

## **Vorlesungsverzeichnis**

M.Sc. Natural hazards and risk in structural engineering

Winter 2013/14

Stand 08.10.2014

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**M.Sc. Natural hazards and risk in structural engineering****Advanced Training Course****K. Gürlebeck, D. Legatiuk**

Veranst. SWS: 4

Vorlesung

Block, 09:00 - 17:00, Marienstraße 7 B - Seminarraum 205, 07.10.2013 - 11.10.2013  
 Di, Einzel, 09:15 - 12:30, Coudraystraße 13 B - Seminarraum 208, 08.10.2013 - 08.10.2013  
 Mi, Einzel, 09:15 - 12:30, Coudraystraße 13 B - Seminarraum 208, 09.10.2013 - 09.10.2013  
 Do, Einzel, 09:15 - 10:45, Coudraystraße 13 B - Seminarraum 208, 10.10.2013 - 10.10.2013  
 Fr, Einzel, 09:15 - 10:45, Coudraystraße 13 B - Seminarraum 208, 11.10.2013 - 11.10.2013  
 Mo, wöch., 11:00 - 12:30, Coudraystraße 13 D - Pool Fak. B 009, 21.10.2013 - 02.12.2013  
 Mo, wöch., 09:15 - 10:45, Marienstraße 7 B - Projektraum 301  
 Mo, wöch., 09:15 - 10:45, Marienstraße 7 B - Seminarraum 205  
 Mo, wöch., 11:00 - 12:30, Marienstraße 7 B - Seminarraum 205

**Kommentar****Numerical Analysis - Computation**

analytical and numerical solution of ordinary differential equations, numerical analysis for systems of linear algebraic equations, direct and iterative solvers; tool: MATLAB

**CAE**

data structures, object oriented programming and numerical methods;

tool: Java

**Voraussetzungen**

B.Sc.

**Leistungsnachweis**

2 exams (written or oral)

**Wahlpflichtmodul I****Wahlpflichtmodul II****Wahlpflichtmodul III****Earthquake engineering and structural design****Experimental structural evaluation and rehabilitation****Examination "Experimental Structural Evaluation ..."****J. Hildebrand**

Prüfung

Do, Einzel, 09:00 - 12:00, Marienstraße 13 C - Hörsaal C, 20.02.2014 - 20.02.2014

**Experimental Structural Evaluation****J. Hildebrand, V. Zabel**

Veranst. SWS: 2

Vorlesung

Di, wöch., 13:30 - 15:00, Marienstraße 7 B - Seminarraum 102, ab 03.12.2013  
Do, wöch., 09:15 - 10:45, Marienstraße 7 B - Seminarraum 102

#### Kommentar

#### Experimental Structural evaluation

Testing facilities and technical equipment; demands on specimens and scaling requirements; arrangement of sensors, application of equivalent forces and ground motion in pseudostatic and dynamic testing; Load and displacement relationship for full-scale testing of structural elements (RC columns, masonry wall); damping devices, prediction of capacity curves and material properties and parameters; recalculation of model calibration

#### Voraussetzungen

Obligatory moduls of 1<sup>st</sup> and 2<sup>nd</sup> semester

#### Leistungsnachweis

1 exam (written or oral)

### Model testing for Rehabilitation

#### J. Schwarz

Veranst. SWS: 2

Vorlesung

Di, wöch., 15:15 - 16:45, Marienstraße 7 B - Seminarraum 102

#### Kommentar

#### Model testing for rehabilitation

Experimental investigation of retrofitting strategies on small scale structural models; testing of elements real scale, derivation of force-displacement relationships,

#### Voraussetzungen

Obligatory moduls of 1<sup>st</sup> and 2<sup>nd</sup> semester

#### Leistungsnachweis

1 exam (written or oral)

### Signal Processing and Interpretation

#### K. Markwardt

Veranst. SWS: 1

Vorlesung

Mo, wöch., 17:00 - 18:30, Marienstraße 13 C - Hörsaal C, bis 25.11.2013

#### Kommentar

#### Signal processing and interpretation

Conditioning of experimental data, error analysis, analog and digital filters; Fast Wavelet-Transform, compression and denoising algorithms; tool: MATLAB

