Module Handbook

Programme

Civil and Construction Engineering
(Master)

Faculty

Civil Engineering
Deggendorf Institute of Technology

Contents

Module M 1-1 Building Law I

Module name	Building Law I
Module no.	M 1-1
Module head	-
Major field	-
Course number and course name	M 1-1 Building Law I
Instructors	-
Semester	1
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent Study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Basic knowledge of building and construction law
Teaching and learning methods	Projector-assisted lecture
Further information	-
Type of examination	Written exam, 90 min. or oral exam, 15 - 45 min.

Learning objectives

The students are familiar with the key areas of construction contract law; particularly the contents of the three parts of the German Construction Tendering and Contract Regulations (VOB) and its connection to the tendering guidelines of the Act Against Restraints of Competition (GWB) and local codes. Students are familiar with key principles of construction contracting law (e.g. finalising, content and termination of work contracts). Furthermore, they are familiar with the legal requirements for temporary construction workers (especially the Temporary Workers Act, AÜG) as well as the requirements when hiring foreign workers.

Skills:
The students are capable of transferring the knowledge gained in class to cases in practice.
Competencies:
The students are able to apply the skills and knowledge gained in the course in their future work as supervisors and in a team and thus demonstrate social competence as well.

Content

Entering into and implementing building contacts
- Key points of the German Construction Tendering and Contract Regulations (VOB) Part B
- Content and application of the ATV DIN 18299-18459 industrial standard of the VOB Part C
- Tendering Law in the european and national context, particularly Sections 1 and 2 of the VOB Part A with a focus on “alternative proposals / tenders”
- closing permanent and temporary work contracts
- Legal questions of the German General Equal Treatment Act (AGG)
- Permitted content of Form Employment Contracts
- Terminating working contracts through a Notice of Dismissal
- Finalising and content of Severance Agreements
- Key features of temporary workers hiring
- Features of temporary workers specific to construction
- Hiring foreign workers through agencies in consideration of special requirements based on EU membership

Recommended literature

Englert/Katzenbach/Motzke, Beck`scher VOB-Kommentar, Teil C
Langenecker/Maurer, Handbuch des Bauarbeitsrechts
Schalk, Nebenangebote im Baurecht
Script to accompany the lecture; legal texts

Module M 1-2 Geodetic Surveying

Module name	Geodetic Surveying
Module no.	M 1-2
Module head	-
Major field	-
Course number and course name	M 1-2 Geodetic Surveying
Instructors	-
Semester	1
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Bachelor modules B2-VK1; B3-VK2
Teaching and learning methods	Multimedia lecture
Further information	-
Type of examination	Written exam 90 min

Learning objectives

Through the lecture, students will become familiar with various methods of geodetic surveying; in the context of listed heritage buildings as well as projects in the fields of infrastructure, building engineering and civil engineering. Students will deepen the knowledge gained through practical work on concrete case studies.

Content

Fundamentals / Motivation
Reference systems and coordinates
Documenting buildings and building structures:
Official documentation, 3D descriptions
Recording measurements:
Measuring principles, devices and instruments

Measurement Methods
Manual measurements, tachymetric procedures, terrestrial laser scanning, airborne laser scanning, GNSS
Geodetic project management:
Task analysis, measurement planning, measurement recording, processing
Developments and projects:
Geodetic survey of concrete examples from the building and construction industry; data flow from data gathering to analysis
Excursions and external expert lectures

Recommended literature

DIN 18710 1-4: Ingenieurvermessung. Berlin, 2002.
Resnik, B.; Bill, R.: Vermessungskunde für den Planungs-, Bau-und Umweltbereich. ISBN 3-87907-355-4, Verlag Wichmann.

Module M 1-3 Bridges – Design and Construction

Module name	Bridges – Design and Construction
Module no.	M 1-3
Module head	-
Major field	-
Course number and course name	M 1-3 Bridges - Design and Construction
Instructors	-
Semester	1
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0

ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Basic knowledge of building and construction law
Teaching and learning methods	Seminar-style lesson with practice exercises
Further information	-
Type of examination	Written exam 90 min

Learning objectives

Knowledge:
The students should become familiar with the design principles, structural systems and construction methods of bridge engineering
Skills:
The students are able to design and construct bridges
Competencies:
The students can construct the key elements of bridge structures, taking into consideration structural, economic and aesthetic aspects.

Content

Overview of the Key Principles:
Development, terms and concepts, building components, history, legal specifications and standards, literature
Load Calculation for Bridge Structures:
Loads according to DIN Technical Report 101 (new structures) - Loads according to DIN 1072 (existing structures)

Designing the Load-Bearing Structure:
Horizontal load-bearing systems (panel cross-sections, T-beam cross-sections, box girder profiles)
Vertical load-bearing systems (beam bridges, frame bridges, arch bridges)

Construction Methods
Construction methods with in-situ concrete, centring, scaffolding, cantilever, incremental launch, special construction methods and construction methods with prefabricated components

Substructures for Solid Bridges
Abutment, pier, stay, shallow foundations, deep foundations

Bearings, Expansion Joints, Structure
Bridge bearings, specifications, arrangement of bearings, motion resistance, expansion joints, special bridge structures, coping and sealing, drainage, traffic equipment and railings

Forms of Prestressing in Bridge Engineering

Pre-tensioned concrete, bonded post-tensioned concrete, unbonded post-tensioned concrete, external prestressing

Recommended literature

Leonhardt, F.: Vorlesungen über Massivbau, Teil 6, Grundlagen des Massivbrückenbaus Springer-Verlag
Holst, K.-J.: Brücken aus Stahlbeton und Spannbeton, Ernst & Sohn

Module M 1-4 Listed Heritage Buildings

Module name	Listed Heritage Buildings
Module no.	M 1-4
Module head	-
Major field	-
Course number and course name	M 1-4 Listed Heritage Buildings
Instructors	-
Semester	1
Length of module	1 semester
Module frequency	-
Status in curriculum	Mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	-
Teaching and learning methods	Seminar-style lesson, group work, projector
Further information	Student performance record or student assignment
Type of examination	Written exam 90 min

Learning objectives

20% of all built structures are historical buildings built before 1945. These structures are under special protection; thus a special and sensitive approach to their restoration, renovation or replacement is needed. The student should be familiarised with the specific building materials and construction techniques of old historic buildings. He or she is able to recognize and identify the difference between historic buildings and other existing structures. He or she can evaluate symptoms of deterioration and damage, and is able to suggest and lead special methods of inspection and develop appropriate and sensitive restoration measures. Structural considerations are of particular importance. He or she is familiar with the legal situation and the appropriate contact persons in dealing with heritage buildings and knows the suitable laboratories and businesses to

turn to.

Content

- Historical buildings - types
- Special features
- Recognise and classify historical building components
- Protection of historic buildings and monuments
- Historical construction, techniques and materials
- Material properties
- Damages to historic buildings, procedures and approaches
- Laboratory tests
- Restoring historical buildings:
- Masonry walls and historical mortars, wooden structures, finishings and plasters
- Restoration companies, planning companies, specialised engineers, laboratories and art historians will be integrated into the course.

