Vorlesungsverzeichnis

M.Sc. Natural hazards and risk in structural engineering

Winter 2022/23

Stand 23.03.2023

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, ab 10.10.2022

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, Marienstraße 13 C - Hörsaal C, ab 21.10.2022
2-Gruppe Fr, unger. Wo, 07:30 - 09:00, Marienstraße 13 C - Hörsaal D, ab 21.10.2022

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 Veranst. SWS: 2
Vorlesung
Di, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal B, ab 11.10.2022

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, N. Butler, Z. Jaouadi Veranst. SWS: 1

Seminar

1-Gruppe Fr, unger. Wo, 07:30 - 09:00, Marienstraße 13 C - Hörsaal C, Exercise for NHRE (Group 1) and DE, ab 21.10.2022
1-Gruppe Do, wöch., 15:15 - 16:45, Marienstraße 7 B - Seminarraum 205, Tutorium for NHRE (Group 1) and DE, ab 24.11.2022
2-Gruppe Fr, gerade Wo, 07:30 - 09:00, Marienstraße 13 C - Hörsaal D, Exercise for NHRE (Group 2), ab 21.10.2022
2-Gruppe Do, wöch., 15:15 - 16:45, Marienstraße 7 B - Seminarraum 105, Tutorium for NHRE (Group 2) and DE, ab 24.11.2022

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, B. Bode Veranst. SWS: 2

Integrierte Vorlesung

Fr, Einzel, 15:15 - 16:45, Marienstraße 13 C - Hörsaal B, 16.12.2022 - 16.12.2022
Fr, Einzel, 13:30 - 16:45, Coudraystraße 13 B - Hörsaal 3, 13.01.2023 - 13.01.2023
Fr, Einzel, 15:15 - 16:45, Marienstraße 13 C - Hörsaal B, 13.01.2023 - 13.01.2023
Fr, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal B
Fr, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal B

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, Digital (BBB)

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
Vorlesung
Mi, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal B

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, M. Bianco, J. Lopez Zermeño Veranst. SWS: 1

Seminar

1-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Seminarraum 205, Tutorium - Group A
1-Gruppe Do, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, Group 1 (Group A + Group B)
2-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Seminarraum 206, Tutorium - Group B
2-Gruppe Do, wöch., 07:30 - 09:00, Marienstraße 13 C - Hörsaal C, Group 2 (Group C + Group D)
3-Gruppe Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Seminarraum 205, Tutorium - Group C
4-Gruppe Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Seminarraum 206, Tutorium - Group D

2401014 Structural Dynamics (Lecture)

V. Zabel Veranst. SWS: 2

Vorlesung

Di, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, bis 29.11.2022
Mi, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, bis 30.11.2022

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)

V. Zabel, M. Ansari Veranst. SWS: 1

Seminar

1-Gruppe Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Tutorium - Group A, bis 29.11.2022
1-Gruppe Do, wöch., 07:30 - 09:00, Marienstraße 13 C - Hörsaal D, Group 1 (Group A + Group B), bis 01.12.2022
2-Gruppe Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, Tutorium - Group B, bis 29.11.2022
2-Gruppe Do, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal C, Group 2 (Group C + Group D), bis 01.12.2022
3-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Tutorium - Group C, bis 30.11.2022
4-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, Tutorium - Group D, bis 30.11.2022

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

Di, Einzel, 15:15 - 16:45, Marienstraße 13 C - Hörsaal A, 11.10.2022 - 11.10.2022
Di, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal A, ab 18.10.2022

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

1 written report

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

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

J. Schwarz, S. Beinersdorf, P. Hasan, H. Maiwald Veranst. SWS: 3
Seminar
1-Gruppe Mo, wöch., 13:30 - 15:00, Marienstraße 13 C - Hörsaal B, ab 24.10.2022
2-Gruppe Di, wöch., 13:30 - 15:15, Marienstraße 13 C - Hörsaal B, ab 25.10.2022
Mo, Einzel, 13:30 - 15:00, Marienstraße 13 C - Hörsaal B, 10.10.2022 - 10.10.2022

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 C, Seminarroom 1+2 Weimarhalle / Digital via BBB

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
1-Gruppe 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, ab 17.10.2022
2-Gruppe Di, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 301, ab 18.10.2022
3-Gruppe Di, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 301, ab 18.10.2022
4-Gruppe Mo, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 302, Seismic monitoring, ab 17.10.2022
Do, Einzel, 15:15 - 16:45, Marienstraße 13 C - Hörsaal D, 26.01.2023 - 26.01.2023
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:

Description of seismic action; recording instruments, input parameters for seismic hazard assessment; EQ-Action for building design; Measurements for site response evaluation; 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; 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; site categorization and response studies.