#### Voraussetzungen

Obligatory moduls of 1<sup>st</sup> and 2<sup>nd</sup> semester

**Leistungsnachweis**

1 exam (written or oral)

**Structural dynamics****2401003 Structural Dynamics / Baudynamik****V. Zabel**

Veranst. SWS: 4

Integrierte Vorlesung

Mi, wöch., 17:00 - 18:30, Marienstraße 7 B - Seminarraum 205, Tutorium, ab 06.11.2013  
 Mi, wöch., 17:00 - 18:30, Marienstraße 7 B - Seminarraum 206, Tutorium, ab 06.11.2013  
 Di, Einzel, 11:00 - 12:30, Marienstraße 7 B - Seminarraum 205, 17.12.2013 - 17.12.2013  
 Mi, Einzel, 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, 18.12.2013 - 18.12.2013  
 Mi, Einzel, 11:00 - 12:30, Marienstraße 7 B - Projektraum 301, 18.12.2013 - 18.12.2013  
 Di, Einzel, 11:00 - 12:30, Marienstraße 7 B - Seminarraum 205, 14.01.2014 - 14.01.2014  
 Mi, Einzel, 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, 15.01.2014 - 15.01.2014  
 Mi, Einzel, 11:00 - 12:30, Marienstraße 7 B - Projektraum 301, 15.01.2014 - 15.01.2014  
 Di, Einzel, 11:00 - 12:30, Marienstraße 7 B - Seminarraum 205, 28.01.2014 - 28.01.2014  
 Mi, Einzel, 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, 29.01.2014 - 29.01.2014  
 Mi, Einzel, 11:00 - 12:30, Marienstraße 7 B - Projektraum 301, 29.01.2014 - 29.01.2014  
 Di, wöch., 09:15 - 10:45, Marienstraße 7 B - Seminarraum 205  
 Mi, wöch., 09:15 - 10:45, Marienstraße 7 B - Seminarraum 205  
 Mi, wöch., 09:15 - 10:45, Marienstraße 7 B - Projektraum 301

**Kommentar**

**Dynamics:** Single and multidegree-of-freedom systems, frequency response function, Impulse response function, Duhamel integral, step-by-step methods, modal analysis, modal superposition, continuous systems, applications;

**Baudynamik:** Ein- und Zweifreiheitsgradsystem, Frequenzgangfunktion, Impulsreaktionsfunktion, Duhamel-Integral, Zeitschrittverfahren, Modalanalyse, modale Superposition, kontinuierliche Systeme, Anwendung.

**Voraussetzungen**

Bachelor Civil Engineering

**Leistungsnachweis**

Klausur oder mündliche Prüfung

**Geo- and hydrotechnical engineering****Examination "Soil mechanics" (Modul: Geo- and hydrotechnical engineering)****K. Witt, F. Wuttke**

Prüfung

Di, Einzel, 09:00 - 11:00, Coudraystraße 11 C - Seminarraum (geologische Sammlung) 202, 18.02.2014 - 18.02.2014

**Geographical Information Systems (GIS) and building stock survey****Geographical information systems (GIS) and building stock survey**

**W. Schwarz, J. Schwarz**

Veranst. SWS: 4

Integrierte Vorlesung

Mo, wöch., 15:15 - 18:30, Marienstraße 7 B - Seminarraum 205

Mo, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 301

**Leistungsnachweis**

Project report + oral presentation

**Hazard projects and advanced geotechnologies****Examination "Hazard projects and advanced geotechnologies"****J. Schwarz**

Prüfung

Fr, Einzel, 13:00 - 16:00, Marienstraße 7 B - Seminarraum 205, 21.02.2014 - 21.02.2014

**Life-lines engineering****Life-lines engineering****G. Morgenthal, C. Könke**

Veranst. SWS: 4

Integrierte Vorlesung

Mo, wöch., 13:30 - 16:45, Marienstraße 7 B - Seminarraum 102

Mo, wöch., 13:30 - 16:45, Marienstraße 7 B - Projektraum 301

Do, wöch., 11:00 - 12:30, Marienstraße 7 B - Seminarraum 102

**Kommentar**

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

**Leistungsnachweis**

Klausur oder mündliche Prüfung

**Primary hazards and risks****Examination "Seismic Monitoring ..."****J. Schwarz**

Prüfung

Fr, Einzel, 09:00 - 12:00, Marienstraße 13 C - Hörsaal C, 14.02.2014 - 14.02.2014

