

Annex 1
(ref. § 6 para. 3)
Module descriptions

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VW-MOBS-01-SP Mobility System Planning and Research.....	3
VW-MOBS-02-SP Human Behavior and Environmental Effects in Transportation	5
VW-MOBS-03-SP Design and Operation in Public Transportation	7
VW-MOBS-04-RR Road Design and Pavements	8
VW-MOBS-05-DM Data and Models in Transport Planning	10
VW-MOBS-06 Research Task in Mobility Systems.....	12
VW-MOBS-10-SP Urban Mobility Workshop Basics	14
VW-MOBS-11-SP Urban Mobility Workshop Advanced.....	15
VW-MOBS-15-SP Scenarios for Sustainable Mobility	16
VW-MOBS-20-SP Basics in Psychology and Behavioral Economics	17
VW-MOBS-25-SP Cost-Benefit Evaluation of Infrastructure Projects and Traffic Law.....	18
VW-MOBS-26-SP Urbanism	19
VW-MOBS-30-SP Management of Public Transport Systems and Services	20
VW-MOBS-35-SP Railway Operation	21
VW-MOBS-40-RR Urban Engineering and Road Drainage Systems	23
VW-MOBS-45-RR Road Traffic Safety	24
VW-MOBS-50-RR Road User Behavior and Safety	26
VW-MOBS-55-RR Rail Design.....	27
VW-MOBS-60-RR Fundamentals of Traffic System Dynamics and Control.....	29
VW-MOBS-61-RR Advanced Traffic System Dynamics and Control.....	31
VW-MOBS-65-DM Agent-based Modelling in Transportation.....	32
VW-MOBS-70-DM Methods in Data Analytics	34
VW-MOBS-71-DM Advanced Methods in Data Analytics	35
VW-MOBS-75-DM Transport Network Optimization with Emerging Data for Ethical and Sustainable Applications	36
VW-MOBS-82-DM Data Driven Statistics.....	38
VW-MOBS-90-DM Fundamentals of Geoinformatics	39
VW-MOBS-91-DM GIS and Geodata Bases	40
VW-MOBS-116-SP Advanced Tools and Methods of Transportation Ecology	41
VW-MOBS-117-SP Analysis of Vehicle Emissions and Air Pollution	42
VW-MOBS-118a-SP Data Collection and Evaluation Methods for Bicycle Planning.....	44
VW-MOBS-119-SP The nexus of urban air pollution, transport, and policy.....	45
VW-MOBS-121-SP Advanced Issues in Psychology and Behavioral Economics.....	47
VW-MOBS-122-SP Light and Lighting in Transportation Systems	48
VW-MOBS-127-SP Exercises and Readings in Transport Policy in an Academic Context	50
VW-MOBS-141-RR Planning Process and Environmental Protection in Road Design	51
VW-MOBS-142-RR Building Information Modeling for Transportation Infrastructure.....	53
VW-MOBS-180-DM Theoretical Multivariate Statistics.....	54
VW-MOBS-181-DM Applied Multivariate Statistics	56
VW-MOBS-185-DM Algorithms and Traffic Networks	58

VW-MOBS-186-DM Decision Support in Transportation Logistics.....	60
VW-MOBS-192-DM Geodata Infrastructures	62
VW-MOBS-193-DM Geoinformation Services.....	63
VW-MOBS-195-DM Sensor Technology in Transport Systems.....	64
VW-MOBS-200a Vocational Internship in Mobility Systems	65

Module name	Mobility System Planning and Research
Module number	VW-MOBS-01-SP
Module coordinator	Prof. Regine Gerike regine.gerike@tu-dresden.de
Learning goals	Students will gain an understanding of the complex interrelationships involved in mobility system planning, as well as the procedures and processes associated with it, using integrated, collaborative, and consensus-oriented approaches. They will gain a thorough understanding of the various aspects of the planning process and take into account the necessary integrative aspects. They will understand the interrelationships between regional planning, urban planning, and integrated mobility system or transportation planning, and will be able to analyze, not only mobility and transportation demand, but also transportation supply, develop strategies and measures, and evaluate the impacts of planned measures. They will acquire specialist knowledge of approaches to solving practical transportation planning problems and a fundamental understanding of scientific methodologies used in the planning of transportation systems.
Content	The module covers: 1st Classification, principles, objectives, measures, and planning frameworks for mobility system planning, 2nd The functional organization of road networks, 3rd Design of highway infrastructure, 4th Impact analyses and evaluation methods for transportation planning and engineering measures, 5th Understanding and influencing mobility behavior in relation to spatial structures and transportation systems, and 6th research in mobility system planning.
Teaching and learning methods	Lecture 3 hours per week, practical 1 hour per week, and independent study.
Prerequisites	None.
Applicability	This module is a compulsory module in the Mobility Systems Master's degree program. It fulfills the requirements for the modules Urban Mobility Workshop Basics, Road Traffic Safety, Road User Behavior and Safety as well as Research Task in Mobility Systems.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio of 60 hours.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.

Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Human Behavior and Environmental Effects in Transportation
Module number	VW-MOBS-02-SP
Module coordinator	Prof. Jens Borken-Kleefeld verkehrsoekologie@tu-dresden.de
Learning goals	Students will gain a fundamental understanding of human experience and behavior, particularly in the context of transportation and mobility. They will get to know relevant theories, methods, and intervention strategies in psychology and will be able to apply them to traffic planning and design. Students will be able to quantitatively assess the environmental impact of transportation. They will be able to calculate fuel consumption, CO2 emissions, and air pollutant emissions for various modes of transportation, as well as determine noise levels for these modes of transportation. They have studied life cycle assessments and can compare the environmental impacts of different modes of transportation. They will be familiar with approaches for calculating various external effects.
Content	The module covers: 1st Psychological fundamentals, including perception, information processing, judgment, and decision-making, 2nd Research methods in psychology, 3rd Traffic psychology, particularly with regard to issues of traffic safety and mobility, 4th Energy and fuel consumption in transportation, exhaust emissions, noise emissions, greenhouse gas emissions from transportation, 5th Environmental comparison of various modes of transportation and propulsion systems, particularly life-cycle analysis and 6th Accounting and planning procedures, particularly environmental assessments and the internalization of external costs.
Teaching and learning methods	Lecture 4 hours per week, plus independent study.
Prerequisites	None.
Applicability	This module is a compulsory module in the Mobility Systems Master's degree program. It fulfills the requirements for the modules Scenarios for Sustainable Mobility, Advanced Tools and Methods of Transportation Ecology, Analysis of Vehicle Emissions and Air Pollution, Road User Behavior and Safety as well as Research Task in Mobility Systems.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a For a written examination 120-minute written test.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.

Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Design and Operation in Public Transportation
Module number	VW-MOBS-03-SP
Module coordinator	Dean of Studies for Transport Engineering studiendekan-viw@mailbox.tu-dresden.de
Learning goals	Students are familiar with the structure, organization, and financing of public transportation, as well as the interests of public transportation users, and are able to design customer-oriented and cost-effective passenger transportation services in urban and rural areas and integrate them into a comprehensive service system. They will be familiar with the laws and principles governing operational procedures and will be able to plan and carry out operations reliably, as well as respond appropriately in the event of malfunctions.
Content	The module covers: 1st Structure, organization, and financing of public transportation; client-contractor relationships; and regional transit authorities, 2nd User expectations regarding public transportation, 3rd Fundamentals of service and operational planning in urban and rural areas, 4th Basics of operational procedures and 5th Operational control tools for routine and emergency situations.
Teaching and learning methods	Lecture 2 hours per week, practical 2 hours per week, and independent study.
Prerequisites	Participants require foundational knowledge of public transportation organization and operations planning at the Bachelor's level.
Applicability	This module is a compulsory module in the Mobility Systems Master's degree program. It fulfills the requirements for the modules Module Railway Operation and Research Task in Mobility Systems.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 120-minute written test.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Road Design and Pavements
Module number	VW-MOBS-04-RR
Module coordinator	Prof. Reinhard Koettnitz kontakt.strasse@mailbox.tu-dresden.de
Learning goals	Students will acquire knowledge of geometric and structural road design for both urban and rural areas, taking into account all road users and land uses, as well as the design of road traffic facilities. They are able to understand the interrelationships between all relevant constraints and the resulting decision-making processes, are familiar with methods for determining the stress on the road superstructure and the construction materials used, and can dimension standard construction methods for the road superstructure. They are familiar with testing procedures for quality assurance of road construction materials and material mixtures.
Content	The module covers: 1st Design principles for roads and intersections in urban and rural areas, 2nd Design methods for highway infrastructure, 3rd Guidelines for the planning and design of road infrastructure in rural and urban areas, 4th Determination of the load conditions and the construction materials used in road structures, 5th The design of standard construction methods for road pavements and 6th Testing procedures for the quality assurance of building materials and building material mixtures.
Teaching and learning methods	Lecture 4 hours per week, practical 1 hour per week, and independent study.
Prerequisites	None.
Applicability	This module is a compulsory module in the Mobility Systems Master's degree program. It fulfills the requirements for the modules Urban Engineering and Road Drainage Systems, Planning Process and Environmental Protection in Road Design, Building Information Modeling for Transportation Infrastructure as well as Research Task in Mobility Systems.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 150-minute written test.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.
Workload	The workload comprises 150 hours in total.

Module duration	The module runs for the duration of one semester.
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Module name	Data and Models in Transport Planning
Module number	VW-MOBS-05-DM
Module coordinator	Prof. Rico Wittwer rico.wittwer@tu-dresden.de
Learning goals	Students will have in-depth knowledge of concepts related to data preparation, analysis, and utilization for mobility system planning, as well as of basic evaluation and visualization techniques. They will be able to identify research questions, select and prepare appropriate data sets, design suitable methodological approaches and apply methods, conduct analyses, and present, discuss, and critically evaluate the results within the context of project-based studies using existing data and advanced statistical analysis techniques. They will be able to estimate and interpret simple statistical and econometric models.
Content	The module covers: 1st Methods for processing, analyzing, visualizing, and interpreting data in mobility system planning, 2nd Fundamentals of data analysis and data visualization, 3rd Techniques for data preparation, 4th Concepts of data analysis, techniques for presenting and communicating results, 5th Modeling approaches in transportation planning, 6th Areas of application and possible uses of models, 7th Input and validation variables in models and 8th Software-assisted estimation and analysis of simple statistical and econometric models.
Teaching and learning methods	Lecture 2 hours per week, practical 2 hours per week, and independent study.
Prerequisites	None.
Applicability	This module is a compulsory module in the Mobility Systems Master's degree program. It fulfills the requirements for the modules Data Collection and Evaluation Methods for Bicycle Planning, Transport Network Optimization with Emerging Data for Ethical and Sustainable Applications as well as Research Task in Mobility Systems.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio with a scope of 50 hours. The examination language for the portfolio is German or English, at the student's discretion.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.

Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Research Task in Mobility Systems
Module number	VW-MOBS-06
Module coordinator	Prof. Regine Gerike regine.gerike@tu-dresden.de
Learning goals	Students will be able to conduct advanced academic research on current core research areas in transportation science. They will be able to independently understand, interpret, and explain problems in a selected area of mobility systems; critically evaluate and implement potential solutions; and independently and comprehensively address a research question in the field of mobility systems, as well as present and reflect on the research findings. They will be familiar with the methods and requirements of academic work, will know how to work with academic literature and independently address specific research questions, and be equipped to act in a socially responsible manner through their engagement with issues relevant to society as a whole. Students will acquire key skills in the areas of rhetoric, public speaking, and presentation techniques, and will develop greater self-confidence.
Content	The module covers: 1st Independent scholarly analysis, reflection, and discussion of academically relevant issues, 2nd Evaluation of literature focused on research to contextualize the subject matter within the academic field and to establish a theoretical foundation, 3rd Quantitative and qualitative methods for analyzing transportation issues, 4th Analysis of the interrelationships and interdependencies of transportation-related issues, 5th Visualization and presentation techniques for communicating results and 6th Presentation of research projects and their results.
Teaching and learning methods	Seminar 2 hours per week, plus independent study
Prerequisites	The competencies to be acquired in the modules Mobility System Planning and Research, Human Behavior and Environmental Effects in Transportation, Design and Operation in Public Transportation, Road Design and Pavements as well as Data and Models in Transport Planning are a prerequisite.
Applicability	This module is a compulsory module in the Mobility Systems Master's degree program.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a seminar combined term paper with a scope of 250 hours.

