Vorlesungsverzeichnis

M.Sc. Natural hazards and risk in structural engineering

Sommer 2023

Stand 07.12.2023

M.Sc. Natural hazards and risk in structural engineering

Applied mathematics and stochastics for risk assessment

Disaster management and mitigation strategies

Earthquake engineering and structural design

202002 Earthquake engineering and structural design (L + E + P)

J. Schwarz, L. Abrahamczyk, C. Kaufmann, S. Beinersdorf Veranst. SWS: 6
Vorlesung

1-Gruppe Mo, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 301, NHRE - Group A+B
2-Gruppe Mo, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 302, NHRE - Group C+D
3-Gruppe Do, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 301, NHRE - Group B+C
4-Gruppe Do, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 302, NHRE - Group B+C
Mo, wöch., 17:00 - 18:30, Marienstraße 7 B - Seminarraum 205, NHRE - Group A+B
Do, wöch., 13:30 - 16:45, Marienstraße 13 C - Hörsaal D, Lecture

Beschreibung

Students are trained and qualified in tasks of earthquake engineering, natural hazard and risk determining parameters. Students will be able to process input data, to realize design decision for structures of different building type and risk potential, to apply modern building codes and design concepts, to develop earthquake resistant structures and to evaluate structural design.

Earthquake engineering

Seismic Code development and generations; simplified analysis methods; design of structures and regularity criteria for earthquake resistance; performance and experience-based design concepts; rules for engineered buildings (R/C, steel, masonry) and non-engineered buildings; interaction effects between structure and soil, equipment and filling media; special and high risk structures

Structures in Earthquake Regions

Description of National code development; recent code situation; determination of seismic forces for an idealized RC frame system; comparison of different international code levels

Design of RC frames with masonry infill walls in earthquake regions: Application of modern software tools

Training of modelling and calculation with different software tools; interpretation of structural systems in terms of earthquake resistance design (ERD); design and analysis of structural systems for given and modified building layouts; comparison of the results with outcome of damage surveys. Tools: ETABS, SAP2000

Voraussetzungen

recomended module "Primary Hazards and Risks" NHRE

Leistungsnachweis

1 written exam

”Earthquake engineering” / 180 min (67%) / **SuSe** + WiSe

1 Project report + Project presentation

”Structures in Earthquake Regions/Design of RC frames” /

(33%) / **SuSe**

Finite element methods and structural dynamics

Geo- and hydrotechnical engineering

202003 Geo- and hydrotechnical engineering - Part: "Flood hazard and vulnerability assessment" (L + E)

H. Maiwald, S. Beinersdorf Veranst. SWS: 3
Vorlesung
Di, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal D
Do, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal D, Dates by arrangement

Beschreibung

The students should be able to apply the strategies and methods to arbitrary engineering problems in the given fields. To fix the theoretical background the student has to apply the methods independently at given tasks during several projects.

Flood Hazard and Vulnerability Assessment

Flood Management; Fundamentals of flood defence; Management of low-lying areas; Design of river dikes, channels and dams; Design concepts for the defence of structural objects and buildings; Forecasting, management and maintenance in flood defence; Hydrology, hydraulic calculations, flood routing; Characteristics of tsunami action, forces and loads on structures; Structural damage and loss prediction, damage scenarios; Re-interpretation of recent events.

Bemerkung

Vorlesungen in englischer Sprache "Flood hazard and vulnerability assessment"

Leistungsnachweis

1 written exam

”Flood Hazard and Vulnerability Assessment” / 90 min (50%)

/ **SuSe** + WiSe

906014 Geo- and hydrotechnical engineering - Part: "Geotechnical Engineering" (L + E)

P. Staubach, C. Rodríguez Lugo Veranst. SWS: 3
Vorlesung
Mi, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D
Fr, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal D, Dates by arrangement

Beschreibung

The objective of this module is focused on deepening the basics of soils mechanics, the fundamentals of analysis in applications for static and dynamic analysis as well as the basics of soil-structure interaction analysis. The students should be able to apply the strategies and methods to arbitrary engineering problems in the given fields. To fix the theoretical background the student has to apply the methods independently at given tasks during several projects.

