Module Handbook

Mobility and Infrastructure (Master of Science (M.Sc.), SPO 2019)

Summer term 2020
Date: 26/03/2020
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<td>6.26. Road Safety</td>
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<td>6.33. Tendering, Planning and Financing in Public Transport</td>
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<td>6.34. Track Guided Transport Systems Operation and Capacity</td>
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<td>6.36. Traffic Management und Simulation Methods</td>
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<td>6.37. Transport Economics</td>
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<td>6.38. Urban and Regional Planning</td>
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<td>6.40. Urban Development Practical Course</td>
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<td>6.41. Urban Management</td>
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<td>6.42. Wildcard</td>
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1 Preface

The module handbook is the document in which important additional information about the studies is described. The general rules from the examination regulation (s. https://www.sle.kit.edu/imstudium/master-mobilitaet-infrastruktur.php, in German) and the structure of the program are specified by the curriculum (Chapt. 2). The main function of the Module Handbook is the compilation of the module descriptions (Chapt. 5) and the learning controls (Chapt. 6).

In addition to the module handbook information about the single courses (execution, content, etc.) is collected within the course catalog. Links to the courses (online) are given with the learning controls (Chapt. 6). The course language is indicated in the module tables (Chapt. 2) and partly in the course catalog (online). Information about the examinations is provided by the self-service function for students. This information is also announced by postings and web pages of the institutes.

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2 Curriculum

In this section 'Curriculum' rules in addition to the examination regulation (ER/SPO) are described. This can be found on

(2019 KIT 037 Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Masterstudiengang Mobilität und Infrastruktur, vom 19.07.2019; in German)

2.1 Objectives of the master degree program

The graduates of the master degree program 'Mobility and Infrastructure' at Karlsruhe Institute of Technology (KIT) augmented their scientific qualifications obtained in the bachelor degree program with orientation to the professional profile often named as 'traffic engineer', and deepened them beyond the understanding of interrelations technically and scientifically in one of the fields of expertise transport planning, traffic engineering, road or railroad construction.

Because of the complementary fields civil engineering, economic engineering, informatics, architecture (urban planning) and mechanical engineering (automotive engineering) the graduates of all mentioned profiles have knowledge ranging from the societal background of mobility as considered in the empirical mobility research, the economic interrelations between users and operators of traffic infrastructure up to the technical realizations of vehicles and roadways roads or tracks and systems of communication and information technology enabling and optimizing the operation. By their broad interdisciplinary understanding of the wide range and complexity of the task to ensure mobility in a modern society they are able mostly to plan, construct and operate road or track aligned transport systems.

The graduates are able to develop alternatives from the understanding of existing facts and regulations considering present developments and scientific discussions, to question existing methods and work on their further development. Furthermore, on the job they have the capability to be able to communicate and collaborate efficiently with colleagues from several disciplines and to lead expert groups of different disciplines.
**2.2 Structure of the master degree program**

The master degree program 'Mobility and Infrastructure' comprises 120 credit points (CP). It is subdivided into a compulsory elective block, the **Profile Studies** (60 CP), a compulsory block, the **Supplementary Studies** (30 CP), and the **Master's Thesis** (30 CP). In the Profile Studies one of the **Study Profiles** must be selected:

I. Urban and Transport Planning  
II. Traffic Engineering  
III. Highway Engineering

The focus of these study profiles on a specific field is defined by the respectively assigned modules (s. Tab. 1 - 3) in accordance to the different characteristics of the professional profile. Each profile consists of two compulsory elective subjects. In the one compulsory elective subject (30 CP) five specific **basic modules** are predefined. The other compulsory elective subject (30 CP) is characterized by the respective module catalog with the **specialization modules**. All modules in the master degree program are integrated into these study profiles and comprise 6 CP. Most of the modules are assigned to several profiles.

The Supplementary Studies comprise the two compulsory subjects **Subject-Specific Supplements** (24 CP) and **Interdisciplinary Qualifications** (6 CP). Within the subject Subject-Specific Supplements all modules not yet selected or predefined can be selected freely as **Supplementary Modules**. Obtaining the interdisciplinary qualifications basically courses from the respective course catalog on key competences offered by the House of Competence (HoC) or of the Centre for Cultural and General Studies (ZAK) can be selected.

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<tr>
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<td><strong>Master's Thesis</strong></td>
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<td>30 CP</td>
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<td>Urban and Transport Planning - Basics (P 1)</td>
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<td>5 modules with 6 CP selectable</td>
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<td><strong>Subject-Specific Supplements:</strong></td>
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<tr>
<td>freely selectable out of the entire course offer of KIT</td>
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2.2.1 Profile 'Urban and Transport Planning' (P1)

The graduates of the qualification profile 'Urban and Transport Planning' can apply their knowledge about the background of origin of mobility as well as about the methods predicting the traffic demand on long term and large scales for the planning of traffic infrastructure and transportation systems in the context of regional planning particularly urban planning. Furthermore, they are able to analyze the properties of the different transportation systems under consideration of technical as well as economical interrelations in transportation and based on this to opt for the appropriate mode of transport.

Table 1: Modules in Profile Urban and Transport Planning

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<th>Code</th>
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explanations to Table 1:

general:
- LC: learning control
- CP: credit point
- HpW / SWS: hours per week, winter term / summer term
- G / E: language German / English
- 1): Taking this module in the first semester is not recommended.
- 2): Two of these courses with the related learning controls have to be selected.
- 3): Course is offered every semester.
- 4): Module will be offered again as from winter term 2020/21.

type of course:
- L: lecture
- L/E: lecture and exercise, separate or integrated
- S: seminar
- Pj: project

type of learning control:
- wE: written examination
- oE: oral examination
- EoT: examination of other type
- ngA: not graded accomplishment as examination prerequisite
2.2.2 Profile ‘Traffic Engineering’ (P2)

The graduates of the qualification profile ‘Traffic Engineering’ can develop transportation systems further as a whole with their deepened knowledge about technical aspects of roads and railroads and profound knowledge from computer science (simulation models, algorithmics) and mechanical engineering (automotive engineering cars and railways). Thus, they are able to design innovative and optimized mobility systems by their understanding of the interrelations of those technical systems in the traffic.

Table 2: Modules in Profile Traffic Engineering

<table>
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<th>Module Code</th>
<th>Module Name</th>
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<td>oE 6</td>
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<td>M301:</td>
<td>Infrastructure Management</td>
<td>6</td>
<td>Design and Construction of Highways (G)</td>
<td>L 2</td>
<td>wE 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Operation and Maintenance of Highways (G)</td>
<td>L 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M304:</td>
<td>City Transport Facilities</td>
<td>6</td>
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<td>L/E 4</td>
<td>ngA 4</td>
<td>oE 2</td>
</tr>
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<td></td>
<td>Assessment and Evaluation Techniques (G)</td>
<td>L 1</td>
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<td>sum basic modules</td>
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<td>modules Traffic Engineering - Specialization (selectable)</td>
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<td>M502:</td>
<td>Project Integrated Planning</td>
<td>6</td>
<td>Project Integrated Planning (G)</td>
<td>Pj 4</td>
<td>ngA 4</td>
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<tr>
<td>M203:</td>
<td>Planning of Transportation Systems</td>
<td>6</td>
<td>Characteristics of Transportation Systems (G)</td>
<td>L 2</td>
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</tr>
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<td></td>
<td></td>
<td>Strategic Transport Planning (G)</td>
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<tr>
<td>M302:</td>
<td>Highway Design</td>
<td>6</td>
<td>IT-based Road Design (G)</td>
<td>L/E 2</td>
<td>ngA 4</td>
<td>2</td>
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<td></td>
<td></td>
<td></td>
<td>Highway Design Project Study (G)</td>
<td>L/E 2</td>
<td>oE 4</td>
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<tr>
<td>M305:</td>
<td>Road Safety</td>
<td>6</td>
<td>Safety Management in Highway Engineering (G)</td>
<td>L/E 2</td>
<td>ngA 4</td>
<td>3</td>
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<td></td>
<td></td>
<td>Seminar in Highway Engineering (G)</td>
<td>S 2</td>
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(continuing next page)
### Table 2: Modules in Profile Traffic Engineering (continued)

<table>
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<tr>
<th>Code</th>
<th>Name</th>
<th>CP</th>
<th>Name (Language)</th>
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<th>HpW / SWS</th>
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<td>Operation Systems and Track Guided Infrastructure Capacity (G)</td>
<td>L</td>
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<tr>
<td>M602:</td>
<td>2D/3D Image Analysis and Image based Tracking Methods</td>
<td>6</td>
<td>2D Computer Vision (G)</td>
<td>L</td>
<td>1</td>
<td>oE</td>
<td>3</td>
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<td>3D Computer Vision (G)</td>
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<td>Image Sequence Analysis (G)</td>
<td>L</td>
<td>2</td>
<td>oE</td>
<td>3</td>
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<td>M604:</td>
<td>Automotive Engineering</td>
<td>6</td>
<td>Automotive Engineering I (G)</td>
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<td>6</td>
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<tr>
<td>M605:</td>
<td>Algorithms I</td>
<td>6</td>
<td>Algorithms I (G)</td>
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<tr>
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<td>Algorithms for Routing</td>
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<td>Algorithms for Routing (G)</td>
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<td>oE</td>
<td>6</td>
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<tr>
<td>M607:</td>
<td>Technology of Rail Vehicles</td>
<td>6</td>
<td>Rail Vehicle Technology (G)</td>
<td>L</td>
<td>2</td>
<td>wE</td>
<td>6</td>
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<tr>
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<td></td>
<td></td>
<td>Rail System Technology (G)</td>
<td>L</td>
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</table>

**Sum specialization modules**: 66

**Explanations to Table 2:**

<table>
<thead>
<tr>
<th>General</th>
<th>Type of Course:</th>
<th>Type of Learning Control:</th>
</tr>
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<tbody>
<tr>
<td>LC CP</td>
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<td>HpW / SWS</td>
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<td>W / S</td>
<td>S</td>
<td>ngA 4)</td>
</tr>
<tr>
<td>G / E</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**1)** Taking this module in the first semester is not recommended.

**2)** Module will be offered again as from winter term 2020/21.

**3)** Course is offered every semester.

**Type of course:**
- **L**: lecture
- **L/E**: lecture and exercise, separate or integrated
- **S**: seminar
- **Pj**: project

**Type of learning control:**
- **wE**: written examination
- **oE**: oral examination
- **ngA**: not graded accomplishment as examination prerequisite
2.2.3 Profile 'Highway Engineering' (P3)

The graduates of the qualification profile 'Highway Engineering' can evaluate correctly the interrelations (e.g. between design and operation of an highway) or the consequences of decisions (e.g. the impact of an highway on nature and landscape on decades) considering the entire life cycle of the infrastructure element highway. Thus, they are able to design, construct and operate the optimized highway for specific transportation systems.