Credit points and grades	The module is worth 10 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.
Workload	The workload comprises 300 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Urban Mobility Workshop Basics
Module number	VW-MOBS-10-SP
Module coordinator	Prof. Regine Gerike regine.gerike@tu-dresden.de
Learning goals	Students will be able to conduct urban planning and transportation analyses based on the transportation planning process. In particular, they will be able to illustrate and interpret the current urban planning and traffic conditions of streets and public spaces. They will be able to work in an interdisciplinary team, present and discuss their own research findings in public, and to strengthen their social and communication skills through teamwork.
Content	The module covers: Elements of the transportation planning process, Project studies in a specific urban setting and Analysis and assessment of urban traffic.
Teaching and learning methods	Lecture 1 hours per week, practical 1 hour per week, plus independent study. The lecture and practical will be held in German or English. The language of instruction will be specified by the lecturer at the beginning of each semester and announced as is customary at the faculty. A minimum of five participants is required for the module to take place.
Prerequisites	The competencies to be acquired in the module Mobility System Planning and Research are a prerequisite.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules. It fulfills the requirements for the module Urban Mobility Workshop Advanced.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a complex assessment totaling 100 hours. The examination language is German or English, at the student's discretion.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Urban Mobility Workshop Advanced
Module number	VW-MOBS-11-SP
Module coordinator	Prof. Regine Gerike regine.gerike@tu-dresden.de
Learning goals	Students will have the ability to design and evaluate measures to improve traffic and road conditions based on analyses of the traffic planning process. In particular, they will be able to design streets and public spaces in an application-oriented manner as part of an integrated transportation planning approach. They will be able to work in an interdisciplinary team and to present and discuss their own research findings in public. Students will also have strengthened their social and communication skills through teamwork.
Content	The module covers: 1st Design methods and approaches to the design of traffic spaces, 2nd Project studies in a specific urban setting and 3rd Evaluation and development of design solutions.
Teaching and learning methods	Lecture 1 hour per week, plus independent study. The lecture will be held in German or English. The language of instruction will be specified by the lecturer at the beginning of each semester and announced in the usual manner. A minimum of five participants is required for the module to take place.
Prerequisites	The competencies to be acquired in the module Urban Mobility Workshop Basics are a prerequisite.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a complex assessment totaling 115 hours. The examination language is German or English, at the student's discretion.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Scenarios for Sustainable Mobility
Module number	VW-MOBS-15-SP
Module coordinator	Prof. Jens Borken-Kleefeld verkehrsoekologie@tu-dresden.de
Learning goals	Students will be able to identify key elements of future sustainable mobility for Germany, based on scientific and societal guidelines. As such, they will understand the related assessment and evaluation processes. They will be familiar with scenario-based thinking and able to develop their own scenarios for future mobility. They will be able to check scenarios for consistency and plausibility and interpret them. Students will be able to work effectively in groups and present information both verbally and in writing, for example in presentations and term papers.
Content	The module covers: 1st Objectives for sustainable and climate-friendly transportation, 2nd Obstacles to sustainable and climate-friendly transportation, 3rd The components of climate-friendly transportation, 4th Scenarios in forecasting and backcasting for climate-friendly transportation, 5th Examples of future transportation scenarios at the local, national, and European levels, as well as 6th discussion, analysis, and evaluation of various scenarios.
Teaching and learning methods	Lecture 2 hours per week, seminar 2 hours per week, and independent study. Enrollment in the lecture and seminar is limited to 20 students, who will be selected on a first-come, first-served basis. A minimum of five participants is required for the module to take place.
Prerequisites	The competencies to be acquired in the module Human Behavior and Environmental Effects in Transportation are a prerequisite.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a seminar combined term paper with a scope of 60 hours.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Basics in Psychology and Behavioral Economics
Module number	VW-MOBS-20-SP
Module coordinator	Dr. Jens Schade jens.schade@tu-dresden.de
Learning goals	Students will gain a deeper understanding of psychological concepts in the context of transport economics. They can apply basic psychological concepts to address behavioral economics issues. They will have a fundamental understanding of the socially and scientifically relevant intersections between psychology and behavioral economics.
Content	The module covers methods, theories, and research areas in psychology, as well as research areas in behavioral economics.
Teaching and learning methods	Seminars 2 hours per week, plus independent study.
Prerequisites	None.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules. It fulfills the requirements for the module Advanced Issues in Psychology and Behavioral Economics.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a seminar combined term paper with a scope of 100 hours.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Cost-Benefit Evaluation of Infrastructure Projects and Traffic Law
Module number	VW-MOBS-25-SP
Module coordinator	Prof. Georg Hirte georg.hirte@tu-dresden.de
Learning goals	Students will be familiar with practical economic evaluation methods used in the planning of transportation infrastructure. They will be able to document the legally relevant processes involved in the transport of people, goods, and information or messages, and classify them into the appropriate legal categories based on the laws and regulations of transportation law. Students will acquire the interpersonal skills needed to assess situations and effectively assert or defend claims, particularly when communicating with government agencies, courts, clients, and third parties in the field of traffic law. They will acquire knowledge, skills, and competencies in the field of transportation law and will be able to apply this knowledge to resolve minor legal cases involving road law, motor vehicle law, and railway law, while assessing the role of administrative courts.
Content	The module covers evaluation methods used in the federal transportation planning, particularly the standardized evaluation for local public transportation and the guidelines for economic feasibility studies on roads, as well as key principles of transportation law.
Teaching and learning methods	Lecture 4 hours per week, plus independent study. The lectures will be taught in German.
Prerequisites	None.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 120-minute written test. The examination language is German.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Urbanism
Module number	VW-MOBS-26-SP
Module coordinator	Prof. Angela Mensing-de Jong angela.mensing-de_jong@tu-dresden.de
Learning goals	Students will gain an understanding of historical and contemporary theories of space, including urban space, social space, and landscape, and will be able to explain and articulate contemporary requirements for the development of urban landscapes. They will be able to apply their expertise to urban and landscape architectural contexts, and will be able to analyze and interpret situations in an urban context and develop their own concepts and proposed solutions based on this analysis. They will be able to think conceptually, reflect, and argue critically. Students will develop social and communication skills through teamwork.
Content	The module covers spatial phenomena in the built and unbuilt environment, both in theory and practice, case studies of change processes, particularly regarding regionally varying demographic and economic developments as well as housing and working conditions, infrastructural innovations, criteria for sustainable development, formal and informal development, migration, participation, the relationship between nature and the city, urban planning phenomena in an urban context, and concepts for urban planning and open space planning.
Teaching and learning methods	Lecture 2 hours per week, practical 2 hours per week, and independent study. The lecture and practical will be held in German or English. The language of instruction will be specified by the lecturer at the beginning of each semester and announced as is customary at the faculty.
Prerequisites	None.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio with a scope of 70 hours. The examination language is German or English, at the student's discretion.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Management of Public Transport Systems and Services
Module number	VW-MOBS-30-SP
Module coordinator	Prof. Jörn Schönberger joern.schoenberger@tu-dresden.de
Learning goals	Students will be familiar with the decision-making challenges that arise in the design, configuration, and operation of passenger transport systems. They will gain an insight into the algebraic modeling of these decision scenarios and will be able to apply techniques and tools for solving complex models. Students will be able to select and apply the modeling and decision-making methods they have learned in a targeted manner. Students will gain greater self-confidence.
Content	The module covers infrastructure planning, particularly the definition of line routes; timetable development; staff scheduling based on defined service delivery processes; the specification of public transportation products; and an overview of the challenges arising from operational concepts for shared mobility systems. Content is based on the current state of research.
Teaching and learning methods	Lecture 2 hours per week, practical 2 hours per week, and independent study.
Prerequisites	Students require knowledge of operations research at the Bachelor's level, as well as basic programming skills at the Bachelor's level, such as VBA, PHP, Java, or C++. Useful reading for this module: Stroustrup, B.: Programming: Principles and Practice Using C++, Addison Wesley, current edition.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a complex assessment totaling 75 hours.
Credit points and grades	The module is worth 5 credit points. The module grade is the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Railway Operation
Module number	VW-MOBS-35-SP
Module coordinator	Prof. Nikola Bešinović nikola.besinovic@tu-dresden.de
Learning goals	Students will be able to explain the basic principles and framework conditions for the operation of rail systems and will be familiar with the procedures for maintaining train spacing, signaling, and track safety. They will be able to explain and identify the relevant railway operations processes and their time elements. Students will be able to present the process of railway operations planning and its individual stages, describe the concepts used in this process, and apply those concepts to the field of train scheduling. They will be familiar with the causes of delays and how they propagate, as well as with the operations of train scheduling and potential solutions. They will have a deeper understanding of the relationship between quality and capacity in railway systems, be able to explain and apply relevant factors, key metrics, and procedures, and be capable of developing and evaluating operational planning concepts for railways as well as deriving approaches for the qualitative improvement of railway systems. They will be familiar with specific IT tools for planning, managing, and evaluating railway operations and will be able to contribute to their further development.
Content	The module covers: 1st Fundamental characteristics and components of railway systems, 2nd Processes and timing in rail operations, particularly spacing, signaling, track safety, train movements on lines and at junctions, train intervals, shunting, and train preparation, 3rd Operations and scheduling planning, particularly the stages of operations planning for railways and their associated tasks, demand and service networks, integrated regular-interval timetables, train path design and coordination, 4th Operations and operational control, particularly disruptions and delays, fundamentals and models for scheduling and 5th Quality and capacity in railway systems, particularly terminology, influencing factors, and causal relationships, as well as scientific methods for determining quality and capacity and their application.
Teaching and learning methods	Lecture 2.5 hour per week, practical 1.5 hours per week, seminar 0.5 hours per week plus independent study.
Prerequisites	Students require knowledge of physics, particularly vehicle dynamics, at the basic upper secondary school level, as well as knowledge of statistics and stochastics at the Bachelor's level. In addition, the competencies to be acquired in the module Design and Operation in Public Transportation are a prerequisite.

Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio with a scope of 40 hours.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Urban Engineering and Road Drainage Systems
Module number	VW-MOBS-40-RR
Module coordinator	Prof. Reinhard Koettnitz kontakt.strasse@mailbox.tu-dresden.de
Learning goals	Students will understand the influence of road design on the selection and sizing of drainage systems for both rural and urban roads. They will be able to calculate the dimensions of drainage systems. In the context of urban street design, students will acquire a basic understanding of the utilities and conduits located within the road structure. They will be familiar with system requirements and be able to situate them within a street environment.
Content	The module covers: 1st Selection of precipitation measurement events and calculation of the volume of water runoff from the terrain and road, 2nd The sizing and geometric placement of the drainage pipes, 3rd The basic guidelines for the approximate sizing of a storm water retention basin, 4th Legal foundations in municipal planning, 5th Municipal utility and waste management networks and 6th The installation and maintenance of municipal utility lines.
Teaching and learning methods	Lecture 3 hours per week, practical 1 hour per week, and independent study. The lecture and practical will be held in German or English. The language of instruction will be specified by the lecturer at the beginning of each semester and announced as is customary at the faculty.
Prerequisites	Participants require skills acquired in the Road Design and Pavements module.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 120-minute written test. The examination language is German.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Road Traffic Safety
Module number	VW-MOBS-45-RR
Module coordinator	Prof. Regine Gerike regine.gerike@tu-dresden.de
Learning goals	Students will acquire knowledge of road safety indicators and will be able to apply selected road safety methods. They will gain comprehensive and practical knowledge of safe road traffic operations, including the skills necessary for safe road space planning and road design. Students will be able to design measures to improve road safety and evaluate them independently.
Content	The module covers: 1st Fundamentals of traffic accident investigation, 2nd Safe city streets, 3rd Safety of pedestrian and bicycle traffic, 4th On-site accident investigation, 5th Safety audit and 6th Traffic safety network analysis.
Teaching and learning methods	Lecture 2 hours per week, practical 1 hour per week, and independent study. The lecture and practical will be held in German or English. The language of instruction will be specified by the lecturer at the beginning of each semester and announced as is customary at the faculty. Enrollment in the lecture and practical is limited to 30 students, who will be selected on a first-come, first-served basis. A minimum of five participants is required for the module to take place.
Prerequisites	Students require knowledge of geographic information systems at the Bachelor's level, as well as competencies acquired in the Mobility System Planning and Research module.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio of 60 hours.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Road User Behavior and Safety
Module number	VW-MOBS-50-RR
Module coordinator	Prof. Regine Gerike regine.gerike@tu-dresden.de
Learning goals	Students will acquire knowledge of the factors that influence safety-related human behavior in the context of road traffic. In particular, they will understand how road users interact with the transportation infrastructure, become familiar with road safety indicators, and will be well-versed in various data collection and analysis methods. They will be familiar with measures to improve traffic safety, particularly those aimed at changing the behavior of road users, and will be able to assess their effectiveness.
Content	The module covers: 1st Indicators and methods for assessing traffic safety, 2nd Contextual factors influencing traffic safety and behavior, particularly structural, traffic-related, and operational factors influencing traffic safety and behavior, 3rd Personal factors influencing traffic safety and behavior, and 4th Measures for behavior modification and their effectiveness.
Teaching and learning methods	Seminars 4 hours per week, plus independent study. Enrollment in the seminar is limited to 30 students, who will be selected on a first-come, first-served basis. A minimum of five participants is required for the module to take place.
Prerequisites	The competencies to be acquired in the modules Mobility System Planning and Research as well as Human Behavior and Environmental Effects in Transportation are a prerequisite.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio with a scope of 60 hours.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Rail Design
Module number	VW-MOBS-55-RR
Module coordinator	Prof. Duo Liu duo.liu@tu-dresden.de
Learning goals	Students will be familiar with the issues and challenges involved in the planning, design, and construction of railway infrastructure, as well as with the construction and maintenance of railway tracks. They will gain knowledge of methods for the functional design of railway lines and stations, as well as for route planning, traffic engineering, and structural design, based on traffic and operational requirements. They will be able to understand planning and design tasks, and independently and systematically carry out basic tasks related to track layout, station, and route design. Students will be able to use relevant specialized software for basic design tasks. They will be able to assess and take into account structural railway track engineering considerations.
Content	The module covers: 1st Alignment of complex track layouts such as curved switches, curved track connections, and switches in transition curves, 2nd Calculation of track spacing, 3rd Design of platform structures, 4th Planning and design of complex passenger and freight transport facilities, 5th Construction and maintenance of the track, 6th Noise and vibration and 7th Use of appropriate specialist software.
Teaching and learning methods	Lecture 3 hours per week, practical 1 hour per week, and independent study. Enrollment in the module is limited to 50 students, who will be selected on a first-come, first-served basis.
Prerequisites	Participants are expected to have a basic understanding of railway alignment at the Bachelor's level Reading list for this module: Jochim/Lademann, <i>Planung von Bahnanlagen</i> , Fachbuchverlag Leipzig; Menius/Matthews, <i>Bahnbau und Bahninfrastruktur</i> , Springer Vieweg; Profillidis, <i>Railway Planning, Management and Engineering</i> , Publisher Taylor and Francis; Guerriere, <i>Fundamentals of Railway Design</i> , Springer Link.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio with a scope of 30 hours.

Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Fundamentals of Traffic System Dynamics and Control This module is not currently available.
Module number	VW-MOBS-60-RR
Module coordinator	Prof. Meng Wang meng.wang@tu-dresden.de
Learning goals	Students will gain an understanding of the basic principles of traffic flow across various modes of transportation, particularly for vehicles, pedestrians, cyclists, and public transportation. They will be able to identify the key parameters and how they relate to one another, describe a macroscopic traffic flow model, and use the model to simulate and reproduce typical traffic flow phenomena. Students will be able to describe the generic model structure for vehicle following models, pedestrian models, and bicycle traffic models; analyze the string stability property of a linear vehicle following model; and apply linear control theory to specific traffic problems.
Content	The module covers: 1st Empirical observations of traffic flows, including vehicle, pedestrian, bicycle, and public transportation, 2nd The relationship between traffic flow, traffic density, and speed, 3rd Disrupted traffic flow and traffic jams, congestion, and gridlock, 4th Cell transfer model, 5th Models for tracking vehicles, 6th Models for pedestrian traffic and bicycle traffic, 7th State-space formulation of traffic dynamics, 8th Introduction to linear control and 9th Linear feedback traffic control.
Teaching and learning methods	Lecture 3 hours per week, practical 1 hour per week, and independent study.
Prerequisites	Students are expected to have knowledge of linear algebra, calculus (including numerical methods for solving ordinary and partial differential equations), and the fundamentals of linear programming at the Bachelor's level.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules. It fulfills the prerequisites for the module in Advanced Traffic System Dynamics and Control.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute written test.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.

