# Vorlesungsverzeichnis

M.Sc. Digital Engineering

Sommer 2025

Stand 23.09.2025

## M.Sc. Digital Engineering

**Faculty Welcome for Master's Students Digital Engineering**

Tuesday, April 1, 2025, 10 a.m., Bauhausstraße 11, room H

**Project fair**
Tuesday, April 1, 2025, 5 p.m., Steubenstraße 6, Maurice-Halbwachs-Auditorium

# Fundamentals (F)

## Algorithms and Datastructures

### 4555211 Algorithmen und Datenstrukturen

**C. Wüthrich, N.N., Projektbörse Fak. KuG** Veranst. SWS: 4
Vorlesung
Di, wöch., 13:30 - 15:00, Marienstraße 13 C - Hörsaal C, Vorlesung, ab 08.04.2025
Mo, Einzel, 09:00 - 11:00, Steubenstraße 6, Haus F - Hörsaal K20, schriftliche Prüfung/ written exam, 28.07.2025 - 28.07.2025
Mo, wöch., 09:15 - 10:45, Bauhausstraße 11 - N 004, Vorlesung

**Beschreibung**

Das Lernziel dieser Veranstaltung soll zum einen der generelle Umgang und die selbstständige Entwicklung, Analyse, und Optimierung von Algorithmen und Datenstrukturen sein. Zum anderen soll ein Überblick über gängige problemspezifische Verfahren und deren Anwendung in der Praxis vermittelt werden.

**engl. Beschreibung/ Kurzkommentar**

Algorithms and Data Structures

The lecture deals with the principle and the implementation of basic algorithms and data structures. The course teaches among all, the Strings, geometric problems, graphs, mathematical algorithms and NP-complete problems.

**Bemerkung**

**Hinweis**:Diese Vorlesung wird **im aktuellen Semester letztmalig angeboten**. Bitte nutzen Sie diese Gelegenheit, wenn Sie die Veranstaltung noch belegen möchten.Diese Vorlesung wird im aktuellen Semester letztmalig angeboten. Bitte nutzen Sie diese Gelegenheit, wenn Sie die Veranstaltung noch belegen möchten.

**Leistungsnachweis**

Beleg, Klausur

## Applied Mathematics and Stochastics

### 301012 Re-examination: Applied mathematics and stochastics for risk assessment

**B. Rüffer, T. Lahmer**
Prüfung
Mo, Einzel, 09:00 - 12:00, Marienstraße 13 C - Hörsaal D, Re-examination, 28.07.2025 - 28.07.2025

**Bemerkung**

Re-examination

## Introduction to Mechanics

## Mathematics for Data Science

### 301017 Exam: Mathematics for data science

**B. Rüffer, M. Schönlein**
Prüfung
Mi, Einzel, 09:00 - 17:00, Final examination - oral exam (organized by chair) --> please contact the responsible, 30.07.2025 - 30.07.2025

**Beschreibung**

After the course the students will be familiar with the fundamental concepts of data science. The participants can analyse given data sets with respect to dimensionality reduction and clustering. They also know the basic structure of neural networks and support vector machines to solve classification tasks. The participants know relevant methods from linear algebra and optimization and can apply these techniques. This embraces the design of appropriate algorithms and the implementation of different numerical methods to solve the corresponding problems.

**Bemerkung**

linear regression, logistic  regression, dimension reduction, principle component analysis, linear discriminant analysis, multidimensional scaling, k-means clustering, support vector machines, kernel methods, neural networks, natural languange processing

**Voraussetzungen**

B. Sc.; Analysis and Linear Algebra at Bachelor level, knowledge of Matlab or Python

**Leistungsnachweis**

**1 oral exam**
”Mathematics for data science”
30 min (100%) / **SuSe** + WiSe

### 301017 Mathematics for data science

**B. Rüffer, M. Schönlein** Veranst. SWS: 4
Vorlesung
Do, wöch., 13:30 - 15:00, Coudraystraße 13 B - Hörsaal 3
Fr, wöch., 13:30 - 15:00, Coudraystraße 13 B - Hörsaal 3

**Beschreibung**

After the course the students will be familiar with the fundamental concepts of data science. The participants can analyse given data sets with respect to dimensionality reduction and clustering. They also know the basic structure of neural networks and support vector machines to solve classification tasks. The participants know relevant methods from linear algebra and optimization and can apply these techniques. This embraces the design of appropriate algorithms and the implementation of different numerical methods to solve the corresponding problems.

**Bemerkung**

linear regression, logistic  regression, dimension reduction, principle component analysis, linear discriminant analysis, multidimensional scaling, k-means clustering, support vector machines, kernel methods, neural networks, natural languange processing

**Voraussetzungen**

B. Sc.; Analysis and Linear Algebra at Bachelor level, knowledge of Matlab or Python

**Leistungsnachweis**

**1 oral exam**
”Mathematics for data science”
30 min (100%) / **SuSe** + WiSe

## Object-oriented Modeling and Programming in Engineering

### 303005 Object-oriented Modeling and Programming in Engineering (re-examination)

**C. Koch, M. Artus**
Prüfung
Mo, Einzel, 13:00 - 15:00, Steubenstraße 6a, Haus D - Pool 1, 04.08.2025 - 04.08.2025
Mo, Einzel, 13:00 - 15:00, Steubenstraße 6a, Haus D - Pool 2, 04.08.2025 - 04.08.2025

**Leistungsnachweis**

**1 written exam** "Object-oriented Modeling and Programming in Engineering" 120min (100%)

## Software Engineering

### 417290000 Software Engineering

**J. Ringert** Veranst. SWS: 4
Vorlesung
Di, wöch., 09:15 - 10:45, Bauhausstraße 11 - N 004, lecture, ab 08.04.2025
Fr, wöch., 11:00 - 12:30, Bauhausstraße 11 - N 004, lab class, ab 11.04.2025
Fr, Einzel, 11:00 - 12:30, Marienstraße 13 C - Hörsaal C, lab class, 16.05.2025 - 16.05.2025
Fr, Einzel, 11:00 - 12:30, Marienstraße 13 C - Hörsaal B, lab class, 16.05.2025 - 16.05.2025
Mo, Einzel, 12:30 - 14:30, Marienstraße 13 C - Hörsaal A, schriftliche Prüfung/ written exam, 21.07.2025 - 21.07.2025
Mo, Einzel, 12:30 - 14:30, Marienstraße 13 C - Hörsaal B, schriftliche Prüfung/ written exam, 21.07.2025 - 21.07.2025

**Beschreibung**

We introduce the most important aspects of software engineering.

- Motivation and history of software engineering
- Lifecycle models for software development
- Requirements engineering
- Requirement notations
- Software modelling
- Software analysis
- Design patterns
- Testing
- Software quality
- Agile principles
- Open Source Software

After completion students will be able to

- Compare and evaluate software lifecycle models
- Read, create, and assess the quality of requirements
- Read common software modelling notations
- Evaluate and select appropriate software testing strategies
- Understand principles of OSS

**Leistungsnachweis**

Homework for admission to exam

Exam weighted at 100% of final mark

## Statistics

### 301005 Statistics

**N. Gorban, B. Rüffer** Veranst. SWS: 4
Integrierte Vorlesung
Di, Einzel, 09:00 - 12:00, Marienstraße 13 C - Hörsaal A, schriftliche Prüfung / written exam, 05.08.2025 - 05.08.2025
Do, wöch., 15:15 - 16:45, Coudraystraße 13 B - Hörsaal 3, Lecture
Do, wöch., 17:00 - 18:30, Coudraystraße 13 B - Hörsaal 3, Lab class

**engl. Beschreibung/ Kurzkommentar**

Statistics

Contents:
- Probability (Events, classical probability, axiomatic approach, conditional probability)
- Random variables (Discrete random variables, continuous random variables, limit theorems)
- Descriptive statistics (Graphical representation and frequency distributions, location and scattering parameters, bivariate and multivariate analysis: dependence and correlation, regression analysis)
- Inductive statistics
- Point and interval estimation
- Parameter testing
- Goodness-of-fit-tests
- Nonparametric tests
- Tests for independence and correlation

**Voraussetzungen**

B.Sc. in a related study field, Basic knowledge on random variables and the most important distributions

**Leistungsnachweis**

Written exam

## Structural Dynamics

### 401014 Re-examination: Finite element methods and structural dynamics - Part: Structural Dynamics

**T. Most**
Prüfung

Mi, Einzel, 09:00 - 10:30, Marienstraße 7 B - Seminarraum 102, Re-examination, 23.07.2025 - 23.07.2025

**Bemerkung**

Re-examination

### 401014+40 Re-examination: Structural Dynamics

**V. Zabel**
Prüfung
Mi, Einzel, 09:00 - 12:30, Re-examination together with master course NHRE Room 106 M4B, 23.07.2025 - 23.07.2025

## Structural Engineering Models

# Modelling (M)

## Advanced Building Information Modeling

### 303001 Advanced Building Information Modelling

**C. Koch, J. Krischler, J. Taraben** Veranst. SWS: 4
Vorlesung
Mi, wöch., 11:00 - 12:30, Marienstraße 7 B - PC-Pool Luna-red, Exercise
Mi, wöch., 11:00 - 12:30, Coudraystraße 13 B - Pool Fak. B 007, Exercise
Mi, wöch., 11:00 - 12:30, Coudraystraße 11 C - Pool-Raum 101, Exercise
Do, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal A, Lecture

**engl. Beschreibung/ Kurzkommentar**

Advanced Building Information Modelling

Content: Advanced geometric and parametric modelling, Interoperability and collaboration concepts (IFC, IDM, BEP), Advanced use cases (e.g. clash detection, as-built model-ing), BIM programming (incl. visual programming)

Target qualifications: This module introduces advanced concepts of Building Information Modelling (BIM) to provide students with advanced knowledge in order to understand, analyze and discuss scientific research approaches related to BIM. Within the frame of the mod-ule project (coursework) the students will choose a topic from a pre-defined list or come up with their own topic. Based on that they will do detailed research, imple-ment a representative concept in a software prototype and discuss findings and limi-tations. Also the students acquire skills of scientific working and presentation.