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, S. Beinersdorf Veranst. SWS: 2
Integrierte Vorlesung
Mo, Einzel, 09:00 - 16:45, Marienstraße 13 C - Hörsaal D, , 27.02.2023 - 27.02.2023
Di, Einzel, 09:00 - 16:45, Marienstraße 13 C - Hörsaal D, 28.02.2023 - 28.02.2023
Mi, Einzel, 09:00 - 16:45, Marienstraße 13 C - Hörsaal D, 01.03.2023 - 01.03.2023
Do, Einzel, 09:00 - 16:45, Marienstraße 13 C - Hörsaal D, 02.03.2023 - 02.03.2023
Fr, Einzel, 09:00 - 12:30, Marienstraße 13 C - Hörsaal D, 03.03.2023 - 03.03.2023
Fr, wöch., 09:00 - 12:30, dates by arrangement; Please see the announcements by Prof. Morgenthal LH D

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, Marienstraße 13 C - Hörsaal D, Group 1 (Group A + Group B) dates by arrangement
2-Gruppe Fr, wöch., 13:30 - 16:45, Marienstraße 13 C - Hörsaal C, Group 2 (Group C + Group D) 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, Marienstraße 13 C - Hörsaal D, 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, in LH B Introduction to SP, 07.10.2022 - 07.10.2022
Fr, Einzel, 13:30 - 16:45, Marienstraße 7 B - Seminarraum 205, Meeting Special Project KTw (Chair of Advanced Structures), 09.12.2022 - 09.12.2022

Beschreibung

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

Elective compulsory modules

2401011 Applied Structural Dynamics (Lecture)

V. Zabel Veranst. SWS: 2
Vorlesung
Di, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, ab 06.12.2022
Mi, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, ab 07.12.2022

Beschreibung

- Machinery induced vibrations
- Earthquake excitation
- Wind induced vibrations

- Human induced vibrations

2401011 Applied Structural Dynamics (Exercise)

V. Zabel, F. Tartaglione Garcia Veranst. SWS: 1

Seminar

1-Gruppe Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Tutorium Group A, ab 06.12.2022
1-Gruppe Do, wöch., 07:30 - 09:00, Marienstraße 13 C - Hörsaal D, Group 1 (Group A + Group B), ab 08.12.2022
2-Gruppe Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, Tutorium Group B, ab 06.12.2022
2-Gruppe Do, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal C, Group 2 (Group C + Group D), ab 08.12.2022
3-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Tutorium Group C, ab 07.12.2022
4-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, Tutorium Group D, ab 07.12.2022

Bemerkung

- Complementary to the lectures

2202011 Assessment of structural performance (under extreme loading conditions)

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

Vorlesung

Mo, wöch., 15:15 - 16:45, Marienstraße 7 B - Seminarraum 205, Lecture
Di, wöch., 11:00 - 12:30, Marienstraße 7 B - Seminarraum 206, Exercise

Beschreibung

Students will be familiar with the existing building typologies, the methods of structural performance assessment 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 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 and current state in natural hazard and risk assessment. 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 trained to identify failure mechanism and design defects, and to evaluate appropriateness of strengthening measures. Students will be familiar with different analysis methods, techniques, and tools of empirical and analytical vulnerability assessment.

Structural performance of traditional and engineered building types (L)
Reinterpretation of observed response for different building types; building taxonomies; empirical and analytical vulnerability assessment; damage classification and fragility functions; design principles and structural solutions for traditional (masonry) and engineered (steel) type structures, basic rules for non-engineered buildings (with locally available materials); building assessment criteria for strengthening;
evaluation of applied strengthening and rehabilitation measures.

Damage assessment of unreinforced masonry 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; determination of fragility function; risk scenario for a virtual city.

Leistungsnachweis

1 Project report: „Damage assessment of unreinforced masonry 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

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

Vorlesung

Do, wöch., 09:15 - 12:30, Marienstraße 7 B - Seminarraum 205
Do, wöch., 09:15 - 12:30, Marienstraße 7 B - Projektraum 301

Beschreibung

Students will be familiar with the different risk elements in disaster mitigation studies. 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 NHRE database.

Risk evaluation for buildings and urban settlements (L)
Lessons from recent events 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; social risk modelling; decision support systems for OEF, EEW and RRE; building assessment criteria for
existing and new building stock.