Geotechnical Engineering

Classification and identification of soils; Description of soil state; Water in the soil; Hydraulic conductivity and seepage flow; Distribution of vertical stress in the soil; Stress-strain relationships; Settlement analysis; Consolidation theory; Shear strength; Earth pressure; Basics of Soil Dynamics (wave propagation, laboratory and field testing, soil-structure interaction under dynamic loading); Soil Liquefaction (phenomenon, consequences, estimation of liquefaction risk, prevention)

Leistungsnachweis

1 written exam

”Geotechnical Engineering” / 90 min (50%) / **SuSe** + WiSe

Geographical Information Systems (GIS) and building stock survey

Life-lines engineering

Primary hazards and risks

Structural engineering

205013, 205033 Structural engineering - Steel structures (L)

M. Kraus, S. Ibañez Sánchez Veranst. SWS: 3

Vorlesung

Mo, wöch., 13:30 - 15:00, Marienstraße 13 C - Hörsaal D
Di, wöch., 17:00 - 18:30, Marienstraße 13 C - Hörsaal D

Beschreibung

Students will be familiar with the history of structures and structural forms, with building materials and building methods. They will understand the concepts of structural engineering design, including safety concepts, loads and structural design codes. They will be able to convert a structural concept into a mechanical model to determine internal demand and to design and detail the components of the structure, with an emphasis on reinforced concrete and post-tensioned concrete structures as well as steel and steel-concrete composite structures.

Structural Engineering – Advanced systems (summer semester):

Design of steel and steel-concrete composite structures; Post-tensioned concrete structures – design and detailing; Design of steel connections and detailing

Voraussetzungen

B.Sc.

Leistungsnachweis

2 written exams

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

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

Structural parameter survey and evaluation

204018 Structural parameter survey and evaluation (L + E + P)

G. Morgenthal, V. Rodehorst, R. Illge, S. Rau, T. Gebhardt Veranst. SWS: 4.5
Vorlesung
Fr, wöch., 09:15 - 12:30, Marienstraße 13 C - Hörsaal D
Fr, wöch., 13:30 - 15:00, Marienstraße 13 C - Hörsaal D

Beschreibung

The students will be familiar with methods to determine properties of structural systems by means of modern measurement techniques. They will be familiar with the concepts, the application and the limitations of these techniques. They understand the data obtained and the methods to condition, analyse and interpret the data to extract information about structures and structural members and components. They will be able to apply the concepts to develop measurement setups and analysis procedures to problems encountered in structural engineering.

Signal Analysis

Trigonometric polynomials (TP); amplitude-phase and complex representation; approximation of arbitrary periodic functions by TP using method of least squares, calculation of Fourier coefficients and error estimation; Fourier series. Discussion of spectra and Fourier transform and its basic properties; Convolution and its properties and applications; random variables and central limit theorem; applications of Fourier transforms such as filtering of signals and solving differential equations

Sensor-based Monitoring and System Analysis

Types and principles of sensors; important sensor properties; data acquisition techniques; spectral and stochastic analysis of sensor data; properties of structural systems important in experimental testing and structural health monitoring; relevant limit states; structural analysis, modelling and model calibration; applications to static and dynamic response, load determination, physically nonlinear structural behaviour and optimization of sensor system setups

Geo-spatial Monitoring

Preparation and planning of three-dimensional measurement tasks; application of tacheometry, satellite-based positioning (GNSS), terrestrial laser scanning and photogrammetry for monitoring; image-based sensor orientation and surface reconstruction; spatial transformations, georeferencing, distance measures, pointcloud registration and geometric deformation analyses