**Bemerkung**

NHRE: Possible as Elective Compulsory as from Intake 2022

**Voraussetzungen**

Recommended require-ments for participation: Basic knowledge of Computer-Aided Design, BIM concepts, and object-oriented programming

**Leistungsnachweis**

written report, presentation

### 303001 Exam: Advanced building information modeling

**C. Koch**
Prüfung
Do, Einzel, 13:00 - 15:00, Steubenstraße 6, Haus F - Hörsaal K20, Final examination, 31.07.2025 - 31.07.2025
Do, Einzel, 13:00 - 15:00, Marienstraße 13 C - Hörsaal A, Final examination, 31.07.2025 - 31.07.2025

## Complex Dynamics

### 301016 Complex dynamics

**B. Rüffer** Veranst. SWS: 4
Vorlesung
Do, wöch., 09:15 - 10:45, Marienstraße 7 B - Seminarraum 102
Fr, wöch., 09:15 - 10:45, Marienstraße 7 B - Seminarraum 102

**Beschreibung**

After the course the students will be able to analyse mathematical models that describe dynamic behaviour, as they occur in engineering (e.g. mechanical coupling of building structures), in biology and in physics, but also in multi-agent systems in computer science, or as opinion dynamics in psychology. Based on examples from different disciplines, students learn to build simplified models that allow to answer questions on their long-term behaviour. Students will be able to apply methods of feedback design that help shape the dynamics of a given system, along with the relevant stability concepts. As several topics lend themselves for computer simulation, students of this course will develop a proficiency to both implement and analyse mathematical models using computational tools and software.

**Bemerkung**

Examples of complex dynamics. Models for dynamical systems in continuous and discrete time. Computer simulation. Control and Feedback. Stability, stabilization, and Lyapunov functions. Coupled systems: Disturbance or Cooperation? Networks of systems. Consensus. Synchronization.

The topics will be presented in a lecture, deepened by exercises. Some of the exercise include computer programming and simulation.

**Voraussetzungen**

B.Sc., knowledge in Matlab or Python

**Leistungsnachweis**

**1 oral exam**
”Complex dynamics”
30 min (100%) / **SuSe** + WiSe

### 301016 Exam: Complex dynamics

**B. Rüffer**
Prüfung
Mi, Einzel, 09:00 - 17:00, Final examination - oral exam (organized by chair) --> please contact the responsible, 30.07.2025 - 30.07.2025

## Computer models for physical processes - from observation to simulation

## Macroscopic Transport Modelling

### 909020 Prüfung: Macroscopic Transport Modelling

**U. Plank-Wiedenbeck**
Prüfung
Fr, Einzel, 09:00 - 11:00, Marienstraße 7 B - Seminarraum 101, 01.08.2025 - 01.08.2025

## Modelling in the development process

## Optimization

### 451002 Exam: Introduction to Optimization

**T. Lahmer**
Prüfung
Fr, Einzel, 13:00 - 14:30, Marienstraße 13 C - Hörsaal B, 25.07.2025 - 25.07.2025
Fr, Einzel, 13:00 - 14:30, Marienstraße 13 C - Hörsaal D, 25.07.2025 - 25.07.2025

### 451002 Introduction to Optimization (L+E)

**T. Lahmer** Veranst. SWS: 3
Integrierte Vorlesung
Mo, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal B, Lecture
Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Exercise Dates by arrangement

**Beschreibung**

In engineering science, we are often faced with problems having potential for optimization. We learn how to formulate this in mathematical terms, and we will study techniques how to improve the situations, generally by involving numerical models. We will discuss classical optimization problems in the field of linear and nonlinear optimization, e.g. optimization of the use of resources, routing problems, calibration problems and structural optimization. In particular in structural optimization we learn techniques like dimensioning, shape and topology optimization. Optimized structures are discussed also in the context of additive manufacturing techniques.

**Bemerkung**

**Introduction to Optimization (summer semester):**

Definitions, Classification of Optimization Problems,

Linear Problems, Simplex Method, Nonlinear Problems: Constrained and unconstrained continuous problems, descent methods and variants. (Robust) Structural Optimization (including Shape and Topology Optimization)

**Voraussetzungen**

B.Sc.

**Leistungsnachweis**

**1 written or oral exam** (depending on the number of participants)

”Introduction to Optimization” (3 credits) / **SuSe** + WiSe

### 451006 Optimization in Applications (P)

**T. Lahmer** Veranst. SWS: 3
Projektmodul/Projekt

**Beschreibung**

In engineering science, we are often faced with problems having potential for optimization. We learn how to formulate this in mathematical terms, and we will study techniques how to improve the situations, generally by involving numerical models. We will discuss classical optimization problems in the field of linear and nonlinear optimization, e.g. optimization of the use of resources, routing problems, calibration problems and structural optimization. In particular in structural optimization we learn techniques like dimensioning, shape and topology optimization. Optimized structures are discussed also in the context of additive manufacturing techniques.

**Bemerkung**

**Optimization in Applications (summer semester):**

Optimization in Applications is generally a project assigned to the students including own programming and modelling. E.g. innovative optimization strategies are to be implemented in Matlab, Python or similar. Alternatively, engineering models could be subjected to optimization software.

**Leistungsnachweis**

**1 project** ”Optimization in Applications” (3 credits) / **SuSe** + WiSe

## Raumbezogene Informationssysteme/ Spatial information systems (GIS)

### 439100 Prüfung: Raumbezogene Informationssysteme/ Spatial information systems

**T. Gebhardt, V. Rodehorst**
Prüfung
Di, Einzel, 13:00 - 15:00, Bauhausstraße 11 - N 004, 22.07.2025 - 22.07.2025

# Simulation and Validation (SaV)

## Design and Interpretation of Experiments / Signal Processing

### 205014 Re-examination: Design and interpretation of experiments

**M. Kraus**
Prüfung
Do, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal B, Re-examination, 07.08.2025 - 07.08.2025

**Bemerkung**

Re-examination

## Experimental Structural Dynamics

### 401009 Experimental structural dynamics and Structural monitoring (P)

**T. Most, R. Das, F. Tartaglione Garcia** Veranst. SWS: 4
Projekt
Mi, Einzel, 15:15 - 16:45, Marienstraße 13 C - Hörsaal C, guest lecture Prof. Zabel, 25.06.2025 - 25.06.2025
Mo, wöch., 09:15 - 10:45, Marienstraße 7 B - Projektraum 301
Mi, wöch., 15:15 - 16:45, Marienstraße 7 B - Projektraum 301

**Beschreibung**

The students obtain deepened knowledge in structural dynamics, structural dynamic analysis, data processing, dynamic test equipment and its handling. They learn to analyse the dynamic behaviour of a structure utilizing both numerical and experimental state-of-the-art methods. Furthermore, the students have to develop strategies and concepts of investigation. The work in small groups enhances the social competence of the students.

Operational modal analysis, sensor types, sensor positioning, data analysis and assessment, assessment of structural changes, structural modelling, model updating

**Bemerkung**

14 students from NHRE only

**Voraussetzungen**

Structural dynamics

**Leistungsnachweis**

**1 Project report + intermediate and final presentations**

„ Experimental structural dynamics”

(100%) / **SuSe**

## Extended Finite Elements and Mesh Free Methods

## Finite Element Methods (FEM)

### 2401012 Applied Finite element methods (Exercise)

**T. Rabczuk, J. Lopez Zermeño, F. Tartaglione Garcia** Veranst. SWS: 1
Seminar
Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, Exercise
Mi, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 301, Tutorium
Mi, wöch., 13:30 - 15:00, Marienstraße 7 B - Seminarraum 205, Tutorium

### 2401012 Applied Finite element methods (Lecture)

**T. Rabczuk, C. Könke, J. Lopez Zermeño, L. Nguyen Tuan** Veranst. SWS: 2
Vorlesung
Do, wöch., 07:30 - 09:00, Marienstraße 7 B - Seminarraum 205

### 401012 Exam: Finite element methods and structural dynamics - Part: Applied finite element methods

**T. Rabczuk**
Prüfung
Fr, Einzel, 11:00 - 12:30, Marienstraße 7 B - Seminarraum 205, Final examination, 01.08.2025 - 01.08.2025

**Bemerkung**

Re-examination

### 401015+40 Re-examination and exam: Finite Element Methods

**T. Rabczuk**
Prüfung
Fr, Einzel, 09:00 - 12:30, Re-examination together with master course NHRE LH D M13C, 01.08.2025 - 01.08.2025

