Vorlesungsverzeichnis

M.Sc. Natural hazards and risk in structural engineering

WiSe 2023/24

Stand 18.10.2023

M.Sc. Natural hazards and risk in structural engineering

Applied mathematics and stochastics for risk assessment

2301012-1 Applied mathematics (Lecture)

B. Rüffer, N. Gorban Veranst. SWS: 2
Vorlesung
Mo, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal B

Beschreibung

Applied mathematics:

Fundamentals of linear algebra, eigenvalue problems, fixed point principles, solvers; Fourier series, convergence, Fourier transform, Laplace transform; Solution of initial value problems, boundary value problems and eigenvalue problems for ordinary differential equations; All topics are discussed from the mathematical point of view and their implementation will be studied.

Leistungsnachweis

1 written exam

”Applied mathematics and stochastics for risk assessment” / 180 min (100%) / **WiSe** + SuSe

2301012-2 Applied mathematics (Exercise)

B. Rüffer, N. Gorban Veranst. SWS: 1
Seminar
1-Gruppe Fr, gerade Wo, 07:30 - 09:00, Coudraystraße 13 A - Hörsaal 2
2-Gruppe Fr, unger. Wo, 07:30 - 09:00, Coudraystraße 13 B - Hörsaal 3

Beschreibung

Applied mathematics:

Fundamentals of linear algebra, eigenvalue problems, fixed point principles, solvers; Fourier series, convergence, Fourier transform, Laplace transform; Solution of initial value problems, boundary value problems and eigenvalue problems for ordinary differential equations; All topics are discussed from the mathematical point of view and their implementation will be studied.

Leistungsnachweis

1 written exam

”Applied mathematics and stochastics for risk assessment” / 180 min (100%) / **WiSe** + SuSe

2301012-3 Stochastics for risk assessment (Lecture) / Mathematics for risk management (MBM)

T. Lahmer, Z. Jaouadi, R. Das, N. Hazrati Veranst. SWS: 2
Vorlesung
Di, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal B

Beschreibung

Stochastics for risk assessment:

Introduction to probability theory with focus on situations characterized by low probabilities. Random events, discrete and continuous random variables and associated distributions. Descriptive statistics, parameter estimation. Risk Assessment by means of FORM and Monte Carlo Simulations. Introduction to reliability theory: Extreme value distributions; stochastic modeling with software tools e.g. MATLAB, Octave, Excel, R. Reliability Analysis of Systems. Catastrophic events + risk problems, Applications

Leistungsnachweis

1 written exam

”Applied mathematics and stochastics for risk assessment” / 180 min (100%) / **WiSe** + SuSe

2301012-4 Stochastics for risk assessment / Mathematics for risk management (MBM) (Exercise)

T. Lahmer, Z. Jaouadi, R. Das, N. Hazrati Veranst. SWS: 1
Seminar

1-Gruppe Mi, wöch., 17:00 - 18:30, Marienstraße 7 B - Seminarraum 104, Tutorium for NHRE (Group 1) and DE
1-Gruppe Fr, unger. Wo, 07:30 - 09:00, Coudraystraße 13 A - Hörsaal 2, Exercise for NHRE (Group 1) and DE
2-Gruppe Mi, wöch., 17:00 - 18:30, Marienstraße 7 B - Seminarraum 105, Tutorium for NHRE (Group 2) and DE
2-Gruppe Mi, wöch., 17:00 - 18:30, Marienstraße 7 B - Seminarraum 205, Tutorium - Online-Tutors
2-Gruppe Fr, gerade Wo, 07:30 - 09:00, Coudraystraße 13 B - Hörsaal 3, Exercise for NHRE (Group 2)

Beschreibung

Stochastics for risk assessment:

Introduction to probability theory with focus on situations characterized by low probabilities. Random events, discrete and continuous random variables and associated distributions. Descriptive statistics, parameter estimation. Risk Assessment by means of FORM and Monte Carlo Simulations. Introduction to reliability theory: Extreme value distributions; stochastic modeling with software tools e.g. MATLAB, Octave, Excel, R. Reliability Analysis of Systems. Catastrophic events + risk problems, Applications

Leistungsnachweis

1 written exam

”Applied mathematics and stochastics for risk assessment” / 180 min (100%) / **WiSe** + SuSe

Disaster management and mitigation strategies

2901005 Project- and Disaster Management

H. Bargstädt, J. Melzner, A. Azimian, B. Bode, S. Beinersdorf Veranst. SWS: 2
Integrierte Vorlesung

Fr, Einzel, 13:30 - 15:00, Marienstraße 13 C - Hörsaal D, 20.10.2023 - 20.10.2023
Fr, Einzel, 13:30 - 15:00, Marienstraße 13 C - Hörsaal D, 10.11.2023 - 10.11.2023
Fr, Einzel, 13:30 - 15:00, Marienstraße 13 C - Hörsaal D, 01.12.2023 - 01.12.2023
Fr, Einzel, 13:30 - 16:45, Marienstraße 13 C - Hörsaal A, Final presentations, 26.01.2024 - 26.01.2024
Fr, wöch., 09:15 - 12:30, Marienstraße 13 C - Hörsaal C