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 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 projects and evaluation of structures”
90 min (50%) / **WiSe** + SuSe

1 Project presentation (oral) ”Response estimate for disastrous and recent events”
(50%) / **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 D, 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, F. Alkam, Z. Jaouadi 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 D, 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, Digital (BBB)
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

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

2202012 Experimental testing based on impact and resistance: wind, fire and earthquake

L. Abrahamczyk Veranst. SWS: 4
Vorlesung
Mi, wöch., 15:15 - 18:30, Marienstraße 7 B - Seminarraum 205

Prüfungen

202001 Seismic Monitoring / Regional Ground Motion (Exam)

J. Schwarz, L. Abrahamczyk, C. Kaufmann, S. Beinersdorf
Prüfung
Fr, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal B, Final exam, 17.02.2023 - 17.02.2023
Fr, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal C, Final exam, 17.02.2023 - 17.02.2023

Voraussetzungen

Bachelor Civil Engineering

204017 Wind Engineering (Exam)

G. Morgenthal, R. Höffer, I. Kavrakov
Prüfung
Fr, Einzel, 15:00 - 16:30, Marienstraße 13 C - Hörsaal B, Final exam, 03.03.2023 - 03.03.2023
Fr, Einzel, 15:00 - 16:30, Marienstraße 13 C - Hörsaal C, Final exam, 03.03.2023 - 03.03.2023

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

2205012, 205032 Structural engineering – Standard systems (Exam), until WiSe 21/22 Reinforced and post-tensioned concrete structures (205032), from WiSe 22/23

G. Morgenthal, S. Rau, S. Chawdhury, I. Kavrakov
Prüfung
Mo, Einzel, 09:00 - 10:30, Marienstraße 13 C - Hörsaal B, Final exam, 13.02.2023 - 13.02.2023

Mo, Einzel, 09:00 - 10:30, Marienstraße 13 C - Hörsaal C, Final exam, 13.02.2023 - 13.02.2023

Beschreibung

Structural Engineering – Standard systems / ”Reinforced and post-tensioned concrete structures”:

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” / new name ”Reinforced and post-tensioned concrete structures” / 90 min (50%) / **WiSe** + SuSe

”Advanced systems” / new name ”Steel structures” / 90 min (50%) / **SuSe** + WiSe

301012-1 Applied mathematics (Exam)

B. Rüffer, N. Gorban
Prüfung
Mo, Einzel, 09:00 - 12:00, Marienstraße 13 C - Hörsaal B, Final exam, 20.02.2023 - 20.02.2023
Mo, Einzel, 09:00 - 12:00, Marienstraße 13 C - Hörsaal C, Final exam, 20.02.2023 - 20.02.2023

Leistungsnachweis

1 written exam

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

401014 Structural Dynamics (Exam)

V. Zabel
Prüfung
Mi, Einzel, 09:00 - 10:30, Marienstraße 7 B - Seminarraum 205, Final exam, 15.02.2023 - 15.02.2023
Mi, Einzel, 09:00 - 10:30, Marienstraße 7 B - Seminarraum 206, Final exam, 15.02.2023 - 15.02.2023
Mi, Einzel, 09:00 - 10:30, Marienstraße 7 B - Seminarraum 104, Final exam, 15.02.2023 - 15.02.2023
Mi, Einzel, 09:00 - 10:30, Marienstraße 7 B - Seminarraum 105, Final exam, 15.02.2023 - 15.02.2023
Mi, Einzel, 09:00 - 10:30, Marienstraße 7 B - Seminarraum 106, Final exam, 15.02.2023 - 15.02.2023

Voraussetzungen

Bachelor Civil Engineering

Leistungsnachweis

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

401015 Finite element methods (Exam)

T. Rabczuk
Prüfung
Fr, Einzel, 09:00 - 10:30, Marienstraße 13 C - Hörsaal B, Final exam, 24.02.2023 - 24.02.2023
Fr, Einzel, 09:00 - 10:30, Marienstraße 13 C - Hörsaal C, Final exam, 24.02.2023 - 24.02.2023

Voraussetzungen

Bachelor Civil Engineering

Leistungsnachweis

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

904002 Geographical information systems (GIS) and building stock survey (Exam)

V. Rodehorst, S. Beinersdorf, J. Schwarz Veranst. SWS: 4
Prüfung
Mi, Einzel, 09:00 - 10:30, Marienstraße 13 C - Hörsaal A, Final exam, 22.02.2023 - 22.02.2023

