-Verlag Jeweils die aktuellen Auflagen Nationale und internationale Fachzeitschriften, z.B. GWF-Wasser/ Abwasser, KA Abwasser, Abfall, Hrsg. und Verlag GFA, W.Sci.Tech., Wat. Res., Wasser und Abfall Diverse Merk- und Arbeitsblätter des DVGW und der DWA</p>		

15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none">• 364501 Scientific Seminar• 364502 Lecture Rainwater Harvesting and Management• 364503 Excursions
<hr/>	
16. Abschätzung Arbeitsaufwand:	
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17. Prüfungsnummer/n und -name:	36451 Special Aspects of Urban Water Management (Seminar presentation) (LBP), schriftlich, eventuell mündlich, Gewichtung: 1.0
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18. Grundlage für ... :	
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19. Medienform:	
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20. Angeboten von:	Siedlungswasserwirtschaft und Wasserrecycling
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Modul: 50630 Tendering, Contracting and Project Management

2. Modulkürzel:	240903003	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Gerd Maurer		
9. Dozenten:	<ul style="list-style-type: none"> • Gerd Maurer • Ibrahim Al-Hammad 		
10. Zuordnung zum Curriculum in diesem Studiengang:	<p>M.Sc. Infrastructure Planning, PO 2012 → Spezialisierungsmodule</p> <p>M.Sc. Infrastructure Planning, PO 2012 → Zusatzmodule</p>		
11. Empfohlene Voraussetzungen:			
12. Lernziele:	Basic understanding of Construction Management of Infrastructure Projects: Tendering, Cost Estimation, International Contracting, Scheduling and Project Management		
13. Inhalt:	<p>The lectures and exercises cover the following topics:</p> <p>Construction Management, Cost Calculation of Construction, Procedures of Cost Estimation, Tendering Procedure, International Contracts, Contractual Conditions, FIDIC Contract Conditions, Scheduling Techniques, Bar Chart, Network Planning</p> <p>Including exercises and an holistic case study project regarding the Tendering, Contracting and Execution process of a realistic Waste Water treatment plant.</p> <p>The case study will be discussed in class. Assignments regarding the case study project have to be prepared by the students and presented after submittal.</p>		
14. Literatur:	<p>FIDIC „red book“: Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer</p> <p>and</p> <p>FIDIC "yellow book": Conditions of Contract for Plant and Design-Build for Electrical and Mechanical Plant and for Building and Engineering Works Designed by the Contractor</p>		
15. Lehrveranstaltungen und -formen:	506301 Lecture Tendering, Contracting & Project Management		
16. Abschätzung Arbeitsaufwand:	Sum 168h		
17. Prüfungsnummer/n und -name:	50631 Tendering, Contracting and Project Management (PL), schriftliche Prüfung, 120 Min., Gewichtung: 1.0		
18. Grundlage für ... :			
19. Medienform:	<p>Powerpoint, Black Board, Computer</p> <p>webbased databases</p>		
20. Angeboten von:	Infrastructure Planning (MIP)		

Modul: 50600 Traffic Engineering and Road Construction

2. Modulkürzel:	021320012	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, WiSe
4. SWS:	4.5	7. Sprache:	Englisch
8. Modulverantwortlicher:	Univ.-Prof. Markus Friedrich		
9. Dozenten:	<ul style="list-style-type: none"> • Markus Friedrich • Jürgen Holzwarth 		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Spezialisierungsmodule M.Sc. Infrastructure Planning, PO 2012 → Zusatzmodule		
11. Empfohlene Voraussetzungen:			
12. Lernziele:	The students are familiar with basic traffic control measures for private and public transport and understand the fundamental methods for analyzing the capacity of signalized and unsignalized road intersections. They have a basic knowledge on how to design and construct urban and rural roads and know approaches for financing the road infrastructure.		
13. Inhalt:			
14. Literatur:	<ul style="list-style-type: none"> • Friedrich, M.: Traffic Engineering, Reader • Holzwarth, J.: Road Design and Construction, Reader 		
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 506001 Lecture Traffic Engineering • 506002 Exercise Traffic Engineering • 506003 Lecture Road Design and Construction 		
16. Abschätzung Arbeitsaufwand:	Attendance time lecture: 50h Attendance time exercise: 14h Self study time: 116h Total: 180h		
17. Prüfungsnummer/n und -name:	50601 Traffic Engineering and Road Construction (PL), schriftliche Prüfung, 120 Min., Gewichtung: 1.0		
18. Grundlage für ... :			
19. Medienform:			
20. Angeboten von:	Institut für Straßen- und Verkehrswesen		