Voraussetzungen

Primary hazards and risks

Applied mathmathics

Leistungsnachweis

1 written exam

”Structural parameter survey and evaluation ”/ 120 min

(100%) / **SuSe** + WiSe

Special Project

Elective compulsory modules

2401012 Applied Finite element methods (Lecture)

T. Rabczuk, C. Könke Veranst. SWS: 2

Vorlesung
Mo, wöch., 07:30 - 09:00, Marienstraße 7 B - Seminarraum 205

2401012 Applied Finite element methods (Exercise)

T. Rabczuk, A. Habtemariam, J. Lopez Zermeño, F. Tartaglione Garcia Veranst. SWS: 1

Seminar
Mo, wöch., 09:15 - 10:45, Marienstraße 7 B - Projektraum 301, Übung
Mi, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 301, Tutorium
Mi, wöch., 13:30 - 15:00, Marienstraße 7 B - Seminarraum 205, Tutorium
Fr, wöch., 07:30 - 09:00, Marienstraße 7 B - Seminarraum 105, Tutorium

303001 Advanced Building Information Modelling

C. Koch, M. Alabassy, J. Krischler Veranst. SWS: 4

Vorlesung
Mi, wöch., 11:00 - 12:30, Marienstraße 7 B - Student Design Studio – SDS 303, Exercise
Mi, wöch., 11:00 - 12:30, Coudraystraße 13 B - Pool Fak. B 007, 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

204031 Computational and Experimental Wind Engineering (L, E, P)

G. Morgenthal, S. Chawdhury, G. Tondo Veranst. SWS: 6

Vorlesung
Mi, wöch., 11:00 - 12:30, Marienstraße 7 B - Projektraum 301
Mi, wöch., 11:00 - 12:30, Marienstraße 7 B - Seminarraum 205
Do, wöch., 09:15 - 10:45, Marienstraße 7 B - Projektraum 301
Do, wöch., 09:15 - 10:45, Marienstraße 7 B - Seminarraum 205

Beschreibung

The course aims to introduce the students to the fundamentals and state-of-the-art methods of wind engineering and different aerodynamic
phenomena that are relevant to the design of long-span cable-supported bridges. To characterize and quantify aerodynamic and
aeroelastic effects, students will understand the concepts of computational fluid dynamics (CFD) simulations and experimental wind tunnel
tests, along with their advantages and limitations. Students will be able to model complex bridge structures using Finite Element Analysis
methods and simulate dynamic response due to wind. Different combinations of analytical, numerical and experimental analysis
approaches are employed to investigate dynamic wind excitations with a focus on identifying serviceability issues and ultimate limit
scenarios of the structure.
Participating students are tasked with practical bridge design-oriented challenges and work in groups to address them. Group organization
and goal-oriented work are an important aspect to the project work. Results are reported periodically in presentations. Results are to be
summarized in a report following scientific writing standards and presented orally.

Bemerkung

Literature review on aerodynamic phenomena in long-span bridges; Fundamentals of computational wind engineering; Aerodynamic loads;
Self-excited or motion-induced forces; Aerodynamic instabilities; Finite Element modelling and dynamic simulation of long-span bridges
(arches, cable-stayed bridges, suspension bridges); Model Validation; Analytical and semi-analytical aerodynamic models; 2D and pseudo-
3D CFD simulations; Developing experimental scaled models; Experimental wind tunnel testing; Comparison of results from different
methods; Strategies for vibration mitigation; Aerodynamic optimization; Scientific writing and design-focused reporting.