Table 3: Modules in Profile Highway Engineering

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Name</th>
<th>Course Description</th>
<th>Type</th>
<th>HPW / SWS</th>
<th>LC</th>
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<tbody>
<tr>
<td>M301:</td>
<td></td>
<td>Design and Construction of Highways (G)</td>
<td>L</td>
<td>2</td>
<td>wE 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operation and Maintenance of Highways (G)</td>
<td>L</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>M302:</td>
<td></td>
<td>IT-based Road Design (G)</td>
<td>L/E</td>
<td>2</td>
<td>ngA 3) oE 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Highway Design Project Study (G)</td>
<td>L/E</td>
<td>2</td>
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<tr>
<td>M303:</td>
<td></td>
<td>Practical Laboratory Training in Road Construction (G)</td>
<td>L/E</td>
<td>2</td>
<td>oE 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pavement Structural Design and Failure Analysis (G)</td>
<td>L</td>
<td>2</td>
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</tr>
<tr>
<td>M304:</td>
<td></td>
<td>City Transport Facilities (G)</td>
<td>L/E</td>
<td>4</td>
<td>ngA 3) oE 2</td>
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<tr>
<td></td>
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<td>Environmental Impact Assessment (G)</td>
<td>L</td>
<td>1</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Assessment and Evaluation Techniques (G)</td>
<td>L</td>
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| sum basic modules | | 30 | 12 | 8 |

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Name</th>
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<th>Type</th>
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<th>LC</th>
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<tbody>
<tr>
<td>M501:</td>
<td></td>
<td>Laws concerning Traffic and Roads (G)</td>
<td>L</td>
<td>2</td>
<td>wE 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental Impact Assessment (G)</td>
<td>L</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assessment and Evaluation Techniques (G)</td>
<td>L</td>
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</table>

<table>
<thead>
<tr>
<th>modules Highway Engineering - Specialization (selectable)</th>
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</thead>
<tbody>
<tr>
<td>M502: Project Integrated Planning 1)</td>
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<tr>
<td></td>
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<tr>
<td>M305:</td>
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<tr>
<td>M306:</td>
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<tr>
<td>M101:</td>
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(continuing next page)
### Table 3: Modules in Profile Highway Engineering (continued)

<table>
<thead>
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<th>Code</th>
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<tr>
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<tr>
<td>M103:</td>
<td>Space and Infrastructure</td>
<td>6</td>
<td>Logistics, Supply and Disposal (G)</td>
<td>L/E</td>
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<td></td>
<td>Fundamentals of Geographic Information Systems for Modelling and Planning (G)</td>
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<tr>
<td>M201:</td>
<td>Models and Methods in Traffic Engineering and Transportation Planning</td>
<td>6</td>
<td>Methods and Models in Transportation Planning (G)</td>
<td>L/E</td>
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<td></td>
<td>Traffic Engineering (G)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M202:</td>
<td>Traffic Management and Simulation Methods</td>
<td>6</td>
<td>Traffic Management and Transport Telematics (G)</td>
<td>L/E</td>
<td>2</td>
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<tr>
<td></td>
<td>Traffic Flow Simulation (G)</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**sum specialization modules** 48

20 14

**explanations to Table 3:**

**general:**
- **LC:** learning control
- **CP:** credit point
- **HpW / SWS:** hours per week
- **W / S:** winter term / summer term
- **G / E:** language German / English
  - 1) Taking this module in the first semester is not recommended.
  - 2) Module will be offered again as from winter term 2020/21.

**type of course:**
- **L:** lecture
- **L/E:** lecture and exercise, separate or integrated seminar
- **S:** seminar
- **Pj:** project

**type of learning control:**
- **wE:** written examination
- **oE:** oral examination
- **ngA:** not graded accomplishment as examination prerequisite
2.3 Mentoring, Modulwahl, persönlicher Studienplan

The selection options within the studies require that each student compiles an individual curriculum. This comprises the selection of one of the three study profiles with the respective modules and the selection of the modules within the Supplementary Studies (supplementary modules). This selection has to be supervised by a mentor chosen by the student (§ 17 a). The mentor has to be a professor of the KIT-Department Civil Engineering, Geo and Environmental Sciences and to be involved with one module in the selected profile.

By selection of the profile the five basic modules are determined. The five specialization modules have to be taken from the respective module catalog (s. Tab. 1 - 3 ). Within the Supplementary Studies four subject-specific modules have to be selected freely from the master degree program 'Mobility and Infrastructure' or any related one.

The module Interdisciplinary Qualifications (comp. also ER/SPO § 15a) compiles the student by herself or himself respectively with an extent of 6 CP from the respective offering of the KIT House of Competence (HoC) or the Centre for Cultural and General Studies (ZAK). In special cases the mentor eventually in coordination with the Examination Committee Master can accept further suitable courses as interdisciplinary qualifications which are not included in the offers of HoC and ZAK as mentioned above. The module Interdisciplinary Qualifications is completed without grade. After consultation with the lecturer a grade can be reported but is not included in the calculation of the overall grade.

For the selection of the modules within the study profiles and the supplementary studies the form for module selection available on the web page of the Examination Committee Master, https://www.tmb.kit.edu/PAM.php, has to filled in by the student and to by transferred by the mentor to the study program coordinator to be stored in the Campus Management System. The module selection shall be stored there in time to register for the exams in the first semester of the master degree program (comp. ER/SPO § 19 Par.4), so that the management of the examinations (registration, deregistration if applicable, result booking etc.) can be processed smoothly. The individual curriculum can be viewed any time via the portal Campus Management for Students, https://campus.studium.kit.edu.

The selection of the modules have to be made with care. On the one hand, the assignment of the modules to the respective part of the program, Profile Studies or Supplementary Studies respectively, will be transferred to the master degree certificate. On the other hand, changes of the module selection has to be agreed by the selected mentor and should be limited to exceptional cases, e.g. if a compulsory elective module is not offered at short notice. As far as the respective module is not yet begun, changes of the module selection are generally possible.

2.4 Beginning and completion of a module

Every module and every examination is allowed to be credited only once (comp. ER/SPO § 7 Par. 5). The binding decision whether a module is selected is made by the student at the time of registering for the corresponding examination, also partial examination (comp. ER/SPO § 5 Par. 2). The student can reset this binding selection by deregistration in time. After attendance of the examination, especially of a partial examination, a module cannot be replaced by another one any more. By request to the examination committee the assignment can be changed.

A module is completed if the general examination of the module has been passed (grade min. 4.0). In case that the module examination consists of several partial examinations, it holds: The module is completed if all partial examinations are passed (grade min. 4.0) so that the minimum requirement of credits of this module have been met.

2.5 Registration, deregistration, repetition of examinations

The registration to examinations, also to not graded accomplishments and examination prerequisites, takes place online via the portal Campus Management for Students, https://campus.studium.kit.edu. The following functions can be accessed there after login:

- register to and deregister from examinations
- retrieve examination results
- print transcript of records

A successful online registration covers the admission to the examination. A confirmation for this is provided by the portal Campus Management for Students and can serve as proof for a made registration in case of doubts. If there occurs a problem with an attempt of an online registration the study program coordinator has to be informed as soon as possible in addition to the examiner on order to solve the problem in advance to the date of examination. In case of an oral examination the online registration is to be combined directly with the negotiation of an examination date with the examiner.

A registered examination has either to be taken or a deregistration has to be made in advance to the deadline of deregistration. In particular, this is valid if for instance the date of an oral examination is shifted to the next semester because the management of the examinations has to be made in terms of the semester. The rules for the deregistration from an examination are given by the ER/SPO § 10. The deregistration from examinations of other
kinds as well as from not graded accomplishments (ER/SPO § 10 Par. 3) have to be made latest at the date of submission or presentation.

Principally, a failed examination can be repeated once, latest by the end of the examination period of the next but one semester to this examination (comp. ER/SPO § 8). If failing a written repeat examination a specific oral repeat examination can be taken. This is part of the repeat examination and will not be evaluated independently. After the specific oral repeat examination the overall grade of the repeat examination is determined, either grade 4.0 (passed) or grade 5.0 (failed).

If the repeat examination (including a specific oral repeat examination) will be failed as well, the examination claim is lost. A potential request for a second repetition has to be made without delay after loosing the examination claim. Requests for a second repetition of an examination require the approval of the examination committee. A counseling interview is mandatory.

Further information is available in the examination regulation (ER/SPO, http://www.sle.kit.edu/imstudium/master-mobilitaet-infrastruktur.php; in German), and from the Examination Committee Master or the 'Fachschaft' (student council).

2.6 Students with disability or chronic disease

Students with disability or chronic disease have the opportunity to get preferred access to participation limited courses, to adapt the order of taking certain courses to their requirements, or to take examinations of single kinds as well as from not graded accomplishments. The wishes of the students may be respected when formulating the topic. In case that the student in time.

The student submits an informal request with the respective attests to the examination committee. The examination committee defines in agreement with the examiner the details for the respective examination and informs the student the individual curriculum in agreement with the mentor. The recognition is made by the Examination Committee Master. Usually, modules in extent of 12 CP at maximum can be credited in the subject Subject-Specific Supplements. Additional credit points get lapsed.

The recognition of accomplishments obtained outside of the higher education system is made also with the respective recognition form of the Examination Committee Master (https://www.tmb.kit.edu/PAM.php). A recognition is possible if the obtained competences contribute to achieve the qualification goals of the study program. These are included into the individual curriculum in agreement with the mentor. usually, modules in extent of 12 CP at maximum can be credited in the subject Subject-Specific Supplements. Additional credit points get lapsed.

The recognition form has to be submitted to the Examination Committee Master which transfers it for crediting the accomplishments. Further information about recognitions can be found on the web page of the Examination Committee Master (https://www.tmb.kit.edu/PAM.php).

2.8 Admission, preparation and completion of the master's thesis

The Master's Thesis has to be prepared usually in semester 4 in the selected profile (comp. also ER/SPO § 14). The topic of the master's thesis has to be assigned by a professor of the Department of Civil Engineering, Geo- and Environmental Sciences. The wishes of the students may be respected when formulating the topic. In case that the master's thesis shall be prepared outside of KIT the leaflet 'Merkblatt - Externe Abschlussarbeiten' (http://www.haa.kit.edu/downloads/KIT_ALLGEMEIN_Merkblatt_Externe_Abschlussarbeiten.pdf) has to be considered.

Those are admitted to the master's thesis who has passed successfully modules of extent of minimum 42 CP within the master program Mobility and Infrastructure. Obtained results in the module Interdisciplinary Qualifications cannot be counted for this purpose. The supervisor initiates that the master's thesis will be uploaded to the campus management system. After notification via e-mail the master's thesis has to be registered online at the portal Campus Management for Students. The admission is made after verification of the required prerequisites and eventual further conditions. These steps have to be completed before starting the thesis (date of beginning).
The duration of preparation is six months. The master's thesis can be written in German or English. It has to be completed by a presentation that is considered in the grading within one month after submission. It is very much recommended to have gained already all technical and soft skills required for the preparation of the topic of the master's thesis before beginning the thesis project.

2.9 Additional accomplishments

An additional accomplishment is a voluntarily taken examination, which is not considered in the overall grade (comp. ER/SPO § 15). In total, additional accomplishments can be taken in extent of 30 CP at maximum from the entire offer of KIT.

The examination in the desired additional accomplishment shall be registered online by the student in time within the registration period. A few additional accomplishments are available in the module 'Further Examinations'. There not available and desired additional accomplishment or additional modules respectively must be forwarded via e-mail to the Study Program Service of the department ('Studiengangservice Bau-Geo-Umwelt'). This makes the desired selection available in the campus management system so that the registration to the exam is possible online. By request to the examination committee the assignment can by changed subsequently.