Beschreibung

Acquisition of knowledge of the methods of the project management and acquisition of skills with their practical application:
Imparting of means and methods as well as of social and technical aspects of the project management in the construction industry (the-oretical and on the basis practical examples)
Consolidate of knowledge in handling a project management soft-ware

Additional: Lecture of "Sociology of disaster"

Bemerkung

Modul "Disaster management and mitigation strategies" --> 6 ECTS

Part "Mitigation strategies" --> see lecture "Sociology of disaster"

Leistungsnachweis

1 written exam

”Project and disaster management ”/ 120 min

(50%) / **WiSe** + SuSe

1 Presentation + presentation paper

”Urban Sociology” (50%) / **WiSe**

901033 Sociology of disaster

J. Melzner, R. Podlaszewska, H. Bargstädt, S. Beinersdorf, B. Bode Veranst. SWS: 2

Integrierte Vorlesung

Mo, wöch., 17:00 - 18:30, Marienstraße 13 C - Hörsaal C

engl. Beschreibung/ Kurzkommentar

Modul "Disaster management and mitigation strategies" --> 6 ECTS

Part "Mitigation strategies" --> see lecture "Urban Sociology"

Leistungsnachweis

1 written exam (digitial)

”Project and disaster management ”/ 120 min

(50%) / **WiSe** + SuSe

1 Project report (digital)

”Urban Sociology” (50%) / **WiSe**

Earthquake engineering and structural design

Finite element methods and structural dynamics

2401015 Finite element methods (Lecture)

T. Rabczuk Veranst. SWS: 2

Vorlesung

Do, wöch., 07:30 - 09:00, Marienstraße 13 C - Hörsaal D, dates by arrangement

Beschreibung

Finite element methods: (50% of semester course time)

strong and weak form of equilibrium equations in structural mechanics, Ritz and Galerkin principles, shape functions for 1D, 2D, 3D elements, stiffness matrix, numerical integration, Characteristics of stiffness matrices, solution methods for linear equation systems, post-processing and error estimates, defects of displacements based formulation, mixed finite element approaches,

Voraussetzungen

Bachelor Civil Engineering

Leistungsnachweis

1 written exam: „Fundamentals of finite element methods”/ 90 min (50%)

2401015 Finite element methods (Exercise)

T. Rabczuk, J. Lopez Zermeño, L. Nguyen Tuan Veranst. SWS: 1
Seminar
1-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Seminarraum 205, Tutorium - Group 1
1-Gruppe Mi, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal D, Group 1
2-Gruppe Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Seminarraum 205, Tutorium - Group 2

2401014 Structural Dynamics (Lecture)

T. Most Veranst. SWS: 2
Vorlesung
Di, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal B, * dates by arrangement

Beschreibung

Structural Dynamics: (50% of semester course time)

- SDOF systems:

- free vibrations, harmonic, impulse and general excitation for undamped and damped systems,
- Impulse response function, frequency response function, base excitation,
- Time step analysis: Duhamel integral, central difference and Newmark methods;

- MDOF systems: modal analysis, modal superposition, modal damping, Rayleigh damping, Frequency response functions

- Continuous systems

Voraussetzungen

Bachelor Civil Engineering

Leistungsnachweis

1 written exam: „Fundamentals of structural dynamics”/ 90 min (50%)

2401014 Structural Dynamics (Exercise)

T. Most, M. Ansari Veranst. SWS: 1
Seminar
1-Gruppe Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Tutorium - Group 1
2-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Tutorium - Group 2

Di, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal D, Group 1

Bemerkung

- Complementary to the lectures

Geo- and hydrotechnical engineering

Geographical Information Systems (GIS) and building stock survey

2904002 Geographical information systems (GIS) and building stock survey (Lecture)

V. Rodehorst Veranst. SWS: 1
Integrierte Vorlesung
Do, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D

Beschreibung

Students will be trained to reproduce existing natural hazard and risk related data in GIS format using GIS Software Solutions and Tools, will be able to create basic layers for hazard and risk assessment and to establish relevant links and to solve simple example tasks. Students will be trained in building stock survey, vulnerability assessment, damage interpretation and handling of tools for detailed empirical and instrumental elaboration. Training in instruments, equipment, and technologies for advanced detailed building survey (geodetic, photogrammetric, satellite data).

Content:

Fundamentals of three-dimensional positioning, photogrammetry, GIS/cartography, land management / cadastre; earthwork computation; spatial data in daily life; instruments, equipment, and technologies for advanced detailed building survey (geodetic, photogrammetric, satellite data).