Leistungsnachweis

1 Intermediate presentation
”Theoretical background and work update (20%)” / SuSe

1 Final presentation
”Presentation of final outcome (30%)” / SuSe

1 Final report
”Computational and Experimental Wind Engineering for Long-
span Bridge Design” (50%) / SuSe

301016 Complex dynamics

B. Rüffer Veranst. SWS: 4
Vorlesung
Di, wöch., 09:15 - 12:30, Coudraystraße 13 B - Hörsaal 3, ab 09.05.2023
Di, wöch., 07:30 - 10:45, Coudraystraße 13 A - Hörsaal 2

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 written exam

”Complex dynamics”

120 min (100%) / **SuSe** + WiSe

401009 Experimental structural dynamics and Structural monitoring (P)

V. Zabel Veranst. SWS: 4
Projekt
Di, wöch., 07:30 - 12:30, 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**

451002 Introduction to Optimization (L+E)

T. Lahmer Veranst. SWS: 3

Integrierte Vorlesung

Mo, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, Lecture
Do, 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

202004 Multi-hazard and risk assessment (L + E)

J. Schwarz, S. Beinersdorf, H. Maiwald, N. Hadidian Moghaddam, P. Hasan Veranst. SWS: 4

Vorlesung

Mo, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal D
Di, wöch., 13:30 - 15:00, Marienstraße 13 C - Hörsaal D

Beschreibung

The students will be familiar with the probability of natural hazard and risk determining parameters. They will be able to recognize procedures of single and multi-hazard assessment and to process input data and to apply tools to study areas. Students will be introduced in further advanced geotechnologies and existing or on-going research as well as global projects conducted by GFZ.

Hazard Assessment and Applications

Primary input and output parameters for EQ (and other natural) hazard; Earthquake statistics and occurrence probability; Methodology of seismic hazard assessment; Seismicity models; Examples of seismic hazard and risk studies; Synopses of natural hazards; procedures and developments in multi-hazard assessment; Case studies of multi-hazard, vulnerability, and risk considerations.

Workshop

”Natural Hazards and Advanced Geotechnologies”

Compilation of EQ hazard-related data

Treatment of long-term seismicity data files; elaboration of earthquake data to get harmonized input for PSHA; earthquake catalogues; creation of shakemaps; data pre-processing; Hazard Description for the Project regions

-> Excursion to GeoResearchCenter Potsdam

Bemerkung

In this course 28 students can take part. **It is compulsory for the DAAD-scholarship holders of NHRE intake 2022.** There will be an introduction to the module at April 4th, where everybody interested can participate.

If you are interested to take part in the course, please write a **proposal** why you are interested and what are the major problems in your country related to multi-hazard that you identified yourself. Please **submit this to silke.beinersdorf@uni-weimar.de until April 3rd, 2023**. We will inform you about the decision until April 7th, 2023.

The excursion to Potsdam will take place this semester. **As soon as you are accepted, you will be enroled to the moodle-room.**

Voraussetzungen

recommended module "Primary Hazards and Risks" (NHRE)

completion of the module "Geographical information systems (GIS) and building stock survey" (NHRE) or basic knowledge of GIS-Systems is also recommended

Leistungsnachweis

1 written exam

”Multi-Hazard and risk assessment ”/ 90 min

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

1 Project report (SYMULTHAN)

(50%) / **SuSe**

205007 Modelling of steel structures and numerical simulation (L + E)

M. Kraus, S. Ibañez Sánchez, S. Mämpel Veranst. SWS: 4

Vorlesung

1-Gruppe Mo, wöch., 11:00 - 12:30, Marienstraße 7 B - Projektraum 301, Exercise
1-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Exercise
2-Gruppe Mo, wöch., 11:00 - 12:30, Marienstraße 7 B - Projektraum 302, Exercise
2-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, Exercise
Mo, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal D, Exercise
Mi, wöch., 07:30 - 09:00, Marienstraße 13 C - Hörsaal D, Exercise

Beschreibung

The students will be familiar with skills and expertise in the field of nonlinear structural analyses. Extensive knowledge of theoretical basics and modern modelling methods including numerical representations are the aim of the course. The students will acquire skills in handling advanced tools for the analysis and the design of structures.