## Fundamentals of structural health monitoring (SHM) and intelligent structural systems

## Modelling of Steel Structures and Numerical Simulation

### 205007 Exam: Modelling of steel structures and numerical simulation

**M. Kraus**
Prüfung
Mi, Einzel, 09:00 - 11:00, Final examinationMeeting Room SHS, 06.08.2025 - 06.08.2025

**Bemerkung**

## Simulation Methods in Engineering

### 303002 Simulation Methods in Engineering

**C. Koch, M. Artus** Veranst. SWS: 4
Vorlesung
Mi, Einzel, 14:00 - 15:30, Steubenstraße 6, Haus F - Hörsaal K20, 06.08.2025 - 06.08.2025
Mi, Einzel, 14:00 - 15:30, Marienstraße 13 C - Hörsaal A, 06.08.2025 - 06.08.2025
Fr, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal A
Fr, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 301
Fr, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 302

**engl. Beschreibung/ Kurzkommentar**

Simulation Methods in Engineering

Content:

- System analysis and modelling
- System dynamics
- Discrete event simulation

- Multi-agent simulation
- Input data and stochastic simulation
- Simulation based optimization
- Introduction to the software AnyLogic

Target qualifications:

This module provides students with comprehensive knowledge about computer based simulation concepts to address practical challenges in engineering. Modern simulation and optimization software is introduced within tutorials. The module project (coursework) offers an opportunity to students to work in groups on current problems in the context of civil and environmental engineering (e.g. production logistics, pedestrian simulation, pollutant dispersion). Using object-oriented simula-tion software the students will analyze, model and simulate different engineering systems. The programming is carried out using Java. Also the students acquire team working and presentation skills.

**Voraussetzungen**

Recommended require-ments for participation: Basic knowledge of programming

**Leistungsnachweis**

Short group report, group presentation, written exam

## Stochastic Simulation Techniques and Structural Reliability

### 451007 Exam: Stochastic Simulation Techniques and Structural Reliability

**T. Lahmer**
Prüfung
Fr, Einzel, 13:30 - 15:00, Marienstraße 13 C - Hörsaal B, Final examination, 08.08.2025 - 08.08.2025
Fr, Einzel, 13:30 - 15:00, Marienstraße 13 C - Hörsaal D, Final examination, 08.08.2025 - 08.08.2025

### 451007 Stochastic Simulation Techniques and Structural Reliability (L+E)

**T. Lahmer** Veranst. SWS: 3
Integrierte Vorlesung
Di, wöch., 09:15 - 10:45, Coudraystraße 11 C - Pool-Raum 101, Exercise dates by arrangement
Di, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal D, Lecture

**Beschreibung**

Soils, rocks and materials like concrete are in the natural state among the most variable of all engineering materials. Engineers need to deal with this variability and make decisions in situations of little data, i.e. under high uncertainties. The course aims in providing the students with techniques state of the art in risk assessment (structural reliability) and stochastic simulation.

The course topics comprise
- (a very brief review) of probability theory
- discrete and continuous random processes and fields
- estimation of statistical parameters
- stochastic simulation techniques (Monte Carlo Samplings)
- reliability-based design
- sensitivity analysis
- structural safety
- Risk assessment and stochastic modelling in practice

**Bemerkung**

The lecture consists of weekly lectures by Prof. Tom Lahmer (Bauhaus University Weimar) throughout the semester and an intensive practical training (Blockkurs) on applications by Dr. Thomas Most (DYNARDO, Weimar)
Please indicate your interest in the course via an E-Mail to Prof. Tom Lahmer (tom.lahmer@uni-weimar.de) by briefly citing the title of the lecture and providing your name until **April 1st** as this will make the organization of rooms, course material, etc. much easier.

Possible combinations with other lectures acc. to the NHRE-Modulguide.

**Voraussetzungen**

Basic knowledge in probability theory

**Leistungsnachweis**

**1 written or oral exam** (depending on the number of participants)

”Stochastic Simulation Techniques and Structural Reliability” / (50%) / **SuSe** + WiSe

### 451011 Stochastic Simulation Techniques and Structural Reliability (P)

**T. Lahmer** Veranst. SWS: 3
Projektmodul/Projekt

**Beschreibung**

The course topics comprise

- (a very brief review) of probability theory
- discrete and continuous random processes and fields
- estimation of statistical parameters
- stochastic simulation techniques (Monte Carlo Simulation)
- reliability-based design
- sensitivity analysis
- structural reliability (FORM, FOSM, Subset Simulation, …)
- Risk assessment and stochastic modelling in practice

The project (extra 3 credits) involves own programming of stochastic simulation algorithms, e.g. generators of random fields, methods to assess structural reliability, and combination of stochastic simulation techniques with engineering models.

**Bemerkung**

Possible combinations with other lectures acc. to the NHRE-Moduleguide.

**Voraussetzungen**

Basic knowledge in probability theory

**Leistungsnachweis**

**1 written or oral exam** (depending on the number of participants)

”Stochastic Simulation Techniques and Structural Reliability” / (50%) / **SuSe** + WiSe

## Visualization and Data Science (VaDS)

## Complexity Theory

### 422150032 Complexity Theory

**A. Jakoby** Veranst. SWS: 4

Vorlesung

Mi, wöch., 09:15 - 10:45, Bauhausstraße 11 - N 004, Lecture, ab 02.04.2025
Di, wöch., 11:00 - 12:30, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), Lab class , ab 08.04.2025
Mi, Einzel, 09:00 - 11:00, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), schriftliche Prüfung/ written exam, 24.09.2025 - 24.09.2025

**Beschreibung**

Lernziel Ziel ist die Vermittlung grundlegender Kenntnisse, Denkweisen und Konzepte der Komplexitätstheorie. Als Folgerung sollen den Studierenden die prinzipiellen Möglichkeiten und Grenzen der Informationsverarbeitung aufgezeigt werden.

Zentrale Themen sind

- Komplexitätsklassen
- Reduktion
- Effizienz versus Aufwendig
- NP vollständige Probleme
- Approximierbarkeit

**engl. Beschreibung/ Kurzkommentar**

Complexity Theory

The aim this course is to impart basic knowledge on concepts of complexity theory. The course present knowledge on the limits of information processing.

Key topics include

- Complexity Classes
- Reductions
- Efficiency versus Intractability
- NP complete problems

**Voraussetzungen**

Diskrete Mathematik

**Leistungsnachweis**

Klausur

## Generative Software Engineering

### 422150031 Generative Software Engineering

**J. Ringert, .. Soaibuzzaman** Veranst. SWS: 4

Vorlesung

Mi, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal B, Lecture / lab class, ab 02.04.2025
Mo, wöch., 11:00 - 12:30, Bauhausstraße 11 - R 015, Lecture / lab class, ab 07.04.2025
Mo, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal C, schritfliche Prüfung/ written exam, 04.08.2025 - 04.08.2025

**Beschreibung**

We introduce main approaches and techniques to generative software development.

- Model Driven Engineering
- Software Modeling languages for structure and behavior
  - Class Diagrams, Object Diagrams, OCL
  - Sequence Diagrams and State Machines
- Software model consistency and semantics
- Code Generation from class diagrams
- Code generation from State Machines
- Reactive Synthesis from temporal specifications
- Software Product Lines
- Domain Specific Languages
- Model Transformations

After completion students will be able to

- Contrast different modelling languages and chose based on purpose
- Analyze model consistency
- Evaluate and apply code generators
- integrate generated code in software projects
- create and analyze temporal specifications
- synthesize software from temporal specifications
- understand domain specific languages and model transformations

**Bemerkung**

Lecturer: Prof. Ringert

**Leistungsnachweis**

Homework for admission to exam

Exam weighted 100% for final mark

## Image Analysis and Object Recognition

### 4336010 Image Analysis and Object Recognition

**V. Rodehorst, M. Kaisheva** Veranst. SWS: 4

Vorlesung

Di, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal A, Lecture, ab 08.04.2025
Do, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal A, Lab class, ab 17.04.2025
Di, Einzel, 10:00 - 12:30, Marienstraße 13 C - Hörsaal B, schriftliche Prüfung/ written exam, 29.07.2025 - 29.07.2025
Di, Einzel, 10:00 - 12:30, Marienstraße 13 C - Hörsaal C, schriftliche Prüfung/ written exam, 29.07.2025 - 29.07.2025
Di, Einzel, 10:00 - 12:30, Marienstraße 13 C - Hörsaal D, schriftliche Prüfung/ written exam, 29.07.2025 - 29.07.2025

**Beschreibung**

Bildanalyse und Objekterkennung

Die Vorlesung gibt eine Einführung in die Grundlagen der Mustererkennung und Bildanalyse. Behandelt werden unter anderem die Bildverbesserung, lokale und morphologische Operatoren, Kantenerkennung, Bilddarstellung im Frequenzraum, Fourier-Transformation, Hough-Transformation, Segmentierung, Skelettierung, Objektklassifizierung und maschinelles Lernen zur visuellen Objekterkennung.

**engl. Beschreibung/ Kurzkommentar**

Image analysis and object recognition

The lecture gives an introduction to the basic concepts of pattern recognition and image analysis. It covers topics as image enhancement, local and morphological operators, edge detection, image representation in frequency domain, Fourier transform, Hough transform, segmentation, thinning, object categorization and machine learning for visual object recognition.