All taken additional accomplishments are listed in the transcript of records. If a module is completed this module can be included in the master degree certificate as additional module on request by the student. This applies also to additional accomplishments which were recognized by the examination committee.
3 Further information

3.1 About the module handbook . . .

The module handbook is the relevant document in which the structure of the program is described and therefore it provides assistance for the orientation during the studies. It describes the modules belonging to the program and contains information about:

- the structure of the modules,
- the extent of the modules (in CP),
- the interdependencies of the modules,
- the learning outcomes of the modules,
- the type of assessment and examinations,
- the computation of the grade of the module and
- the placement of the module in the course of study.

Each module consists of one or more interrelated courses, which are completed by one or more examinations or not graded accomplishment. The extent of each module is characterized by 6 CP, which will be credited after the successful completion of the module. The module handbook provides the necessary information that the students can customize content and time schedule of the interdisciplinary studies according to personal needs, interest and job perspective.

In addition to the module handbook the course catalog and the institutes (web pages) provide important information. These are updated every semester concerning variable course details (e.g. time and location of the course) as well as short-term modifications.

3.2 About module examinations, examination committee . . .

The module examinations can be taken as a general examination or as several partial examinations. If the module examination is offered as a general examination, the entire content of the module will be reviewed in a single examination. If the module examination consists of partial examinations, the content of each course will be reviewed in corresponding partial examinations. Then the module examination can be taken over several semesters. Also not graded accomplishments can be part of the module examination, e.g. as examination prerequisites.

The Examination Committee Master, https://www.tmb.kit.edu/PAM.php, is responsible for all legal questions in the context of examinations. For instance, all requests on second repetition, extension of deadlines or recognitions are submitted to this. It decides about their approval.

3.3 About changes in module offer . . .

The offer of modules changes in the course of the semesters. Modules can be discontinued or added or the module examination may change. If possible, such changes are announced in the module handbook with sufficient time in advance, at latest at the beginning of the semester as from they are valid (s. Chapt. Current changes).

Usually, it is valid that students who started a module (s. selection and completion of a module) can complete this in that form as started. The respective examinations are provided onwards over a certain time period usually at least one semester after time of change. In general, a consultation with the examiner is recommended in such a case.
3.4 Contact persons

Dean of Study Affairs:
Prof. Dr. Peter Vortisch
Institute for Transport Studies, Bldg. 10.30, R. 305
consultation: on appointment
Phone: 0721/608-42255
Email: peter.vortisch@kit.edu

Study Program Coordination:
PD Dr. Ulf Mohrlok
Department of Civil Engineering, Geo and Environmental Sciences, Bldg. 10.81, R. 311
consultation: on appointment
Phone: 0721/608-46517
Email: ulf.mohrlok@kit.edu

Examination Committee Master:
Prof. Dr.-Ing. Kunibert Lennerts (chairperson)
Dipl.-Wi.-Ing. Heike Schmidt-Bäumler (person in charge)
Institute of Technology and Management in Construction, Bldg. 50.31, R. 005 (ground floor)
consultation: Wed. 13.00 – 14.00 h
Phone: 0721/608-46008
Email: pam@bgu.kit.edu
Web: https://www.tmb.kit.edu/PAM.php

Students’ Advisory Service:
Dr.-Ing. Harald Schneider
Institute of Technology and Management in Construction, Bldg. 50.31, R. 008 (ground floor)
consultation: on appointment
Phone: 0721/608-43881
Email: harald.schneider@kit.edu

Study Program Service (‘Studiengangservice Bau-Geo-Umwelt’):
Department of Civil Engineering, Geo and Environmental Sciences, Bldg. 10.81, R. 312
Email: studiengangservice@bgu.kit.edu
Web: http://www.bgu.kit.edu/studiengangservice.php

Fachschaft:
Students in Civil Engineering
Bldg. 10.81 (Altes Bauing. Geb.), R. 317.1 (3rd floor)
consultation: s. http://www.fs-bau.kit.edu
Phone: 0721/608-43895
Email: fsbau@lists.kit.edu
Web: http://www.fs-bau.kit.edu

3.5 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
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</table>
4 Current changes

In the following, the important changes are listed as from summer term 2020. Although this process was done with great care, other/minor changes may exist.

modules offered newly as from winter term 2020/21:
   Track Guided Transport Systems - Technical Design and Components [mobiM401-EBTECHNIK], will be offered again as compulsory elective module.

changes of the courses assigned to the modules as from winter term 2020/21:
   Special Issues of Public Transport [mobiM208-VERSPEZOEV]:
      the course Information Management for Public Mobility Services (6232813), 2 HpW/SWS, will be offered in winter term.

changed examinations and not graded accomplishments as from summer term 2020:
   Space and Infrastructure [mobiM103-PLRAUMINF]:
      The module examination is a written examination.
   Planning of Transportation Systems [mobiM203-VERPLAN]:
      The module examination is a written examination.
   Urban Design in Practice [mobiM601-PRAXSTB]:
      The not graded accomplishment 'Urban Development - Practical Course' is additional part of the module as examination prerequisite.
5 Modules

5.1 Module: Track Guided Transport Systems - Technical Design and Components (bauiM3P4-EBTECHNIK) [M-BGU-100010]

Responsible: Jan Tzschaschel
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Profile Specialization / Urban and Transport Planning (Usage from 4/1/2020)
Profile Specialization / Traffic Engineering (Usage from 4/1/2020)
Profile Specialization / Highway Engineering (Usage from 4/1/2020)
Subject-Specific Supplements (Usage from 4/1/2020)

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</table>

Mandatory

T-BGU-100052 Track Guided Transport Systems - Technical Design and Components 6 CR Tzschaschel

Competence Certificate
- 'Teilleistung' T-BGU-100052 with written examination according to § 4 Par. 2 No. 1
details about the learning control see at the 'Teilleistung'

Competence Goal
Students are enabled to analyse the field of guided transport systems in its thematic complexity, to recognise the technical context and develop solutions to problems.

Module grade calculation
grade of the module is grade of the exam

Prerequisites
none

Content
- law, organisation and development of railways
- basics of dynamics of train movements
- introduction to planning and design of train stations and railway line layout
- introduction to the layout and dimensioning of the superstructure
- future developments of railway traffic

Recommendation
none

Annotation
IMPORTANT:
The module will be offered once again as from summer term 2020.

Workload
contact hours (1 HpW = 1 h x 15 weeks):
- lectures/exercises: 60 h

independent study:
- preparation and follow-up lectures/exercises: 60 h
- examination preparation: 60 h

total: 180 h
5 MODULES

Module: Track Guided Transport Systems - Technical Design and Components (bauM3P4-EBTECHNIK) [M-BGU-100010]

Mobility and Infrastructure (Master of Science (M.Sc.), SPO 2019)
Module Handbook as of 26/03/2020

Literature
Zilch, Diederichs, Katzenbach: Handbuch f. Bauingenieure, Springer-Verlag
Pachl, J.; Systemtechnik des Schienenverkehrs, Springer Vieweg
5.2 Module: Urban and Regional Planning (mobiM101-PLSTAREG) [M-BGU-100007]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences

Part of: Profile Basics / Urban and Transport Planning
Profile Specialization / Highway Engineering
Subject-Specific Supplements

Mandatory

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Competence Certificate
- "Teilleistung" T-BGU-100050 with oral examination according to § 4 Par. 2 No. 2
  details about the learning control see at the 'Teilleistung'

Competence Goal
The aim is to provide an overview of important tasks for spatial planning, of the legal principles, methods and strategies for solving spatial problems on urban and regional level. The students shall be able to develop planning strategies, particularly in the field of planning on a supra-local level.

Module grade calculation
grade of the module is grade of the exam

Prerequisites
none

Content
In the lectures basic goals and tasks of planning of different levels, procedures and instruments, the relationship between governmental and private planning are taught. The scientific contexts are developed systematically to strengthen the various methodological approaches to understand and evaluate them. Particular attention will be paid inter alia to changing conditions, such as demographic and economic developments.

Recommendation
module Mobility and Infrastructure [bautBFP5-MOBIN]

Annotation
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):
- Urban Planning lectures/exercises: 30 h
- Regional Planning lectures: 30 h

independent study:
- preparation and follow-up Urban Planning lectures/exercises: 30 h
- preparation and follow-up Regional Planning lectures: 30 h
- examination preparation: 60 h

total: 180 h

Literature
list of literature to module
5.3 Module: Urban Renewal (mobiM102-PLSTUMB) [M-BGU-100013]

**Responsible:** Prof. Dr.-Ing. Peter Vortisch

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** Profile Basics / Urban and Transport Planning

### Subject-Specific Supplements

**Credits:** 6

**Recurrence:** Each summer term

**Duration:** 1 term

**Language:** German

**Level:** 4

**Version:** 2

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**Competence Certificate**

- 'Teilleistung' T-BGU-108441 with oral written according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-108442 with oral examination according to § 4 Par. 2 No. 2

Details about the learning controls see at the respective 'Teilleistung'

**Competence Goal**

The aim is to convey the principles and methods of urban renewal. In the module adaptation strategies are taught, by which cities and city regions react to changing conditions. These changes - such as climate change, demographics or changing economic practices - are encountered by urban concepts city-wide, on the level of city quarters or on the building level. In addition to the urban redevelopment in Germany selected references from Europe are examined.

**Module grade calculation**

Grade of the module is CP weighted average of grades of the partial exams

**Prerequisites**

None

**Content**

Based on the core module "Urban and Regional Planning" this lecture is focused on adaptation strategies of cities and urban regions. In addition to a classification in the current discussions on urban redevelopment basic methods and tools are taught. The students of the module Urban Renewal shall be able to elaborate strategies of urban renewal and redevelopment. The basic methodological framework is the discussion of projects as examples for good practice. The module will be supplemented by courses such as "History of Urban Planning and the Built Environment" to consider the historical development and cultural heritage. In addition, in the course "Building Theory" urban qualities and implementation on the building level are taught.

**Recommendation**

None

**Annotation**

None

**Workload**

Contact hours (1 HpW = 1 h x 15 weeks):

- Urban Management lectures/exercises: 30 h
- Urban Planning I: History of Urban Planning and the Built Environment lectures: 30 h

Independent study:

- preparation and follow-up Urban Management lectures/exercises: 30 h
- examination preparation Urban Management: 30 h
- preparation and follow-up Urban Planning I: History of Urban Planning and the Built Environment lectures: 30 h
- examination preparation History of Urban Planning: 30 h

Total: 180 h
Literature
list of literature to module
Module: Space and Infrastructure (mobiM103-PLRAUMINF) [M-BGU-100014]

**Responsible:** Dr.-Ing. Martin Kagerbauer

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** Profile Specialization / Urban and Transport Planning
Profile Specialization / Highway Engineering
Subject-Specific Supplements

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</table>

**Competence Certificate**

- ‘Teilleistung’ T-BGU-100056 with written examination according to § 4 Par. 2 No. 1
- details about the learning control see at the ‘Teilleistung’

**Competence Goal**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Prerequisites**

none

**Content**

see German version

**Recommendation**

none

**Annotation**

As from summer term 2020 the learning control is a written exam.