Design of steel structures using finite element methods; basics of the design; modelling of structures and loads; nonlinear material behaviour, numerical analyses of steel-members and structures regarding geometric and physical nonlinearities; stability behaviour of members including flexural and lateral torsional buckling

Leistungsnachweis

1 Project report

”Modelling of steel structures and numerical simulation” (0%) / **SuSe**

1 written exam

”Modelling of steel structures and numerical simulation”/ 120 min (100%) / **SuSe** + WiSe

301017 Mathematics for data science

B. Rüffer, M. Schönlein Veranst. SWS: 4

Vorlesung

Mi, Einzel, 13:30 - 16:45, Coudraystraße 13 B - Hörsaal 3, 05.04.2023 - 05.04.2023
Mo, wöch., 09:15 - 12:30, Coudraystraße 13 A - Hörsaal 2

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

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

Leistungsnachweis

1 written exam

”Complex dynamics”

120 min (100%) / **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

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

T. Lahmer Veranst. SWS: 3

Integrierte Vorlesung

Di, wöch., 11:00 - 12:30, Coudraystraße 13 A - Hörsaal 2, Lecture
Fr, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Exercise dates by arrangement

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, 2023** 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

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

303001 Advanced Building Information Modelling

C. Koch, M. Alabassy, J. Krischler Veranst. SWS: 4
Vorlesung
Mi, wöch., 11:00 - 12:30, Marienstraße 7 B - Student Design Studio – SDS 303, Exercise

Mi, wöch., 11:00 - 12:30, Coudraystraße 13 B - Pool Fak. B 007, 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
Fr, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal A
Fr, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 301, Exercise
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

Prüfungen

202002 Exam: Earthquake engineering and structural design

L. Abrahamczyk, J. Schwarz
Prüfung
Di, Einzel, 08:00 - 11:00, Marienstraße 13 C - Hörsaal B, Final examination, 25.07.2023 - 25.07.2023
Di, Einzel, 08:00 - 11:00, Marienstraße 13 C - Hörsaal D, Final examination, 25.07.2023 - 25.07.2023

202003 Exam: Geo- and hydrotechnical engineering - Part: "Flood hazard and vulnerability assessment"

H. Maiwald, J. Schwarz
Prüfung
Do, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal A, Final examination, 03.08.2023 - 03.08.2023
Do, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal C, Final examination, 03.08.2023 - 03.08.2023

202004 Exam: Multi-hazard and risk assessment

J. Schwarz, S. Beinersdorf, H. Maiwald
Prüfung
Do, Einzel, 09:00 - 10:30, Marienstraße 13 C - Hörsaal B, 27.07.2023 - 27.07.2023

Beschreibung

The students will be familiar with the probability of natural hazard and risk determining parameters. They will be able to recognize procedures of single and multi hazard assessment and to process input data and to apply tools to study areas. Students will be introduced in further advanced geotechnologies and existing or on-going research as well as global projects conducted by GFZ.

Hazard Assessment and Applications

Primary input and output parameters for EQ (and other natural) hazard; Earthquake statistics and occurrence probability; Methodology of seismic hazard assessment; Seismicity models; Examples of seismic hazard and risk studies; Synopses of natural hazards; procedures and developments in multi-hazard assessment; Case studies of multi-hazard, vulnerability and risk considerations.

Workshop

”Natural Hazards and Advanced Geotechnologies” --> due to the current situation, we will be not able to conduct the excursion - this part will be replaced by: Multi-hazard study of your home country and building stock survey

Compilation of EQ hazard-related data

Treatment of long term seismicity data files; elaboration of earthquake data to get harmonized input for PSHA; earthquake catalogues (for the countries of the participants and adjacent regions); data pre-processing; Hazard Description for the Project regions

Excursion to GeoResearchCenter Potsdam --> the recent situation might allow to have the excursion this year

Bemerkung

In this course 28 students can take part. **It is compulsory for the DAAD-scholarship holders of NHRE intake 2021.** There will be an introduction to the module at April 4th, where everybody interested can participate.