Recommended literature

Booklets from the University of Karlsruhe, Special Research Field (SFB) 315

Module M 1-5 Earthworks

Module name	Earthworks
Module no.	M 1-5
Module head	Prof. Dr. Volker Wirth
Major field	-
Course number and course name	M 1-5 Earthworks
Instructors	-
Semester	1
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Basic knowledge of construction management and geotechnics
Teaching and learning methods	Projector-supported lecture
Further information	The final grade will be determined by student performance certificates
Type of examination	Written exam 90 min

Learning objectives

Knowledge:
Basic knowledge of the particulars of earthworks in construction management as well as knowledge of earthworks-specific tools of geotechnics.
Skills:
In the context of exercises, the students are able to directly transfer the knowledge gained to examples relevant in practice:
- Requests for tender in compliance with German Construction Tendering and Contract Regulations (VOB), (e.g. additional parameters for soil classes 6 and 7)
- Geotechnical supervision in construction
- Statements of account in compliance with the VOB (e.g. permitted approximation methods for quantity calculations
Competencies:
Through group-oriented work on case studies, students develop an awareness of the risks and special considerations of earthworks. They become acquainted with the geotechnical construction techniques and concepts necessary to solve management problems specific to earthworks.

Content

Construction Management:
- Earthworks from a Management Perspective: typical cases in practice, VOB rules
Case study Soil Improvement: Calls for tender with free text, disputes over account statements, price types
Case Study Rock Milling: incomplete call for tender, cooperation between contractor and client, contractor claims
Case Study Conflict Management: inconsistent soil values from client and contractor; clash between client and contractor, crisis management, role-play
Geotechnics:
Ground surveying and subsoil investigations, examination of construction projects and measures
Classic earthworks in consideration of subsoil types and classes, backfill areas
Assembly and compaction controls (incl. Additional Technical Terms of Contract and Guidelines for Earthworks in Road Construction, ZTVE-StB as well as RIL 836)
Earthworks with bonding agents for stabilisation
Subsoil improvements - subsoil replacement, preloading and overstressing, in-depth compaction etc.
Geotextile Reinforcement Construction Methods - base courses, retaining structures

Recommended literature

Wirth: Lecture Script “Construction Management in Earthworks”
VOB: German Construction Tendering and Contract Regulations
STLB Standard Services Book for Construction Engineering and the New Standard Services Book for Construction
STLK - Standard Specifications Catalogue for Road and Bridge Construction, Research Society for Roads and Transportation

LB STB By - Specifications for Street and Bridge Construction Tenders in Bavaria, The Bavarian Ministry of the Interior, for Building and Transport
Floss (2006): ZTVE - Kommentar mit Kompendium Erd- und Felsbau; Kirschbaum-Verlag
Smoltczyk(Hrsg.): Grundbautaschenbuch Band1, 6-te Auflage 2001,Ernst & Sohn, Berlin.
Standards and rules documents
Course Script (with further readings)

Module M 1-6 Seismic Engineering - Fundamentals

Module name	Seismic Engineering – Fundamentals
Module no.	M 1-6
Module head	-
Major field	-
Course number and course name	M 1-6 Seismic Engineering – Fundamentals
Instructors	-
Semester	1
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Fundamentals of Structural Dynamics
Teaching and learning methods	Lecture with overhead projector and whiteboard
Further information	The final grade will be determined by course work certificates
Type of examination	Written exam 90 min

Learning objectives

The students will become familiarised with important seismological principles and key connections between earthquake measurements, load-bearing capacity and ductility. Furthermore, they should gain the ability to design simple earthquake-resistant structures, perform calculations using common calculation methods, and carry out measurements and constructive detailing based on and the principles of a capacity measurement.

Content

Introduction to seismological principles, design and measurement concepts for the earthquake-resistant design of buildings

In detail:
Seismological fundamentals: types and characteristics of earthquakes; earthquake scales; seismological and engineering-based analyses, epicentre, depth of focus, magnitude, intensity, physical parameters, time courses, response spectrums
Earthquake-resistant design of simple buildings: structural properties, structure types, basic design principles, structural deformations, ductility classes, load-bearing capacity and calculated ductility, earthquake calculations
Calculation methods: structural vibrations, response spectrum method, time-history analysis, calculation of high-rise structures
Calculation and structural design: methods of capacity calculation, failure mechanisms, post-limit stiffness, capacity calculation, application to various structural systems and building types

Recommended literature

Bergmeister, K.; Wörner, J.-D. (Hrsg.): Betonkalender 2008, Schwerpunktthema: Erdbebensicheres Bauen, Ernst & Sohn.
Meskouris, K.; Hintzen, K.-G.: Bauwerke und Erdbeben, 2. erw. und akt. Aufl. mit Anwendungen nach DIN 4149:2005; Vieweg & Sohn, 2007.
Bachmann, H.: Erdbebensicherung von Bauwerken; Birkhäuser, 1995.
Paulay, T.; Bachmann, H.; Moser, K.: Erdbebenbemessung von Stahlbetonhochbauten; Birkhäuser, 1990.
Müller, F.P.; Keintzel, E.: Erdbebensicherung von Hochbauten; Ernst & Sohn, 1984.
Paulay, T.; Priestley, M.J.N.: Seismic Design of Reinforced Concrete and Masonry Buildings; Wiley & Sons, 1992.
Pocanschi, A.; Phocas M. C.: Kraefte in Bewegung, Die Techniken des erdbebensicheren Bauens, Teubner, 2003
DIN 4149:2005-04: Bauten in deutschen Erdbebengebieten. Eurocode 8: Design of structures for earthquake resistence, Part 1-6.
Skinner, R.I.; Robinson, W.H.; McVerry, G.H.: An Introduction to Seismic Isolation, Wiley & Sons, 1993.
Port and Harbour Research Institute, Japan (Ed.): Handbook on Liquefaction Remediation of Reclaimed Land, Balkema, 1997.
Print-outs from the lecture (with list of further readings)

Module M 1-7 Risks in Geotechnics

Module name	Risks in Geotechnics
Module no.	M 1-7
Module head	Prof. Bernhard Peintinger
Major field	-
Course number and course name	M 1-7 Risks in Geotechnics
Instructors	-
Semester	1
Length of module	-
Module frequency	-
Status in curriculum	mandatory

Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 60.0 hours Independent study: 30.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Basic knowledge of mechanical properties of soil and bedrock; calculation and design of geotechnical structures
Teaching and learning methods	Tele-teaching
Further information	The final grade will be determined by course work certificates
Type of examination	Written exam 90 min

Learning objectives

Based on previously-gained knowledge in calculating and designing geotechnical building structures, students should gain an awareness of the risks in geotechnics which result from insufficient site investigation as well as from inaccurate or a lack of calculation models.

Content

- causes of damages and minimizing damages in civil engineering works
- types and extent of site investigation based on the DIN 4022 standard
- rock layer joints, rock layer surveying, rock classification for constructional purposes in road works
- completing a subsoil report as a student assignment
- calculation models and their accuracy using the example of excavations; serviceability limit states 1 and 2
- observation methods
- measuring techniques
- estimating probabilities (Monte Carlo methods)

Recommended literature

Hrsg: Institut für Bauforschung e.V., Victor Rizkallah: Bauschäden im Hoch- und Tiefbau, Band 1: Tiefbau, Fraunhofer IRB, Stuttgart 2007
Risiken in der Geotechnik, Lectures at the TU Munich, not yet published

Module M 1-8 Structural Design and Economic Efficiency in Construction and Maintenance

Module name	Structural Design and Economic Efficiency in Construction and Maintenance
Module no.	M 1-8
Module head	Prof. Konrad Deffner
Major field	-
Course number and course name	M 1-8 Structural Design and Economic
Instructors	-
Semester	1
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Knowledge of basic rules and regulations in building construction and technical drawing
Teaching and learning methods	Lecture with overhead projector, whiteboard
Further information	The final grade will be determined by course work certificates
Type of examination	Written exam 90 min

Learning objectives

Insight into the complexity of parameters in building planning and their mutual interdependence
Deepening of knowledge of constructional norms, rules and legalities and the correlation between the planning parameters of function, floor plan organisation, economic efficiency and construction
In-depth knowledge of primary structural systems and secondary structure, their static and physical functions and interdependence as well as aspects of architectural design
Ability to assess complex planning concepts and to develop and implement building plans in cooperation with other actors in building planning.