**Workload**

contact hours (1 HpW = 1 h x 15 weeks):

- Logistics, Supply and Disposal lectures/exercises: 30 h
- Fundamentals of Geographic Information Systems for Modelling and Planning lectures/exercises: 60 h

independent study:

- preparation and follow-up Logistics, Supply and Disposal lectures/exercises: 30 h
- preparation and follow-up Fundamentals of Geographic Information Systems for Modelling and Planning lectures/exercises: 15 h
- examination preparation: 45 h

total: 180 h

**Literature**

list of literature to module
5.5 Module: Models and Methods in Traffic Engineering and Transportation Planning (mobiM201-VERMODELL) [M-BGU-100008]

**Responsible:** Prof. Dr.-Ing. Peter Vortisch

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:**
- Profile Basics / Urban and Transport Planning
- Profile Basics / Traffic Engineering
- Profile Specialization / Highway Engineering
- Subject-Specific Supplements

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**Mandatory**

| T-BGU-100012 | Models and Methods in Traffic Engineering and Transportation Planning | 6 CR | Vortisch |

**Competence Certificate**

- "Teilleistung" T-BGU-100012 with oral examination according to § 4 Par. 2 No. 2

**Competence Goal**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Prerequisites**

none

**Content**

Methods and models in transport planning as well as the relevant tools and methods for the traffic engineer.

**Transport Planning:**
- four-Step-Algorithm
- aggregate versus individual models
- choice modeling

**Traffic Engineering:**
- measuring traffic flow data
- description of traffic conditions / fundamental diagram
- capacity of roads and intersections with and without traffic signals

**Recommendation**

none

**Annotation**

none

**Workload**

contact hours (1 HpW = 1 h x 15 weeks):
- Methods and Models in Transportation Planning lectures/exercises: 30 h
- Traffic Engineering lectures/exercises: 30 h

independent study:
- preparation and follow-up Methods and Models in Transportation Planning lectures/exercises: 30 h
- preparation and follow-up Traffic Engineering lectures/exercises: 30 h
- examination preparation: 60 h

total: 180 h
Literature
lecture notes with additional references / exercises
5.6 Module: Traffic Management und Simulation Methods (mobilM202-VERMANAGE) [M-BGU-100015]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Profile Basics / Traffic Engineering
Profile Specialization / Highway Engineering
Subject-Specific Supplements

Credits 6
Recurrence Each term
Duration 1 term
Language German
Level 4
Version 1

Mandatory
T-BGU-100008 Traffic Management und Simulation Methods 6 CR Vortisch

Competence Certificate
- 'Teilleistung' T-BGU-100008 with oral examination according to § 4 Par. 2 No. 2
details about the learning control see at the 'Teilleistung'

Competence Goal
Acquisition of the specific and advanced knowledge and the relevant methodologies in the field of traffic engineering. Basic considerations in the development and the application of simulation models in transport planning and traffic engineering.

Module grade calculation
grade of the module is grade of the exam

Prerequisites
none

Content
In excess of the basic module "Model approaches and methods in transportation" more advanced methods of traffic engineering will be dealt with (advanced signalisation, control of routes and networks). Furthermore methods for the development of simulation models as well as their application will be in the focus (application of professional software tools for transport planning and traffic engineering). Another issue are transport telematics and intelligent transportation system.

Recommendation
none

Annotation
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):
- Traffic Management and Transport Telematics lectures/exercises: 30 h
- Traffic Flow Simulation lectures/exercises: 30 h

independent study:
- preparation and follow-up Traffic Management and Transport Telematics lectures/exercises: 30 h
- preparation and follow-up Traffic Flow Simulation lectures/exercises: 30
- examination preparation: 60 h

total: 180 h

Literature
lecture notes
guidelines ('Handbuch zur Bemessung von Straßen', 'Richtlinien für Lichtsignalanlagen'),
software documentations
Module: Planning of Transportation Systems (mobiM203-VERPLAN) [M-BGU-100016]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Profile Basics / Urban and Transport Planning
Profile Specialization / Traffic Engineering
Subject-Specific Supplements

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Mandatory

| T-BGU-100013 | Planning of Transportation Systems | 6 CR | Vortisch |

Competence Certificate
- ‘Teilleistung’ T-BGU-100013 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Competence Goal
The students know all common means of transport and their properties. They can assess advantages and disadvantages of the means of transport from the perspective of users, operators and the environment, and they can make decisions about the system adapted to the situation. They understand the systemic interrelation of means of transport, infrastructure and mobility behaviour. The students know the methods of transportation planning common in practice and can these critically evaluate and develop further.

Module grade calculation
grade of the module is grade of the exam

Prerequisites
none

Content
- means of transport and their properties: capacity, velocity and energy consumption;
- environmental impacts: pollutant emission, noise and traffic safety;
- origin and evolution of traffic demand;
- examples of transport systems: bicycle traffic as system, planning procedures in public transport,
- boundary conditions of strategic planning: target systems, civic participation, policy influence;
- application of models;
- activity development;
- impact investigation and evaluation;
- examples: federal road plan, international master plans;
- transport development plans

Recommendation
course Transportation (6200406)

Annotation
As from summer term 2020 the learning control is a written exam.
Workload
contact hours (1 HpW = 1 h x 15 weeks):

- Characteristics of Transportation Systems lectures: 30 h
- Strategic Transport Planning lectures: 30 h

independent study:

- preparation and follow-up Characteristics of Transportation Systems lectures: 30 h
- preparation and follow-up Strategic Transport Planning lectures: 30 h
- examination preparation: 60 h

total: 180 h

Literature
lecture notes and materials are available for downloading
5.8 Module: Intermodality in Freight, Long-Distance and Air Transport (mobiM205-VERINTER) [M-BGU-100020]

Responsible: Bastian Chlond
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Profile Specialization / Urban and Transport Planning
Subject-Specific Supplements

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Mandatory

| T-BGU-106611 | Freight Transport | 3 CR | Chlond |
| T-BGU-106301 | Long-Distance and Air Traffic | 3 CR | Chlond |

Competence Certificate
- 'Teilleistung' T-BGU-106611 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-106301 with written examination according to § 4 Par. 2 No. 1
details about the learning controls see at the respective 'Teilleistung'

Competence Goal
Knowledges about the characteristics of freight transportation, long distance travel and air travel against the background of the globalization and and EU-integration Knowledge about the challenges and the design and of intermodal transport services.

Module grade calculation
grade of the module is CP weighted average of grades of the partial exams

Prerequisites
none

Content
- relevant factors for the demand in freight transport
- methods for demand forecasts and planning in freight transport
- measures for influencing the demand in freight transport as well as their efficiency
- particularities of the airline industry in a global market shown in case studies
- organisation of the airline industry
- particularities of Long Distance Travel
- methodology of the Federal Transport Master Plan
- evolution of Long Distance Transport Systems

Recommendation
none

Annotation
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):
- Freight Transport lectures/exercises: 30 h
- Long-distance and Air Traffic lectures: 30 h

independent study:
- preparation and follow-up Freight Transport lectures/exercises: 30 h
- examination preparation Freight Transport (partial exam): 30 h
- preparation and follow-up Long-distance and Air Traffic lectures: 30 h
- examination preparation Long-distance and Air Traffic (partial exam): 30 h

total: 180 h
Literature
lecture accompanying documents
5.9 Module: Analysis and Evolution of Mobility (mobiM206-VERANAMOB) [M-BGU-100583]

Responsible: Dr.-Ing. Martin Kagerbauer
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Profile Specialization / Urban and Transport Planning

Subject-Specific Supplements

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Mandatory

T-BGU-101004  Analysis and Evolution of Mobility  6 CR  Kagerbauer

Competence Certificate
- 'Teilleistung' T-BGU-101004 with oral examination according to § 4 Par. 2 No. 2
details about the learning control see at the 'Teilleistung'

Competence Goal
The students master the methods to capture and to analyse the mobility behaviour of the people and recognize trends in the behaviour. They know up to date mobility offers and are able to evaluate these from the point of view of users and operators.

Module grade calculation
grade of the module is grade of the exam

Prerequisites
none

Content
- capturing mobility: measurements and surveys, data preparation
- analysis: statistical methods and software tools therefore (SAS, R), also practical exercises at PC
- new forms of mobility, e.g. sharing systems for cars and bicycles
- mobility services: rideshare services, intermodal information systems etc.
- analysis of functionality, interrelations and backgrounds of these mobility forms

Recommendation
course Transportation (6200406)

Annotation
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):
- Transportation Data Analysis lectures/exercises: 30 h
- Mobility Services and new Forms of Mobility lectures/exercises: 30 h

independent study:
- preparation and follow-up Transportation Data Analysis lectures/exercises: 30 h
- preparation and follow-up Mobility Services and new Forms of Mobility lectures/exercises: 30 h
- examination preparation: 60 h

total: 180 h
5.10 Module: Special Issues of Public Transport (mobiM208-VERSPEZOEV) [M-BGU-103357]

**Responsibility:** Prof. Dr.-Ing. Peter Vortisch

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** Profile Specialization / Urban and Transport Planning  
Subject-Specific Supplements

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**Election block: Electives (2 items as well as 6 credits)**

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<td>Tendering, Planning and Financing in Public Transport</td>
<td>3 CR</td>
<td>Vortisch</td>
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<td>T-BGU-100014</td>
<td>Seminar in Transportation</td>
<td>3 CR</td>
<td>Chlond, Vortisch</td>
</tr>
<tr>
<td>T-BGU-106608</td>
<td>Information Management for Public Mobility Services</td>
<td>3 CR</td>
<td>Vortisch</td>
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</table>

**Competence Certificate**

Two learning controls have to be selected:
- 'Teilleistung' T-BGU-101005 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-100014 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-106608 with examination of other type according to § 4 Par. 2 No. 3

Details about the learning controls see at the respective 'Teilleistung'.

**Competence Goal**

See German version

**Module grade calculation**

Grade of the module is CP weighted average of grades of the partial exams.

**Prerequisites**

None

**Content**

See German version

**Recommendation**

Course Transportation (6200406)

**Annotation**

None

**Workload**

Contact hours (1 HpW = 1 h x 15 weeks):

- Tendering, Planning and Financing in Public Transport lectures: 30 h
- Seminar in Transportation: 30 h
- Regional Planning lectures: 30 h
- Information Management for public Mobility Services lectures/exercises: 30 h

Independent study, as selected courses:

- Preparation and follow-up Tendering, Planning and Financing in Public Transport lectures: 30 h
- Examination preparation Tendering, Planning and Financing in Public Transport (selectable partial exam): 30 h
- Preparation of term paper and presentation (selectable partial exam): 60 h
- Preparation and follow-up Information Management for public Mobility Services lectures/exercises: 30 h
- Preparation accompanying exercises Information Management for public Mobility Services (selectable partial exam): 30 h

Total: 180 h
5.11 Module: Infrastructure Management (mobiM301-STRINFRA) [M-BGU-100009]

**Responsible:** Prof. Dr.-Ing. Ralf Roos

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** Profile Basics / Traffic Engineering

**Profile Basics / Highway Engineering**

**Subject-Specific Supplements**

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**Mandatory**

| T-BGU-106300 | Infrastructure Management | 6 CR Roos |

**Competence Certificate**

- “Teilleistung” T-BGU-106300 with written examination according to § 4 Par. 2 No. 1
details about the learning control see at the respective "Teilleistung”

**Competence Goal**

The graduates are able to apply and develop respectively methods and techniques for different tasks related to the life cycle of a road (design, construction, operation and maintenance) and to examine these with regard to their technical suitability and economic feasibility. Further, they have the competence to be able to apply these methods to other problems and in different fields and modify them respectively.