Bemerkung

Zum Bestehen des Moduls und der Anrechnung von 6 CP ist die Teilnahme an Vorlesung und des zugeordneten Seminars notwendig. Prüfungsleistung wird in Form eines Projektbeleges und einer Zwischenabgabe erbracht.

In order to pass the module and to reach the credits of 6 CP the participation in lectures and the assigned seminar is necessary. Examination is in form of a Project report and an intermediate submission.

Voraussetzungen

Prüfungsleistung wird in Form eines Projektbeleges und Präsentation erbracht.

Examination is in form of a Project report and presentation.

Leistungsnachweis

1 written exam

”Geographical Information Systems (GIS) and building stock survey” / 90 min (100%) / **WiSe** + SuSe

1 written report

”Geographical Information Systems (GIS) and building stock survey” (Examination requirement) / **WiSe**

2904002 Geographical information systems (GIS) and building stock survey (Exercise/Project)

J. Schwarz, S. Beinersdorf, H. Maiwald Veranst. SWS: 3
Seminar
1-Gruppe Mo, wöch., 13:30 - 15:00, Marienstraße 13 C - Hörsaal B
2-Gruppe Di, wöch., 13:30 - 15:00, Marienstraße 13 C - Hörsaal D

Beschreibung

Training in:

Coordinate systems; global maps for the natural hazard phenomena; quality and availability of input data; layers for natural hazard related parameters (topography, geology, and subsoil); reproduction of historical events and associated parameters; layers for risk assessment and loss estimation procedures; link between layers and risk mapping procedures. In parallel, necessary foundations in scientific working are taught and trained.

Bemerkung

We will start at 24.10.2022 with the exercises.

Leistungsnachweis

1 written exam

”Geographical Information Systems (GIS) and building stock survey” / 90 min (50%) / **WiSe** + SuSe

1 written report

”Geographical Information Systems (GIS) and building stock survey” (50%) / **WiSe**

Life-lines engineering

2204019 Life-lines engineering (Lecture)

G. Morgenthal, S. Chawdhury, G. Tondo, I. Kavrakov Veranst. SWS: 4
Integrierte Vorlesung
Do, wöch., 13:30 - 16:45, Marienstraße 13 C - Hörsaal B

Beschreibung

The students will be familiar with bridges in the context of their functions as critical infrastructure. They will be familiar with the design objectives with specific emphasis on risks associated with natural hazards and with strategies to limit damage and to ensure operability after a major natural disaster. They will be able to develop structural concepts and to carry out detailed design of such structures, including the application of relevant codes of practice.

Life-lines Engineering

History of bridge engineering; types of bridges; structural concepts and articulation; planning and design; construction methods; structural modelling and analysis; elastic and plastic design approaches; performance-based design; structural detailing; dynamic characteristics and behaviour under dynamic loading; seismic response and isolation; response to wind loading

Training in:

Structural modelling and Finite Element Analysis; design of post-tensioning systems in bridges; design and detailing of girders and piers; seismic response; wind response, analysis of cable stayed bridges

Leistungsnachweis

1 written exam

”Life-lines Engineering ”/ 180 min (100%) / **WiSe** + SuSe

2204019 Life-lines engineering (Exercise)

G. Morgenthal, S. Chawdhury, G. Tondo, I. Kavrakov Veranst. SWS: 2
Seminar
Do, wöch., 17:00 - 18:30, Marienstraße 13 C - Hörsaal B

Beschreibung
Design and construction of bridges in earthquake endangered regions, seismic design philosophies for bridges, specifics of seismic loads on bridges, possibilities and application of seisimic isolation, experimental results, consideration of a simply supported bridge with different mechanical characeristics on a real earthquake record

Leistungsnachweis
Klausur oder mündliche Prüfung

Primary hazards and risks

2202001 Seismic Monitoring / Regional Ground Motion

J. Schwarz, L. Abrahamczyk, C. Kaufmann, S. Beinersdorf Veranst. SWS: 4
Integrierte Vorlesung
1-Gruppe Mo, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 301
2-Gruppe Mo, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 301
3-Gruppe Di, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 301
Do, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal D
Do, wöch., 13:30 - 15:00, Marienstraße 13 C - Hörsaal D

Beschreibung

Seismic Monitoring

Basics of Engineering Seismology (parameters of source, path, attenuation; site conditions and shaking); Macroseismic scales, Intensity measures and correlations; Time- and frequency dependent description of seismic action; recording instruments, input parameters for seismic hazard assessment; EQ-Action for building design; Measurements for site response evaluation; site categorization and response studies; Building Monitoring Systems: tasks and developments, analysis of instrumental data; identification of dynamic and structural parameters

Regional Ground Motion

Identification of hazard describing parameters; seismic networks, availability/ elaboration of ground motion data and records; strong-Motion Databases; selection of site-related ground motion; handling of data files; Ground Motion Prediction Equations (GMPEs); application of ground motions models and tools to the study area and target site; re-interpretation of national code background.