Content

- overview of simple principles of function, form, construction and economic efficiency of buildings
- overview of primary structure types
- overview of constructional systems of building interiors

- overview of the constructive systems of foundation and earth contacting building elements
- overview of the constructive systems of flat roofs
- overview of the constructive systems of facades
- overview of the mutual interdependence and correlation between constructive systems

Recommended literature

Andrea Deplazes (Hrsg.): Architektur Konstruieren vom Rohmaterial zum Bauwerk, Birkhäuser, 2005, Basel
Walter Belz: Zusammenhänge bemerkungen zur Baukonstruktion und dergleichen,
Rudolf Müller, 1993, Köln
Leicher: Tragwerkslehre in Beispielen und Zeichnungen, Werner, 2002, Düsseldorf
Dierks, Schneider, Wormuth: Baukonstruktion, Werner, 2002, Düsseldorf
Döring, Meschke, Kind-Barkauskas, Schwerm: Fassaden Architektur und Konstruktion mit Betonfertigteilen,
Verlag Bau +Technik, 2000, Düsseldorf
Schittich (Hrsg.): Gebäudehüllen Konzepte Schichten Material, Birkhäuser, 2001, Basel / München
Eisele Staniek (Hrsg.): Bürobau Atlas, Callway, 2005, München
Lehrstuhl für Baukonstruktion und Entwerfen RWTH Aachen: Arbeitsblätter zur Baukonstruktion,
Wissenschaftsverlag Mainz, 1999, Aachen
Detail, Zeitschrift für Architektur,
Institut für internationale Architekturdokumentation, München
- current publications
- supplementary materials, DIT server

Module M 1-9 Advanced Soil Mechanics

Module name	Advanced Soil Mechanics
Module no.	M 1-9
Module head	-
Major field	-
Course number and course name	M 1-9 Soil Mechanics
Instructors	-
Semester	1
Length of module	-
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Basic knowledge of soil mechanics and geotechnics
Teaching and learning methods	Lecture with overhead projector and computer exercises
Further information	The final grade will be determined by course work certificates
Type of examination	Written exam 90 min

Learning objectives

The students will become familiar with non-linear substance properties and behaviour of subsoil. Without an understanding of which, it is hardly possible to successfully, efficiently and sustainably restore buildings with foundation damages.

Furthermore, basic principles of stress and deformation correlations and of limit states in subsoil will be imparted.

Building on this, students will learn how key parameters for modelling are determined.

To supplement the lecture, the concepts learned will be transferred to practical exercises and examples using computer programmes. Furthermore, knowledge will be deepened through concrete projects. In this way, students will gain methodological skills and competencies in order to systematically approach and manage complex problems which arise in practice-relevant situations.

Content

Delayed compression: consolidation of single and multi-layer soils, consolidation conditions (equivalent stresses, normal and over-consolidation), secondary

settlement (creep), viscosity (toughness)
Triaxial stress / deformation behaviour: test types (CD, CU, UU), stress path and stress-strain curves, dilatancy and contractancy, softening and residual shear strength, shear strength of normal and over-consolidated soils, velocity-dependent behaviour,
list of cyclic tests.
Plastic failure of soils: static and kinematic collapse theorem, initial and end stability, stress fields and flow velocity, kinematic load and stability calculation, compound fracture mechanisms
Finite stress-strain behaviour, flow rules, relation between stiffness and stress, models: Mohr-Coulomb theory, Cam-Clay (soft soil), Small-Strain model, determining parameters for models
Supplementary exercises on the computer: load capacity of foundations, load-subsidence behaviour of dams, deep foundations, stability of embankments, lateral earth pressure calculations, etc.

Recommended literature

Smoltczyk(Hrsg.): Grundbautaschenbuch Band1, 6-te Auflage 2001,Ernst & Sohn, Berlin.
Gudehus, G. (1981): Bodenmechanik, Enke Verlag.
Powrie, W. (1997): Soil Mechanics ? Concept and Applications; Spon Press, London and New York.
Kolymbas, D. (1998): Geotechnik ?Bodenmechanik und Grundbau; Springer Verlag, Berlin Heidelberg New York.
Lancelotta (1995): Geotechnical Engineering; Balkema.
Potts & Zdravkovic (2001): Finite Element Analysis in Geotechnical Engineering I + II; Thomas Telford, London.
Plaxis-Manual.
Empfehlungen der AK Numerik der DGGT, Essen. Normen und Regelwerke
Script to accompany the lectures

Module M 1-10 Numerical Methods

Module name	Numerical Methods
Module no.	M 1-10
Module head	-
Major field	-
Course number and course name	M 1-10 Numerical Methods
Instructors	-
Semester	1
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Basic knowledge of programming (VBA)
Teaching and learning methods	Lecture / e-Learning course (teleteaching) with computer exercises
Further information	The final grade consists of: Student work: 1 written assignment Examination: 1 written exam, 90 – 180 minutes or oral examination: 15 – 45 minutes
Type of examination	Written exam 90 min

Learning objectives

Students should understand how structural mechanics algorithms function and gain insight into the convergence behaviour of numerical approximation methods. Solutions are found on the basis of independently developed as well as available (software) tools.
A further learning objective is to be able to transfer theoretically developed, computer-oriented numerical methods into a programme. The key point here is to teach the difference between analytical and numerical processes and the significance of numerical processes in mechanical engineering.

Content

Iteration methods: fixed-point interation; Newton-Raphson-Iteration, practical examples from mechanical engineering
Eigenvalue calculation: introductory example; eigenvalue and stability; numerical eigenvalue calculation, examples of accompanying and linearised eigenwert analyses

Graph curves: iterative and incremental development
Solving systems of linear equations: direct solution methods; iterative solution methods
Computer-oriented numerical methods:
Iterative methods: theory and programming based on Excel-VBA
Rigid body fraction methods:
Introduction to the kinematic element method and its application in geotechnics: geometric and mechanical model, discretization
Example: Developing proposals for repairing a dam taking the current into consideration

Recommended literature

Script to accompany the lecture with a list of required readings

Module M 1-11 Structural Dynamics in Practice

Module name	Structural Dynamics in Practice
Module no.	M 1-11
Module head	-
Major field	-
Course number and course name	M 1-11 Structural Dynamics in Practice
Instructors	-
Semester	1
Length of module	-
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	-
Teaching and learning methods	Lecture primarily in the form of a tele-teaching course
Further information	The final grade will be determined by course work certificates
Type of examination	Written exam 90 min

Learning objectives

The students will gain an understanding of the basic principles of structural dynamics and their significance in building practice. They will learn to evaluate dynamic problems, develop constructive solutions, and avoid dynamics-related damages.