**Module grade calculation**

grade of the module is grade of the exam

**Prerequisites**

none

**Content**

The module addresses further topics about design and construction of roads such as aspects of safety, junctions, construction materials, way of construction and drainage. In the phase of operation of a road after release for traffic logistical and technical aspects of the operation service (road control, snow and ice control, green belt care etc.) as well as the maintenance of roads (status recognition and evaluation, surface and structure properties, pavement management a.o.) come to the fore which are important for smooth and safe traffic flow. These are discussed in the classes fundamentally.

**Recommendation**

none

**Annotation**

none

**Workload**

contact hours (1 HpW = 1 h x 15 weeks):

- Design and Construction of Highways lectures: 30 h
- Operation and Maintenance of Highways lectures: 30 h

independent study:

- preparation and follow-up Design and Construction of Highways lectures: 30 h
- preparation and follow-up Operation and Maintenance of Highways lectures: 30 h
- examination preparation: 60 h

total: 180 h
Module: Highway Design (mobiM302-STRENTW) [M-BGU-100017]

Responsible: Dr.-Ing. Matthias Zimmermann
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Profile Basics / Highway Engineering
Profile Specialization / Traffic Engineering
Subject-Specific Supplements

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<td>Study project Design of a Rural Road</td>
<td>2 CR</td>
<td>Roos, Zimmermann</td>
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<td>T-BGU-100057</td>
<td>Highway Design</td>
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Competence Certificate
- 'Teilleistung' T-BGU-109917 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100057 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

Competence Goal
The graduates can apply methods as well as manual and computer aided procedures for the design of a road in position elevation and cross section and design new roads. Furthermore, they are able to develop and evaluate variants of new roads considering traffic, topographic, ecologic and economic requirements as well as to assess road designs in compliance with the technical regulations.

Module grade calculation
grade of the module is grade of the exam

Prerequisites
none

Content
In this module the procedure of finding the route of a bypass road will be discussed and applied to a specific planning example. After defining the boundary conditions for the draft of this bypass road design solutions are developed in the map, in the gradient diagram and in the cross-section manually by small teams. The results are discussed. Here also, tests are made whether the standards are satisfied and related to requirements of the spatial route planning. In parallel to this manual route planning of the road, the procedure of a computer aided road design is addressed in theory as well as practically at basic design examples. The exercises are conducted by use of the both most popular design codes.

Recommendation
preliminary attendance of the module Infrastructure Management [mobiM301-STRINFRA]

Annotation
none
Workload
contact hours (1HpW = 1 h x 15 weeks):

- IT-based Road Design lectures/exercises: 30 h
- Highway Design Project Study lectures/exercises: 30 h

independent study:

- preparation and follow-up IT-based Road Design lectures/exercises: 30 h
- preparation and follow-up Highway Design Project Study lectures/exercises: 30 h
- attestation of study project (examination prerequisite): 20 h
- examination preparation: 40 h

total: 180 h
5.13 Module: Road Construction (mobiM303-STRBAUT) [M-BGU-100006]

Responsible: Prof. Dr.-Ing. Ralf Roos
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Profile Basics / Highway Engineering
Subject-Specific Supplements

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Competence Certificate
- "Teilleistung" T-BGU-100058 with oral examination according to § 4 Par. 2 No. 2
details about the learning control see at the 'Teilleistung'

Competence Goal
The graduates are able to dimension and to test roadway constructions build of asphalt and concrete empirically and by calculation and to assess the impact of internal and external influencing factors on roadway constructions. Furthermore, they are able to explain mechanisms of failure, to question and to evaluate failures as well as to test material parameters by experimental techniques in the lab.

Module grade calculation
grade of the module is grade of the exam

Prerequisites
none

Content
In this module material models, influencing factors on roadway constructions as well as basics and parameters for an empirical and calculatory dimensioning of transportation routes are addressed deeply. Furthermore, deficiencies and failures of roadway constructions are presented and failure mechanisms are explained. In the practical training experiments on the determination of material parameters of unconsolidated materials, bitumen and asphalt are conducted, analysed and evaluated as well as the application of dimensioning methods are examined at real-world examples.

Recommendation
preliminary attendance of the module Infrastructure Management [mobiM301-STRINFRA]

Annotation
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- Practical Laboratory Training in Road Construction lectures/exercises: 30 h
- Pavement Structural Design and Failure Analysis lectures: 30 h

independent study:

- preparation and follow-up Practical Laboratory Training in Road Construction lectures/exercises: 30 h
- preparation and follow-up Pavement Structural Design and Failure Analysis lectures: 30 h
- examination preparation: 60 h

total: 180 h
5.14 Module: City Transport Facilities (mobiM304-STRIVA) [M-BGU-100026]

Responsible: Prof. Dr.-Ing. Ralf Roos
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Profile Basics / Traffic Engineering
Profile Basics / Highway Engineering
Profile Specialization / Urban and Transport Planning
Subject-Specific Supplements

Credits 6
Recurrence Each winter term
Duration 1 term
Language German
Level 4
Version 2

Mandatory

| T-BGU-109912 | Exercises and student research project City Transport Facilities | 2 CR | Roos |
| T-BGU-100083 | City Transport Facilities | 4 CR | Roos |

Competence Certificate
- 'Teilleistung' T-BGU-109912 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100083 with oral examination according to § 4 Par. 2 No. 2
Details about the learning controls see at the respective 'Teilleistung'

Competence Goal
The graduates are able to plan and design city transport facilities related to car, bicycle, pedestrian and public traffic as well as to test, evaluate and optimize existing infrastructure. Further, they are able to assess the different usage requirements of different types of transportation and to consider them appropriately in design planning.

Module grade calculation
grade of the module is grade of the exam

Prerequisites
none

Content
Manifold requirements are put on city transport facilities in contrast to overland roads: usage from transit to access traffic, usage for stationary traffic, weak road users such as bicyclist and pedestrians, the demand of moving traffic, for stay and recreation activities up to the designing of the transport facilities considering the citycape. Contemporarily, a variety of carriers of traffic are found within urban areas which have to be taken into consideration for designing roads and junctions as well as the network of transportation routes. All aspects are covered, discussed and their handling is practised at practically relevant case studies within this module.

Recommendation
none

Annotation
none

Workload
Contact hours (1 HpW = 1 h x 15 weeks):

- lectures/exercises: 45 h

Independent study:

- preparation and follow-up lectures/exercises: 30 h
- preparation of exercises and student research project (examination prerequisite): 70 h
- examination preparation: 40 h

Total: 185 h
5.15 Module: Road Safety (mobiM305-STRVSICH) [M-BGU-100021]

**Responsible:** Dr.-Ing. Matthias Zimmermann

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** Profile Specialization / Traffic Engineering
Profile Specialization / Highway Engineering
Subject-Specific Supplements

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**Competence Certificate**
- 'Teilleistung' T-BGU-109912 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100062 with oral examination according to § 4 Par. 2 No. 2

**Details about the learning controls see at the respective 'Teilleistung'**

**Competence Goal**
The graduates are able to apply methods and techniques for the improvement of road safety, to evaluate the safety of road networks, road sections and junctions, to identify accident black spots, to analyse accidents and their causes as well as to develop measures to improve road safety and evaluate them in their effect. Furthermore, they are able to self-organized and have organisational and didactic competences available related to team work and presentations.

**Module grade calculation**
grade of the module is grade of the exam

**Prerequisites**
none

**Content**
In this course the theoretical basics of road safety are repeated and fundamental improvements are discussed. During the following seminar in highway engineering changing regional accident black spots are analysed and improvements for the road authorities are worked out and will be presented.

**Recommendation**
none

**Annotation**
none

**Workload**
contact hours (1 HpW = 1 h x 15 weeks):

- Safety Management in Highway Engineering lectures/exercises: 30 h
- Seminar in Highway Engineering: 30 h

independent study:

- preparation and follow-up Safety Management in Highway Engineering lectures/exercises: 30 h
- preparation of seminar paper (examination prerequisite): 60 h
- examination preparation: 60 h

total: 180 h
Module: Special Topics in Highway Engineering (mobiM306-STRSPEZ) [M-BGU-100022]

Responsible: Prof. Dr.-Ing. Ralf Roos
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Profile Specialization / Highway Engineering
Subject-Specific Supplements

Credits: 6
Recurrence: Each summer term
Duration: 1 term
Language: German
Level: 4
Version: 2

Mandatory

| T-BGU-106734 | Special Topics in Highway Engineering | 6 CR | Hess, Roos |

Competence Certificate
- ‘Teilleistung’ T-BGU-106734 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the ‘Teilleistung’

Competence Goal
The graduates are able to apply methods and techniques for specific aspects in the life cycle of a road, to modify them for the application case and to analyse the obtained knowledge. They are able to investigate the organisation and implementation of the operation and maintenance of a road, for instance, to reveal the weak points and to develop improvement possibilities.

Module grade calculation
grade of the module is grade of the exam

Prerequisites
none

Content
In this module the duties of the management of existing roads are acquired and the technical and commercial control from the point of view of the road authorities are explained. Further, different methods for the simulation, analysis and evaluation of additional problems and special aspects in highway engineering are presented and discussed by means of varying topics of design, construction, operation and maintenance of roads (e.g. statistical analysis of large data sets, simulation of traffic flow under particular boundary conditions, construction material analysis in lab experiments, innovative contractual forms for construction and operation of roads, econ. privatization).

Recommendation
preliminary attendance of the module Infrastructure Management [mobiM301-STRINFRA]

Annotation
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):
- Technical and Economic Management Tools in Highway Engineering lectures: 30 h
- Simulations and Analysis Methods in Highway Engineering lectures: 15 h
- Special Topics in Highway Engineering lectures: 15 h

independent study:
- preparation and follow-up Technical and Economic Management Tools in Highway Engineering lectures: 30 h
- preparation and follow-up Simulations and Analysis Methods in Highway Engineering lectures: 15 h
- preparation and follow-up Special Topics in Highway Engineering lectures: 15 h
- examination preparation: 60 h

total: 180 h
5.17 Module: Track Guided Transport Systems - Operation and Capacity (mobiM407-EBBETRKAP) [M-BGU-100581]

Responsible: Jan Tzschaschel
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Profile Specialization / Traffic Engineering
Subject-Specific Supplements

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**Competence Certificate**

- "Teilleistung" T-BGU-101002 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Competence Goal**
The Students can analyse, structure and describe formally problems in the field of operation of track guided transport systems. They are able to process methodically questions of security and capacity of railway tracks and to propose solutions.

**Module grade calculation**

grade of the module is grade of the exam

**Prerequisites**
This module must not be selected together with one of the modules Track Guided Transport Systems - Basics of Operating Systems [mobiM402-EBBETRIEB] and Track Guided Transport Systems - Operational Logistics and Management [mobiM403-EBLOGISTIK] not offered any more.