Voraussetzungen

Bachelor Civil Engineering

Leistungsnachweis

1 Project report

”Regional Ground Motion” (17%) / **WiSe**

2 written exams

”Seismic Monitoring” / 180 min (50%) / **WiSe** + SuSe

”Wind Engineering” / 90 min (33%) / **WiSe** + SuSe

2204017 Wind Engineering

G. Morgenthal, I. Kavrakov, A. Athanasiou, S. Beinersdorf, G. Tondo Veranst. SWS: 2

Integrierte Vorlesung

Sa, Einzel, 09:15 - 16:45, Marienstraße 13 C - Hörsaal D, 20.01.2024 - 20.01.2024
Fr, wöch., 09:15 - 12:30, LH 2 C13A * dates by arrangement Time schedule will be announced by the responsible lecturers. Lecture shares timeslot with lecture structural engineering.

Beschreibung

Wind Risk Mitigation in Structural Engineering

meteorology, stochastic wind effects including aeroelasticity, extreme value analysis; risk chain, storm tracks with high damage accumulation, hazard maps; basics of wind resistant design and environmental planning, wind tunnel technology, monitoring and simulations, risk control (control of exposition, shelter projects, wind effects at new types of infrastructures), examples and applications

Leistungsnachweis

1 Project report

”Regional Ground Motion” (17%) / **WiSe**

2 written exams

”Seismic Monitoring” / 180 min (50%) / **WiSe** + SuSe

”Wind Engineering” / 90 min (33%) / **WiSe** + SuSe

Structural engineering

2205032 Structural engineering – Reinforced and post-tensioned concrete structures (Exercise)

G. Morgenthal, S. Chawdhury, I. Kavrakov, S. Rau, C. Taube, G. Tondo Veranst. SWS: 1

Seminar

1-Gruppe Fr, wöch., 13:30 - 16:45, Coudraystraße 13 A - Hörsaal 2, Group 1 dates by arrangement
1-Gruppe Fr, wöch., 13:30 - 16:45, Group 1 dates by arrangement
2-Gruppe Fr, wöch., 13:30 - 16:45, Marienstraße 13 C - Hörsaal C, Group 2 dates by arrangement

2205032 Structural engineering – Reinforced and post-tensioned concrete structures (Lecture)

G. Morgenthal, S. Chawdhury, I. Kavrakov, S. Rau, G. Tondo Veranst. SWS: 2

Vorlesung

Fr, wöch., 09:15 - 12:30, Coudraystraße 13 A - Hörsaal 2, dates by arrangement

Beschreibung

Structural Engineering – Standard systems:

History of structures; building materials; structural form and structural behavior; actions on structures; structural reliability and codes of practice; mechanical modelling of structures; design of reinforced concrete and steel structures

Leistungsnachweis

2 written exams

”Standard systems” / 90 min (50%) / **WiSe** + SuSe

”Advanced systems” / 90 min (50%) / **SuSe** + WiSe

Structural parameter survey and evaluation

Special Project

NHM17-50(Special Project (Introduction)

S. Beinersdorf
Projekt
Fr, Einzel, 11:00 - 12:30, Marienstraße 13 C - Hörsaal B, in LH B Introduction to SP, 06.10.2023 - 06.10.2023
Do, Einzel, 19:00 - 20:30, Marienstraße 7 B - Seminarraum 205, Special project BiB, 26.10.2023 - 26.10.2023
Do, Einzel, 19:00 - 20:30, Marienstraße 7 B - Seminarraum 205, Special project BiB, 02.11.2023 - 02.11.2023
Do, Einzel, 19:00 - 20:30, Marienstraße 7 B - Seminarraum 205, Special project BiB, 09.11.2023 - 09.11.2023

Beschreibung

Introduction to Special projects in **LH 6, C9A**

Elective compulsory modules

2401011 Applied structural dynamics

A. Athanasiou Veranst. SWS: 2
Vorlesung
Mi, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D

Beschreibung

Appl. SD (winter semester): The students will be introduced to the theory of structural dynamics and apply such theory to solve problems occurring in engineering practice. In particular, the students shall: (i) learn how to formulate the dynamic equilibrium of idealised structural systems, (ii) implement analytical and numerical methods for dynamic response simulations under earthquake and wind excitation, and (iii) predict and evaluate the performance of single- and multi- story buildings in seismic and wind environments, excited in the linear and nonlinear range of response.

Course content:

free and forced vibrations, dynamic equilibrium, analytical and numerical solutions, modal analysis, response spectrum, vibration of buildings under earthquake and wind excitation, seismic response of linear and nonlinear systems, dynamic wind response simulation, comprehensive and realistic in-class examples.