**Leistungsnachweis**

Erfolgreiche Bearbeitung der Übungen sowie des Miniprojekts und Klausur

## Introduction to Machine Learning

## Photogrammetric Computer Vision

## Randomized Algorithms

## Real-time Rendering

## Visualization

### 4555262 Visualisierung

**B. Fröhlich, D. Kiesel, I. López García, G. Rendle** Veranst. SWS: 4

Vorlesung

Do, wöch., 13:30 - 15:00, Bauhausstraße 11 - R 015, Lecture / Lab class , ab 03.04.2025
Fr, wöch., 13:30 - 15:00, Bauhausstraße 11 - Pool G, Lab class, ab 04.04.2025
Mo, wöch., 09:15 - 10:45, Bauhausstraße 11 - Pool G, Lab class, ab 07.04.2025
Fr, Einzel, 10:00 - 12:00, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), Prüfung / exam, 26.09.2025 - 26.09.2025
Fr, Einzel, 10:00 - 12:00, Karl-Haußknecht-Straße 7 - Seminarraum (IT-AP) 001, Prüfung / exam, 26.09.2025 - 26.09.2025

**Beschreibung**

Im ersten Teil der Veranstaltung werden die wichtigsten Verfahren und Techniken aus dem Bereich der Informationsvisualisierung für folgende Datentypen vorgestellt: multi-dimensionale und hierarchische Daten, Graphen, Zeitreihen und mengenbasierte Daten. Der zweite Teil beschäftigt sich mit verschiedenen Ansätzen und Algorithmen zur Visualisierung volumetrischer und vektorieller Simulations- und Messdaten. Die Veranstaltung wird englischsprachig angeboten.

In den Übungen werden eine Auswahl der in den Vorlesungen vorgestellten Visualisierungsansätze umgesetzt, getestet und evaluiert. Die abschließende Übungsaufgabe ermöglicht es Ihnen, ein eigenes Visualisierungsprojekt zu entwerfen, implementieren, evaluieren und präsentieren.

**Voraussetzungen**

Programmierkenntnisse sowie gute Kenntnisse von Algorithmen und Datenstrukturen sind erforderlich, z.B. nachgewiesen durch den erfolgreichen Abschluss der entsprechenden Lehrveranstaltungen des Bachelor-Studiengangs Medieninformatik.

In den Laborveranstaltungen werden JavaScript- und grundlegende GLSL-Programmierung eingesetzt. Grundkenntnisse der Computergrafik sind hilfreich, z.B. erworben durch die Vorlesung Computergrafik im Bachelor-Studiengang Medieninformatik.

**Leistungsnachweis**

Vorlesungsbegleitende, bewertete Übungen, mündliche oder schriftliche Prüfung und ein abschließendes Projekt.

## Elective Modules

### 4555262 Visualisierung

**B. Fröhlich, D. Kiesel, I. López García, G. Rendle** Veranst. SWS: 4

Vorlesung

Do, wöch., 13:30 - 15:00, Bauhausstraße 11 - R 015, Lecture / Lab class , ab 03.04.2025
Fr, wöch., 13:30 - 15:00, Bauhausstraße 11 - Pool G, Lab class, ab 04.04.2025
Mo, wöch., 09:15 - 10:45, Bauhausstraße 11 - Pool G, Lab class, ab 07.04.2025
Fr, Einzel, 10:00 - 12:00, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), Prüfung / exam, 26.09.2025 - 26.09.2025
Fr, Einzel, 10:00 - 12:00, Karl-Haußknecht-Straße 7 - Seminarraum (IT-AP) 001, Prüfung / exam, 26.09.2025 - 26.09.2025

**Beschreibung**

Im ersten Teil der Veranstaltung werden die wichtigsten Verfahren und Techniken aus dem Bereich der Informationsvisualisierung für folgende Datentypen vorgestellt: multi-dimensionale und hierarchische Daten, Graphen, Zeitreihen und mengenbasierte Daten. Der zweite Teil beschäftigt sich mit verschiedenen Ansätzen und Algorithmen zur Visualisierung volumetrischer und vektorieller Simulations- und Messdaten. Die Veranstaltung wird englischsprachig angeboten.

In den Übungen werden eine Auswahl der in den Vorlesungen vorgestellten Visualisierungsansätze umgesetzt, getestet und evaluiert. Die abschließende Übungsaufgabe ermöglicht es Ihnen, ein eigenes Visualisierungsprojekt zu entwerfen, implementieren, evaluieren und präsentieren.

**Voraussetzungen**

Programmierkenntnisse sowie gute Kenntnisse von Algorithmen und Datenstrukturen sind erforderlich, z.B. nachgewiesen durch den erfolgreichen Abschluss der entsprechenden Lehrveranstaltungen des Bachelor-Studiengangs Medieninformatik.

In den Laborveranstaltungen werden JavaScript- und grundlegende GLSL-Programmierung eingesetzt. Grundkenntnisse der Computergrafik sind hilfreich, z.B. erworben durch die Vorlesung Computergrafik im Bachelor-Studiengang Medieninformatik.

**Leistungsnachweis**

Vorlesungsbegleitende, bewertete Übungen, mündliche oder schriftliche Prüfung und ein abschließendes Projekt.

## 2909035/01 Fundamentals of Microscopic Traffic Simulation

**U. Plank-Wiedenbeck, L. Thiebes, M. Fedior, J. Uhlmann** Veranst. SWS: 2

Vorlesung

Di, wöch., 13:30 - 15:00, Raum der VSP, Schwanseestraße, 01.04.2025 - 08.07.2025
Di, Einzel, 13:30 - 15:00, Marienstraße 7 B - Seminarraum 106, Raum der VSP, Schwanseestraße, 03.06.2025 - 03.06.2025
Di, Einzel, 13:30 - 15:00, Marienstraße 7 B - Seminarraum 106, Raum der VSP, Schwanseestraße, 24.06.2025 - 24.06.2025
Di, Einzel, 13:30 - 15:00, Marienstraße 7 B - Seminarraum 106, Raum der VSP, Schwanseestraße, 01.07.2025 - 01.07.2025

**Beschreibung**

1. Grundlagen
• Verkehrsmanagement und signalisierte Knotenpunkte
• Verkehrsfluss
• Verkehrsflussmodellierung
2. Mikroskopische Verkehrsflussmodellierung
• Fahrzeugfolgemodelle
• Anwendungsfälle
• Modellierung von Fahrzeugnetzen und Simulationsmöglichkeiten
3. Signale und Daten für die mikroskopische Verkehrssimulation
• Verkehrsflussrelevante Signale und Daten
• Erfassung von verkehrsflussrelevanten Signalen und Daten
• Verkehrserhebungen und Datenanalyse
• Grundlagen von GNSS in FCD-Systemen
4. Mikroskopische Modellierungsverfahren
• Kalibrierung und Validierung
• Emissionsmodellierung
• Aktuelle Forschung

**engl. Beschreibung/ Kurzkommentar**

Traffic Management

**Bemerkung**

Gemeinsam mit dem Teil "Software-based Simulation of Traffic and Emissions" umfasst das Modul "Microscopic Traffic Simulation" 4 SWS und 6 LP.

**Voraussetzungen**

Vorausgesetzt werden entweder erfolgreich absolvierte oder parallel zu belegende Module in den Bereichen Verkehrstechnik und Straßenplanung oder ein vergleichbares Vorwissen. Studierende ohne einschlägige Vorkenntnisse im Verkehrsbereich haben innerhalb der ersten sechs Vorlesungswochen die Möglichkeit, den Onlinekurs „Mobility and Transport in the Sustainable City" zu absolvieren. Dies gilt insbesondere für Studierende des Studiengangs Digital Engineering mit der Profillinie „Mobility and Transport", für die dies das erste Modul mit Verkehrsbezug ist.

**Leistungsnachweis**

In dem Modulteil "Software-based Simulation of Traffic and Emissions" sindist ein semesterbegleitender Belege anzufertigen. Die Vorlesung " Fundamentals of Microscopic Traffic Simulation" schließt mit einer schriftlichen Prüfung (60 min) ab. Die Belegabgabe ist eineBelege sind Prüfungsvoraussetzung. Die Modulnote setzt sich aus der Note ders Beleges (50 %) und der Prüfung (50 %) zusammen. Es ist keine Einzelbelegung der beiden Modulteile möglich.

## 301005 Statistics

**N. Gorban, B. Rüffer** Veranst. SWS: 4

Integrierte Vorlesung

Di, Einzel, 09:00 - 12:00, Marienstraße 13 C - Hörsaal A, schriftliche Prüfung / written exam, 05.08.2025 - 05.08.2025
Do, wöch., 15:15 - 16:45, Coudraystraße 13 B - Hörsaal 3, Lecture
Do, wöch., 17:00 - 18:30, Coudraystraße 13 B - Hörsaal 3, Lab class

**engl. Beschreibung/ Kurzkommentar**

Statistics

Contents:
- Probability (Events, classical probability, axiomatic approach, conditional probability)
- Random variables (Discrete random variables, continuous random variables, limit theorems)
- Descriptive statistics (Graphical representation and frequency distributions, location and scattering parameters, bivariate and multivariate analysis: dependence and correlation, regression analysis)
- Inductive statistics
- Point and interval estimation
- Parameter testing
- Goodness-of-fit-tests
- Nonparametric tests
- Tests for independence and correlation

**Voraussetzungen**

B.Sc. in a related study field, Basic knowledge on random variables and the most important distributions

**Leistungsnachweis**

Written exam

## 301016 Complex dynamics

**B. Rüffer** Veranst. SWS: 4

Vorlesung

Do, wöch., 09:15 - 10:45, Marienstraße 7 B - Seminarraum 102
Fr, wöch., 09:15 - 10:45, Marienstraße 7 B - Seminarraum 102

**Beschreibung**

After the course the students will be able to analyse mathematical models that describe dynamic behaviour, as they occur in engineering (e.g. mechanical coupling of building structures), in biology and in physics, but also in multi-agent systems in computer science, or as opinion dynamics in psychology. Based on examples from different disciplines, students learn to build simplified models that allow to answer questions on their long-term behaviour. Students will be able to apply methods of feedback design that help shape the dynamics of a given system, along with the relevant stability concepts. As several topics lend themselves for computer simulation, students of this course will develop a proficiency to both implement and analyse mathematical models using computational tools and software.