**Primary hazards and risks - Seismic Monitoring / Regional Ground Motion Prediction and database /****J. Schwarz**

Veranst. SWS: 4

Integrierte Vorlesung

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

**Kommentar**

## Seismic Monitoring

measurements for site response evaluation; description of seismic action; recording instruments and input models for seismic hazard assessment; EQ-Action for building design; Building Monitoring Systems: tasks and developments, review of database

## Regional Ground Motion Prediction and database

Identification of Primary input hazard parameters; Ground Motion Prediction Models (GMPM) for different study area; elaboration of ground motion data and records; Application of ground motions models and tools to the study area; re-interpretation of national code background; tool: MATLAB

**Leistungsnachweis**

1 exam (written or oral - weighting acc. to credit points)

### Primary hazards and risks - Wind Risk Mitigation in Structural Engineering

**J. Schwarz**

Veranst. SWS: 2

Integrierte Vorlesung

Do, Einzel, 09:00 - 18:00, Marienstraße 7 B - Seminarraum 205, 27.03.2014 - 27.03.2014

Fr, Einzel, 09:00 - 18:00, Marienstraße 7 B - Seminarraum 205, 28.03.2014 - 28.03.2014

Sa, Einzel, 09:00 - 13:00, Marienstraße 7 B - Seminarraum 205, 29.03.2014 - 29.03.2014

Mo, Einzel, 13:00 - 15:00, 31.03.2014 - 31.03.2014

**Kommentar**

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 exam (written or oral - weighting acc. to credit points)

### Disastermanagement and mitigation strategies

#### 1432220 Urban Sociology (Introduction)

**F. Eckardt**

Veranst. SWS: 2

Vorlesung

Mo, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal C, 14.10.2013 - 31.01.2014

**Kommentar**

This lecture introduces the key ideas of urban sociology. It will deliver a first understanding of the most important scholars in urban sociology from the classics (Simmel, Weber, Chicago School) to today's research. It provides furthermore a reading of historical approaches to urban studies in Germany and a reflection on important aspects of recent urban development (segregation, gentrification, multiculturalism). It pays special to the sociology of cities in disaster situations.

**Leistungsnachweis**

Hausarbeit

**1432220 Urban Sociology (Introduction)**

**F. Eckardt**

Veranst. SWS: 2

Prüfung

Mi, Einzel, 15:15 - 16:45, Marienstraße 13 C - Hörsaal A, 12.02.2014 - 12.02.2014

**Leistungsnachweis**

**Disaster Management**

**H. Bargstädt**

Veranst. SWS: 3

Integrierte Vorlesung

Fr, Einzel, 14:30 - 19:30, Marienstraße 7 B - Seminarraum 206, 29.11.2013 - 29.11.2013

Sa, Einzel, 09:15 - 15:00, Marienstraße 7 B - Seminarraum 205, 30.11.2013 - 30.11.2013

Fr, wöch., 09:15 - 12:30, Marienstraße 7 B - Seminarraum 205

**Bemerkung**

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

Part "Mitigation strategies" --> see lecture "The Sociology of Risk"

**Kommentar**

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 (theoretical and on the basis practical examples)

Consolidate of knowledge in handling a project management soft-ware

Additional: Lecture of "The Sociology of Risk"

**Leistungsnachweis**

Klausur oder mündliche Prüfung

**Examination "Project- and disaster management"**

**H. Bargstädt**

Prüfung

Di, Einzel, 15:00 - 16:30, Coudraystraße 13 A - Hörsaal 2, 25.02.2014 - 25.02.2014

**Stochastics and risk assessment**

**Exam "Stochastics and Risk Assessment - Part: Signal Analysis"**

**K. Markwardt**



Prüfung

Mi, Einzel, 10:00 - 11:00, Coudraystraße 13 A - Hörsaal 2, 19.02.2014 - 19.02.2014