Leistungsnachweis

1 written exam: ”Applied structural dynamics” /

90 min (50%) / **WiSe** + SuSe

2202011 Assessment of structural performance (under extreme loading conditions)

L. Abrahamczyk, A. Athanasiou, H. Maiwald, J. Schwarz, P. Hasan, A. Uzair, S. Beinersdorf Veranst. SWS: 6

Vorlesung

Di, wöch., 17:00 - 18:30, Marienstraße 7 B - Seminarraum 205, Lecture *dates by arrangement
Do, wöch., 09:15 - 12:30, Marienstraße 7 B - Seminarraum 205, Lecture

Beschreibung

Students will be familiar with methods of structural performance assessment, compliance criteria and design rules for traditional and engineered building types. Students should be able to evaluate the quality of structural systems, to interpret the performance of masonry and steel structures under horizontal action, to derive appropriate models and to decide upon the applicability of equivalent or simplified ones. Students get introduced to passive vibration control technologies for the reduction of seismic and wind induced building response. Students will be trained the principles and application of seismic isolation and supplemental damping devices, gain insight into the design provisions, modelling requirements and practical realization of base isolation.

Students will be informed about on-going research projects and recent code developments which are linked to the course topics and options for further graduation (master thesis). Training of student's ability to apply methods mirroring the current state in natural hazard and risk assessment will be qualified. Students will be able to apply modern software tools to transfer buildings into dynamic models and to evaluate the seismic response characteristics: In dependence on design situation and performance directed concepts; they will be guided to identify design defects, and to evaluate the appropriateness of strengthening measures.

Structural performance of traditional and engineered building types (L)

Reinterpretation of observed response for different building types; design principles, compliance criteria and structural solutions for traditional (masonry) and engineered (steel) type structures; building assessment criteria for strengthening; theoretical basis of seismic isolation and passive supplemental damping; mechanical characteristics and modelling of isolators and dampers; practical examples.

Application of base-isolation to unreinforced masonry and RC structures (E, P)

Search for typical building representatives of the target regions (home countries of the participants); derivation of structural layout and simplified models of representative building types; modelling and assessment of masonry structures applying equivalent frame approach; determination of characteristic building response parameters; damage prognosis; designing the isolation system; comparison of building response and performance.

Leistungsnachweis

1 Project report: "Application of base-isolation to unreinforced masonry and RC structures" (33%) / **WiSe**

1 written exam: "Assessment of structural performance (under extreme loading conditions)"/ 120 min (67%) / **WiSe** + SuSe

2202005 Risk projects and evaluation of structures

J. Schwarz, L. Abrahamczyk, H. Maiwald, P. Hasan, A. Uzair, S. Beinersdorf Veranst. SWS: 5

Vorlesung

Mo, wöch., 15:15 - 16:45, Marienstraße 7 B - Seminarraum 205, lecture

Di, wöch., 11:00 - 12:30, Marienstraße 7 B - Seminarraum 205, exercise

Beschreibung

Students will be familiar with the different risk elements in disaster mitigation studies and problems encountered in the design of buildings against earthquake and wind action. Students will be able to apply methods and current state in natural hazard and risk assessment integrating research and practical applications to urban settlements or structure-specific risk analysis and planning decisions. Students will be familiar with different analysis methods, knowledge-based techniques and tools of empirical and analytical vulnerability assessment. Students will be familiar with the existing building typologies and be able to evaluate the quality of structural systems, to interpret the performance under horizontal action. Students are encouraged to contribute reports of regionally particular building types to World Housing Encyclopedia and/or NHRE database (collection of world-wide case studies à wind or earthquake dominated design; tall & high-rise buildings à comparison of horizontal actions).

Methods for risk assessment of buildings and urban settlements (L)

Lessons from recent events (earthquake, wind, flood) and field missions; assessment of hazard phenomena; reinterpretation of observed response for different building types; building taxonomies; knowledge-based exposure modelling; empirical and analytical vulnerability assessment; damage classification and fragility functions; damage modelling for large building stocks (earthquake, wind, flood); social risk modelling; decision support systems for OEF, EEW and RRE; building assessment criteria for existing and new building stock; assessment of structural performance under wind and earthquake.

Response estimate for disastrous events (E, P)

Training in risk scenarios: elaboration of input data for the target area (home countries), generation of shake maps; elaboration of fragility functions; generation of risk scenarios for testbeds or virtual cities and application of decision support system; simulation of mitigation measures.

Studies on Recent Natural Hazard Events (P)

Description and assessment of hazard phenomena; affected regions; building types; reinterpretation of observed damages for different building types; conclusions from rapid response actions; initiated/necessary mitigation measures (consequences of the event); recent developments in design and construction.

Voraussetzungen

B.Sc.