**Content**

- operation and signal systems
- safety and signalbox technologies
- time table compilation
- performance and capacity of railway lines
- proof of safety
- operation and dimensioning of marshalling yards

**Recommendation**

none

**Annotation**

none

**Workload**

contact hours (1 HpW = 1 h x 15 weeks):

- Operation Track Guided Systems lectures: 30 h
- Operation Systems and Track Guided Infrastructure Capacity lectures: 30 h

independent study:

- preparation and follow-up Operation Track Guided Systems lectures: 30 h
- preparation and follow-up Operation Systems and Track Guided Infrastructure Capacity lectures: 30 h
- examination preparation: 60 h

total: 180 h
Literature
Fiedler, Grundlagen der Bahntechnik, Werner-Verlag, Düsseldorf
Hausmann, Enders, Grundlagen des Bahnbetriebs, Bahn-Fachverlag, Heidelberg
Pachl, Systemtechnik des Schienenverkehrs, Teubner-Verlag, Stuttgart

Responsible: Prof. Dr.-Ing. Ralf Roos
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: Profile Basics / Urban and Transport Planning
Profile Basics / Traffic Engineering
Profile Basics / Highway Engineering

Credits: 6
Recurrence: Each summer term
Duration: 1 term
Language: German
Level: 4
Version: 2

Mandatory

Competence Certificate
- 'Teilleistung' T-BGU-100050 with written examination according to § 4 Par. 2 No. 1
details about the learning control see at the 'Teilleistung'

Competence Goal
The graduates know the legal framework concerning construction and operating of roads and can justify and question decisions. Furthermore, they understand methods concerning environmental impact analysis of infrastructure, they can technically argue and classify evaluations of variants. In addition, they are able to apply assessment and evaluation techniques for the planning of infrastructure projects, to modify them with respect to specific applications and to analyse their results.

Module grade calculation
grade of the module is grade of the exam

Prerequisites
none

Content
Constitutional framework, environmental impact of roads, changing topics concerning mainly procedures in highway engineering Methodologies and application of standardized assessment and decision techniques (Cost-Benefit-Analyses, Value Benefit Analysis etc.) in transport planning

Recommendation
none

Annotation
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):
- Laws concerning Traffic and Roads lectures: 30 h
- Environmental Impact Assessment lectures: 15 h
- Assessment and Evaluation Techniques lectures: 15 h

independent study:
- preparation and follow-up Laws concerning Traffic and Roads lectures: 30 h
- preparation and follow-up Environmental Impact Assessment lectures: 15 h
- preparation and follow-up Assessment and Evaluation Techniques lectures: 15 h
- examination preparation: 60 h

total: 180 h
## 5.19 Module: Project Integrated Planning (mobiM502-PROJEKTIP) [M-BGU-100018]

| Responsible | Prof. Dr.-Ing. Ralf Roos |
| Organisation | KIT Department of Civil Engineering, Geo- and Environmental Sciences |
| Part of | Profile Specialization / Urban and Transport Planning |
| | Profile Specialization / Traffic Engineering |
| | Profile Specialization / Highway Engineering |
| | Subject-Specific Supplements |

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Mandatory

| T-BGU-109916 | Group exercise Project Integrated Planning | 5 CR | Roos |
| T-BGU-100061 | Project Integrated Planning | 1 CR | Roos |

**Competence Certificate**
- 'Teilleistung' T-BGU-109916 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100061 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Competence Goal**
The graduates are able to analyze the planning requirements of the different subject areas in the field mobility and infrastructure and to apply them to a specific example. They identify the weak points, develop realizable solutions and discuss them in the framework of a multi-disciplinary weighing process. Furthermore, they can work self-organized and have organisational and didactic competences with respect to team work and presentation.

**Module grade calculation**
grade of the module is grade of the exam

**Prerequisites**
none

**Content**
A typical practical task in the field of spatial and infrastructure planning has to be elaborated (e.g. ideas contest in town planning). The students have to take charge of certain planning tasks from the fields town planning, transport studies, highway engineering and track guided transport systems and develop different solution concepts based on a conflict and deficiency analysis. In order to obtain an integrated planning concept the requirements of the involved subject areas have to be considered. Subsequent to a weighing process, they select well-founded a acceptable and sustainable concept which they develop further and present in 3 phases to a realizable solution on different levels of detail.

**Recommendation**
preliminary attendance of at least 2 compulsory modules in the selected profile

**Annotation**
none

**Workload**
contact hours (1 HpW = 1 h x 15 weeks):

- on-site meeting, technical group meetings, presentations: 15 h

independent study:

- preparation and follow-up: 15 h
- team exercise (examination prerequisite, part per person): 135 h
- examination preparation and examination: 15 h

total: 180 h
Module: Urban Design in Practice (mobiM601-PRAXSTB) [M-ARCH-100029]

**Responsible:** Prof. Dr.-Ing. Barbara Engel

**Organisation:** KIT Department of Architecture

**Part of:** Profile Specialization / Urban and Transport Planning

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<td>T-ARCH-110885</td>
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<td>Basics of Urban Planning - Practical Course</td>
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**Competence Certificate**

- 'Teilleistung' T-ARCH-110885 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-ARCH-106570 with written examination according to § 4 Par. 2 No. 1
- ‘Teilleistung’ T-ARCH-109964 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- ‘Teilleistung’ T-ARCH-106581 with written examination according to § 4 Par. 2 No. 1

Details about the learning control see at the respective 'Teilleistung'

**Module grade calculation**

Grade of module is defined by weighted average of grades of the graded partial examinations; the grade 'Urban Construction' has onefold and the grade 'Fundamentals of Town Planning' twofold weight

**Prerequisites**

None

**Recommendation**

None

**Workload**

Contact hours (1 HpW = 1 h x 15 weeks):

- Fundamentals of Town Planning lectures: 30 h
- Urban Construction lectures: 30 h

Independent study:

- Preparation and follow-up Fundamentals of Town Planning lectures: 30 h
- Preparation of exercises to Fundamentals of Town Planning (examination prerequisite): 30 h
- Examination preparation Fundamentals of Town Planning (partial examination): 30 h
- Preparation and follow-up Urban Construction lectures: 10 h
- Preparation exercises (examination prerequisite): 10 h
- Examination preparation Urban Construction (partial examination): 10 h

Total: 180 h
5.21 Module: 2D/3D Image Analysis and Image Based Tracking Methods (mobiM602-BILDANAL) [M-BGU-100674]

**Responsible:** Prof. Dr.-Ing. Stefan Hinz

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** Profile Specialization / Traffic Engineering

**Subject-Specific Supplements**

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**Competence Certificate**

- 'Teilleistung' T-BGU-101166 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-101167 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Module grade calculation**

grade of module is defined by weighted average according credit points of grades of the partial examinations

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**Workload**

contact hours (1 HpW = 1 h x 15 weeks):

- 2D Computer Vision lectures: 15 h
- 3D Computer Vision lectures: 30 h
- Image Sequence Analysis lectures: 30 h

independent study:

- preparation and follow-up 2D Computer Vision lectures: 15 h
- preparation and follow-up 3D Computer Vision lectures: 15 h
- examination preparation Basics in Computer Vision: 15 h
- preparation and follow-up Image Sequence Analysis lectures: 30 h
- examination preparation Image Sequence Analysis: 30 h

**total:** 180 h
5.22 Module: Network Economics (mobiM603-NETZÖKON) [M-WIWI-100032]

**Organisation:** KIT Department of Economics and Management

**Part of:** Profile Specialization / Urban and Transport Planning

**Subject-Specific Supplements**

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**Competence Certificate**
- ‘Teilleistung’ T-WIWI-100005 with written examination according to § 4 Par. 2 No. 1
- ‘Teilleistung’ T-WIWI-100007 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective ‘Teilleistung’

**Module grade calculation**
grade of module is defined by weighted average according credit points of grades of the partial examinations

**Prerequisites**
none

**Recommendation**
none

**Workload**
contact hours (1 HpW = 1 h x 15 weeks):

- Transport Economics lectures/exercises: 45 h
- Competition in Networks lectures/exercises: 45 h

independent study:

- preparation and follow-up Transport Economics lectures/exercises: 15 h
- examination preparation Transport Economics: 30 h
- preparation and follow-up Competition in Networks lectures/exercises: 15 h
- examination preparation Competition in Networks: 30 h

total: 180 h
5.23 Module: Automotive Engineering (mobiM604-FZGTECH) [M-MACH-100027]

**Responsible:** Prof. Dr. Frank Gauterin  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** Profile Specialization / Traffic Engineering  
Subject-Specific Supplements

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**Mandatory**

| T-MACH-100092 | Automotive Engineering I | 6 CR | Gauterin, Unrau |

**Competence Certificate**
- 'Teilleistung' T-MACH-100092 with written examination according to § 4 Par. 2 No. 1  
  details about the learning control see at the respective 'Teilleistung'

**Competence Goal**

The student
- knows the most important components of a vehicle,  
- knows and understands the functioning and the interaction of the individual components,  
- knows the basics of dimensioning the components.

**Module grade calculation**

grade of module is grade of examination

**Prerequisites**

none

**Content**

In the module Automotive Engineering the basics are taught, which are important for the development, the design, the production and the operation of vehicles. Particularly the primary important aggregates like engine, gear and drive train are explained, but also technical equipment, which make the operation safer and easier.

In the module Automotive Engineering the focus is on passenger cars and commercial vehicles, which are designed for road applications.

**Recommendation**

none

**Workload**

contact hours (1 HpW = 1 h x 15 weeks):
- lectures, exercises: 60 h

independent study:
- preparation and follow-up lectures, exercises: 60 h  
- examination preparation: 60 h

total: 180 h
Module: Algorithms I (mobIM605-ALGO I) [M-INFO-100030]

**Responsible:** Prof. Dr. Peter Sanders

**Organisation:** KIT Department of Informatics

**Part of:** Profile Specialization / Traffic Engineering

**Subject-Specific Supplements**

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**Mandatory**

| T-INFO-100001 | Algorithms I | 6 CR Sanders |

**Competence Certificate**

(kein Eintrag)Mobilität und Infrastruktur Master 2013

- 'Teilleistung' T-INFO-100001 with written examination according to § 4 Par. 2 No. 2
details about the learning control see at the respective 'Teilleistung'

**Module grade calculation**

grade of module is grade of examination

**Prerequisites**

none

**Recommendation**

none

**Workload**

(kein Eintrag)Mobilität und Infrastruktur Master 2013

contact hours (1 HpW = 1 h x 15 weeks):

- lectures, exercises: 60 h

independent study:

- preparation and follow-up lectures, exercises: 60 h
- examination preparation: 60 h

total: 180 h
5.25 Module: Algorithms for Routing (mobiM606-ALGOROUT) [M-INFO-100031]

Responsible: Prof. Dr. Dorothea Wagner
Organisation: KIT Department of Informatics
Part of: Profile Specialization / Traffic Engineering
Subject-Specific Supplements

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Mandatory

T-INFO-100002 Algorithms for Routing 6 CR Wagner

Competence Certificate
- ‘Teilleistung’ T-INFO-100002 with oral examination according to § 4 Par. 2 No. 2
- details about the learning control see at the respective ‘Teilleistung’

Module grade calculation
grade of module is grade of examination

Prerequisites
none

Recommendation
taking the module Algorithms I [mobiM605-ALGO-I]

Workload
contact hours (1 HpW = 1 h x 15 weeks):
  • lectures, exercises: 45 h

independent study:
  • preparation and follow-up lectures, exercises: 75 h
  • examination preparation: 60 h

total: 180 h
5 MODULES
Module: Technology of Rail Vehicles (mobiM607-SCHIENENFZG) [M-MACH-100028]

5.26 Module: Technology of Rail Vehicles (mobiM607-SCHIENENFZG) [M-MACH-100028]

Responsible: Prof. Dr.-Ing. Peter Gratzfeld
Organisation: KIT Department of Mechanical Engineering

Part of: Profile Specialization / Traffic Engineering
Subject-Specific Supplements

Credits 6
Recurrence Each term
Language German
Level 4
Version 2

Mandatory
T-MACH-100082 Technology of Rail Vehicles 6 CR Gratzfeld

Competence Certificate
- 'Teilleistung' T-MACH-100082 with oral examination according to § 4 Par. 2 No. 2
details about the learning control see at the 'Teilleistung'

Competence Goal

- The students understand relations and interdependencies between rail vehicles, infrastructure and operation in a rail system.
- Based on operating requirements and legal framework they derive the requirements concerning a capable infrastructure and suitable concepts of rail vehicles.
- They recognize the impact of alignment, understand the important function of the wheel-rail-contact and estimate the impact of driving dynamics on the operating program.
- The students learn the role of rail vehicles and understand their classification. They understand the basic structure and know the functions of the main systems. They understand the overall tasks of vehicle system technology.
- They learn functions and requirements of car bodies and judge advantages and disadvantages of design principles. They know the functions of the car body's interfaces.
- They know about the basics of running dynamics and bogies.
- The students learn about advantages and disadvantages of different types of traction drives and judge, which one fits best for each application.
- They understand brakes from a vehicular and an operational point of view. They assess the fitness of different brake systems.
- They know the basic setup of train control management system and understand the most important functions.
- They specify and define suitable vehicle concepts based on requirements for modern rail vehicles.