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**

202002 Re-examination: Earthquake engineering and structural design

J. Schwarz, L. Abrahamczyk, C. Kaufmann
Prüfung
Di, Einzel, 15:15 - 16:45, Marienstraße 13 C - Hörsaal D, Q & A, 07.02.2023 - 07.02.2023
Di, Einzel, 13:00 - 16:00, Marienstraße 7 B - Seminarraum 205, Re-examination, 14.02.2023 - 14.02.2023

Bemerkung

Re-examination

202003 Re-examination: Geo- and hydrotechnical engineering - Part: "Flood Hazard and Vulnerability Assessment"

H. Maiwald, J. Schwarz
Prüfung
Do, Einzel, 13:00 - 14:30, Marienstraße 7 B - Seminarraum 205, Re-examination, 23.02.2023 - 23.02.2023

Bemerkung

Re-examination

204018 Re-examination: Structural parameter survey and evaluation

G. Morgenthal, V. Rodehorst, R. Illge
Prüfung
Do, Einzel, 09:00 - 11:30, Marienstraße 7 B - Seminarraum 205, Re-examination, 02.03.2023 - 02.03.2023

Bemerkung

Re-examination

205013, 205033 Re-examination: Structural engineering - Advanced systems (205013), until SuSe 22 Steel structures (205033), from SuSe 23

M. Kraus
Prüfung
Mo, Einzel, 13:00 - 14:30, Marienstraße 13 C - Hörsaal C, Re-examination, 27.02.2023 - 27.02.2023

Bemerkung

Re-examination

451007 Re-Examination: Stochastic Simulation Techniques and Structural Reliability

T. Lahmer
Prüfung
Mo, Einzel, 09:00 - 11:00, Marienstraße 7 B - Seminarraum 205, Re-examination, 20.02.2023 - 20.02.2023

906014 Re-examination: Geo- and hydrotechnical engineering - Part: "Geotechnical Engineering"

P. Staubach
Prüfung
Mo, Einzel, 13:00 - 15:30, Coudraystraße 9 A - Hörsaal 6, Re-examination, 20.02.2023 - 20.02.2023

Bemerkung

Re-examination

204019 Life-lines engineering (Exam)

G. Morgenthal, S. Chawdhury, G. Tondo, I. Kavrakov
Prüfung
Di, Einzel, 09:00 - 12:00, Marienstraße 13 C - Hörsaal B, Final exam, 28.02.2023 - 28.02.2023
Di, Einzel, 09:00 - 12:00, Marienstraße 13 C - Hörsaal C, Final exam, 28.02.2023 - 28.02.2023

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

2901033 Project- and Disaster Management (Exam)

J. Melzner, R. Podlaszewska, H. Bargstädt, B. Bode
Prüfung
Do, Einzel, 09:00 - 10:00, Marienstraße 13 C - Hörsaal B, Final exam, 16.02.2023 - 16.02.2023

Leistungsnachweis

1 written exam ”sociology of disaster”/ 60 min (50%) / **WiSe** + SuSe

1 Presentation + presentation paper ”project and disaster management” (50%) / **WiSe**

401011 Applied Structural Dynamics (Exam)

V. Zabel
Prüfung
Mi, Einzel, 11:00 - 12:30, Marienstraße 7 B - Seminarraum 104, Final exam, 15.02.2023 - 15.02.2023
Mi, Einzel, 11:00 - 12:30, Marienstraße 7 B - Seminarraum 105, Final exam, 15.02.2023 - 15.02.2023
Mi, Einzel, 11:00 - 12:30, Marienstraße 7 B - Seminarraum 106, Final exam, 15.02.2023 - 15.02.2023

401012 Re-Examination: Applied Finite element methods

T. Rabczuk
Prüfung
Fr, Einzel, 11:00 - 12:30, Marienstraße 7 B - Seminarraum 205, Re-examination, 24.02.2023 - 24.02.2023

205007 Re-examination: Modelling of steel structures and numerical simulation (205007)

M. Kraus
Prüfung
Mi, Einzel, 13:00 - 15:00, Marienstraße 13 C - Hörsaal C, Re-examination, 01.03.2023 - 01.03.2023

Bemerkung

Re-examination

451002 Re-examination: Introduction to Optimization

T. Lahmer
Prüfung
Fr, Einzel, 13:00 - 15:00, Marienstraße 13 C - Hörsaal C, Re-examination, 17.02.2023 - 17.02.2023

Bemerkung

Re-examination

451006 Re-examination: Optimization in Applications

T. Lahmer
Prüfung
Fr, Einzel, 13:00 - 15:00, Re-examination The exam will be in LH C (M13C) together with the Re-examination: Introduction to Optimization. , 17.02.2023 - 17.02.2023

Bemerkung

Re-examination

202005 Risk projects and evaluation of structures (Exam)

L. Abrahamczyk, J. Schwarz, S. Beinersdorf, A. Uzair
Prüfung
Di, Einzel, 09:00 - 11:00, Marienstraße 7 B - Seminarraum 205, 21.02.2023 - 21.02.2023

Beschreibung

Training of student’s ability to apply methods and current state in natural hazard and risk assessment integrating research and practical applications to site- or structure-specific risk analysis and planning decisions.