Seismic Monitoring / Earthquake Engineering

Leistungsnachweis

1 written exam ”Risk evaluation for buildings and urban settlements” 90 min (50%) / **WiSe** + SuSe

1 Project presentation (oral) ”Response estimate for disastrous and recent events” (35%) / **WiSe**

1 Project presentation (oral) ”Studies on Recent Natural Hazard Events” (15%) / **WiSe**

2205014 Design and interpretation of experiments: Experiments in Structural Engineering

M. Kraus, S. Ibañez Sánchez, S. Mämpel Veranst. SWS: 2

Integrierte Vorlesung

Di, wöch., 13:30 - 15:00, Marienstraße 13 C - Hörsaal C, Experiments in structural engineering

Beschreibung

Students will be familiar with following: Design and setup as well as evaluation and interpretation of experimental testing in structural engineering. Provision of techniques linking experimental and mathematical / numerical modelling. Parallel assessment of steps being part of any verification and validation procedure. Discussion of common techniques of optimal experimental designs

Bemerkung

The course gives an overview on experiments and their evaluation regarding different tasks and scopes of structural engineering. Next to different testing techniques applied for diverse aims, the equipment and measuring devices employed for testing are treated as well.

Besides the experiment itself, it is an important question, how we can use the experimental data for the calibration and validation of models in engineering. In this course, we give insights to techniques called parameter and system identification.

As often signals are not useable directly, transforms are necessary, like filtering, Fourier Transform, Wavelet Transform and, in particular for signals with noise, averaging techniques. Having models at hand, the experiment can be designed virtually by means of nonlinear optimization.

Leistungsnachweis

1 written exam / 120 min / **WiSe** + SuSe including

”Experiments in Structural Engineering” and

”Signal Processing, Design of Experiments and System Identification”

2205014 Design and interpretation of experiments: Signal Processing, Design of Experiments and System Identification

T. Lahmer, Z. Jaouadi, R. Das Veranst. SWS: 2

Integrierte Vorlesung

1-Gruppe Mi, unger. Wo, 09:15 - 10:45, Marienstraße 7 B - Projektraum 301, Exercise
2-Gruppe Mi, gerade Wo, 09:15 - 10:45, Marienstraße 7 B - Projektraum 301, Exercise
3-Gruppe Mi, unger. Wo, 11:00 - 12:30, Marienstraße 7 B - Projektraum 301, Exercise
4-Gruppe Mi, gerade Wo, 11:00 - 12:30, Marienstraße 7 B - Projektraum 301, Exercise
Di, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal C, Signal Processing, Design of Experiments and System Identification

Beschreibung

Students will be familiar with following: Design and setup as well as evaluation and interpretation of experimental testing in structural engineering. Provision of techniques linking experimental and mathematical / numerical modelling. Parallel assessment of steps being part of any verification and validation procedure. Discussion of common techniques of optimal experimental designs

Bemerkung

The course gives an overview on experiments and their evaluation regarding different tasks and scopes of structural engineering. Next to different testing techniques applied for diverse aims, the equipment and measuring devices employed for testing are treated as well.

Besides the experiment itself, it is an important question, how we can use the experimental data for the calibration and validation of models in engineering. In this course, we give insights to techniques called parameter and system identification.

As often signals are not useable directly, transforms are necessary, like filtering, Fourier Transform, Wavelet Transform and, in particular for signals with noise, averaging techniques. Having models at hand, the experiment can be designed virtually by means of nonlinear optimization.

Leistungsnachweis

1 written exam / 120 min / **WiSe** + SuSe including

”Experiments in Structural Engineering” and

”Signal Processing, Design of Experiments and System Identification”

2906016 Secondary Hazards and Risks (land-use, site studies)

P. Staubach, G. Aselmeyer, C. Rodríguez Lugo Veranst. SWS: 4

Integrierte Vorlesung

Mo, wöch., 13:30 - 15:00, Coudraystraße 11 C - Seminarraum (geologische Sammlung) 202
Di, wöch., 09:15 - 10:45, Coudraystraße 13 A - Hörsaal 2

Beschreibung

The objective of this module is focused on deepening the skills of the students to judge the risk of a landslide (secondary hazard) in a given sloping ground caused by a primary hazard (e.g. earthquake, heavy rainfall). The students learn advanced methods for the investigation and monitoring of possibly instable soil and rock masses. They deepen their knowledge with respect to different methods of slope stability analysis under static loading and seismic impact. The students are able to study slope stability by means of the finite element method. They know various methods of slope stabilization. They know and can apply basic methods of Geotechnical Earthquake Engineering. To fix the theoretical background the students have to apply the methods learned at given tasks within a project.

Bemerkung

Different methods of slope stability analysis in cases of static and seismic loading (pseudo-static method, Newmark sliding block analysis); Slope investigation and monitoring; Slope stabilization methods; Analysis of slope stability by means of the finite element method (including computer exercise with finite element program Plaxis); Seismic design of retaining structures; Ground response analysis; Stability of rock masses

Voraussetzungen

Geo- and hydrotechnical Engineering (Soil Mechanics)