The scientific approach of the students will be encouraged through dealing with complex theoretical principles, abstract mechanical models and their practical application. Their active participation in lectures which take place primarily on a communication platform of the German Research Network (DFN) enable the students to work with future-oriented communication technology.

Content

overview of basic dynamic problems in the building industry
- measuring technology and signal analysis in the building industry
- constructions methods for buildings in earthquake-prone areas
- building vibration: causes, prognosis and estimations
- Determining dynamic loads for buildings as a result of wind; constructive measures to reduce these loads
- Vibration Isolation

Recommended literature

- Achmus, M., Kaiser, J., tom Wörden, F. (2004): Bauwerkserschütterungen durch Tiefbauarbeiten. Bericht 20 der Informationsreihe des Instituts für Bauforschung e.V., Hannover.
- Clough, Penzien: Dynamics of Structures (McGraw-Hill-Verlag)
- Deutsche Bahn AG: Körperschall und Erschütterungsschutz, Leitfaden für den Planer.
- Eibl, Häussler-Combe: Baudynamik, Betonkalender 1997/II (Verlag Ernst & Sohn)
- Flesch: Baudynamik praxisgerecht, Band 1 und 2 (Bauverlag)
- Gross, Hauger, Schnell: Technische Mechanik, Band 3 ? Kinetik (Springer Verlag)
- Grundmann, et. al.: Einführung in die Baudynamik (Mitteilungen Institut für Bauingenieurwesen, TUM)
- Kramer: Angewandte Baudynamik (Verlag Ernst & Sohn)
- Lehrstuhl für Nachrichtentechnik , Technische Universität München: Lerntutorial ?Signaldarstellung?.
- Neuner, Springer: Grundlagen der Baudynamik (Skriptum, FH Deggen und FH Regensburg)
- Petersen: Dynamik der Baukonstruktionen (Vieweg-Verlag)
- Pocanschi, Phocas: Kräfte in Bewegung (Teubner-Verlag)
- Ruscheweyh: Dynamische Windwirkung an Bauwerken, Band 1 und 2 (Bauverlag)

Module M 1-12 Building Safety

Module name	Building Safety
Module no.	M 1-12
Module head	-
Major field	-
Course number and course name	M 1-12 Building Safety
Instructors	-

Semester	1
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Basic knowledge of programming (VBA)
Teaching and learning methods	Lecture with beamer and whiteboard
Further information	Final grade in the form of a student performance record
Type of examination	Written exam 90 min

Learning objectives

Knowledge:
Fundamentals of safety theory
Skills:
The students are able to transfer the knowledge gained to practical examples in the form of exercises
Competencies:
The students develop social skills through group-oriented work on projects and assignments

Content

Causes of building collapse
- Danger analysis
- Elements of probability theory, interpreting samples, distributions, functions of random variables
- Models for loads and stability factors
- Reliability of elements and systems
- Cases in practice (tunnels, high rise buildings)

Recommended literature

Schneider, J.: Sicherheit und Zuverlässigkeit im Bauwesen, vdf Verlag (deutsch und englisch), 1996.
U Kersken-Bradley, M. and Diamantidis, D.: Sicherheit der Baukonstruktionen. Handbuch der Sicherheitstechnik, Carl Hanser Verlag, 1985.
Joint Committee on Structural Safety (JCSS), Assessment of Existing Structures, RILEM Publications S.A.R.L., edited by D. Diamantidis, 2001.
Rackwitz R.: Optimization and Risk Acceptability based on the Life Quality Index. Structural Safety, 24, 297-331, 2002.
Structural Safety, 24, 297

Joint Committee on Structural Safety (JCSS), Probabilistic Model Code, www.jcss.ethz.ch
Print-outs from the lectures

Module M 1-13 Water Management and Sanitation – Maintenance and Retrofitting

Module name	Water Management and Sanitation – Maintenance and Retrofitting
Module no.	M 1-13
Module head	-
Major field	-
Course number and course name	M 1-13 Water Management and Sanitation - Maintenance and Retrofitting
Instructors	-
Semester	1
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 45.0 hours Independent study: 45.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Bachelor modules B2-SWG 1 and B3-SWG 2
Teaching and learning methods	Multimedia lecture Tele-teaching lecture
Further information	Final grade in the form of a student performance record
Type of examination	Written exam 90 min

Learning objectives

The students will develop the ability to:

- independently acquire fundamental knowledge in the assessment of water supply and wastewater disposal facilities.
- apply this knowledge in practice-relevant cases using an integrative approach; taking into consideration other relevant scientific disciplines

Content

- Introduction to the changing requirements for water supply and wastewater disposal facilities in terms of legislation, administrative provisions and regulations.

- Typical damage profiles in water supply facilities such as wells, underground pipelines and reservoirs, their causes, and introduction to renovation and retrofitting
- Examination of underground pressure pipes for drinking and service water; methods of renovation and retrofitting
- Methods of damage detection in sewer networks and rainwater systems in wastewater disposal, causes of damage as well as how to avoid them; trenchless renovation
- Analytical water parameters, and how to interpret them for drinking water, service water, waste water as well as in bodies of water.
- Hydraulic and qualitative analyses of rainwater treatment facilities and elements of water treatment plants with regard to operational deficiencies and capacity limits as well as renovation and partial expansion
- In situ methods of rainwater treatment to relieve overstrained sewage systems
- Monitoring and inspection mechanisms in domestic water management and sanitation

Recommended literature

- DVGW Deutsche Vereinigung des Gas- und Wasserfaches, Postfach 14 03 62, 53058 Bonn: Regelwerk.
- ATV-DVWK Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall, Postfach 11 65, 53758 Hennef: Regelwerk.
- Mutschmann/Stimmelmayer: Taschenbuch der Wasserversorgung, Vieweg Verlag
H. Roscher u.a.: Sanierung städtischer Wasserversorgungsnetze, Verlag Bauwesen
Imhof: Taschenbuch der Stadtentwässerung, Oldenbourg.
Abwassertechnische Vereinigung: ATV-Handbücher zur Abwassertechnik, Verlag Ernst + Sohn.
Bliefert: Umweltchemie, VCH Weinheim.
Habeck/Tropfke: Abwasserbiologie, Werner Verlag.
Print-outs from the lectures (with list of further readings)

Module M 1-14 Road Construction

Module name	Road Construction
Module no.	M 1-14
Module head	Prof. Dr. Bernhard Bösl
Major field	-
Course number and course name	M 1-14 Road Construction
Instructors	-
Semester	1
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0

Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Previous knowledge of road planning and construction
Teaching and learning methods	Seminar-style lesson with beamer, overhead projector and whiteboard
Further information	Final grade in the form of a student performance record
Type of examination	Written exam 90 min

Learning objectives

The students should gain the ability to evaluate the condition of asphalt surfaces. Through acquisition of advanced knowledge of the specific properties of asphalt, the students should have the skills required to analyze and evaluate damages to asphalt surfaces and to select appropriate renovation methods. In addition, they should have gained the ability to carry out a survey and evaluation of the current condition of roads and implement appropriate repair measures.
Furthermore, the students should possess the knowledge and skills which are acquired through the operation of traffic facilities and road networks. This includes knowledge concerning recording and assessing traffic accidents in addition to maintenance. The students should be able to recognize and analyze sites of frequent accidents.