If you are interested to take part in the course, please write a **proposal** why you are interested and what are the major problems in your country related to multi-hazard that you identified yourself. Please **submit this to silke.beinersdorf@uni-weimar.de until April 4th, 2022**. We will inform you about the decision until April 8th, 2022.

The excursion to Potsdam might take place this semester.

As soon as you are accepted, you will be enroled to the moodle-room.

Voraussetzungen

recommended module "Primary Hazards and Risks" (NHRE)

completion of the module "Geographical information systems (GIS) and building stock survey" (NHRE) or basic knowledge of GIS-Systems is also recommended

Leistungsnachweis

1 written exam

”Multi-Hazard and risk assessment ”/ 90 min

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

1 Project report (SYMULTHAN)

(50%) / **SuSe**

204018 Exam: Structural parameter survey and evaluation

R. Illge, G. Morgenthal, V. Rodehorst
Prüfung
Fr, Einzel, 13:00 - 16:00, Marienstraße 13 C - Hörsaal B, Final examination, 11.08.2023 - 11.08.2023
Fr, Einzel, 13:00 - 16:00, Marienstraße 13 C - Hörsaal D, Final examination, 11.08.2023 - 11.08.2023

205013, 205033 Exam: Structural engineering - Advanced systems, until SuSe22; Steel structures, from SuSe23

M. Kraus
Prüfung
Mo, Einzel, 13:00 - 14:30, Steubenstraße 6, Haus F - Hörsaal K20, Final examination, 07.08.2023 - 07.08.2023

906014 Exam: Geo- and hydrotechnical engineering - Part: "Geotechnical Engineering"

P. Staubach
Prüfung
Mo, Einzel, 13:00 - 15:00, Marienstraße 13 C - Hörsaal D, Final examination, 31.07.2023 - 31.07.2023
Mo, Einzel, 13:00 - 15:00, Marienstraße 13 C - Hörsaal B, Final examination, 31.07.2023 - 31.07.2023

205007 Exam: Modelling of steel structures and numerical simulation

M. Kraus
Prüfung
Mi, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal B, Final examination, 09.08.2023 - 09.08.2023
Mi, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal D, Final examination, 09.08.2023 - 09.08.2023

Bemerkung

301017 Exam: Mathematics for data science

B. Rüffer
Prüfung
Mi, Einzel, 09:00 - 11:00, Coudraystraße 13 B - Seminarraum 208, Final examination, 02.08.2023 - 02.08.2023
Mi, Einzel, 09:00 - 11:00, Coudraystraße 13 B - Seminarraum 210, Final examination, 02.08.2023 - 02.08.2023

303001 Exam: Advanced building information modeling

C. Koch
Prüfung
Do, Einzel, 13:00 - 15:00, Steubenstraße 6, Haus F - Hörsaal K20, 03.08.2023 - 03.08.2023

451002 Exam: Introduction to Optimization

T. Lahmer
Prüfung
Fr, Einzel, 09:00 - 10:30, Marienstraße 13 C - Hörsaal B, Final examination, 28.07.2023 - 28.07.2023
Fr, Einzel, 09:00 - 10:30, Marienstraße 13 C - Hörsaal A, Final examination, 28.07.2023 - 28.07.2023

451007 Exam: Stochastic Simulation Techniques and Structural Reliability

T. Lahmer
Prüfung
Di, Einzel, 13:00 - 14:30, Marienstraße 13 C - Hörsaal A, Final examination, 01.08.2023 - 01.08.2023

202001 Re-examination: Primary hazards and risks - Part: Seismic monitoring

J. Schwarz
Prüfung

Fr, Einzel, 13:00 - 16:00, Marienstraße 13 C - Hörsaal C, Re-examination, 28.07.2023 - 28.07.2023

Bemerkung

Re-examination

204017 Re-examination: Wind risk mitigation in structural engineering

R. Höffer, G. Morgenthal, J. Schwarz
Prüfung
Do, Einzel, 13:00 - 14:30, Marienstraße 7 B - Seminarraum 205, Re-examination, 10.08.2023 - 10.08.2023