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 trained to identify failure mechanism and design defects, and to evaluate appropriateness of strengthening measures. Students will be familiar with different analysis methods, techniques and tools of empirical and analytical vulnerability assessment. Students are encouraged to contribute reports of regionally particular building types to World Housing Encyclopedia and NHRE database.

Bemerkung

Lessons from recent events and field missions; assessment of hazard phenomena; reinterpretation of observed response for different building types; recent developments in design and construction; performance assessment of masonry, steel and wooden structures as well as interaction effects between structure and soil, equipment and filling media; damage classification and fragility functions; building assessment criteria for strengthening; evaluation of applied strengthening and rehabilitation measures.

Training in:

Modelling and assessment of masonry structures applying equivalent frame approach; determination of characteristic building response parameters; determination of fragility function.

Voraussetzungen

B.Sc.

Seismic Monitoring / Earthquake Engineering

Leistungsnachweis

1 written project report (instead of exam!)

”Risk projects and evaluation of structures”

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

1 Project presentation (oral)

”Risk projects” (25%) / **WiSe**

Project reports (written short paper)

”Evaluation of structures” (25%) / **WiSe**

202011 Assessment of structural performance (under extreme loading conditions) (Exam)

J. Schwarz, L. Abrahamczyk, S. Beinersdorf, H. Maiwald, P. Hasan, A. Uzair
Prüfung
Mo, Einzel, 13:00 - 15:00, Marienstraße 7 B - Seminarraum 205, Final exam, 13.02.2023 - 13.02.2023

Beschreibung

Students will be familiar with the existing building typologies, the methods of structural performance assessment and design rules for traditional and engineered building types. Examples of different small to large scale testing and the instrumentation requirements are elaborated to provide structure related parameters and characteristic force-displacement relationships in support of analytical studies and the re-interpretation of damage patterns. 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 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).

Bemerkung

Structural performance of traditional and engineered building types (L)

Examples of small and larger scale testing; facilities and technical equipment; demands on specimens and scaling requirements; application of equivalent forces and ground motion in pseudo-static and dynamic testing; load and displacement relationship for full-scale testing of structural elements and building configurations; prediction of capacity curves and material properties and parameters; design principles and structural solutions for traditional (masonry) and engineered (steel) type structures, basic rules for non-engineered buildings (with locally available materials).

Elaboration of structural models for performance assessment of existing buildings (P)

Search for typical building representatives of the target regions (home countries of the participants); experimental investigation of design and retrofitting strategies using small-scale structural models; testing of elements and interpretation of failure mechanisms, derivation of structural layout and simplified models of representative building types, damage prognosis and comparison with observed response; fragility functions; introduction in data processing for simulation tools, a.o.3MURI

Small Scale testing (E)

For the target masonry building of the project, a representative small scale model has to be developed following the scaling requirements as well the demands and limitations on specimens and size of testing platform. A real model for testing has to prepared using a set of small stone units and wooden elements. The model will be shaken using existing facilities. [Note: The realization and final testing depend on the pandemic situation.]

Leistungsnachweis

1 Project report

„Elaboration of structural models for performance assessment of existing buildings and their small-scale testing” (33%) / **WiSe**

1 written exam

„Assessment of structural performance (under extreme loading conditions)”/ 180 min (67%) / **WiSe** + SuSe

205014 Design and interpretation of experiments (Exam)

M. Kraus, T. Lahmer, F. Alkam, Z. Jaouadi, S. Mämpel
Prüfung
Do, Einzel, 13:00 - 15:00, Marienstraße 13 C - Hörsaal C, Final exam, 02.03.2023 - 02.03.2023

Leistungsnachweis

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

”Experiments in Structural Engineering” and

”Signal Processing, Design of Experiments and System Identification”

906016 Secondary Hazards and Risks (land-use, site studies) (Exam)

P. Staubach, G. Aselmeyer
Prüfung
Mi, Einzel, 13:00 - 15:00, Coudraystraße 11 C - Seminarraum (geologische Sammlung) 202, Final exam, 22.02.2023 - 22.02.2023

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