**Bemerkung**

Examples of complex dynamics. Models for dynamical systems in continuous and discrete time. Computer simulation. Control and Feedback. Stability, stabilization, and Lyapunov functions. Coupled systems: Disturbance or Cooperation? Networks of systems. Consensus. Synchronization.

The topics will be presented in a lecture, deepened by exercises. Some of the exercise include computer programming and simulation.

**Voraussetzungen**

B.Sc., knowledge in Matlab or Python

**Leistungsnachweis**

**1 oral exam**
”Complex dynamics”
30 min (100%) / **SuSe** + WiSe

## 301017 Exam: Mathematics for data science

**B. Rüffer, M. Schönlein**
Prüfung
Mi, Einzel, 09:00 - 17:00, Final examination - oral exam (organized by chair) --> please contact the responsible, 30.07.2025 - 30.07.2025

**Beschreibung**

After the course the students will be familiar with the fundamental concepts of data science. The participants can analyse given data sets with respect to dimensionality reduction and clustering. They also know the basic structure of neural networks and support vector machines to solve classification tasks. The participants know relevant methods from linear algebra and optimization and can apply these techniques. This embraces the design of appropriate algorithms and the implementation of different numerical methods to solve the corresponding problems.

**Bemerkung**

linear regression, logistic  regression, dimension reduction, principle component analysis, linear discriminant analysis, multidimensional scaling, k-means clustering, support vector machines, kernel methods, neural networks, natural languange processing

**Voraussetzungen**

B. Sc.; Analysis and Linear Algebra at Bachelor level, knowledge of Matlab or Python

**Leistungsnachweis**

**1 oral exam**
”Mathematics for data science”
30 min (100%) / **SuSe** + WiSe

## 301017 Mathematics for data science

**B. Rüffer, M. Schönlein** Veranst. SWS: 4
Vorlesung
Do, wöch., 13:30 - 15:00, Coudraystraße 13 B - Hörsaal 3
Fr, wöch., 13:30 - 15:00, Coudraystraße 13 B - Hörsaal 3

**Beschreibung**

After the course the students will be familiar with the fundamental concepts of data science. The participants can analyse given data sets with respect to dimensionality reduction and clustering. They also know the basic structure of neural networks and support vector machines to solve classification tasks. The participants know relevant methods from linear algebra and optimization and can apply these techniques. This embraces the design of appropriate algorithms and the implementation of different numerical methods to solve the corresponding problems.

**Bemerkung**

linear regression, logistic  regression, dimension reduction, principle component analysis, linear discriminant analysis, multidimensional scaling, k-means clustering, support vector machines, kernel methods, neural networks, natural languange processing

**Voraussetzungen**

B. Sc.; Analysis and Linear Algebra at Bachelor level, knowledge of Matlab or Python

**Leistungsnachweis**

**1 oral exam**
”Mathematics for data science”
30 min (100%) / **SuSe** + WiSe

## 302014 Indoor Environmental Modeling

**C. Völker, H. Alsaad** Veranst. SWS: 4
Integrierte Vorlesung
Mo, Einzel, 13:00 - 16:00, exam, 14.07.2025 - 14.07.2025
Mo, wöch., 13:30 - 16:45, Coudraystraße 13 B - Pool Fak. B 007, Vorlesung

**Beschreibung**

Das Modul führt in die Untersuchung und Bewertung des Raumklimas ein, wobei der Schwerpunkt auf den Simulations- und Validierungsaspekten dieses Themas liegt. Die Studierenden lernen die Grundlagen des Raumklimas, die Methoden der raumklimatischen Modellierung und die für die Validierung der Simulationen notwendigen empirischen Messungen kennen. Dieses Modul beinhaltet einen Gruppenbeleg, in dem die Studierenden zunächst empirische Messungen in den Laboren der Professur Bauphysik durchführen und diese Experimente anschließend mit Hilfe der Strömungssimulation modellieren. Die Simulationen werden anhand der Messungen validiert. Durch diese Aufgaben lernen die Studierenden die notwendigen Fähigkeiten für wissenschaftliche Forschung, fortgeschrittene Simulationswerkzeuge, wissenschaftliches Schreiben, Präsentation und Teamarbeit.

**Bemerkung**

Die Veranstaltung ist auf eine **Gesamt-Teilnehmerzahl von 12** begrenzt.

**Voraussetzungen**

Es ist kein Abschluss in einer vorhergehenden Lehrveranstaltung notwendig.

Kenntnisse in den Grundlagen der numerischen Analyse, FEM, FVM oder ähnlichem werden für die Teilnahme vorausgesetzt

**Leistungsnachweis**

Beleg, Präsentation und mündliche Prüfung

## 303001 Advanced Building Information Modelling

**C. Koch, J. Krischler, J. Taraben** Veranst. SWS: 4
Vorlesung
Mi, wöch., 11:00 - 12:30, Marienstraße 7 B - PC-Pool Luna-red,  Exercise
Mi, wöch., 11:00 - 12:30, Coudraystraße 13 B - Pool Fak. B 007,  Exercise
Mi, wöch., 11:00 - 12:30, Coudraystraße 11 C - Pool-Raum 101,  Exercise
Do, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal A, Lecture

**engl. Beschreibung/ Kurzkommentar**

Advanced Building Information Modelling

Content: Advanced geometric and parametric modelling, Interoperability and collaboration concepts (IFC, IDM, BEP), Advanced use cases (e.g. clash detection, as-built model-ing), BIM programming (incl. visual programming)

Target qualifications: This module introduces advanced concepts of Building Information Modelling (BIM) to provide students with advanced knowledge in order to understand, analyze and discuss scientific research approaches related to BIM. Within the frame of the mod-ule project (coursework) the students will choose a topic from a pre-defined list or come up with their own topic. Based on that they will do detailed research, imple-ment a representative concept in a software prototype and discuss findings and limi-tations. Also the students acquire skills of scientific working and presentation.

**Bemerkung**

NHRE: Possible as Elective Compulsory as from Intake 2022

**Voraussetzungen**

Recommended require-ments for participation: Basic knowledge of Computer-Aided Design, BIM concepts, and object-oriented programming

**Leistungsnachweis**

written report, presentation

## 303002 Simulation Methods in Engineering

**C. Koch, M. Artus** Veranst. SWS: 4

Vorlesung

Mi, Einzel, 14:00 - 15:30, Steubenstraße 6, Haus F - Hörsaal K20, 06.08.2025 - 06.08.2025
Mi, Einzel, 14:00 - 15:30, Marienstraße 13 C - Hörsaal A, 06.08.2025 - 06.08.2025
Fr, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal A
Fr, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 301
Fr, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 302

**engl. Beschreibung/ Kurzkommentar**

Simulation Methods in Engineering

Content:

- System analysis and modelling
- System dynamics
- Discrete event simulation
- Multi-agent simulation
- Input data and stochastic simulation
- Simulation based optimization
- Introduction to the software AnyLogic

Target qualifications:

This module provides students with comprehensive knowledge about computer based simulation concepts to address practical challenges in engineering. Modern simulation and optimization software is introduced within tutorials. The module project (coursework) offers an opportunity to students to work in groups on current problems in the context of civil and environmental engineering (e.g. production logistics, pedestrian simulation, pollutant dispersion). Using object-oriented simula-tion software the students will analyze, model and simulate different engineering systems. The programming is carried out using Java. Also the students acquire team working and presentation skills.

**Voraussetzungen**

Recommended require-ments for participation: Basic knowledge of programming

**Leistungsnachweis**

Short group report, group presentation, written exam

## 420160000 Introduction to Natural Language Processing

**B. Stein, M. Wolska, N. Mirzakhmedova, M. Wiegmann** Veranst. SWS: 3
Vorlesung

Do, wöch., 15:15 - 16:45, Bauhausstraße 11 - N 004, Lecture, ab 03.04.2025
Do, wöch., 17:00 - 18:30, Bauhausstraße 11 - N 004, Lab class, ab 03.04.2025
Do, Einzel, 15:15 - 18:30, Marienstraße 13 C - Hörsaal C, 10.04.2025 - 10.04.2025
Do, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal A, schriftliche Prüfung/ written exam, 24.07.2025 - 24.07.2025
Do, Einzel, 09:00 - 11:00, Coudraystraße 13 B - Hörsaal 3, schriftliche Prüfung/ written exam, 24.07.2025 - 24.07.2025

**Beschreibung**

This course gives an overview of basic techniques of working with language data. We will introduce basic linguistic notions, issues involved in building and working with language corpora, current standard techniques for preparing text for analysis, and methods of computational processing of a subset of language phenomena. By the end of the course students will

(1) have an understanding of key word-level, syntactic, semantic, and discourse phenomena,

(2) be aware of issues involved in building text corpora,

(3) be familiar with typical language processing tasks addressed in the NLP community and methods of addressing them, and

(4) will be able to perform tasks that are part of a standard NLP pipeline.