Module frequency	The module is offered each winter semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Advanced Traffic System Dynamics and Control This module is not currently available.
Module number	VW-MOBS-61-RR
Module coordinator	Prof. Meng Wang meng.wang@tu-dresden.de
Learning goals	Students will be able to identify and explain the most important nonlinear phenomena and network traffic phenomena, as well as explain and characterize the most important advanced control methods for nonlinear network traffic problems. They will be able to compare and evaluate the latest technology in existing control concepts based on relevant publications and apply an advanced control method to the design of a city grid control system. Students will be able to design an appropriate traffic signal control system for real-world multimodal transportation systems.
Content	The module covers: 1st Network dynamics, in particular the simple and multimodal macroscopic fundamental diagram and network equilibria, 2nd Fundamentals of model predictive control, robust, adaptive, and networked control, 3rd multimodal traffic control, 4th network traffic control — in particular perimeter control and gating, network partitioning, hierarchical control, multi-agent control, and 5th C-ITS and CAV-based control.
Teaching and learning methods	Lecture 3 hours per week, practical 1 hour per week, plus independent study.
Prerequisites	The competencies to be acquired in the module Traffic System Dynamics and Control are a prerequisite.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute written test.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Agent-based Modeling in Transportation
Module number	VW-MOBS-65-DM
Module coordinator	Prof. Regine Gerike regine.gerike@tu-dresden.de
Learning goals	Students will be familiar with activity-based approaches to traffic modeling, particularly agent-based simulations. They will be able to create their own traffic simulation models, identify and prepare suitable input data, and use it to estimate traffic supply and demand. They will be able to implement traffic planning measures and research questions in simulation models, and generate and interpret results using application software and simple data analysis scripts.
Content	The module covers: 1st Activity-based traffic models and traffic simulation models, as well as their application in traffic planning, 2nd Agent-based traffic simulations, 3rd Processing of input data for model creation, 4th Development of simulation models for specific application contexts, 5th Sub-models and algorithms, 6th Behavioral economic concepts, 7th Creation of simulation models using application software and 8th Model analysis using appropriate analytical tools and methods.
Teaching and learning methods	Lecture 2 hours per week, practical 2 hour per week, plus independent study. The lecture and practical will be held in German or English. The language of instruction will be specified by the lecturer at the beginning of each semester and announced as is customary at the faculty.
Prerequisites	Students require knowledge of linear algebra, single-variable functional analysis, differential equations, and differential calculus for functions of several variables at the Bachelor's level.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a complex assessment totaling 60 hours. The examination language for the complex assessment is German or English, at the student's discretion.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.

Module duration	The module runs for the duration of one semester.
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Module name	Methods in Data Analytics
Module number	VW-MOBS-70-DM
Module coordinator	Prof. Pascal Kerschke pascal.kerschke@tu-dresden.de
Learning goals	Students will learn the fundamental methods of data analysis. They will be able to apply these methods and identify and resolve any problems that arise.
Content	The module covers theoretical concepts and the application of basic data analysis methods relevant to working with transportation-related data.
Teaching and learning methods	Lecture 2 hours per week, practical 2 hours per week, and independent study.
Prerequisites	Students require basic practical skills in statistics and data analysis at Bachelor's level.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute written test.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Advanced Methods in Data Analytics
Module number	VW-MOBS-71-DM
Module coordinator	Prof. Pascal Kerschke pascal.kerschke@tu-dresden.de
Learning goals	Students will learn advanced data analysis methods that enable them to analyze data in depth. They will be able to apply these methods and identify and resolve any problems that arise.
Content	The module covers theoretical concepts and the application of advanced data analysis methods in the context of current research relevant to the processing of transportation data.
Teaching and learning methods	Lecture 2 hours per week, practical 2 hours per week, and independent study. Enrollment in the module is limited to 30 students, who will be selected on a first-come, first-served basis.
Prerequisites	Students require basic practical skills in statistics and data analysis at Bachelor's level.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute written test.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Transport Network Optimization with Emerging Data for Ethical and Sustainable Applications
Module number	VW-MOBS-75-DM
Module coordinator	Prof. Steve Travis Waller Steven_travis.waller@tu-dresden.de
Learning goals	Students will be able to utilize new data sources and network optimization methods—such as routing algorithms, complex network allocation, and location and vehicle optimization — within the framework of metrics and constraints that explicitly take into account the ethical aspects of mobility.
Content	The module covers: 1st Fundamentals of transportation networks, network terminology, computational complexity, network optimization models, and network optimization algorithms, 2nd Advanced concepts of network theory and related problems in transportation planning, 3rd Advanced variants of static and dynamic user equilibrium, complex network design problems, vehicle routing problems, and facility location problems, 4th Quantifiable approaches that are specifically suited for network optimization with regard to sustainability, equity, and environmental compatibility, 5th Quantifying equity and environmental justice in the context of transportation, 6th Modeling relevant system metrics within algorithmic approaches, 7th Applying the concepts to transportation planning problems such as network design problems, and 8th fundamentals of automated planning.
Teaching and learning methods	Lecture 3 hours per week, plus independent study.
Prerequisites	The competencies to be acquired in the module Data and Models in Transport Planning are a prerequisite. Reading list for this module: Ahuja, Ravindra K., Magnanti, Thomas L., Orlin, James B.: Network Flows: Theory, Algorithms, and Applications, Harlow: Person, current edition; Sheffi, Yosef: Urban Transportation Networks: Equilibrium Analysis with Mathematical Programming Methods, Englewood Cliffs, N. J.: Prentice-Hall, current edition.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a seminar combined term paper with a scope of 70 hours.

Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Data Driven Statistics
Module number	VW-MOBS-82-DM
Module coordinator	Prof. Ostap Okhrin ostap.okhrin@tu-dresden.de
Learning goals	Students will have a sound understanding of data analysis, with a particular focus on unstructured data sets and the handling of missing data. They will possess comprehensive skills in the use of statistical software.
Content	The module covers: 1st Graphical interpretation of numerical data, 2nd Decision trees, 3rd Cluster analysis, 4th Maximum margin classifiers and support vector machines (SVM), 5th Missing data and 6th Neural networks.
Teaching and learning methods	Lecture 2 hours per week, plus independent study. Enrollment in the module is limited to 30 students, who will be selected on a first-come, first-served basis.
Prerequisites	Students require knowledge of statistics and mathematics at basic upper secondary school level.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. If more than 20 students register, the module examination consists of a 120-minute written exam. If less than 20 students register, it consists of a 30-minute non-public oral exam as an individual examination; if so, this will be announced to the registered students in writing at the end of the registration period.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.
Supporting literature	Hastie, T., Tibshirani, R., Friedman, J., The Elements of Statistical Learning: Data Mining, Inference, and Prediction (2nd Edition), Springer Verlag, 2009.