**Stochastics and Risk Assessment - Mathematical simulation / Risk problems**

**T. Lahmer, K. Müller**

Veranst. SWS: 4

Vorlesung

Mo, wöch., 13:30 - 15:00, Risk problems: Hörsaal 6, C9A, 14.10.2013 - 25.11.2013

Di, wöch., 15:15 - 16:45, Risk problems: Hörsaal 2, C13A, 15.10.2013 - 26.11.2013

Mo, wöch., 13:30 - 15:00, Marienstraße 7 B - Seminarraum 205, Mathematical simulation, 02.12.2013 - 03.02.2014

Di, wöch., 15:15 - 16:45, Marienstraße 7 B - Seminarraum 205, Mathematical simulation, 03.12.2013 - 04.02.2014

**Kommentar**

Introduction to probability theory: Random events, discrete and continuous random variables; Descriptive statistics: parameters of one- and twodimensional samples, graphical representation of samples; Exploratory statistics: statistical tests and parameter estimation; Reliability theory: extreme value distributions; stochastic modeling with software tools like Matlab, Octave, Excel or R.

Characteristics and classification of random functions, which are necessary for risk analysis; catastrophic events and risk problems; hazard / risk / safety / reliability / damage / cost and fuzzy models; life time consideration; analysis by logic trees and charts (fault trees, event trees, cause/consequence charts, decision trees); risk assessment and risk acceptance.

**Leistungsnachweis**

Klausur oder mündliche Prüfung

**Stochastics and Risk Assessment - Signal Analysis**

**K. Markwardt**

Veranst. SWS: 2

Vorlesung

Mi, wöch., 13:30 - 15:00, Marienstraße 7 B - Seminarraum 205

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

Mi, wöch., 15:15 - 16:45, Marienstraße 7 B - Seminarraum 206

**Leistungsnachweis**

Klausur oder mündliche Prüfung

**Structural engineering**

**Structural engineering**

**G. Morgenthal**

Veranst. SWS: 6

Vorlesung

Di, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 301, ab 12.11.2013

Di, wöch., 13:30 - 15:00, Marienstraße 7 B - Seminarraum 205

Do, wöch., 13:30 - 16:45, Marienstraße 7 B - Seminarraum 205

**Elective compulsory modules**

**Advanced Modeling – CAE**

**K. Gürlebeck, K. Markwardt**

Veranst. SWS: 4

Vorlesung

Di, wöch., 09:15 - 10:45, Coudraystraße 13 B - Seminarraum 210

Di, wöch., 11:00 - 12:30, Coudraystraße 13 B - Seminarraum 210

Di, wöch., 11:00 - 12:30, Coudraystraße 13 D - Pool-Raum 010

**Kommentar**

Students will have experience in Computer Aided Engineering (CAE) by establishing a problem specific model on the basis of a mathematical formulation, an applicable solution technique, design of efficient data structures and software implementation.

Konvergenz, Stabilität und Fehlerbetrachtung der Finiten-Differenz-Methode (FDM),

Modellierung stationärer und instationärer Wärmeleitprobleme

Konzepte der objekt-orientierten Programmierung: Modellbildung (UML), abstrakte Klassen und Methoden, Interfaces

Entwurf und Entwicklung eines Framework für Anwendungsentwicklung nach der Methode der Finiten Elemente (FEM)

Anwendungsentwicklung auf Basis des FEM-Framework

**Voraussetzungen**

FEM + Struct. Dyn., Adv. Mod.-Calc.

Programming in Java

**Leistungsnachweis**

1 exam (written or oral)

**Examination "Modelling of structures and numerical simulation"****F. Werner, F. Scheiber**

Prüfung

Mi, Einzel, 13:00 - 15:00, Room 206 (M7), 12.02.2014 - 12.02.2014

**Examination "Secondary hazards and risks"****K. Witt**

Prüfung

Fr, wöch., 13:00 - 15:00, Coudraystraße 11 C - Seminarraum (geologische Sammlung) 202, 14.02.2014 - 14.02.2014

**Fundamentals of structural health monitoring (SHM) and intelligent structural systems****K. Smarsly, E. Tauscher, J. Wagner**

Integrierte Vorlesung

Mi, wöch., 09:15 - 12:30, Coudraystraße 13 D - Pool-Raum 010

**Bemerkung**

Please note: Time and location will be announced. Enrollment must be done online. **Information on how to enroll will be provided in the first lecture.**