**Leistungsnachweis**

Klausur

## 422150031 Generative Software Engineering

**J. Ringert, .. Soaibuzzaman** Veranst. SWS: 4
Vorlesung

Mi, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal B, Lecture / lab class, ab 02.04.2025
Mo, wöch., 11:00 - 12:30, Bauhausstraße 11 - R 015, Lecture / lab class, ab 07.04.2025
Mo, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal C, schritfliche Prüfung/ written exam, 04.08.2025 - 04.08.2025

**Beschreibung**

We introduce main approaches and techniques to generative software development.

- Model Driven Engineering
- Software Modeling languages for structure and behavior
  - Class Diagrams, Object Diagrams, OCL
  - Sequence Diagrams and State Machines
- Software model consistency and semantics
- Code Generation from class diagrams
- Code generation from State Machines
- Reactive Synthesis from temporal specifications
- Software Product Lines
- Domain Specific Languages
- Model Transformations

After completion students will be able to

- Contrast different modelling languages and chose based on purpose
- Analyze model consistency
- Evaluate and apply code generators
- integrate generated code in software projects
- create and analyze temporal specifications
- synthesize software from temporal specifications
- understand domain specific languages and model transformations

**Bemerkung**

Lecturer: Prof. Ringert

**Leistungsnachweis**

Homework for admission to exam

Exam weighted 100% for final mark

## 422150032 Complexity Theory

**A. Jakoby** Veranst. SWS: 4

Vorlesung

Mi, wöch., 09:15 - 10:45, Bauhausstraße 11 - N 004, Lecture, ab 02.04.2025
Di, wöch., 11:00 - 12:30, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), Lab class , ab 08.04.2025
Mi, Einzel, 09:00 - 11:00, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), schriftliche Prüfung/ written exam, 24.09.2025 - 24.09.2025

**Beschreibung**

Lernziel Ziel ist die Vermittlung grundlegender Kenntnisse, Denkweisen und Konzepte der Komplexitätstheorie. Als Folgerung sollen den Studierenden die prinzipiellen Möglichkeiten und Grenzen der Informationsverarbeitung aufgezeigt werden.

Zentrale Themen sind

- Komplexitätsklassen
- Reduktion
- Effizienz versus Aufwendig
- NP vollständige Probleme
- Approximierbarkeit

**engl. Beschreibung/ Kurzkommentar**

Complexity Theory

The aim this course is to impart basic knowledge on concepts of complexity theory. The course present knowledge on the limits of information processing.

Key topics include

- Complexity Classes
- Reductions
- Efficiency versus Intractability
- NP complete problems

**Voraussetzungen**

Diskrete Mathematik

**Leistungsnachweis**

Klausur

## 424150030 Advanced Topics in Software Engineering

**J. Ringert** Veranst. SWS: 2
Seminar
Fr, wöch., 15:15 - 16:45

**Beschreibung**

This module is a seminar worth 3 ECTS.

The module focuses on a systematic literature review:

- finding a topic from Software Engineering,
- defining research questions for a literature review, and
- reviewing Software Engineering literature to answer your research questions.

Your mark will be determined by:

- intermediate submissions of your progress,
- presentations of your findings during the semester, and
- a final seminar paper and presentation (submitted at the end of the semester).

**Leistungsnachweis**

Presentations during the semester

Final seminar paper

## 425160000 Current Topics in Cryptography: Secure Channels

**S. Lucks, N. Lang, J. Leuther** Veranst. SWS: 2
Seminar
Di, Einzel, 17:00 - 18:30, InfoSec Lab, B11, Raum K016, 08.04.2025 - 08.04.2025

**Beschreibung**

Ein sicherer Kanal (secure channel) zwischen zwei oder mehreren Teilnehmern gewährleistet die Vertraulichkeit 1 und Integrität der übertragenen Daten. Ein Übertragungskanal zwischen zwei Entitäten kann beispielsweise durch die Verwendung von "Authenticated Encryption Modes", die sowohl Daten verschlüsseln als auch authentifizieren, sicher gemacht werden. In diesem Seminar werden Sie selbstständig ein ausgewähltes wissenschaftliches Thema aus dem Bereich der Kryptographie bearbeiten. Das Thema wird in Absprache mit den Betreuern ausgewählt. Auch selbst vorgeschlagene Themen oder Gebiet Ihrer Wahl (im Rahmen des Seminar-Themas) sind gerne gesehen. Es wird Präsenztermine für den Kick-off, die Zwischenpräsentation und die Abschlusspräsentation geben. Dazwischen können bei Bedarf flexibel Termine für Fragen und Antworten vereinbart werden.

**Bemerkung**

Terminabsprache über Moodle-Kurs

**Voraussetzungen**

Introduction to Modern Cryptography (or equivalent)

**Leistungsnachweis**

Eigenständige Bearbeitung eines Themas, mündliche Präsentation zu einem Thema, Teilnahme an Diskussion zu den präsentierten Themen

## 4336010 Image Analysis and Object Recognition

**V. Rodehorst, M. Kaisheva** Veranst. SWS: 4

Vorlesung

Di, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal A, Lecture, ab 08.04.2025
Do, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal A, Lab class, ab 17.04.2025
Di, Einzel, 10:00 - 12:30, Marienstraße 13 C - Hörsaal B, schriftliche Prüfung/ written exam, 29.07.2025 - 29.07.2025
Di, Einzel, 10:00 - 12:30, Marienstraße 13 C - Hörsaal C, schriftliche Prüfung/ written exam, 29.07.2025 - 29.07.2025
Di, Einzel, 10:00 - 12:30, Marienstraße 13 C - Hörsaal D, schriftliche Prüfung/ written exam, 29.07.2025 - 29.07.2025

**Beschreibung**

Bildanalyse und Objekterkennung

Die Vorlesung gibt eine Einführung in die Grundlagen der Mustererkennung und Bildanalyse. Behandelt werden unter anderem die Bildverbesserung, lokale und morphologische Operatoren, Kantenerkennung, Bilddarstellung im Frequenzraum, Fourier-Transformation, Hough-Transformation, Segmentierung, Skelettierung, Objektklassifizierung und maschinelles Lernen zur visuellen Objekterkennung.

**engl. Beschreibung/ Kurzkommentar**

Image analysis and object recognition

The lecture gives an introduction to the basic concepts of pattern recognition and image analysis. It covers topics as image enhancement, local and morphological operators, edge detection, image representation in frequency domain, Fourier transform, Hough transform, segmentation, thinning, object categorization and machine learning for visual object recognition.

**Leistungsnachweis**

Erfolgreiche Bearbeitung der Übungen sowie des Miniprojekts und Klausur

## 451002 Introduction to Optimization (L+E)

**T. Lahmer** Veranst. SWS: 3

Integrierte Vorlesung

Mo, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal B, Lecture
Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Exercise Dates by arrangement

**Beschreibung**

In engineering science, we are often faced with problems having potential for optimization. We learn how to formulate this in mathematical terms, and we will study techniques how to improve the situations, generally by involving numerical models. We will discuss classical optimization problems in the field of linear and nonlinear optimization, e.g. optimization of the use of resources, routing problems, calibration problems and structural optimization. In particular in structural optimization we learn techniques like dimensioning, shape and topology optimization. Optimized structures are discussed also in the context of additive manufacturing techniques.

**Bemerkung**

**Introduction to Optimization (summer semester):**

Definitions, Classification of Optimization Problems,

Linear Problems, Simplex Method, Nonlinear Problems: Constrained and unconstrained continuous problems, descent methods and variants. (Robust) Structural Optimization (including Shape and Topology Optimization)

**Voraussetzungen**

B.Sc.

**Leistungsnachweis**

**1 written or oral exam** (depending on the number of participants)

”Introduction to Optimization” (3 credits) / **SuSe** + WiSe

## 451006 Optimization in Applications (P)

**T. Lahmer** Veranst. SWS: 3
Projektmodul/Projekt

**Beschreibung**

In engineering science, we are often faced with problems having potential for optimization. We learn how to formulate this in mathematical terms, and we will study techniques how to improve the situations, generally by involving numerical models. We will discuss classical optimization problems in the field of linear and nonlinear optimization, e.g. optimization of the use of resources, routing problems, calibration problems and structural optimization. In particular in structural optimization we learn techniques like dimensioning, shape and topology optimization. Optimized structures are discussed also in the context of additive manufacturing techniques.

**Bemerkung**

**Optimization in Applications (summer semester):**

Optimization in Applications is generally a project assigned to the students including own programming and modelling. E.g. innovative optimization strategies are to be implemented in Matlab, Python or similar. Alternatively, engineering models could be subjected to optimization software.

**Leistungsnachweis**

**1 project** ”Optimization in Applications” (3 credits) / **SuSe** + WiSe

## 4526501 Academic English Part One

**G. Atkinson** Veranst. SWS: 2
Kurs
Mi, wöch., 15:15 - 16:45, Consultations, R.N212, B11 (indiv.appointments)
Mi, wöch., 17:00 - 18:30, Bauhausstraße 11 - R 015, Academic English Part I+II (alternating)

**Beschreibung**

This is the first part of a two-part course which aims to improve your ability to express yourself clearly in written English and to develop a suitably coherent academic writing style. Part One concentrates mainly on structure in writing academic articles, essays and reports. We begin by examining the structure of individual paragraphs and move on to extended texts of various types (e.g. process essays, cause/effect, comparison/contrast, etc.). Particular attention is paid to connectives, i.e. transitional phrases and constructions which help you link ideas and paragraphs in a logical, systematic way.