Module name	Fundamentals of Geoinformatics
Module number	VW-MOBS-90-DM
Module coordinator	Prof. Lars Bernard Lars.Bernard@tu-dresden.de
Learning goals	Students will learn the key fundamentals of geoinformatics, particularly geodata modeling, geodata analysis, geodatabases, and geographic information systems. They will be able to apply numerous simple application strategies to a specific example in a research area within geoinformatics. They will know how to use the essential tools of geoinformatics effectively and confidently, particularly those of geographic information systems.
Content	The module covers the mathematical and computational foundations of geoinformatics, the fundamentals of geodata modeling and analysis, the basics of geodatabases and geographic information systems (GIS), current research areas in geoinformatics, and practical in-depth exploration of simple geoinformatics application examples.
Teaching and learning methods	Lecture 2 hours per week, practical 2 hours per week, and independent study. The language of instruction for both the lecture and the practical is German.
Prerequisites	Applicants are expected to have high school-level knowledge of mathematics and basic computer skills, particularly in data management, MS Office software, internet research, and email communication.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules. It fulfills the requirements for the modules GIS and Geodata Bases as well as Geodata Infrastructures.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a 90-minute written test and a ungraded portfolio of 30 hours. The language of the written exam and the portfolio is German.
Credit points and grades	The module is worth 5 credit points. The module grade is calculated from the weighted average grade of the individual examined assessments pursuant to § 15 para. 1 sentence 6 of the General Examination Regulations. The portfolio is weighted one time and the exam double.
Module frequency	The module is offered each winter semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	GIS and Geodata Bases
Module number	VW-MOBS-91-DM
Module coordinator	Prof. Lars Bernard Lars.Bernard@tu-dresden.de
Learning goals	Students will gain an overview of the practical applications of geographic information systems (GIS) and geo-databases and will be able to use them independently. They will have methodological expertise in the development of GIS and geo-database applications, as well as in project-based teamwork. They will be able to present the results of these projects in writing.
Content	The module covers in-depth strategies for researching, collecting, integrating, managing, and analyzing geodata using geo-database systems and GIS; the independent development of geo-databases; the independent translation of complex problems into process models for GIS; and the presentation of the resulting developments.
Teaching and learning methods	Lecture 0.5 hour per week, practical 1.5 hours per week, seminar 2 hours per week plus independent study. The language of instruction for the lecture, practical, and seminar is German.
Prerequisites	Participants require skills acquired in the Fundamentals of Geoinformatics module.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules. It fulfills the requirements for the Geodata Infrastructures module.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a complex assessment totaling 60 hours. The examination language for the complex assessment is German or English, at the student's discretion.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Advanced Tools and Methods of Transportation Ecology
Module number	VW-MOBS-116-SP
Module coordinator	Prof. Jens Borken-Kleefeld verkehrsoekologie@tu-dresden.de
Learning goals	Students will become familiar with key methods and tools for addressing and quantifying issues related to transportation and the environment. They will be able to independently analyze problems and identify the pros and cons from a transportation and environmental perspective. They are able to analyze current literature relevant to their research question and to present complex issues. Students will develop their teamwork skills and improve their social and communication skills. They will be able to lead written and oral presentations and discussions.
Content	The module covers: 1st Fundamentals of environmental balancing and assessing the environmental impacts of transportation, 2nd More advanced aspects of life cycle assessment, 3rd Current issues in the analysis of remote sensing emissions, 4th Selected environmental assessments in transportation planning and 5th application cases for the methods, illustrated with selected examples.
Teaching and learning methods	Seminars 4 hours per week, plus independent study. Enrollment in the seminar is limited to 20 students, who will be selected on a first-come, first-served basis. A minimum of five participants is required for the module to take place.
Prerequisites	The competencies to be acquired in the module Human Behavior and Environmental Effects in Transportation are a prerequisite.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a seminar combined term paper with a scope of 70 hours.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Analysis of Vehicle Emissions and Air Pollution
Module number	VW-MOBS-117-SP
Module coordinator	Prof. Jens Borken-Kleefeld verkehrsoekologie@tu-dresden.de
Learning goals	Students will acquire knowledge of common methods for measuring vehicle emissions, particularly non-contact techniques. They will be able to demonstrate the measurement principle, strengths, and limitations of remote sensing emission measurements, analyze remote sensing measurements for specific purposes, and critically evaluate the validity of the data. They will know how to correct the data, if necessary. Students will be able to extract emission factors from the data on their own, compare them with standard emission models, and understand the basics of big data analysis.
Content	The module covers: 1st Major traffic-related pollution, 2nd Characteristics, applications, and limitations of remote sensing emission measurements, 3rd Current remote sensing measurement campaigns, 4th Principles of remote sensing data analysis, 5th Handling uncertainty and mistakes, 6th Exemplary data analysis, 7th Real emissions of today's vehicles and 8th Comparison with emission models.
Teaching and learning methods	Seminars 4 hours per week, plus independent study. Enrollment in the seminar is limited to 15 students, who will be selected on a first-come, first-served basis. A minimum of five participants is required for the module to take place.
Prerequisites	The competencies to be acquired in the module Human Behavior and Environmental Effects in Transportation are a prerequisite.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a seminar combined term paper with a scope of 70 hours.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.
Workload	The workload comprises 150 hours in total.

Module duration	The module runs for the duration of one semester.
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Module name	Data Collection and Evaluation Methods for Bicycle Planning
Module number	VW-MOBS-118-SP
Module coordinator	Prof. Jens Borken-Kleefeld verkehrsoekologie@tu-dresden.de
Learning goals	Students will acquire in-depth knowledge of bicycle traffic survey and analysis methods and will be familiar with related empirical research questions. In group work, they will be able to develop, evaluate, and present practical survey designs. Students will also have strengthened their social and communication skills through teamwork and will be able to present and discuss their findings effectively, both verbally and in writing.
Content	The module covers an overview of survey methods used in cycling, data collection, and data analysis.
Teaching and learning methods	Seminars 4 hours per week, plus independent study. The language of instruction for the seminar may be German or English; it is determined by the instructor at the beginning of each semester and announced in the customary manner. Enrollment in the seminar is limited to 15 students, who will be selected on a first-come, first-served basis. A minimum of five participants is required for the module to take place.
Prerequisites	The competencies to be acquired in the module Data and Models in Transport Planning are a prerequisite.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a seminar combined term paper with a scope of 70 hours.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	The nexus of urban air pollution, transport, and policy
Module number	VW-MOBS-119-SP
Module coordinator	Prof. Erika von Schneidemesser ecs@rifs-potsdam.de
Learning goals	Students understand the fundamental physical and chemical processes that influence the composition of the atmosphere and can deduce the relevance of these processes for air quality management and mobility planning. They understand the interactions between air pollution and climate change and know why these issues should not be addressed in isolation. They have a conceptual understanding of how monitoring approaches relate to policy and regulations and what role science can play in policy decision-making. Students can successfully collaborate in groups and present information both orally and in writing, for example in presentations and term papers.
Content	The module covers the following topics: 1. The composition of the atmosphere, particularly natural and anthropogenic sources of air pollution, with a focus on urban areas and transportation, 2. Fundamental physical and chemical processes in the atmosphere, particularly their relevance and implications for policy, 3. Links between air pollution and climate change, and 4. Fundamentals of a transdisciplinary approach, both theoretical and practical, to linking science and policy.
Teaching and learning methods	2 SWS lecture, 2 SWS seminar, self-study. Enrollment in the module is limited to 24 students, who will be selected on a first-come, first-served basis. The module will be offered only if there are at least 5 participants.
Prerequisites	Students are expected to have acquired the competencies covered in the course Human Behavior and Environmental Effects in Transportation.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module exam. The module exam consists of a 120-minute written exam.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the winter semester.
Workload	The workload comprises 150 hours in total.

Module duration	The module runs for the duration of one semester.
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Module name	Advanced Issues in Psychology and Behavioral Economics
Module number	VW-MOBS-121-SP
Module coordinator	Dr. Jens Schade jens.schade@tu-dresden.de
Learning goals	Students will gain a deeper understanding of psychological concepts in the context of transport economics. They will be able to apply psychological theories and methods effectively to solve complex behavioral economics problems. They will have an in-depth understanding of the socially and scientifically relevant intersections between psychology and behavioral economics.
Content	The module covers application areas, intervention strategies, and spheres of action in psychology, as well as in behavioral economics.
Teaching and learning methods	Seminar 2 hours per week, plus independent study.
Prerequisites	Participants are expected to have acquired the skills covered in the “Basics in Psychology and Behavioral Economics” module.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master’s degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a seminar combined term paper with a scope of 100 hours.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Light and Lighting in Transportation Systems
Module number	VW-MOBS-122-SP
Module coordinator	Dr. Christoph Schulze christoph.schulze@tu-dresden.de
Learning goals	Students will become familiar with the requirements and technical design criteria for artificial lighting, as well as the use of lighting technology to facilitate communication and influence behavior in traffic systems. This includes active lighting and targeted reflective elements in traffic engineering. Students will be able to evaluate the role of lighting elements in ensuring that traffic flows operate with the desired capabilities and necessary safety. They will be able to understand the central role of visual perception processes in lighting functions and traffic safety, particularly under nighttime traffic conditions. Students will be able to classify practical lighting measurements and lighting requirements in terms of function and quality.
Content	The module covers: 1st Fundamentals of lighting technology and vision, 2nd Fixed traffic lighting, 3rd Light signals, 4th Reflective properties of transportation infrastructure and 5th Nighttime traffic safety.
Teaching and learning methods	Lecture 2 hours per week, seminar 2 hours per week, and independent study. The lecture and seminar will be held in German or English. The language of instruction will be specified by the lecturer at the beginning of each semester and announced as is customary at the faculty. Enrollment in the module is limited to 30 students, who will be selected on a first-come, first-served basis. A minimum of three participants is required for the module to take place.
Prerequisites	None.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio with a scope of 30 hours. The examination language is German or English, at the student's discretion.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.