Module grade calculation
grade of module is grade of examination

Prerequisites
none

Content

1. Railway System: railway as system, subsystems and interdependencies, definitions, laws, rules, railway and environment, economic impact
2. Operation: Transportation, public transport, regional transport, long-distance transport, freight service, scheduling
3. Infrastructure: rail facilities, track alignment, railway stations, clearance diagram
4. Wheel-rail-contact: carrying of vehicle mass, adhesion, wheel guidance, current return
5. Vehicle dynamics: tractive and brake effort, driving resistance, inertial force, load cycles
6. Vehicle system technology: structure and main systems of rail vehicles
7. Car body: functions, requirements, design principles, crash elements, interfaces
8. Bogies: forces, running gears, axle configuration
9. Drives: vehicle with/without contact wire, dual-mode vehicle
10. Brakes: tasks, basics, principles, blending, brake control
11. Train control management system: definitions, networks, bus systems, components, examples
12. Vehicle concepts: trams, metros, regional trains, intercity trains, high speed trains, double deck coaches, locomotives, freight wagons
Recommendation
none

Annotation
A bibliography is available for download (Ilias-platform).
This module comprises the entire lecture "Rail Vehicle Technology" and chapter 1 to 5 of the lecture "Rail System Technology".

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- Rail Vehicle Technology lectures: 30 h
- Rail System Technology lectures: 15 h

independent study:

- preparation and follow-up Rail Vehicle Technology lectures: 30 h
- preparation and follow-up Rail System Technology lectures: 15 h
- examination preparation: 90 h

total: 180 h

Learning type
Lectures
Module: Module Master Thesis (mobiMSC-THESIS) [M-BGU-105164]

**Responsible:** Prof. Dr.-Ing. Peter Vortisch

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** Master Thesis

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**Mandatory**

| T-BGU-110432 | Master Thesis | 30 CR | Vortisch |

**Competence Certificate**

thesis and final presentation according to § 14 ER/SPO

**Competence Goal**

The student is able to investigate independently a complex problem within a particular research field of his choice in limited time, following scientific methods. He can search autonomously for literature, can find own approaches, can evaluate his results and can classify them according to the state of the art. He is further able to present clearly the essential matter and results in his master thesis and in a comprehensive presentation.

**Module grade calculation**

The grade of the module results from the evaluation of the Master Thesis and the final presentation.

**Prerequisites**

Modules in extent of minimum 42 CP has to be passed in order to be admitted to the Master Thesis according to ER/SPO § 14 Par. 1. Results obtained in the module Key Competences [mobiMW0-UEQUAL] cannot be counted for this purpose.

**Content**

The Master Thesis is an independent written report and comprises the theoretical or experimental work on a complex problem within a particular field of civil engineering with scientific methods. The topic of the master thesis derives from the students choice of a particular field. The student and can make proposals for the topic.

**Recommendation**

All technical skills and soft skills required for working on the selected topic and the preparation of the thesis should be attained.

**Annotation**

Information about the procedure regarding admission and registration of the Master Thesis see chap. 2.8.

**Workload**

- working on thesis project: 720 h
- thesis writing: 150 h.
- preparation of presentation: 30 h

total: 900 h
5.28 Module: Interdisciplinary Qualifications (mobiMW0-UEQUAL) [M-BGU-105163]

**Responsible:** Prof. Dr.-Ing. Peter Vortisch

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** Interdisciplinary Qualifications

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**Election block: Interdisciplinary Qualifications (at least 6 credits)**

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<td>T-BGU-100133</td>
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**Competence Certificate**

According to selected courses, freely be chosen from the course catalogue for Interdisciplinary Qualifications of HoC and ZAK.

**Competence Goal**

Learning outcomes can be divided into three main complementary categories:

1. **Contextual Knowledge**
   - Students are aware of the cultural context of their position and are in a position to consider the views and interests of others (beyond the boundaries of subject, culture, and language).
   - They have enhanced their ability to participate properly and appropriately in academic or public discussions.

2. **Practical Focus**
   - Students have gained an insight into the routines of professional life.
   - They have further developed their capability to learn.
   - They have improved their scope of action by extending their knowledge of foreign languages.
   - They are able to relate their field of experience to basic aspects of business administration and law.

3. **Basic Competences**
   - The students autonomously acquire new knowledge in a planned, specific, and methodologically founded manner and use it for solving tasks and problems.
   - They can evaluate own work.
   - They possess efficient work techniques, can set priorities, take decisions, and assume responsibility.

**Module grade calculation**

Not graded

**Prerequisites**

None

**Content**

With the key competences, the House of Competence (HoC) and the Centre for Cultural and General Studies (ZAK) offer a wide range of courses, which are bundled thematically for better orientation. The contents are explained in detail in the descriptions of the courses on the internet pages of HoC (http://www.hoc.kit.edu/lehrangebot.php) and ZAK (http://www.zak.kit.edu/english/general_studies.php).

**Recommendation**

None

**Annotation**

The mentor can recognize, if applicable in consultation with the Examination Committee, further suitable courses as interdisciplinary qualifications which are not listed in the mentioned offers of HoC and ZAK. If the Examination Committee accepted the recognition of a course in principle, online registration to the respective examination is possible. Language courses of the 'Sprachenzentrum' (SpZ) are usually recognized. Further information about the Interdisciplinary Qualifications see Sect. 2.3.
Workload
see course description of HoC, and lecture descriptions of ZAK
6 Courses

6.1 Course: Algorithms for Routing [T/INFO-100002]

Responsible: Prof. Dr. Dorothea Wagner
Organisation: KIT Department of Informatics
Part of: M/INFO-100031 - Algorithms for Routing

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Events

| SS 2020 | 24638 | Algorithmen für Routenplanung (mit Übungen) | 3 SWS | Lecture / Practice (VÜ) | Buchhold, Zeitz, Zündorf, Sauer, Ueckerdt |

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none
### 6.2 Course: Algorithms I [T-INFO-100001]

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<th>Dachsbacher, Schüßler, Jung, Opitz</th>
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**Competence Certificate**
written exam, 120 min.

**Prerequisites**
none

**Recommendation**
none

**Annotation**
none
6.3 Course: Analysis and Evolution of Mobility [T-BGU-101004]

Responsible: Dr.-Ing. Martin Kagerbauer
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-100583 - Analysis and Evolution of Mobility

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Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none
6.4 Course: Automotive Engineering I [T-MACH-100092]

**Responsible:** Prof. Dr. Frank Gauterin  
Dr.-Ing. Hans-Joachim Unrau  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** M-MACH-100027 - Automotive Engineering

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**Competence Certificate**
written exam, 120 min.

**Prerequisites**
none

**Recommendation**
none

**Annotation**
none
6.5 Course: Basics in Computer Vision (2D/3D) [T-BGU-101166]

**Responsible:** Prof. Dr.-Ing. Stefan Hinz

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** M-BGU-100674 - 2D/3D Image Analysis and Image Based Tracking Methods

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**Competence Certificate**
oral exam, appr. 30 min.

**Prerequisites**
none

**Recommendation**
none

**Annotation**
none
### 6.6 Course: Basics of Urban Planning - Practical Course [T-ARCH-109964]

**Responsible:**
- Prof. Henri Bava
- Prof. Dr.-Ing. Barbara Engel

**Organisation:** KIT Department of Architecture

**Part of:** M-ARCH-100029 - Urban Design in Practice

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**Competence Certificate**
- regular delivery of exercises

**Prerequisites**
- none

**Recommendation**
- none

**Annotation**
- none
### 6.7 Course: City Transport Facilities [T-BGU-100083]

**Responsible:** Prof. Dr.-Ing. Ralf Roos  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** M-BGU-100026 - City Transport Facilities

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**Competence Certificate**  
oral exam, appr. 45 min.

**Prerequisites**  
Exercises and student research project City Transport Facilities has to be passed.

**Modeled Conditions**  
The following conditions have to be fulfilled:

1. The course T-BGU-109912 - Exercises and student research project City Transport Facilities must have been passed.

**Recommendation**  
none

**Annotation**  
none
### 6.8 Course: Competition in Networks [T-WIWI-100005]

**Responsible:** Prof. Dr. Kay Mitusch  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-100032 - Network Economics

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**Competence Certificate**  
written exam, 60 min. during the semester break.  
Examination is offered every semester and can be retried at any regular examination date.

**Prerequisites**  
one

**Recommendation**  
one

**Annotation**  
one
### 6.9 Course: Exercises and student research project City Transport Facilities [T-BGU-109912]

**Responsible:** Prof. Dr.-Ing. Ralf Roos  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** M-BGU-100026 - City Transport Facilities

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**Competence Certificate**

1 report approx. 5 pages and 3 planning documents

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none
6.10 Course: Freight Transport [T-BGU-106611]

**Responsible:** Bastian Chlond

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** M-BGU-100020 - Intermodality in Freight, Long-Distance and Air Transport

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**Type:** Written examination

**Credits:** 3

**Recurrence:** Each term

**Version:** 2

**Competence Certificate**
written exam, 60 min.

**Prerequisites**
none

**Recommendation**
none

**Annotation**
none
6.11 Course: Fundamentals of Town Planning [T-ARCH-106581]

Responsible: Prof. Henri Bava
Prof. Dr.-Ing. Barbara Engel

Organisation: KIT Department of Architecture

Part of: M-ARCH-100029 - Urban Design in Practice

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Events

| SS 2020 | 1731203 | Basics of Urban Planning | 4 SWS | Lecture (V) | Bava, Engel, Reuß, Brezovska, Gerstberger, Romero Carnicero, Rogge |

Competence Certificate
written exam, 90 min.

Prerequisites
The accomplishment 'Basics of Urban Planning - Practical Course' has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-ARCH-109964 - Basics of Urban Planning - Practical Course must have been passed.

Recommendation
none

Annotation
none
6.12 Course: Group exercise Project Integrated Planning [T-BGU-109916]

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**Competence Certificate**
integrated term paper of the whole group and 2 presentations of the result

**Prerequisites**
none

**Recommendation**
none

**Annotation**
none
6.13 Course: Highway Design [T-BGU-100057]

**Responsible:** Prof. Dr.-Ing. Ralf Roos  
Dr.-Ing. Matthias Zimmermann

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** M-BGU-100017 - Highway Design

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<td>Projektstudie Außerortsstraße</td>
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**Competence Certificate**
oral exam, appr. 30 min.