Modul: 19310 Urban Drainage and Design of Wastewater Treatment Plants

2. Modulkürzel:	021210251	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, SoSe
4. SWS:	5.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Univ.-Prof. Heidrun Steinmetz		
9. Dozenten:	<ul style="list-style-type: none"> • Heidrun Steinmetz • Ulrich Dittmer 		
10. Zuordnung zum Curriculum in diesem Studiengang:	<p>M.Sc. Infrastructure Planning, PO 2012 → Spezialisierungsmodule</p> <p>M.Sc. Infrastructure Planning, PO 2012 → Zusatzmodule</p>		
11. Empfohlene Voraussetzungen:	<p>Chemistry and Biology for Environmental Engineers</p> <p>Sanitary Engineering</p>		
12. Lernziele:	<p>Advanced knowledge of processes and concepts for urban drainage and municipal wastewater treatment systems</p> <p>Basics of construction and dimensioning of different urban drainage systems, stormwater treatment facilities and wastewater treatment plants as a base for dimensioning and discussion of proved and innovative technologies</p> <p>Deeper understanding for system connections as base for a decisions during the planning process</p>		
13. Inhalt:	<p>Design of sewer systems and stormwater treatment</p> <p>(Dr.- Ing. Ulrich Dittmer)</p> <p>principles of collection and disposal design of combined and separate sewer systems Sustainable urban drainage systems (SUDS) and low impact design(LID) Application of rainfall runoff models (computer exercise using U.S. EPA Stormwater Management Model) different techniques for treatment and retention design of treatment facilities</p> <p>Design of wastewater treatment plants (Prof. Dr.-Ing. Heidrun Steinmetz)</p> <p>Municipal wastewater treatment different techniques for advanced biological wastewater treatment (nitrogen and phosphorous removal) principles of process engineering design of biological wastewater treatment plants and the main important aggregates design of sludge treatment plants</p> <p>Seminar: feasibility studies</p> <p>(Prof. Dr.- Ing. Heidrun Steinmetz and external consultants)</p> <p>special examples for sanitation concepts for world wide application</p>		

Ecological sanitation and resource orientated systems

case studies

14. Literatur:	<ul style="list-style-type: none"> • Butler, D., Davies, J.W) .Urban drainage, Spon press London, US EPA: SWMM 5.0 users manual • Henze, M., Harremoes, J. la Coour Jansen, J., Arvin, E: Wastewater treatment. Springer Verlag Berlin • Lens, P, Zeeman,G., Lettinga, G.: Decentralised Sanitation and reuse. IWA publishing, London • Different German standards (DWA, Hennef) • Lecture notes
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 193101 Vorlesung und Übung Design of Sewer System and Stormwater Treatment • 193102 Vorlesung und Übung Design of Wastewater Treatment Plants • 193103 Seminar Case Study • 193104 Exkursion
16. Abschätzung Arbeitsaufwand:	<p>Time of attendance: approx. 70 hours (including 4*4hours for excursion) 1,5 SWS</p> <p>Private Study: approx. 110 hours</p> <p>Lecture 1 Presence time: 28 hours, self study 30 hours, project 0, Sum: 58 hours</p> <p>Lecture 2: Presence time: 28 hours, self study 30 hours, project 40, Sum: 58 hours</p> <p>Case study: Presence time: 14 hours, self study 10 hours, project 0, Sum: 25 hours</p>
17. Prüfungsnummer/n und -name:	19311 Urban Drainage and Design of Wastewater Treatment Plants (PL), schriftliche Prüfung, 120 Min., Gewichtung: 1.0
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Siedlungswasserwirtschaft und Wasserrecycling

Modul: 19360 Water Quality and Treatment

2. Modulkürzel:	021210051	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	jedes 2. Semester, SoSe
4. SWS:	4.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Univ.-Prof. Heidrun Steinmetz		
9. Dozenten:	<ul style="list-style-type: none"> • Heidrun Steinmetz • Carsten Meyer 		
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Spezialisierungsmodule M.Sc. Infrastructure Planning, PO 2012 → Zusatzmodule		
11. Empfohlene Voraussetzungen:	Knowledge in Sanitary Engineering, Water Supply and Hydraulics Contents of Water and Power Supply		
12. Lernziele:	<ul style="list-style-type: none"> • The students learn how to characterize and protect water bodies as well as to improve the water quality • Students understand the contribution of wastewater treatment to the preventive protection of receiving waters and they learn the basic methods of water quality management instruments • Students understand the necessity of water treatment as essential element of drinking water supply • Students learn the chemical, physical and biological background of water treatment technologies, their possibilities and boundaries and they are able to develop, design and dimension treatment schemes for different raw water qualities 		
13. Inhalt:	Water Quality Management: <ul style="list-style-type: none"> • Terms and introduction: environmental data from Germany • Characterisation and assessment of flowing waters, stagnant waters and groundwater • Water quality parameters, WHO drinking water guidelines, targets for drinking water and sanitation, description of water quality in relation to use • Improvement of water quality, reduction of pollution load, point pollutants and diffuse loads, improving the self-purification capacity of waters, technical helps, assessment of progress • Water quality management; the European Union Framework Directive; quality planning and maintenance, monitoring networks Water Treatment: <ul style="list-style-type: none"> • Water supply and water treatment: basic requirements, drinking water standards • Mechanical treatment: Screening, Sieving, Sedimentation, (Membrane)Filtration, Gas-Exchange, Flotation • Carbondioxide-Carbonate-Balance: relevance, chemical background • Deacidification: mechanical and chemical methods • Removal of iron, manganese and arsenic: methods • Decarbonization: chemical methods • Flocculation • Adsorption 		