#### Kommentar

Structural health monitoring (SHM) and smart structural systems, also referred to as “smart structures” or “intelligent infrastructure”, are primary subjects of this course: Basic principles of modern SHM are taught; also, concepts of smart structural systems, which are capable of self-assessing their structural condition with a certain degree of intelligence, are elucidated in more detail. Measuring techniques, data acquisition systems, data management and processing as well as data analysis algorithms will be discussed. Furthermore, approaches towards autonomous and embedded computing, to be used for continuous (remote) monitoring of civil infrastructure, are presented. Throughout the course, a number of illustrative examples is shown, demonstrating how state-of-the-art SHM systems and smart structural systems are implemented. In small groups, the students design structural health monitoring systems that are validated in the field. The outcome of every group is to be documented in a paper, which is graded, together with an oral examination, at the end of the course. No previous experience in the above fields is required by the students; limited enrollment.

#### Voraussetzungen

Object-oriented modeling and Java programming language.

#### Leistungsnachweis

Oral examination and written paper.

### Nonlinear Analysis of Structures under Extreme Loading

#### G. Morgenthal, H. Timmler

Veranst. SWS: 4

Integrierte Vorlesung

Fr, Einzel, 09:15 - 12:30, Marienstraße 7 B - Seminarraum 205, 29.11.2013 - 29.11.2013

Fr, wöch., 13:30 - 16:45, Marienstraße 7 B - Seminarraum 205

Fr, wöch., 15:15 - 16:45, Marienstraße 7 B - Projektraum 301

#### Kommentar

Geometrically and physically nonlinear analysis of steel- and RC-structures under extreme loading; energy and numerical methods;

basics of modeling of structures and loads; nonlinear material behavior; stability and large deformations of beam structures; capacity design of seismically loaded RC-structures

#### Voraussetzungen

B. Sc.

Mechanics

#### Leistungsnachweis

1 exam (written or oral)

### Risk projects and evaluation of structures

#### J. Schwarz

Veranst. SWS: 4

Integrierte Vorlesung

Do, wöch., 13:30 - 16:45, Marienstraße 7 B - Seminarraum 103

Do, wöch., 13:30 - 16:45, Marienstraße 7 B - Projektraum 301

**Kommentar**

Risk mitigation projects

German TaskForce for Earthquake and lessons from recent missions; reinterpretation of case studies for different building types; evaluation of damaged structures, basics of tagging; Rehabilitation strategies and applied reconstruction techniques; design concepts; regional seismic risk assessment projects; damage scenarios, and loss prediction; results from Global Earthquake Model (GEM)

Evaluation and Re-Design of structures

Empirical and analytical vulnerability assessment for representatives of typical building types; identification of structural, non structural and structural affecting systems; replacement and up-grading of existing systems, performance- and scenario-based evaluation of structural damage; definition of critical conditions for simplified approaches; modeling and analysis of strengthened systems.

training in calculation tools Perform3D / 3Muri

**Voraussetzungen**

B.Sc.

Primary Hazards and risks; Earthquake engineering and structural design/ GIS

**Leistungsnachweis**

1 exam (written or oral)

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

**K. Witt, F. Wuttke**

Veranst. SWS: 4

Integrierte Vorlesung

Mo, Einzel, 09:15 - 10:45, Coudraystraße 11 C - Seminarraum (geologische Sammlung) 202, 21.10.2013 - 21.10.2013

Fr, wöch., 13:30 - 18:30, Coudraystraße 11 C - Seminarraum (geologische Sammlung) 202, 5 dates -> see message board

**Kommentar**

Mass Movements: Classification, Landslides in Soil & Rock, Landslide hazards, Slope-Stability- Analysis, Slope Monitoring & Investigation, Slope Control, Stabilization; Problem Soils: Quick clays, Expansive and Collapsible soils

Geotechnical Earthquake Engineering: Assessment of Liquefaction potential, Amplification studies and site effects & topography, Seismic bearing capacity, Seismic design of retaining walls & Seismic earth pressure

**Voraussetzungen**

Geo- and hydrotechnical Engineering (Soil Mechanics)

**Leistungsnachweis**

1 exam (written or oral)