**Bemerkung**

You are advised to take Part One first, although it is possible to take both parts in reverse order or concurrently (i.e. in the same semester). You may only do the latter on the authority of the course leader (Atkinson).

**Voraussetzungen**

Registration (compulsory)

**All students must register.** First time particpants are required to present a B2 English Level certificate along with their email registration. All students, **including those who have already taken Academic English Part Two and those who need to repeat Academic English Part One,** must register by contacting Howard Atkinson at: howard.atkinson@uni-weimar.de**.**

**You will be informed by email when registration opens and when the deadline is. Please do not attempt to register until you have received this Email. Registration Emails should be given the subject heading: AE I Registration.**

**Leistungsnachweis**

continuous assessment

## 4526502 Academic English Part Two

**G. Atkinson** Veranst. SWS: 2

Kurs

Mi, wöch., 15:15 - 16:45, Consultations, R.N212, B11 (indiv.appointments)
Mi, wöch., 17:00 - 18:30, Bauhausstraße 11 - R 015, Academic English Part I+II alternating

**Beschreibung**

Part Two of the Academic English course concentrates on improving and refining aspects of academic writing style. It includes sections on clause and sentence structure, punctuation rules and how to incorporate quotations, statistics and footnotes into academic texts.

**Bemerkung**

You are advised to take Part One first, although it is possible to take both parts in reverse order or concurrently (i.e. in the same semester). You may only do the latter on the authority of the course leader (Atkinson).

**Voraussetzungen**

Registration (compulsory)

**All students must register.** First time particpants are required to present a B2 English Level certificate along with their email registration. All students, **including those who have already taken Academic English Part One and those who need to repeat Academic English Part Two,** must register by contacting Howard Atkinson at: howard.atkinson@uni-weimar.de**.**

**You will be informed by email when registration opens and when the deadline is. Please do not attempt to register until you have received this Email. Registration Emails should be given the subject heading: AE II Registration.**

**Leistungsnachweis**

continuous assessment

### 4555211 Algorithmen und Datenstrukturen

**C. Wüthrich, N.N., Projektbörse Fak. KuG** Veranst. SWS: 4
Vorlesung
Di, wöch., 13:30 - 15:00, Marienstraße 13 C - Hörsaal C, Vorlesung, ab 08.04.2025
Mo, Einzel, 09:00 - 11:00, Steubenstraße 6, Haus F - Hörsaal K20, schriftliche Prüfung/ written exam, 28.07.2025 - 28.07.2025
Mo, wöch., 09:15 - 10:45, Bauhausstraße 11 - N 004, Vorlesung

**Beschreibung**

Das Lernziel dieser Veranstaltung soll zum einen der generelle Umgang und die selbstständige Entwicklung, Analyse, und Optimierung von Algorithmen und Datenstrukturen sein. Zum anderen soll ein Überblick über gängige problemspezifische Verfahren und deren Anwendung in der Praxis vermittelt werden.

**engl. Beschreibung/ Kurzkommentar**

Algorithms and Data Structures

The lecture deals with the principle and the implementation of basic algorithms and data structures. The course teaches among all, the Strings, geometric problems, graphs, mathematical algorithms and NP-complete problems.

**Bemerkung**

**Hinweis**:Diese Vorlesung wird **im aktuellen Semester letztmalig angeboten**. Bitte nutzen Sie diese Gelegenheit, wenn Sie die Veranstaltung noch belegen möchten.Diese Vorlesung wird im aktuellen Semester letztmalig angeboten. Bitte nutzen Sie diese Gelegenheit, wenn Sie die Veranstaltung noch belegen möchten.

**Leistungsnachweis**

Beleg, Klausur

### 909035 Prüfung: Microscopic traffic simulation

**U. Plank-Wiedenbeck**
Prüfung
Do, Einzel, 13:00 - 14:00, Marienstraße 7 B - Seminarraum 101, 07.08.2025 - 07.08.2025

## Project

### 425110000 Agent-based AI for Illumulus

**B. Stein, T. Gollub, S. Ruth** Veranst. SWS: 10
Projekt

**Beschreibung**

What makes a story a good story? In the project, we want to develop multi-modal story quality metrics which allow for the implementation of an agent-based feedback loop into Illumulus, our story generation AI.

Goals: Develop next version of Illumulus featuring :

- The state-of-the-art models for text and image generation.

- Automated story and image quality assessment

- Agent-based feedback loop

- Adherence to context information (about the user and the event).

- A conversational interface for the user interaction.

**Bemerkung**

Time and place will be announced at the project fair.

**Leistungsnachweis**

Projektbericht, Abschlusspräsentation

## 425110003 Bobby Tables - How to Implement an Insecure System

**S. Lucks, N. Lang, J. Leuther** Veranst. SWS: 10
Projekt

**Beschreibung**

Um zu verstehen, wie man ein sicheres System erstellt, fangen wir damit an, absichtlich ein unsicheres System zu bauen. Inspiriert von OWASP's Juice Shop (https://help.owasp-juice.shop/) ist unser Ziel, eine Plattform zu entwickeln, welche verschiedene Sicherheitslücken aufweist, um als Übungen für Penetrationstests und andere Angriffe genutzt werden können. Ausgehend vom Konzept des berühmten XKCD-Comics „Exploits of a Mom" (https://xkcd.com/327/) möchten wir eine Plattform in einem Schulumfeld gestalten.

**Bemerkung**

Time and place will be announced at the project fair.

**Voraussetzungen**

At least one of the following:

- very good programming skills

- passed Webtechnologie

- passed Software Engineering

- passed Einführung in die Programmierung

**Leistungsnachweis**

Zwischenpräsentationen, Abschlusspräsentation, Abschlussbericht

## 425110005 Digital Twin for a Building Exposed to Wind Hazards

**C. Koch, M. Artus, G. Morgenthal, A. Athanasiou** Veranst. SWS: 10
Projekt

**Beschreibung**

The project starts with the collection of design information pertaining to the case study - a wind sensitive building in Weimar. Subsequently, climatic data for the city of Weimar is gathered. Guidance is provided to students in the design and development of the sensor system. The students are responsible for programming the sensors and integrating the collected sensor data into the system. Data engineering processes are employed to interpret sensor measurements and update system parameters. Ultimately, the students develop a virtual twin that visualizes the building's observed performance.

**Bemerkung**

Time and place will be announced at the project fair.

**Leistungsnachweis**

Project report and short oral presentation.

## 425110008 Distributed Wireless Sensor Systems and Digital Twins

**J. Ringert, B. Burse, M. Artus** Veranst. SWS: 10
Projekt

**Beschreibung**

We will develop low-cost distributed sensor nodes and apply them in a case study setting. The measures sensor data will be stored and made available for different analysis scenarios, e.g., exploring augmented building information models (BIMs).

**Bemerkung**

Time and place will be announced at the project fair.

**Voraussetzungen**

Digital Engineering students must have completed their foundations

**Leistungsnachweis**

Projektbericht und Ergebnisse in Form von Software

## 425110010 Hot Topics in Computer Vision: Realistic Relighting of Point Clouds

**V. Rodehorst, J. Eick, A. Frolov, M. Kaisheva, D. Tschirschwitz** Veranst. SWS: 10
Projekt

**Beschreibung**

Die Teilnehmer werden an ein aktuelles forschungs- oder industrierelevantes Thema herangeführt. Es ist nicht beabsichtigt einen festgelegten Bereich in voller Breite zu explorieren. Stattdessen werden die Teilnehmer mit der

vollen Komplexität eines begrenzten Themas konfrontiert und die Eigeninitiative gefördert. Es ermöglicht einen Einblick in die Forschungs- und Entwicklungsprojekte des Fachgebiets.

**Bemerkung**

Time and place will be announced at the project fair.

**Voraussetzungen**

Vorlesungen „Photogrammetric Computer Vision” oder „Image Analysis and Object Recongnition” wünschenswert. Gute Programmierkenntnisse (z.B. C/C++, MATLAB/Octave, Python, OpenCL/CUDA)

**Leistungsnachweis**

Aktive Mitarbeit, Einführungsvortrag, Abschlusspräsentation, Dokumentation

## 425110011 Logic, Argumentation, and LLMs

**B. Stein, K. Heinrich, M. Kanadan** Veranst. SWS: 10
Projekt

**Beschreibung**

Large language models (LLMs) have remarkable language capabilities that open up new possibilities for logical reasoning and argumentation. This project explores reasoning and argumentation abilities of LLMs using various approaches, including Walton's argument schemes and knowledge bases.

Goals: Development of an argumentation agent that is able to:

- detect and analyze argument structures, and

- identify inconsistencies and weak points in an argumentation.

**Bemerkung**

Time and place will be announced at the project fair.

**Leistungsnachweis**

Projektbericht, Abschlusspräsentation

## 425110012 Manipulierte Flüsse

**A. Jakoby, R. Adejoh** Veranst. SWS: 10
Projekt

**Beschreibung**

... folgt.