- Disinfection: chemical and physical methods

14. Literatur:	<p>Lecture notes and material for exercises will be provided during the lecture. Hints are given for additional literature from the internet as well as libraries, e.g.</p> <ul style="list-style-type: none"> • American Water Works Assoc.: Water Quality and Treatment, McGraw-Hill Inc., 1999 • David A. Chin: Water-Quality Engineering in Natural Systems, John Wiley & Sons, Inc., 2006 • Degrémont: Water Treatment Handbook Vol. 1 & Vol. 2, Lavoisier Publishing 1991 • C. Binnie and M. Kimber: Basic Water Treatment: Fourth Edition, IWA Publishing, 2009 • Nicholas P. Cheremisinoff: Handbook of Water and Wastewater Treatment Technologies, Bitterworth & Heinemann, Boston Oxford Auckland Johannesburg Melbourne New Delhi, 2002 • WHO Guidelines, 2006 • Mutschmann, J; Stimmelmayer, F.: Taschenbuch der Wasserversorgung, Vieweg-Verlag
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 193601 Lecture Water Treatment • 193602 Lecture Water Quality Management
16. Abschätzung Arbeitsaufwand:	<p>Time of attendance: ca. 42 h</p> <p>Private study: ca. 138 h</p> <p>1) Lecture: presence time = 34,0; self study = 106,0; Sum = 140,0</p> <p>2) Exercise: presence time = 8,0; self study = 32,0; Sum = 40,0</p> <p>Sum Lecture (140) + Sum Exercise (40) = 180,0</p>
17. Prüfungsnummer/n und -name:	<p>19361 Water Quality and Treatment (PL), schriftliche Prüfung, 120 Min., Gewichtung: 1.0</p>
18. Grundlage für ... :	
19. Medienform:	
20. Angeboten von:	Siedlungswasserwirtschaft und Wasserrecycling

400 Deutschkurse

Zugeordnete Module: 19150 German as a Foreign Language

Modul: 19150 German as a Foreign Language

2. Modulkürzel:	SZ	5. Moduldauer:	1 Semester
3. Leistungspunkte:	6.0 LP	6. Turnus:	unregelmäßig
4. SWS:	8.0	7. Sprache:	-
8. Modulverantwortlicher:	John Nixon		
9. Dozenten:			
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012 → Deutschkurse		
11. Empfohlene Voraussetzungen:			
12. Lernziele:			
13. Inhalt:			
14. Literatur:			
15. Lehrveranstaltungen und -formen:	<ul style="list-style-type: none"> • 191501 Seminar German as a Foreign Language I • 191502 Seminar German as a Foreign Language II 		
16. Abschätzung Arbeitsaufwand:			
17. Prüfungsnummer/n und -name:	<ul style="list-style-type: none"> • 19151 German as a Foreign Language I (PL), schriftlich oder mündlich, Gewichtung: 1.0 • 19152 German as a Foreign Language II (PL), schriftlich oder mündlich, Gewichtung: 1.0 		
18. Grundlage für ... :			
19. Medienform:			
20. Angeboten von:			

Modul: 81000 Master's Thesis Infrastructure Planning

2. Modulkürzel:	240903001	5. Moduldauer:	1 Semester
3. Leistungspunkte:	30.0 LP	6. Turnus:	jedes Semester
4. SWS:	20.0	7. Sprache:	Englisch
8. Modulverantwortlicher:	Elke Schneider		
9. Dozenten:			
10. Zuordnung zum Curriculum in diesem Studiengang:	M.Sc. Infrastructure Planning, PO 2012		
11. Empfohlene Voraussetzungen:	The topic of the Master Thesis can be handed out only the moment at least 78 credit points have been acquired already by the candidate. One month after 90 credit points have been acquired, the candidate is supposed to start the work on his master thesis or to ask for the assignment of the topic at the latest.		
12. Lernziele:	The candidate shall be capable of dealing with a multidisciplinary problem from the context of infrastructure planning within a given time frame on the basis of scientific methods, He/she should also be able to present the results in an appropriate form both in writing and orally. The candidate should be capable of developing a suitable concept for the thesis including the selection of appropriate scientific methods as well as a realistic project schedule for the treatment of the selected topic in an international research environment. Effective scientific work shall be implemented throughout the thesis working period, the candidate shall learn how to discuss a scientific topic touching upon different disciplines in the field of infrastructure planning by discussing his topic with two different academic supervisors from two different fields of expertise.		
13. Inhalt:	The Master's Thesis should illustrate that the candidate is in the position to deal with a multidisciplinary problem from the context of infrastructure planning within a given time frame on the basis of scientific methods. Candidates are encouraged to select a topic related to infrastructure planning problems or projects of their respective home country.		
14. Literatur:	Recent literature on the topic of the scientific problem, project reports, interviews with representatives of institutions concerned with a project, data available or collected throughout the Master's thesis working period.		
15. Lehrveranstaltungen und -formen:			
16. Abschätzung Arbeitsaufwand:	Sum 900h		
17. Prüfungsnummer/n und -name:			
18. Grundlage für ... :			
19. Medienform:			
20. Angeboten von:			