Leistungsnachweis

1 Project report

”Secondary Hazards and Risks” (33%) / **WiSe**

1 written exam

„Secondary Hazards and Risks”/ 120 min (67%) / **WiSe** + SuSe

303005 Object-oriented Modeling and Programming in Engineering

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

Vorlesung

Di, wöch., 15:15 - 16:45, Marienstraße 7 B - Projektraum 301, Exercise NHRE
Di, wöch., 15:15 - 16:45, Marienstraße 7 B - Projektraum 302, Exercise NHRE
Do, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal B, lecture
Fr, wöch., 11:00 - 12:30, Marienstraße 7 B - Projektraum 301, Exercise DEM
Fr, wöch., 11:00 - 12:30, Marienstraße 7 B - Projektraum 302, Exercise DEM

Beschreibung

Objektorientierte Modellierung und Programmierung für Ingenieure

In diesem Modul wird fundamentales Wissen vermittelt, um objektorientierte Softwarelösungen für Ingenieuraufgaben zu konzipieren und zu implementieren. Dies beinhaltet Fähigkeiten zur Analyse von Ingenieurproblemen, um entsprechende objektorientierte Modelle zu erzeugen und geeignete Algorithmen auszuwählen. Die verwendete Programmiersprache ist Java. Da die Basiskonzepte allgemeingültig beschrieben werden, werden die Studierenden in die Lage versetzt, auch andere modernen Programmiersprachen zu einzusetzen.

Inhalte:

- Kontrollstrukturen (alternatives, loops, sequences)
- Grundlegende Datenstrukturen und Algorithmen
- Prinzipien der objektorientierten Softwareentwicklung (Datenkapselung, Vererbung, Polymorphie)
- Unified Modeling Language als Werkzeug für Softwareentwurf und –dokumentation
- Entwicklung grafischer Nutzerschnittstellen mithilfe des Model-View-Controller-Entwurfsmusters

engl. Beschreibung/ Kurzkommentar

Object-oriented Modeling and Programming in Engineering

This module covers the basic knowledge needed to develop and implement object-oriented software solutions for engineering problems. This includes the ability to analyse an engineering problem, so that corresponding object-oriented models can be created and suitable algorithms can be selected. The programming language used in this module is Java. However, the since fundamental concepts are described in general, students will be able to program in other modern programming languages.

Content:

- Essential programming constructs (alternatives, loops, sequences)
- Fundamental data structures and algorithms
- Principles of object oriented software development (encapsulation, inheritance and polymorphism)
- The Unified Modeling Language as a tool for software design and documentation

Development of graphical user interfaces using the Model-View-Controller pattern

Leistungsnachweis

schriftliche Klausur

Elective Modules

Seit Wintersemester 2018/19 besteht an der Bauhaus-Universität Weimar ein zusätzliches Angebot an fächerübergreifenden Lehrveranstaltungen im Rahmen der Bauhaus.Module. **Studierende des NHRE können Bauhaus.Module aus dem Bereich Master belegen.** Inwiefern diese Module des **Wahlbereichs** ersetzen können, muss individuell mit der Fachstudienberatung geklärt werden. Das Angebot der Bauhaus.Module findet sich unterweimar.de/bauhausmodule.

Bemerkung:

– nur Masterkurse der BUW

– besonders engl. Kurse

Wunsch nach Einteilung der BM im bison nach Sprachen

2909020	**Macroscopic Transport Modelling**

K. McFarland, L. Thiebes, U. Plank-Wiedenbeck, J. Uhlmann Veranst. SWS: 4
Integrierte Vorlesung
Di, wöch., 11:00 - 15:00, Marienstraße 7 B - Student Design Studio – SDS 303
Di, wöch., 11:00 - 15:00, Marienstraße 7 B - Projektraum 302

Beschreibung

Part A: Principles
Transport planning framework, methodology and procedures, Land-Use-Data, behavioral data, opertional and network data. 4-step modlleing approach, methods and algorithms. Calibration and validation, Forecasting and scenario calculations. Empirical traffic data for model validation and calibration.Strengths and weaknesses of different model approaches.
Part B: Model Development
Model setting up - traffic generation, traffic destnations, mode choice and route choice calculation methods. Agent based demand models. Modelling transport demand side and supply side (e.g. network, transport modes, infrastructure, operation) for individual and public transport.
Part C: Transport Model Application
Application of transport models in transport planning. Model setup and configuration according to different planning tasks.Student presentation (group work). Modelling exercises based on PTV Visum software application. Application of learned methodological approach(es) and critical reflection of the model outputs.Perspectives in transport modelling.

Voraussetzungen

Teilnehmeranzahl auf 15 begrenzt. Bestätigung der Professur Verkehrssystemplanung notwendig

Bewerbung bis 12.10.2023 ausschließlich per Mail an vsp@bauing.uni-weimar.de. Bitte kurz den fachlichen Hintergrund und die Motivation für die Kursteilnahme schildern.