Content

- Theoretical principles of the damage characteristics of asphalt construction
- Dimensioning the surface structure in asphalt construction
- Material behaviour of asphalt
- Skid resistance of asphalt surfaces
- Survey and evaluation of the current condition asphalt surfaces
- Repair methods for asphalt roads
- Special types of asphalt
- Recording and assessment of traffic accidents

Recommended literature

Script to accompany the lecture
Relevant roadworks regulations and specifications

Module M 1-15 Hydraulic Engineering – Planning, Construction and Contracting

Module name	Hydraulic Engineering – Planning, Construction and Contracting
Module no.	M 1-15
Module head	Prof. Dr. Rudolf Metzka

Major field	-
Course number and course name	M 1-15 Hydraulic Engineering
Instructors	-
Semester	1
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Hydraulic Engineering Subsoil and Foundations lectures from the Bachelor programme
Teaching and learning methods	Lecture with projector, whiteboard, plans, maps, project work, excursions
Further information	Final grade in the form of a student performance record
Type of examination	Written exam 90 min

Learning objectives

The students should become familiar with optimized planning and construction of hydraulic structures based on state-of-the-art technologies and current engineering standards. Various conditions in terms of legal, technical, economic and environmental aspects must be taken into account.
The students gain in-depth knowledge in executing hydraulic projects, taking into account planning and structural specifications as well as the local conditions.
They will gain the ability to develop viable solutions in hydraulic engineering both independently and in a team; taking into account a variety of cross-linked conditions and constraints.

Content

- Overview of key current issues in hydraulic engineering as well as planning and construction projects in hydraulic engineering
- Influence of legal requirements on the planning and construction of hydraulic structures (water law, environmental law, etc.)
- Overview of key planning instruments (hydrological and hydraulic models, GIS, cost-benefit calculations, etc.)
- Developing planning concepts (instruments, developing alternatives)
- Optimising hydraulic constructions based on determined preconditions from a technical and economical perspective
- Executing plans in hydraulic engineering up to the building phase (required planning documents and inspections, experts and actors involved, impacted parties, legal proceedings)

- Executing construction projects in hydraulic engineering (technical coordination, economic considerations, adapting plans to local conditions, reaction to change, coordinating actors)
- Planning and construction of exemplary hydraulic engineering projects from the fields of flood control, development of waterways, restoring and renovating weirs, etc.

Recommended literature

- Schneider: Bautabellen für Ingenieure; Werner Verlag
- Bretschneider, Hans: Taschenbuch der Wasserwirtschaft; Verlag Paul Parey
- Bollrich, Gerhard: Technische Hydromechanik; Verlag Bauwesen
- Schröder, Wolfgang: Grundlagen des Wasserbaus; Werner Verlag
- DWA/DVWK Merkblätter zu einschlägigen wasserbaulichen Themen
- Bayer. Staatsministerium für Landesentwicklung und Umweltfragen: Wasserland Bayern: Nachhaltige Wasserwirtschaft in Bayern
- Bayer. Landesamt für Wasserwirtschaft: Spektrum Wasser 1: Hochwasser, Eigenverlag
- Schröder, Wolfgang/Römisch, Klaus: Gewässerregelung, Binnenverkehrswasserbau
- Bayer. Landesamt für Wasserwirtschaft: Fließgewässerlandschaften in Bayern, Eigenverlag
- Naudascher, E.: Hydraulik der Gerinne und Gerinnebauwerke. Springer- Verlag
- Kaczynski, Jürgen: Stauanlagen, Wasserkraftanlagen; Werner-Verlag
- Heinz Patt, Dr. Peter Jürging, Werner Kraus: Naturnaher Wasserbau, Entwicklung und Gestaltung von Fließgewässern; Springer-Verlag
- Vischer Daniel, Huber Andreas: Wasserbau - Hydrologische Grundlagen, Elemente des Wasserbaus, Nutz- und Schutzbauten an Binnengewässern; Springer Verlag
- Lattermann Eberhard: Wasserbau-Praxis, Band 1: Gewässerkunde, Flussbau, Stauanlagen, Wasserkraftwerke; Bauwerk Verlag
- Lattermann Eberhard: Wasserbau-Praxis, Band 2: Binnenwasserstraßen, Seewasserstraßen und Seehäfen, Seebau und Küstenschutz; Bauwerk Verlag
- Hartlieb, Arnd: Offene Deckwerke - eine naturnahe Methode zur Sohlstabilisierung eintiefungsgefährdeter Flussabschnitte; Berichte des Lehrstuhls und der Versuchsanstalt für Wasserbau und Wasserwirtschaft Nr. 85
- Bayer. Landesamt für Wasserwirtschaft: Spektrum Wasser 3: Wildbäche ? Faszination und Gefahr; Eigenverlag
- Bayer. Staatsministerium für Landesentwicklung und Umweltfragen, Heft 30 der Schriftenreihe "Wasserwirtschaft in Bayern": Flüsse, Auen, Täler - erhalten und entwickeln
- Bayer. Landesamt für Wasserwirtschaft: Spektrum Wasser 4: Flüsse und Bäche? Lebensadern Bayerns; Eigenverlag, München

Module M 1-16 Building Physics, Measurements and Diagnostics

Module name	Building Physics, Measurements and Diagnostics
Module no.	M 1-16
Module head	-

Major field	-
Course number and course name	M 1-16 Building Physics, Measurements and Diagnostics
Instructors	-
Semester	1
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Successful completion of the course Building Physics 1 with a basic internship and an internship in building physics
Teaching and learning methods	Projector and whiteboard
Further information	Final grade in the form of a student performance record
Type of examination	Written exam 90 min

Learning objectives

Upon completion of the course, students should be able to recognise and classify building damages as a result of faulty construction, record them using measurement technologies and develop a specially tailored renovation concept.

Content

THERMAL INSULATION
1. Preparing a German Energy Saving Ordinance (EnEV) Energy Performance certificate and thermal optimization of a building
2. Developing a zero-energy building
3. Thermal bridges, classification, calculating heat flows
4. Calculating and measuring thermal bridges; measuring procedures, evaluations
5. Analysis and diagnosis of existing building structures
6. Use of the Thermal Bridge Atlas and thermal bridge software, temperature curve in thermal bridges
MOISTURE PROTECTION
7. Heat and moisture transfer, Glaser method, solutions with WUFI, examples, demonstrations

Recommended literature

Stein, J.A.: Physik für Bauingenieure. 2. Band, ISBN 3-931655-05-9, AVH-Verlag, Hamburg, 1997.

Willems, W.M.: Handbuch Bauphysik. 1. Band, ISBN-10 3-528-03982-5, Verlag Fr. Vieweg & Sohn, 2006.
Marquardt, H.: Energiesparendes Bauen. ISBN 3-519-05059-5, Teubner Verlag, Wiesbaden, 2004.