**Bemerkung**

Time and place will be announced at the project fair.

**Leistungsnachweis**

Vorträge, Programme, Projektbericht, Abschlusspräsentation

## 425110013 Out of Bounds | Bauhaus Gamesfabrik

**C. Wüthrich, W. Kissel, G. Pandolfo** Veranst. SWS: 10
Projekt

**Beschreibung**

Herzlich willkommen bei Out of Bounds | Bauhaus Gamesfabrik, einem spannenden interdisziplinären Projekt, das die Fakultäten Kunst & Gestaltung und Medien an unserer Universität zusammenbringt. In diesem innovativen Projekt arbeiten Studierende unterschiedlicher Fachrichtungen in interdisziplinären Gruppen zusammen, um die dynamische Welt der Spieleentwicklung zu erkunden. An der Schnittstelle von Kunst und Technologie dient Out of Bounds | Bauhaus Gamesfabrik als Spielwiese für Kreativität und Innovation. Studierende der Fakultät Kunst & Gestaltung bringen ihre Expertise in visueller Ästhetik, Erzählkunst und Konzeption ein, während diejenigen der Fakultät Medien ihre Fähigkeiten in Programmierung, Animation und interaktiven Medien einbringen. In diesem gemeinschaftlichen Unterfangen werden interdisziplinäre Gruppen gebildet, die einen reichen Ideen- und Perspektivenaustausch fördern. Inspiriert vom Pioniergeist der Bauhaus-Bewegung, wo Kunst und Technologie zusammenkamen, um das moderne Design zu prägen, begeben sich unsere Studierenden auf eine Reise, um immersive und fesselnde Spielerlebnisse zu gestalten. Im Laufe des Projekts vertiefen sich die Studierenden in verschiedene Aspekte der Spieleentwicklung, von der Ideenfindung und Prototypenerstellung bis hin zur Produktion und Präsentation. Unter der Anleitung eines erfahrenen Mentors beider Fakultäten lernen sie, die Komplexität interdisziplinärer Teamarbeit zu bewältigen und ihre einzigartigen Stärken zu nutzen, um Herausforderungen zu meistern und ihre kreative Vision zu verwirklichen. Out of Bounds | Bauhaus Gamesfabrik ist mehr als nur ein Kurs; es ist eine transformative Erfahrung, die Studierenden ermöglicht, die Grenzen des traditionellen Spieldesigns zu überschreiten. Indem sie die Zusammenarbeit fördern und den Geist des Experimentierens annehmen, sind unsere Studierenden bereit, die nächste Generation visionärer Spieleentwickler zu werden und die Zukunft interaktiver Unterhaltung mitzugestalten. Begleiten Sie uns auf dieser aufregenden Reise, auf der digitale Träume Wirklichkeit werden, und lassen Sie uns gemeinsam die Zukunft des Spielens an der Schnittstelle von Kunst und Technologie gestalten.

**Bemerkung**

Time and place will be announced at the project fair.

**Voraussetzungen**

Studierende der Medieninformatik sollten Programmierkenntnisse mitbringen.Studierende der Medienwissenschaft ein grundlegendes Interesse für Storytelling / Game Design

**Leistungsnachweis**

Abschlusspräsentation, fertiges Spiel.

## 425110016 Schwamm drüber - Using Sponges for Security

**S. Lucks, N. Lang, J. Leuther** Veranst. SWS: 10
Projekt

**Bemerkung**

Time and place will be announced at the project fair.

**Voraussetzungen**

- Introduction to Modern Cryptography (or equivalent)

- Interest in scientific work

**Leistungsnachweis**

Zwischenpräsentationen, Abschlusspräsentation, Abschlussbericht

## 425110017 Software Engineering for Autonomous Vehicles 2

**J. Ringert, .. Soaibuzzaman** Veranst. SWS: 10
Projekt

**Beschreibung**

We will develop software to control autonomous vehicles. The physical vehicle will be equipped with a range of sensors, e.g., LiDAR, cameras, gyroscopes, and distance sensors. We will use industry strength software platforms like the Robot Operating System (ROS2).

**Bemerkung**

Time and place will be announced at the project fair.

**Voraussetzungen**

Digital Engineering students must have completed their foundations.

**Leistungsnachweis**

Projektbericht und Ergebnisse in Form von Software

## 425110032 Pupillenbasierte Kognometrie zur Nutzerauthentifizierung

**J. Ehlers** Veranst. SWS: 10
Projekt

**Beschreibung**

Cognometrics can be defined as a class of authentication techniques that build on cognitive or motor abilities of the human user. The current project aims to investigate user interfaces that employ pupil-related data for the purpose of distinguishing individual users. Students should first familiarize themselves with the literature on cognitive pupillometry. In the following project stage, the task is to design two interface prototypes that utilize pupil dynamics for access authentication. Pupillary data are then to be collected in a laboratory study. In the concluding phase of the project, a systematic analysis will be conducted utilizing machine learning methodologies to assess the viability and practicality of the outcome.

**Bemerkung**

Time and place will be announced at the project fair.

**Voraussetzungen**

Basic knowledge in machine learning, e.g. the course ”Introduction to Machine Learning” should have been completed

**Leistungsnachweis**

1) Design two interface prototypes that utilize pupil dynamics for access authentication
2) Conduct a laboratory study to collect pupillary data
3) Apply machine learning techniques to evaluate the usability of the outcome
4) Document the results in an empirical report

## 425110033 Opinion dynamics: how are you influenced by others?

**M. Schönlein** Veranst. SWS: 10
Projekt

**Beschreibung**

This project is concerned with various modelling techniques to describe the evolution of different opinions within an interacting group of individuals. A central part will be the modelling of the interaction among individuals. In this context, an essential part is the description of several mechanisms how the opinion of an individual is influenced by others. This is particularly important if the considered group of individuals is not homogenous. For instance, in the case that group contains extremist trying to make their idea to the leading opinion. The objectives are to devise and implement different modelling techniques to describe the evolution of opinions within groups. Starting from popular existing models, one goal of the project is to investigate new interaction mechanisms.

**Bemerkung**

Time and place will be announced at the project fair.

## 425110034 Statistical analysis in modern academia

**M. Schönlein, S. Bock** Veranst. SWS: 10
Projekt

**Beschreibung**

The academic world increasingly faces challenges related to publication misconduct. Many ethically questionable practices are related to predatory jour- nals and predatory publishers, as these do not implement and enforce sound quality control measures. A list of these ”bad players”, known as Beall’s List [Bea], can help researchers to avoid publishing in outlets of questionable quality. The list is not free from criticism, though, and it is curated by humans. This list may also not be complete. This project aims to use statistics and machine learning techniques to automatically separate the good from the bad journals. The objective of this project are to devise and implement algorithms that will identify and separate ”good” and ”bad” academic journals.

**Bemerkung**

Time and place will be announced at the project fair.

## 425110035 When Code Meets Fluid Flow

**M. Schönlein, N. Gorban** Veranst. SWS: 10
Projekt

**Beschreibung**

This project explores fluid dynamics through interactive simulation. Using a particle-based numerical approach, students will model how fluids move around obstacles and respond to changes in boundary conditions. The simulation will be implemented in Python and visualized with animations. The project combines mathematics, physics, programming, and engineering insight in an accessible and creative way.

**Bemerkung**

Time and place will be announced at the project fair.

## 425110036 Good Dog! – Teaching new Tricks to Spot the Robot

**C. Koch, R. Helbing, J. Krischler** Veranst. SWS: 10
Projekt

**Beschreibung**

Explore the potential and limitations of the Boston Dynamics Spot robot in this project. While impressive, Spot's standard configuration presents opportunities for enhancement. Currently, its autonomy depends critically on QR codes, its features are spread across different applications, and collected data isn't readily processed for analysis. This can lead to inefficient, manual workflows and usability issues due to missing features or integration gaps, particularly noticeable in industries like construction.

The goal of this project is to expand Spot's usability and practical capabilities. You'll dive into testing its standard functions with various payloads, identifying challenges and improvement opportunities using basic workflow scenarios. You will examine existing Python examples and then engage in hands-on development, adapting these examples and using trial and error to create a more streamlined, minimal workflow. This project offers a chance to directly address current limitations and make Spot a more integrated and efficient tool.

**Bemerkung**

Time and place will be announced at the project fair.

**Leistungsnachweis**

1) Project Report

2) Intermediate Presentation

3) Final Presentation

## 909040 Digital Transport Research Lab

**K. McFarland, A. Abdulmawla, D. Heigener, U. Plank-Wiedenbeck, J. Uhlmann**
Projekt
Mi, wöch., 13:30 - 15:00, Marienstraße 7 B - PC-Pool Luna-red, 09.04.2025 - 09.07.2025

**Bemerkung**

Start on 09.04.25 at 13:30

**Voraussetzungen**

Solid knowledge in transport modelling and planning. Familiar in IT application and modelling.

A participation at lectures „Introduction to Mobility and Transport”, and „Microscopic Traffic Simulation” or/and „Macroscopic Transport Modelling” is strongly recommended.

Number of participants is limited to 12 students. In case of more interested students a motivation letter decides about participation.

**Leistungsnachweis**

A certificate can be issued for 12 credits. This requires 4 positive evaluations according to these parts:

Part 1: regular 2 weekly short discussion of project developments / 10%

Part 2: midterm presentation / 20%

Part 3: presentation project study / 30%

Part 4: written project study / 40%