Module duration	The module runs for the duration of one semester.
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Module name	Exercises and Readings in Transport Policy in an Academic Context
Module number	VW-MOBS-127-SP
Module coordinator	Prof. Kay Axhausen axhausen@ethz.ch
Learning goals	Students are able to write summaries of individual essays or a group of essays and draft a review of an essay for a journal. They can use Large Language Models (LLMs) and critically compare their results with their own versions. Students possess in-depth skills in critical writing and text analysis, as well as advanced skills in designing and conducting traffic surveys.
Content	The module covers national traffic surveys, systematic differences among various survey methods, and induced demand.
Teaching and learning methods	Seminar 2 hours per week, and independent study.
Prerequisites	None.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio with a scope of 30 hours.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the winter semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Planning Process and Environmental Protection in Road Design
Module number	VW-MOBS-141-RR
Module coordinator	Prof. Reinhard Koettnitz kontakt.strasse@mailbox.tu-dresden.de
Learning goals	Students will acquire knowledge of the legal requirements and the engineering approach to road infrastructure in the context of nature conservation. You will master the methodological fundamentals of noise control on roads and gain practical insights into issues related to planning and design. They will gain an understanding of the application and design of passive safety systems under various operating conditions, as well as the key stakeholders involved in planning and regulatory procedures, and will be able to analyze and understand the respective viewpoints and present them to others, either independently or as part of a team. Students will be capable of acting responsibly and will be aware of social issues, such as sustainability and safety.
Content	The module covers: 1st Functions and responsibilities of highway departments and engineering firms, 2nd Nature conservation in road design and its integration into the planning process, 3rd Factors and methods for acoustic calculations, 4th Fundamentals of noise control on roads and 5th Passive safety systems in road design.
Teaching and learning methods	Lecture 2 hours per week, practical 1 hour per week, seminar 1 hour per week plus independent study. The lecture, practical and the seminar will be held in German or English. The language of instruction will be specified by the lecturer at the beginning of each semester and announced as is customary at the faculty. A minimum of four participants is required for the module to take place.
Prerequisites	Participants require skills acquired in the Road Design and Pavements module.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio with a scope of 30 hours. The examination language is German.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.

Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Building Information Modeling for Transportation Infrastructure
Module number	VW-MOBS-142-RR
Module coordinator	Prof. Reinhard Koettnitz kontakt.strasse@mailbox.tu-dresden.de
Learning goals	Students will gain an understanding of the fundamental aspects of client information requirements and project management plans based on Building Information Modeling (BIM) in the transportation sector. Students will have a thorough understanding of the BIM process and will be able to integrate the requirements of various trades into the process. Students will have application-oriented knowledge of industry-standard data exchange formats and software solutions and will be able to visualize and present the results of a project.
Content	The module covers: 1st BIM application cases, 2nd Data management and data exchange, 3rd Modeling of infrastructure routes, 4th Quantity and cost estimation, 5th Acoustic and noise protection analyses, and 6th Construction scheduling and collision detection.
Teaching and learning methods	Lecture 2 hours per week, practical 2 hours per week, and independent study. The lecture and practical will be held in German or English. The language of instruction will be specified by the lecturer at the beginning of each semester and announced as is customary at the faculty.
Prerequisites	Participants require skills acquired in the Road Design and Pavements module.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a portfolio with a scope of 60 hours. The examination language is German.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Theoretical Multivariate Statistics
Module number	VW-MOBS-180-DM
Module coordinator	Prof. Ostap Okhrin ostap.okhrin@tu-dresden.de
Learning goals	Students will be able to describe multivariate data and analyze it using practical methods. They will be familiar with regression analysis, simple analysis of variance, general and specific multivariate distributions—in particular, the theory of the multivariate normal distribution — copulas, estimation theory, and hypothesis testing, and will be able to apply these concepts. Students will master the application of mathematical concepts such as linear algebra and integral calculus to statistical problems. They will be able to formulate statistical hypotheses and test them correctly, as well as understand the fundamentals of estimation theory and the properties of the estimators discussed therein, even outside the context of the normal distribution.
Content	The module covers: 1st Linear algebra, 2nd Theory of multivariate normal distribution, 3rd Copula, 4th Estimation theory, 5th Hypothesis testing, 6th Expectation-maximization algorithm and 7th Markov chains
Teaching and learning methods	Lecture 2 hours per week, practical 2 hours per week, and independent study.
Prerequisites	Students require knowledge of mathematics and statistics at basic upper secondary school level. Reading list for this module: Sydsaeter, K., Hammond, P.: Essential Mathematics for Economic Analysis, Financial Times Prentice Hall, Harlow, current edition. Härdle, W., Okhrin, O., Okhrin, Y.: Basic Elements of Computational Statistics, Springer, 2017.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules. It fulfills the requirements for the Applied Multivariate Statistics module.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. If more than 20 students register, the module examination consists of a 120-minute written exam. If up to 20 students register, it consists of a 30-minute non-public oral exam as an individual examination; if so, this will be announced to the registered students in writing at the end of the registration period.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.

Workload	The workload comprises 150 hours.
Module duration	The module runs for the duration of one semester.
Supporting literature	Backhaus, K., Erichson, B., Plinke, W., Weiber, R.: Multivariate Analysemethoden: Eine anwendungsorientierte Einführung, Springer Verlag, 12 th edition. Härdle, W., Simar, L.: Applied Multivariate Statistical Analysis, Springer Verlag, current edition. Härdle, W., Hlavka, Z.: Multivariate Statistics: Exercises and Solutions, Springer Verlag, current edition.

Module name	Applied Multivariate Statistics
Module number	VW-MOBS-181-DM
Module coordinator	Prof. Ostap Okhrin ostap.okhrin@tu-dresden.de
Learning goals	Students will acquire comprehensive knowledge of key multivariate statistical methods, such as cluster analysis, regression analysis, analysis of variance, discriminant analysis, and factor analysis, and will apply these methods in a practical manner when analyzing real-world datasets. They will be able to develop predictive models and apply classification methods based on data. Students will gain key skills in rhetoric, presentation techniques, and teamwork.
Content	The module covers: 1st Linear algebra, 2nd Principal component analysis, 3rd Factor analysis, 4th Correspondence analysis, 5th Canonical correlation analysis, 6th Multidimensional scaling, 7th Discriminant analysis and 8th Linear and logistic regression
Teaching and learning methods	Lecture 2 hours per week, practical 2 hours per week, and independent study. Enrollment in the lecture and practical is limited to 30 students, who will be selected on a first-come, first-served basis.
Prerequisites	Participants require skills acquired in the Theoretical Multivariate Statistics module.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a seminar combined term paper with a scope of 70 hours.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.
Supporting literature	Backhaus, K., Erichson, B., Plinke, W., Weiber, R.: Multivariate Analysemethoden: Eine anwendungsorientierte Einführung, Springer Verlag,