Module M2b - 1 Corporate Accounting

Module name	Corporate Accounting
Module no.	M2b -1
Module head	Prof. Dr. Volker Wirth
Major field	-
Course number and course name	M 2b-1 Corporate Accounting
Instructors	-
Semester	2
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	-
Teaching and learning methods	Lecture with projector, Project Controlling portion as a tele-teaching lecture and whiteboard
Further information	Final grade in the form of a student performance record
Type of examination	Written exam 90 min

Learning objectives

Knowledge:
- Fundamental knowledge of financial management
- Knowledge of the tools of project controlling

Skills:
The students are able to directly transfer the knowledge learned in the course to practice-oriented examples in the context of exercises:
- typical accounting cases
- drawing up simple balance-sheets
- cash flow calculations
- earnings projection for building completion
- target-performance comparisons
- opportunities-risks analysis with catalogue of actions

Competencies:

Through group-oriented case studies, students develop an understanding of specific financial principles and are able to assess construction projects in light of key financial and cost-accounting figures. Thus, they are able to meet the demands required by corporate tasks and roles.

Content

Financial Management
- Accounting
Tax balance sheet, trade balance
Assessing unfinished services
Balance sheet figures, balance sheet analysis
Balance Scorecard
Project Controlling
- Overall oncept of construction site controlling
- Minimum controlling
Control procedures (target-performance comparisons)
Commercial consultation
Pilot construction site
Controlling culture
EDP (electronic data processing) case study

Recommended literature

Breunig, Rechnungswesen ? Bau, Manuskript Prof. Dr. Bernd Breunig, Hochschule Karlsruhe, Fakultät Bauingenieurwesen, Auflage 2006
Wirth, Controlling in der Baupraxis, Werner Verlag 2. Auflage, 2006

Module M2b – 10 Interior Fit-Out

Module name	Interior Fit-Out
Module no.	M2b -10
Module head	Prof. Dr. Volker Wirth
Major field	-
Course number and course name	M 2b-10 Interior Fit-Out
Instructors	-
Semester	2
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements /	-

prerequisites	
Teaching and learning methods	Lecture with projector, case studies, exercises
Further information	Final grade in the form of a student performance record
Type of examination	Written exam 90 min

Learning objectives

Knowledge:
- Fundamental knowledge of practical construction management of interior fit-outs
- Management problems specific to interior fit-outs (in-process design and planning, mutual interference between the different trades, etc.)

Skills:
The students are able to directly transfer the knowledge learned in the course to practice-oriented examples in the context of case studies:
- Tendering: recognising hinderances to targets and complications
- Contract negotiations: documenting pricing bases
- Construction: updating scheduling as a result of in-process interference from other trades (e.g. installations) and changes to the design (e.g. as a result of change of tenant).

Competencies:
Through group-oriented case studies, students develop the ability to better handle interior fit-out construction projects

Content

Building Construction / Fit-out
- Scheduling interior fit-out projects from acquisition to completion

Project scheduling as a working process; recognising and avoiding risks in a project
Technical and commercial scheduling in interior fit-out projects
Instruments and tools of professional project management (clarification lists, documentation, correspondence and communication)
Hard and soft skills / requirements of projects in foreign countries within Europe
Case study: interior fit-out project

Recommended literature

Nutsch "Handbuch der Konstruktion: Innenausbau", DVA, 2000
Becker, Pfau, Tichelmann: Trockenbauatlas Band 1 & 2 , 2003/2005

Module M2b - 11 Tunnel Construction

Module name	Tunnel Construction
Module no.	M2b -11
Module head	Prof. Dr. Volker Wirth
Major field	-
Course number and course	M 2b-11 Tunnel Construction

name	
Instructors	-
Semester	2
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	-
Teaching and learning methods	Lecture with projector, case studies, exercises
Further information	Final grade in the form of a student performance record
Type of examination	Written exam 90 min

Learning objectives

Knowledge:
- Fundamental knowledge of planning tunnel construction projects
Typical construction methods (e.g. New Austrian Tunneling Method / Sequential Excavation Method)
Management problems specific to underground construction / tunnel construction (building site risks, system risks, etc.)
Skills:
The students are able to directly transfer the knowledge learned in the course to practice-oriented examples in the context of case studies:
- Tendering: best possible description of sub-services and geotechnical factors - - Contract negotiation: documenting pricing bases
- Construction: updating scheduling as a result of in-process interferences (e.g. geotechnical).
Competencies:
Through group-oriented case studies, students develop the ability to play a professional role in the planning and construction of tunnel projects

Content

Planning:
realising a project: basic principles of project planning
geology: impacts on planning and construction
basic principles of selecting an excavation method and its basic preconditions, as well as implementation in project planning
inputing planning / excavation methods into building phase models and distance diagrams as a basis for tendering
quality standards from a planner perspective for tendering
case study “Construction Phase Diagrams and Quality Management”

Construction:
conventional tunnelling (methods, phases, problems)
machine tunnelling (methods, phases, problems)
case study: managing amendments to the contract

Recommended literature

o Joham: Lecture manuscript "Baumanagement im Tunnelbau"
o Böheim: Lecture manuscript "Planung und Bauüberwachung von Tunnelbauvorhaben"
o Girmscheid: Baubetrieb und Bauverfahren im Tunnelbau, Ernst & Sohn, Berlin, 2008

Module M2b - 12 Project-Oriented Seminar Work

Module name	Project-Oriented Seminar Work
Module no.	M2b -12
Module head	Prof. Dr. Volker Wirth
Major field	-
Course number and course name	M 2b-12 Project-Oriented Seminar Work
Instructors	-
Semester	3
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	6.0
ECTS	10.0
Workload	Class time: 100.0 hours Independent study: 200.0 hours Total: 300.0 hours
Language of instruction	German
Admission requirements / prerequisites	-
Teaching and learning methods	Lecture with projector, case studies, exercises
Further information	Final grade in the form of a student performance record
Type of examination	-

Learning objectives

The goal of this module is the independent work on a practice-oriented project from an area of civil engineering selected by the student. The student should demonstrate his or her ability to independently complete and present a practical assignment using scientific methods.

Content

Project work
The practical project can be completed outside the University in cooperation with an engineering office, construction company or government agency. The project will be supervised by a professor.

Recommended literature

Specific literature recommendations depending on the selected topic

Module M2b - 2 Building Law II

Module name	Building Law II
Module no.	M2b -2
Module head	-
Major field	-
Course number and course name	M 2b-2 Building Law II
Instructors	-
Semester	2
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 30.0 hours Total: 60.0 hours
Language of instruction	German
Admission requirements / prerequisites	Knowledge of construction law / construction labour law / corporate construction law / criminal construction law
Teaching and learning methods	Lecture with projector
Further information	-
Type of examination	Written exam, 90 - 180 min. or Oral exam, 15 - 45 min.

Learning objectives

Knowledge:
The students are familiar with key areas of concern in construction law, construction labour law, criminal construction law and corporate construction law; particularly the areas specified under the “Content” section of this module description.
Skills:
The students are able to assume responsibility and leadership roles and to lead a building company from the legal side of the business; in particular they are able to recognise legal issues as they arise and solve them either themselves or with the assistance of specialists. They are aware of risks and dangers from the area of criminal law.
Competencies:
The students have on overview not only of relevant legal provisions, but also a profound understanding of difficult problem areas of construction, labour and corporate building law so that they are able to act as leaders and competently provide answers to key questions.