Bemerkung

Re-examination

204019 Re-examination: Life-lines engineering

G. Morgenthal
Prüfung
Di, Einzel, 13:00 - 16:00, Marienstraße 7 B - Seminarraum 205, Re-examination, 08.08.2023 - 08.08.2023

Bemerkung

Re-examination

2205012, 205032 Re-examination: Structural engineering - Standard systems, until WiSe21/22; Reinforced and post-tensioned concrete structures, from WiSe 22/23

G. Morgenthal
Prüfung
Mo, Einzel, 13:30 - 15:00, Marienstraße 13 C - Hörsaal C, Re-examination, 24.07.2023 - 24.07.2023

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

B. Rüffer, T. Lahmer
Prüfung
Mo, Einzel, 09:00 - 12:00, Coudraystraße 13 A - Hörsaal 2, Re-examination, 31.07.2023 - 31.07.2023

Bemerkung

Re-examination

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

V. Zabel
Prüfung
Mi, Einzel, 09:00 - 10:30, Marienstraße 7 B - Seminarraum 106, Re-examination, 26.07.2023 - 26.07.2023

Bemerkung

Re-examination

401015 Re-examination: Finite element methods and structural dynamics - Part: Finite element methods

T. Rabczuk
Prüfung
Fr, Einzel, 09:00 - 10:30, Marienstraße 13 C - Hörsaal D, Re-examination, 04.08.2023 - 04.08.2023

Bemerkung

Re-examination

901033 Re-examination: Disaster management and mitigation strategies - Part: Sociology of disaster

H. Bargstädt, J. Melzner, R. Podlaszewska, B. Bode
Prüfung
Do, Einzel, 13:00 - 14:30, Marienstraße 7 B - Seminarraum 205, Re-examination, 27.07.2023 - 27.07.2023

Bemerkung

Re-examination

904002 Re-examination: Geographical information systems (GIS) and building stock survey

V. Rodehorst, J. Schwarz, S. Beinersdorf
Prüfung
Mi, Einzel, 09:00 - 10:30, Marienstraße 7 B - Seminarraum 205, 02.08.2023 - 02.08.2023

202005 Re-examination: Risk projects and evaluation of structures

L. Abrahamczyk, J. Schwarz
Prüfung
Di, Einzel, 09:00 - 11:30, Marienstraße 13 C - Hörsaal C, Re-examination, 01.08.2023 - 01.08.2023

Bemerkung

Re-examination

205014 Re-examination: Design and interpretation of experiments

M. Kraus
Prüfung
Do, Einzel, 09:00 - 11:00, Marienstraße 7 B - Seminarraum 103, 10.08.2023 - 10.08.2023
Do, Einzel, 09:00 - 11:00, Marienstraße 7 B - Seminarraum 102, 10.08.2023 - 10.08.2023

Bemerkung

Re-examination

401011 Re-examination: Finite element methods and structural dynamics - Part: Applied structural dynamics

V. Zabel
Prüfung
Mi, Einzel, 11:00 - 12:30, Marienstraße 7 B - Seminarraum 106, Re-examination, 26.07.2023 - 26.07.2023

Bemerkung

Re-examination

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

T. Rabczuk
Prüfung
Fr, Einzel, 11:00 - 12:30, Marienstraße 13 C - Hörsaal D, Re-examination, 04.08.2023 - 04.08.2023

Bemerkung

Re-examination

906016 Re-examination: Secondary hazards and risks

P. Staubach
Prüfung
Mi, Einzel, 13:00 - 15:00, Coudraystraße 11 C - Seminarraum (geologische Sammlung) 202, Re-examination, 02.08.2023 - 02.08.2023

Bemerkung

Re-examination

301016 Exam: Complex dynamics

B. Rüffer
Prüfung
Fr, Einzel, 14:00 - 16:00, Coudraystraße 13 B - Seminarraum 210, 04.08.2023 - 04.08.2023