	12 th edition. Härdle, W., Simar, L.: Applied Multivariate Statistical Analysis, Springer Verlag, current edition. Härdle, W., Hlavka, Z.: Multivariate Statistics: Exercises and Solutions, Springer Verlag, current edition.
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Module name	Algorithms and Traffic Networks This module is not currently available.
Module number	VW-MOBS-185-DM
Module coordinator	Prof. Jörn Schönberger joern.schoenberger@tu-dresden.de
Learning goals	Students will learn about classic optimization problems in transportation networks and the strategies for solving them. They will be able to break down simple planning problems into subproblems, organize the relevant data in a structured manner, select appropriate optimization algorithms to solve the problems, and implement these algorithms in a programming language. Students will be able to identify standard tasks and make use of existing programming libraries. They will be able to solve programming problems in small teams.
Content	The module covers: 1st Basic knowledge of the C++ programming language, 2nd Use and development of open data sources, 3rd Graphs as a modeling concept, 4th Algorithms in graphs, 5th Optimal path and traveling salesmen problems and their solutions, 6th Implementation of optimization algorithms, 7th Validation, testing, and implementation of self-developed programs and 8th typical approaches to software development and the management of software development projects
Teaching and learning methods	Lecture 1 hour per week, practical 3 hour per week, and independent study. Enrollment in the lecture and practical is limited to 30 students, who will be selected on a first-come, first-served basis.
Prerequisites	Students require knowledge of mathematical modeling, operations research, and programming at the Bachelor's level.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a complex assessment totaling 60 hours.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.
Workload	The workload comprises 150 hours in total.

Module duration	The module runs for the duration of one semester.
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Module name	Decision Support in Transportation Logistics
Module number	VW-MOBS-186-DM
Module coordinator	Prof. Jörn Schönberger joern.schoenberger@tu-dresden.de
Learning goals	Students will learn about design concepts for algebraic search methods used to solve decision-making problems. They will understand the design and implementation of modern artificial intelligence search algorithms, particularly evolutionary and genetic search, local search, and ant colony optimization algorithms, and will be able to design and implement prototype search algorithms for selected decision-making problems in logistics and transportation logistics. Students will be able to tackle complex, practical decision-making problems by applying search algorithms and derive concrete recommendations for action. They will have advanced media literacy in the use of software and programming languages and will have developed greater personal confidence.
Content	The module covers: 1st Basic scenarios for vehicle dispatch planning, 2nd Encoding relevant scenario data into XML files, 3rd Design and prototypical implementation of simple decision-making algorithms for vehicle dispatch planning, 4th Integration of existing algorithm libraries via an API, 5th Metaheuristics, 6th Visualization of solutions to complex vehicle dispatch planning problems, and 7th Integration of electronic map systems into vehicle dispatch planning algorithms.
Teaching and learning methods	Lecture 2 hours per week, practical 2 hours per week, and independent study. Enrollment in the lecture and practical is limited to 30 students, who will be selected on a first-come, first-served basis.
Prerequisites	Students require knowledge of operations research, logistics and a high-level programming language, ideally C++, at the Bachelor's level. Useful reading for this module: Stroustrup, B.: Programming: Principles and Practice Using C++, Addison Wesley, current edition.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a complex assessment totaling 75 hours. The examination language is German.
Credit points and grades	The module is worth 5 credit points. The module grade is the grade of the examined assessment.
Module frequency	The module is offered each year in the summer semester.
Workload	The workload comprises 150 hours in total.

Module duration	The module runs for the duration of one semester.
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Module name	Geodata Infrastructures
Module number	VW-MOBS-192-DM
Module coordinator	Prof. Lars Bernard lars.bernard@tu-dresden.de
Learning goals	Students will acquire a sound overview of geodata infrastructures and related technologies. They will gain methodological expertise in setting up geoinformation services and in using and adapting the relevant software products.
Content	The module covers organizational and technical concepts of spatial data infrastructures (SDI), interoperability for geoinformation, and the development of spatial data infrastructures based on interoperable geoinformation services.
Teaching and learning methods	Lecture 2 hours per week, practical 2 hours per week, and independent study.
Prerequisites	Participants require skills acquired in the Fundamentals of Geoinformatics module.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a complex assessment totaling 40 hours. The examination language is German or English, at the student's discretion.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Geoinformation Services
Module number	VW-MOBS-193-DM
Module coordinator	Dr. Stephan Mäs Stephan.maes@tu-dresden.de
Learning goals	Students will be able to critically analyze current research and development work in the field of geoinformation services and systems. Using use case scenarios as examples, they will be able to plan and implement software projects for the development of geoinformation services.
Content	The module covers the design, planning, and implementation of a software project for the development of geoinformation services for various use case scenarios in geoinformatics, including environmental and traffic planning.
Teaching and learning methods	Seminar 2 hours per week, plus independent study. The seminar will be held in German or English. The language of instruction will be specified by the lecturer at the beginning of each semester and announced as is customary at the faculty.
Prerequisites	Students are required to have basic knowledge of geoinformatics, in particular about geodata structures, geo-databases, analysis of geo-objects, GIS, software modeling and design, programming, and geodata infrastructures at the Bachelor's level
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises a complex assessment totaling 80 hours. The examination language is German or English, at the student's discretion.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Sensor Technology in Transport Systems
Module number	VW-MOBS-195-DM
Module coordinator	Prof. Oliver Michler oliver.michler@tu-dresden.de
Learning goals	Students will master the fundamentals of the physical effects underlying sensor use and methods of sensor data processing. They will be able to classify, specify, and design sensor systems; apply sensor systems for traffic data collection and processing in intelligent transportation systems; integrate sensor systems; and assess and evaluate selected mode-specific sensor applications.
Content	The module covers: 1st Fundamentals of the physical effects involved in sensor use, 2nd Selected measurement parameters, sensors, and methods for sensor data processing, 3rd Practical application of sensor data and 4th Applications in sensor data processing and intelligent transportation systems.
Teaching and learning methods	Lecture 2 hour per week, practical 2 hour per week, and independent study.
Prerequisites	Students require foundational knowledge of electrical engineering, information technology, and telecommunications, as well as a basic understanding of the theory and technology of information systems, vehicle communication, and localization at the Bachelor's level.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. If more than 15 students register, the module examination consists of a 90-minute written exam. If less than 15 students register, it consists of a 30-minute non-public oral exam as an individual examination; if so, this will be announced to the registered students in writing at the end of the registration period. The language of the written exam or oral exam is either German or English, at the student's discretion.
Credit points and grades	The module is worth 5 credit points. The module grade corresponds to the grade of the examined assessment.
Module frequency	The module is offered each winter semester.
Workload	The workload comprises 150 hours in total.
Module duration	The module runs for the duration of one semester.

Module name	Vocational Internship in Mobility Systems
Module number	VW-MOBS-200a
Module coordinator	Dean of Studies for Transport Engineering studiendekan-viw@mailbox.tu-dresden.de
Learning goals	Students will be able to apply their knowledge of transport science to specific practical problems in mobility planning. They will be familiar with the academic activities and methodologies typical of the field of mobility planning. Students will possess key skills in the areas of social competence and teamwork, and will have developed a strong sense of self.
Content	The module covers academic knowledge of transportation science as applied in professional practice, as well as specific job requirements.
Teaching and learning methods	At least 275 hours of internship and independent study.
Prerequisites	None.
Applicability	This module is one of 36 elective compulsory modules in the Mobility Systems Master's degree program, from which students must select 10 or 11 modules.
Requirements for earning credit points	Credit points are awarded upon passing the module examination. The module examination comprises an ungraded term paper with a scope of 5 hours.
Credit points and grades	The module is worth 10 credit points. The module examination will be assessed as either "pass" or "fail."
Module frequency	The module is offered each semester.
Workload	The workload comprises 300 hours in total.
Module duration	The module runs for the duration of one semester.