Notwendig: Vorkenntnisse in der Modellierung/ Simulation und Verkehrsplanung und-technik. **Sollten keine Vorkenntnisse im Bereich der Verkehrsplanung vorliegen muss zuerst der Kurs "International Case Studies in Transportation" belegt werden.**

Leistungsnachweis

Teil A:

Klausur (120 Min), Englisch, 50%

Teil B:

Beleg, Bericht und Präsentation, Englisch, 50%

Die Belegabgabe ist Vorraussetzung für die Klausurteilnahme

2909021 International Case Studies in Transportation

M. Rünker, T. Feddersen, U. Plank-Wiedenbeck, J. Uhlmann Veranst. SWS: 4
Vorlesung
Di, wöch., 17:00 - 18:30, Coudraystraße 11 C - Seminarraum/Hörsaal 001
Di, wöch., 19:00 - 20:30, Coudraystraße 11 C - Seminarraum/Hörsaal 001

Beschreibung

Wie gehen wir mit Herausforderungen im Bereich Mobilität und Verkehr um, z. B. mit den Auswirkungen auf die Klimakrise, mit Problemen des zunehmenden Gegensatzes zwischen ländlichen und städtischen Gebieten oder mit Fragen der Migration und räumlichen Beschränkungen? Wir glauben, dass dies nur durch die Zusammenführung von Fachwissen aus verschiedenen akademischen und praktischen Bereichen erreicht werden kann. Das Seminar

stellt daher Positionen aus einer ausgeprägt interdisziplinären Position vor, die Verkehrs- und Stadtplanung mit Medienwissenschaft, Medienkunst, Journalismus und Sozialwissenschaft verbindet. Darüber hinaus bieten wir Perspektiven, die auch über den europäischen Kontext hinausgehen, und präsentieren Beispiele, die als "Best Practice" gesehen werden können. Der Kurs ist in zwei Teile gegliedert: Zunächst werden die Studierenden gebeten, an einem Online-Angebot teilzunehmen, das eine Einführung in die Grundlagen der Verkehrsplanung bietet. Anschließend werden in einem intermedialen Seminar Texte, Hörstücke und audiovisuelles Material zum Thema Verkehr und seinen Auswirkungen vorgestellt.

Bemerkung

Das Seminar findet im wöchentlichen Rhythmus statt: Dienstag (17.00 - 18.30 Uhr). Es gibt eine einführende Informationsveranstaltung (17.10.23), die jedem Studierenden offen steht, wobei die maximale Teilnehmendenzahl auf 15 Personen begrenzt ist.

Voraussetzungen

Bitte beachten Sie, dass eine kurze Bewerbung mit Darstellung Ihrer Motivation und Ihres akademischen Hintergrunds erforderlich ist. Die Modalitäten werden auf der Informationsveranstaltung näher erläutert.

Leistungsnachweis

Mündliche Prüfung in Form einer Präsentation.

Collaboration in BIM projects

L. Abrahamczyk, C. Koch Veranst. SWS: 2

Vorlesung

Mo, wöch., 17:00 - 18:45, Marienstraße 7 B - Student Design Studio – SDS 303, Start on 30.10.2023

Beschreibung

Adopting BIM means establishing a continuous flow of information, as with BIM, information is collected digitally to be available when it is needed, wherever it is needed, during every phase of the building process. Students will be familiar with well-structured workflows, multidisciplinary collaboration processes, defined standards, open workflows and model-centred communication. They will be informed that collaborative working brings significant project benefits. BIM collaborative approach advantages are elaborated and trained such as: possibility for each professional to use the best software solutions for their specific discipline without any risk of incompatibility or loss of data; workflows integration; reduction of errors caused by lack of coordination and updating; complete accessibility to data contained in the BIM model; information sharing, verification, review and validation. Students should be able to apply the BIM collaborative approach on a simple example. Students get introduced to Revit Software. Students will be trained the principles and application of BIM workflow as well as the accomplishment of a project among an interdisciplinary team.

Students will

- gain proficiency in working with BIM software tools commonly used in the industry (create, edit, and manage 3D models, generate drawings, perform clash detection, and extract data from BIM models);
- acquire competences in managing and integrating data within the BIM environment;
- learn how to collaborate effectively within multidisciplinary teams and coordinate information across different stakeholders in a BIM project;
- develop skills in creating comprehensive project documentation using BIM, including drawings, schedules, reports, and presentations.

Collaboration in BIM projects (P, L)

Concepts of Building Information Modelling: Introduction, terminology, reference standards, technical specifications and guidelines; BIM roles for architects, engineers, construction and facility management; BIM execution plan: workflows, information requirements, integrated project delivery, common data environment, modelling and visualization, management of incompatibilities; BIM tools and platforms: concepts of platform and tools, interoperability, IFC format.

Students will develop a design proposal for a pre-defined purpose (e.g. pavilion) as a team of architecture, structural engineer and management students to hands on train BIM collaborative approach.

Bemerkung

Module will start end of October.

Leistungsnachweis

1 Group project presentation (oral) "Collaboration in BIM projects" (60%) / **WiSe**

1 Group project report: "Collaboration in BIM projects" (40%) / **WiSe**

Prüfungen