**Prerequisites**
Study project Design of a Rural Road hat to be passed.

**Modeled Conditions**
The following conditions have to be fulfilled:

1. The course T-BGU-109917 - Study project Design of a Rural Road must have been passed.

**Recommendation**
one

**Annotation**
one

**Responsible:** Prof. Dr. Joachim Vogt

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** M-BGU-100013 - Urban Renewal

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**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none
6.15 Course: Image Sequence Analysis [T-BGU-101167]

**Responsible:** Prof. Dr.-Ing. Stefan Hinz

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** M-BGU-100674 - 2D/3D Image Analysis and Image Based Tracking Methods

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**Competence Certificate**
oral exam, appr. 20 min.

**Prerequisites**
none

**Recommendation**
none

**Annotation**
none
6.16 Course: Information Management for Public Mobility Services [T-BGU-106608]

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-103357 - Special Issues of Public Transport

Type
Examination of another type

Credits
3

Recurrence
Each summer term

Version
1

Competence Certificate
lecture accompanying exercises, appr. 5 pieces

Prerequisites
none

Recommendation
none

Annotation
none
6.17 Course: Infrastructure Management [T-BGU-106300]

**Responsible:** Prof. Dr.-Ing. Ralf Roos

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** M-BGU-100009 - Infrastructure Management

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**Competence Certificate**

written exam, 120 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none
6.18 Course: Introduction to Matlab [T-BGU-106765]

**Responsible:** Dr.-Ing. Uwe Ehret

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** M-BGU-105163 - Interdisciplinary Qualifications

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**Competence Certificate**

implementation of a Matlab code with report, appr. 1 page

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**Responsible:** Hon.-Prof. Dr. Dietmar Hönig  
Prof. Dr.-Ing. Ralf Roos  
Prof. Dr.-Ing. Peter Vortisch  

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  

**Part of:** M-BGU-100011 - Laws and Proceedings Concerning Traffic and Roads  

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**Competence Certificate**  
written exam, 120 min.

**Prerequisites**  
none

**Recommendation**  
none

**Annotation**  
none
# 6.20 Course: Long-Distance and Air Traffic [T-BGU-106301]

**Responsible:** Bastian Chlond  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** M-BGU-100020 - Intermodality in Freight, Long-Distance and Air Transport

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**Competence Certificate**  
written exam, 60 min.

**Prerequisites**  
none

**Recommendation**  
none

**Annotation**  
none
6.21 Course: Master Thesis [T-BGU-110432]

**Responsible:** Prof. Dr.-Ing. Peter Vortisch

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** M-BGU-105164 - Module Master Thesis

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**Competence Certificate**

duration appr. 6 months
presentation within one month after submission of the thesis

**Prerequisites**
defined for the module Master Thesis

**Final Thesis**
This course represents a final thesis. The following periods have been supplied:

- **Submission deadline** 6 months
- **Maximum extension period** 3 months
- **Correction period** 8 weeks

This thesis requires confirmation by the examination office.

**Recommendation**
see module

**Annotation**
Information about the procedure regarding admission and registration of the Master Thesis see chap. 2.8.
### 6.22 Course: Models and Methods in Traffic Engineering and Transportation Planning [T-BGU-100012]

**Responsible:** Prof. Dr.-Ing. Peter Vortisch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** M-BGU-100008 - Models and Methods in Traffic Engineering and Transportation Planning

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**Competence Certificate**  
oral exam, appr. 20 min.

**Prerequisites**  
none

**Recommendation**  
none

**Annotation**  
none
**6.23 Course: Planning of Transportation Systems [T-BGU-100013]**

**Responsible:** Prof. Dr.-Ing. Peter Vortisch

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** M-BGU-100016 - Planning of Transportation Systems

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**Competence Certificate**

Written exam, 120 min.

**Prerequisites**

None

**Recommendation**

None

**Annotation**

None
6.24 Course: Project Integrated Planning [T-BGU-100061]

Responsible: Prof. Dr.-Ing. Ralf Roos
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-100018 - Project Integrated Planning

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Competence Certificate
oral exam, appr. 30 min.

Prerequisites
Group exercise Project Integrated Planning has to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-BGU-109916 - Group exercise Project Integrated Planning must have been passed.

Recommendation
none

Annotation
none
### 6.25 Course: Road Construction [T-BGU-100058]

**Responsible:** Prof. Dr.-Ing. Ralf Roos  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** M-BGU-100006 - Road Construction

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**Competence Certificate**  
oral exam, appr. 30 min.

**Prerequisites**  
none

**Recommendation**  
none

**Annotation**  
none
### 6.26 Course: Road Safety [T-BGU-100062]

**Responsible:** Dr.-Ing. Matthias Zimmermann  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** M-BGU-100021 - Road Safety

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**Competence Certificate**  
oral exam, appr. 30 min.

**Prerequisites**  
Seminar paper Road Safety has to be passed.

**Modeled Conditions**  
The following conditions have to be fulfilled:

1. The course T-BGU-109915 - Seminar paper Road Safety must have been passed.

**Recommendation**  
one

**Annotation**  
one
6.27 Course: Seminar in Transportation [T-BGU-100014]

**Responsible:** Bastian Chlond
Prof. Dr.-Ing. Peter Vortisch

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** M-BGU-103357 - Special Issues of Public Transport

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**Competence Certificate**
seminar paper, appr. 10 pages, and presentation, appr. 10 min.

**Prerequisites**
none

**Recommendation**
none

**Annotation**
none
T 6.28 Course: Seminar paper Road Safety [T-BGU-109915]

**Responsible:** Dr.-Ing. Matthias Zimmermann  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** M-BGU-100021 - Road Safety

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<td>Seminar im Straßenwesen</td>
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**Competence Certificate**
integrated seminar paper of the team, appr. 10 pages/person and plan documents, presentation appr. 10 min.

**Prerequisites**
none

**Recommendation**
none

**Annotation**
none
6.29 Course: Space and Infrastructure [T-BGU-100056]

Responsible: Dr.-Ing. Martin Kagerbauer
Dr. Sina Keller

Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences

Part of: M-BGU-100014 - Space and Infrastructure

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Events

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Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none
6.30 Course: Special Topics in Highway Engineering [T-BGU-106734]

**Responsible:** Rainer Hess  
Prof. Dr.-Ing. Ralf Roos

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** M-BGU-100022 - Special Topics in Highway Engineering

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<th>Steuerungsinstrumente für Betrieb und Erhaltung von Straßeninfrastruktur</th>
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**Competence Certificate**  
oral exam, appr. 30 min.

**Prerequisites**  
none

**Recommendation**  
none

**Annotation**  
none
6.31 Course: Study project Design of a Rural Road [T-BGU-109917]

**Responsible:**
Prof. Dr.-Ing. Ralf Roos  
Dr.-Ing. Matthias Zimmermann

**Organisation:**
KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:**
M-BGU-100017 - Highway Design

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**Events**

| WS 19/20 | 6233903 | Projektstudie Außerortsstraße | 2 SWS | Lecture / Practice (VÜ) | Zimmermann, Roos |

**Competence Certificate**
preparation of 4 planning documents

**Prerequisites**
none

**Recommendation**
none

**Annotation**
none
6.32 Course: Technology of Rail Vehicles [T-MACH-100082]

Responsible: Prof. Dr.-Ing. Peter Gratzfeld
Organisation: KIT Department of Mechanical Engineering

Part of: M-MACH-100028 - Technology of Rail Vehicles

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Competence Certificate
oral exam, appr. 30 min., no tools or reference materials may be used

Prerequisites
none

Recommendation
none

Annotation
none
### 6.33 Course: Tendering, Planning and Financing in Public Transport [T-BGU-101005]

**Responsible:** Prof. Dr.-Ing. Peter Vortisch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** M-BGU-103357 - Special Issues of Public Transport

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**Competence Certificate**  
oral exam, appr. 20 min.

**Prerequisites**  
none

**Recommendation**  
none

**Annotation**  
none
### 6.34 Course: Track Guided Transport Systems - Operation and Capacity [T-BGU-101002]

**Responsible:** Jan Tzschaschel  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** M-BGU-100581 - Track Guided Transport Systems - Operation and Capacity

| Events         | SS 2020 6234801 | Operation Track Guided Systems | 2 SWS | Lecture (V) | Tzschaschel  
|----------------|------------------|--------------------------------|-------|-------------|--------------|
|                | SS 2020 6234804 | Operation Systems and Track Guided Infrastructure Capacity | 2 SWS | Lecture (V) | Tzschaschel, Mitarbeiter/innen  

**Competence Certificate**  
oral exam, appr. 45 min.

**Prerequisites**  

**Recommendation**  
none

**Annotation**  
none

Responsible: Jan Tzschaschel
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: M-BGU-100010 - Track Guided Transport Systems - Technical Design and Components

Type
Written examination

Credits
6

Recurrence
Each term

Version
1

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none
### 6.36 Course: Traffic Management und Simulation Methods [T-BGU-100008]

**Responsible:** Prof. Dr.-Ing. Peter Vortisch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** M-BGU-100015 - Traffic Management und Simulation Methods

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#### Events

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**Competence Certificate**  
oral exam, appr. 20 min.

**Prerequisites**  
none

**Recommendation**  
none

**Annotation**  
none
6.37 Course: Transport Economics [T-WIWI-100007]

**Responsible:** Prof. Dr. Kay Mitusch
Dr. Eckhard Szimba

**Organisation:** KIT Department of Economics and Management

**Part of:** M-WIWI-100032 - Network Economics

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**Competence Certificate**
written exam, 60 min. during the semester break.
Examination is offered every semester and can be retried at any regular examination date.

**Prerequisites**
none

**Recommendation**
none

**Annotation**
none
**6.38 Course: Urban and Regional Planning [T-BGU-100050]**

**Responsible:** Dr. Tamer Soylu  
Sebastian Wilske

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** M-BGU-100007 - Urban and Regional Planning

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**Competence Certificate**
oral exam, appr. 30 min.

**Prerequisites**
none

**Recommendation**
none

**Annotation**
none
6.39 Course: Urban Development [T-ARCH-106570]

**Organisation:** KIT Department of Architecture

**Part of:** M-ARCH-100029 - Urban Design in Practice

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**Competence Certificate**

written exam, 60 min.

**Prerequisites**
The non graded accomplishment 'Urban Development - Practical Course' has to be passed.

**Modeled Conditions**
The following conditions have to be fulfilled:

1. The course T-ARCH-110885 - Urban Development - Practical Course must have been passed.

**Recommendation**
none

**Annotation**
none
### 6.40 Course: Urban Development - Practical Course [T-ARCH-110885]

**Organisation:** KIT Department of Architecture  
**Part of:** M-ARCH-100029 - Urban Design in Practice

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**Competence Certificate**  
regular delivery of exercises

**Prerequisites**  
none

**Recommendation**  
none

**Annotation**  
none
6.41 Course: Urban Management [T-BGU-108442]

**Responsible:** Prof. Dr. Anke Karmann-Woessner

**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** M-BGU-100013 - Urban Renewal

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**Competence Certificate**
oral exam, appr. 15 min.

**Prerequisites**
none

**Recommendation**
none

**Annotation**
none
Course: Wildcard [T-BGU-100133]

Organisation: University
Part of: M-BGU-105163 - Interdisciplinary Qualifications

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