Content

- Determining Construction Target and Construction Performance; especially §2 No. 1 VOB/B and provisions in section 4 of the VOB/C-DIN Standards
- Examination and Notification Obligations (pre-contact and contract); especially § 3 no. 3; 4 No. 3; 4 No. 1 VOB/B and VOB/C
- Liability for Defects according to § 13 No. 1 VOB/B; §633 BGB; before acceptance: § 4 No. 7 VOB/B
- Exemption from defects according to § 13 No. 3 VOB/B
- Specific problems of invoicing; especially partial invoices, advance invoices and final accounts; § 16 VOB/B
- Insolvency Law in the construction industry
- Rights and Obligations of Corporate Leaders and Managers
- Behaviour towards Employees in the Case of Illness and Misconduct
- Establishment, Management and Succession of Construction Companies
- Corporate Construction Law; especially joint ventures law (ARGE)
- Criminal Offences in Construction and their

Recommended literature

Englert/Motzke/Wirth, Baukommentar
Langenecker/Maurer, Handbuch des Bauarbeitsrechts
Heidland, Bau-Insolvenzrecht
Ganten/Jagenburg/Motzke, Beck`scher VOB-Kommentar, Teil B
Script to accompany the lecture; legislative texts; VOB texts (German Construction Tendering and Contract Regulations)

Module M2b - 3 New Competition and Contract Forms

Module name	New Competition and Contract Forms
Module no.	M2b -3
Module head	Prof. Dr. Volker Wirth
Major field	-
Course number and course name	M 2b-3 New Design Competition and Contracting Forms
Instructors	-
Semester	2
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 30.0 hours Total: 60.0 hours
Language of instruction	German
Admission requirements / prerequisites	Knowledge of procurement law, corporate law, ARGE law
Teaching and learning methods	Lecture with projector
Further information	Final grade in the form of a student performance record
Type of examination	Written exam 90 min

Learning objectives

Knowledge:
The students are familiar with key problem areas of procurement law, corporate law, ARGE law
Skills:
The students are able to assume responsibility and leadership roles or work in a team to lead a building company from the legal side of the business; in particular they are able to recognise legal issues as they arise and solve them either themselves or with the assistance of specialists.
Competencies:
The students have on overview not only of relevant legal provisions, but also a profound understanding of difficult problem areas of procurement, corporate and ARGE law so that they are able to take on leadership roles and competently provide answers to key questions.

Content

Risk estimation and sharing in joint construction projects in the context of special contract forms such as GMP, partnering, etc.

Recommended literature

Script to accompany the lecture as well as particular literature such as:
Eschenbruch et. Al., Partnering am Bau
Ingenstau/Korbion VOB-Commentary with specific discussion of new contract forms in construction

Module M2b - 4 Negotiation Competence

Module name	Negotiation Competence
Module no.	M2b-4
Module head	Prof. Dr. Volker Wirth
Major field	-
Course number and course name	M 2b-4 Negotiating Competence
Instructors	-
Semester	2
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	-
Teaching and learning methods	Lecture with projector, video analysis
Further information	Lecture with projector, video analysis
Type of examination	Written exam 90 min

Learning objectives

Knowledge:
- in-depth knowledge of questioning technique, dealing with objections,
- handling conflicts, pitching benefits
- psychographic profiles and their application

Skills:
The students are able to transfer knowledge gained to negotiations / conflict situations typical in practice in the context of role plays:
- positive discourse without placing blame
- responding to objections without escalation
- Convincingly voicing options with benefit arguments

Competencies:
Through group-oriented case studies in the form of video analyses, the students gain the competence to reach agreements which satisfy all those involved; even in difficult situations (conflicts).

Content

- 9 Steps of Negotiation (based on the Harvard Method)
- Questioning Techniques
- Dealing with Objections
- Handling Conflicts
- Psychographic Profiles
- Pitching Benefits
- Moderation
- Roleplays (video analyses)
- Contract Negotiations
- Crisis Meetings
- Dealing with Contract Amendments (conflict)

Recommended literature

- Schulze-Seeger "Die Kunst des Überzeugens" in Wirth/Bührle/Schulze- Seeger, Erfolgsfaktor Nachtragsmanagement, expert verlag, 2000
- Fisher/Ury/Patton “Das Harvard-Konzept”, Campus Frankfurt 1996

Module M2b - 5 Project Management

Module name	Project Management
Module no.	M2b-5
Module head	Prof. Dr. Volker Wirth
Major field	-
Course number and course name	M 2b-5 Project Management
Instructors	-
Semester	2
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	4.0
ECTS	6.0
Workload	Class time: 60.0 hours Independent study: 120.0 hours Total: 180.0 hour
Language of instruction	German
Admission requirements / prerequisites	-
Teaching and learning methods	Lecture with projector, case studies, exercises
Further information	Final grade in the form of a student performance record
Type of examination	Written exam 90 min

Learning objectives

Knowledge: important project management techniques (see Content)

Skills:
In the context of case studies, the students are able to transfer the knowledge they have gained in project management to tasks typical in practice:

- drawing up price quotes for material and subcontractor services
- evaluating price comparison lists
- drawing up and evaluating contract amendments
- computer-assisted drawing up of simple work schedules with interdependencies
- assessing opportunities / risks from the employer and employee perspective
- procedures and views of project development
- procedures / methods from planning, tendering and contracting to construction

Competencies:

Through group-oriented case studies, the students develop the competence to professionally execute construction projects using modern methods of project management.

Content

- Procurement: Material and Subcontractor Services
- Contract / Subcontract management: complex case studies, basis for claim according to VOB, entitlement amount based on original calculations, strategy, consensus between employer and employee, current legal interpretation
- Project Planning Tools, Computer Workshop MS Project, Power Project (or equivalent programme)
- Elements of Risk Management using Practical Examples from the Employer's Perspective (Marmary Project Istanbul) and the Employee's Perspective (Transrapid Munich)
  - Opportunities / Risks
  - Risk Cycle and Areas of Risk
  - Risk Management Systems
- Practical example from surface construction (current construction project)
  - Planning - Project Management
  - Construction - Project Management
- Practical example "Sewer System Schwanthalerhöhe" (current construction project)
- Planning: Damage Assessment, Basic Evaluation, Preliminary Planning, Conceptual Design with a Selection of Retrofitting Procedures, Project Cost Calculation, Role of Project Management in the Planning Phase, Quality Standards
- Tendering: Important Positions, Cost Planning and Scheduling, Working Tools and Coordination, Problems, Tender Evaluation and Contracting
- Construction Process: Inliner Quality Standards, Health and Safety (SiGe) Plan, External Monitoring, Publicity Work, Project Management, Problems during the Construction Phase, Project Documentation
- VOF (Procurement Law for Freelance Services) Procedures: validity and threshold values, distinction between VOF and VOL (Procurement and Contracting Law for Services), Publication, Selection and Negotiations
- Project Development:
- Basic need for project development through the internationalization and globalization of the construction industry
  - Fields of action of project development
  - Developing the project idea
  - Types of financing
  - Drawing up profitability scenarios
  - Rental and administration management
- Contract management with a focus on contracts of sale and rental contracts
  - Appraisal of property (land and buildings) due diligence

Recommended literature

- Wirth: Lecture script "Beschaffung im Bauunternehmen" (Procurement in Construction Companies)

- Wirth/Bührle/Schulze-Seeger: Erfolgsfaktor Nachtragsmanagement, expert verlag, 2000
- Kyrein: Immobilien- Projektmanagement, Projektentwicklung und -steuerung

Module Mb2 - 6 Problem Solving Techniques

Module name	Problem Solving Techniques
Module no.	M2b-6
Module head	-
Major field	-
Course number and course name	M 2b-6 Problem Solving Techniques
Instructors	-
Semester	2
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	-
Teaching and learning methods	Lecture with projector
Further information	Final grade in the form of a student performance record
Type of examination	Written exam 90 min

Learning objectives

Knowledge:
The students become familiar with the different problem types and learn which issues arise as a result of them. They become familiar with problem solving methods and strategies as a part of successful problem management; however they are also aware of the main obstacles to problem solving. Special focus will be laid on approaches to complex, interlaced problems. Creativity techniques as an important tool will be explained and practised using practical examples. Through a Plan Game, students are able to apply the knowledge they have learned and gain practical experience.
Skills and Competencies:
The students are able to systematically work through and solve problems. They can distinguish between various types of problems and the accompanying questions and issues, and thus set the problem solving process in motion. They are familiar with key problem solving methods, can apply various creativity techniques where needed, and can formulate concrete solutions and evaluate them.

Content

- Definitions
- Problem Types
- Barriers to Problem Solving
- Problem Solving Methods
- Problem Solving and Creativity
- Successful Strategies in Complex Situations
- Creativity Techniques
- Formulating and Evaluating Solutions
- Plan Game
- Internet-based Problem Solving

Recommended literature

- Dietrich Dörner; Die Logik des Mißlingens - rororo-Verlag
- Schelle, Ottmann, Pfeiffer; ProjektManager - GPM
- Josef W. Seifert; Moderation & Kommunikation - Gabal-Verlag
- Rolf W. Schirm; Die Biostrukturanalyse -IBSA
- Paul Watzlawick; Anleitung zum Unglücklichsein - Piper-Verlag

Module M2b - 7 English

Module name	English
Module no.	M2b-7
Module head	-
Major field	-
Course number and course name	M 2b-7 English
Instructors	-
Semester	2
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German
Admission requirements / prerequisites	Level B2 according to the Common European Framework of Reference for Languages
Teaching and learning methods	Partner and group work, plenary sessions with materials from the instructor, short presentations by participants, CDs, short films
Further information	Final grade in the form of a student performance record
Type of examination	Written exam 90 min

Learning objectives

Knowledge:
Everything related to technical processes in the field of construction
Skills:
The students are able to apply the knowledge learned to professional situations both orally and in writing. They are familiar with books of reference and can use them adequately.
Competencies:
The students are able to apply the knowledge and skills gained in their later roles as project managers in international construction projects or related functions.

Content

- Materials
- Mathematical and Physical Correlations
- Understanding and Drafting Building Contracts
- Understanding EU Standards
- Texts on Bulding History, Climate Protection, etc.

Recommended literature

- Morgan, D., Regan, N. (2009), *Take off*, Garnet Publ., Reading
- Bauer, Hans-Jürgen, English for technical purposes, Berlin 2005
- Büchel, Wolfram; Mattes, Rosemarie, Englisch in technischen Berufen, Stuttgart 2004
- Maclean, James; Scott, John, The Penguin Dictionary of Building, London 1995

Module M2b - 8 Language 2: Russian, Portuguese or Spanish A1 / Part I

Module name	Language 2: Russian, Portuguese or Spanish A1 / 1
Module no.	M2b-8
Module head	-
Major field	-
Course number and course name	M 2b-8 Language 2: Russian, Portuguese or Spanish A1 / Part I
Instructors	-
Semester	2
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours

Language of instruction	German
Admission requirements / prerequisites	Knowledge of basic grammatical categories such as verb, noun, adjective, subject, object
Teaching and learning methods	Work with a text book as well as materials from the instructor, applying knowledge learned in partner and group work
Further information	Final grade in the form of a student performance record
Type of examination	Written exam 90 min

Learning objectives

Acquire basic knowledge of the language, e.g. important grammatical structures such as verbs in present tense; the most common form of past tense; singular/plural; vocabulary for everyday life and typical work situations; numbers; local culture; Russian: learning the Cyrillic script

Content

Basic vocabulary, basic grammar
Possible topics:
- Construction Sites
- Family, Vacation, Everyday Life in that Region

Recommended literature

Teaching material is partly a textbook and partly material from the instructor (e.g. Russian “Most”, Portuguese: “Avenida Brasil”; Spanish: “Caminos 1”
More information can be found in the course plan for that semester

Module M2b - 9 Turnkey Building Projects

Module name	Turnkey Building Projects
Module no.	M2b-9
Module head	Prof. Dr. Volker Wirth
Major field	-
Course number and course name	M 2b-9 Turnkey Buiding Projects
Instructors	-
Semester	2
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	2.0
ECTS	3.0
Workload	Class time: 30.0 hours Independent study: 60.0 hours Total: 90.0 hours
Language of instruction	German

Admission requirements / prerequisites	-
Teaching and learning methods	Lecture with projector, case studies, exercises
Further information	Final grade in the form of a student performance record
Type of examination	Written exam 90 min

Learning objectives

Knowledge:
- Fundamental knowledge in practical construction management
- Management problems specific to turnkey building (in-process planning, etc.)
- Specific risks in the building process (change of tenant, buyers' wishes, tender standards, etc.)

Skills:
In the context of case studies, the students are able to directly apply the knowledge learned to tasks typical in practice:
- Tendering: recognising hindrances to targets and complications
- Contract Negotiations: documenting pricing bases
- Construction: updating scheduling as a result of in-process interference and changes to the design

Competencies:
Through group-oriented case studies, students develop the ability to better handle turnkey construction projects

Content

- Success Factors
- Organisational and commercial property development
- Orderly building file management, construction site reporting, work lists
- Legal property development
- Formal requirements, letter templates
- Negotiation protocol, subcontractor and service contracts
- Negotiation protocol with contractor and subcontractors, forms of acceptance of services rendered
- Fit-out work / finishings
- Basic fit-out work and finishing numerous projects, note on sources of error
- Quality control
- Appropriate test methods for evaluating the quality of structural work and finishings

Recommended literature

- Rauh "Kostenermittlung im Schlüsselfertigbau", Werner Verlag, 2008

- Engl "Nachkalkulation im Schlüsselfertigbau", GRIN Verlag 2007

Module M2b - MA Master's Thesis with Presentation

Module name	Master's Thesis with Presentation
Module no.	M2b-MA
Module head	Prof. Dr. Volker Wirth
Major field	-
Course number and course name	M 2b-MA Master's Thesis with Presentation
Instructors	-
Semester	3
Length of module	1 semester
Module frequency	-
Status in curriculum	mandatory
Level	Master
SWS	20.0
ECTS	0.0
Workload	Independent study: 600.0 hours Total: 600.0 hours
Language of instruction	German
Admission requirements / prerequisites	-
Teaching and learning methods	-
Further information	-Written work = 4/5 of the final grade -Colloquium, 30 min. (presentation and critique) = 1/5 of the final grade
Type of examination	-

Learning objectives

The 15-week Master's Thesis should demonstrate that the candidate is capable of independently completing a practice-oriented task in terms of both its technical details as well as its interdisciplinary interdependencies from both scientific and practical perspectives within a predetermined deadline.
The approximately 30-minute colloquium (presentation and questioning) serves to ascertain whether the candidate is able to orally present and independently defend the key fundamentals, principles and results of the Master's Thesis and to clearly assess its significance in practice. The use of presentation tools is expressly desired.

Recommended literature

- Specific literature recommendations depending on the selected topic