

Module Handbook

Civil Engineering

Course Modules for the Masters Degree in
Civil Engineering

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1.0 General Introduction

1.1 Remarks

This Module Handbook is intended as an annotated course catalogue and as a reference document for the accreditation authorities. Information regarding content and organisation of the modules is based on that provided by the lecturers. Please note that this information is subject to alteration.

1.2 Modules

Modulisation is the grouping of subject areas into self-contained, testable units which are well-rounded both thematically and time-wise and allocated a particular number of credit points. Modules can contain a combination of various teaching and learning methods and cover content from a single semester or an academic year. Once all the examination requirements for a particular module have been fulfilled, the relevant credit points will be added to the student's academic record and a grade for the module will be awarded.

1.3 Credit Points

Credit points are awarded in accordance with the standard ECTS (European Credit Transfer System). 60 points should be earned per year of study. The credit point system facilitates the recording of the student's combined overall achievements and the crediting of points from other courses or schools.

1.4 Workload

Each course is allocated credits according to the workload involved. One credit corresponds to a workload of 30 study hours which can include lectures, preparation, revision and exam preparation. The scope of each course and the relevant credits for the individual courses are laid out in the module description. On successful completion of a module, as many credit points will be awarded as credits have been designated for that module.

1.5 Introduction to the module pages

The core of the Masters course consists of the modules 3A and 3B respectively, 4, 4A and 4B respectively. Modules 1, 2, 4, and 6 are compulsory for all students. Modules 3A and 4A must be completed by those working towards specialisation in construction engineering, and modules 3B and 4B must be completed by those wanting to specialise in environment, traffic, water and wastewater. These modules largely deal with technical themes. They account for 80% of the overall degree course. At the same time, emphasis is laid on students acquiring the skills of independent study and gathering information for themselves. In these modules, problem-solving competence is taught and practised. Students are then in a position to solve further problems in a systematic and scientific manner. They are able to independently analyse the task presented to them and to work through the steps necessary for the resolution of the issue. The examples dealt with in the modules serve as a guideline to the scientific approach to problems. The approaches used are transferable and applicable to other problems.

In this way students develop an outstanding ability to analyse and work through the various stages of a procedure and to deal with problems in goal-oriented way. Modules 1 (Project Management) and 2 (Business Economics) are designed as accompanying compact courses and are intended to equip students with a good grounding in

project management and the business skills necessary to people with leadership responsibilities. A further accompanying module is the module Business English which largely comprises communication over the internet and aims to improve spoken English ability.

In the third semester, students must select a number of compulsory electives (module 7) relevant to their specialism. The compulsory electives are designed to supplement the students' existing knowledge with additional practically-oriented elements.

Masters Degree in Civil Engineering

01.12.09

No	Module/Course	Ma1		Ma2		Ma3		CW	Exam			Total CP
		HPW	CP	HPW	CP	HPW	CP		Form	mins.	CP	
BM1	Compact Course in Project Management (WS)	4	4									
BM1-1	Schedule and Cost Management	1	1								1	4
BM1-2	Working methods	1	1								1	
BM1-3	Negotiation techniques	1	1					A	WT	90	1	
BM1-4	Moderation techniques and leadership skills	1	1								1	
BM2	Compact Course in Business Economics and Contract Law (SS)			4	4							
BM2-1	Financing and balancing			2	2							2
BM2-2	Specific business and contract law			1	1			A	WT	90	1	4
BM2-3	Specific business and contract law			1	1						1	
BM3A-I	Technical and economic project analysis (KIB) I	8	13									
BM3A-I-1	Methodological processing of project data and background information I	2	3					A	P,OE		8	13
BM3A-I-2	Handling projects: conception, design, calculation I	3	5									
BM3A-I-3	Project-relevant scientific work I	3	5						A,OE		5	
BM3B-I	Technical and economic project analysis (UVW) I	8	13									
BM3B-I-1	Methodological processing of project data and background information I	2	3					A	P,OE		8	13
BM3B-I-2	Handling projects: infrastructure planning I	3	5									
BM3B-I-3	Project-relevant scientific work I	3	5						A,OE		5	
BM3A-II	Technical and economic project analysis (KIB) II			8	13							
BM3A-II-1	Methodological processing of project data and background information II			2	3			A	P,OE		8	13
BM3A-II-2	Handling projects: conception, design, calculation II			3	5							
BM3A-II-3	Project-relevant scientific work II			3	5				A,OE		5	
BM3B-II	Technical and economic project analysis (UVW) II			8	13							
BM3B-II-1	Methodological processing of project data and background information II			2	3			A	P,OE		8	13
BM3B-II-2	Handling projects: infrastructure planning II			3	5							
BM3B-II-3	Project-relevant scientific work II			3	5				A,OE		5	
BM4	Computer science for the construction sector	2	2	2	2							
BM4-1	Foundation VBA and structured programming	2	2						A			2
BM4-2	Network planning technique and project management software			2	2				A			2
BM4A-I	Computing in civil and building engineering: specialist IT applications (KIB) I	6	8									
BM4A-I-1	Scientific basis of linear and non-linear Finite Element methods I	3	4						A		4	8
BM4A-I-2	Application and checking of special Finite Element Models I	3	4						A		4	
BM4B-I	Computing in civil and building engineering: specialist IT applications (UVW) I	6	8									
BM4B-I-1	Scientific basics of special IT models I	3	4						A		4	8
BM4B-I-2	Application and checking of special Finite Element Models I	3	4						A		4	
BM4A-II	Computing in civil and building engineering: specialist IT applications (KIB) II			6	8							
BM4A-II-1	Scientific basis of linear and non-linear Finite Element methods II			3	4				A		4	8
BM4A-II-2	Application and checking of special Finite Element Models II			3	4				A		4	
BM4B-II	Computing in civil and building engineering: specialist IT applications (UVW) II			6	8							
BM4B-II-1	Scientific basics of special IT models II			3	4				A		4	8
BM4B-II-2	Application and checking of special Finite Element Models II			3	4				A		4	
BM5	Foreign languages	2	3	2	3							
BM5 I	Business English I	2	3						P,OE			3
BM5 II	Business English II			2	3				P,OE			3
BM6	Master's-Thesis (***)							28				28
BM7	Compulsory electives (*)											
BM7-1	Unterhalt und Betreiben von Großanlagen (**)											2
BM7-2	Public-Private-Partnerships and other models of co-operation					1	1					
BM7-3	Business plans and setting up a company					1	1					
BM7-4	Getting published in scientific publications					1	1					
BM7-5	Interpretation von Wirtschaftsnachrichten (**)											
Total		22	30	22	30	5	30					90

*) Must be assigned two of three WPF

CW = Coursework

CAD = Computer Aided Design

VBA = Visual Basic for Applications

HPW = Hours per week (during semester time)

CP = Credit Points

Exam = Exam

OE = Oral exam

P = Presentation

WT = Written test

A = Assignment

A	Choice (KIB): Construction Engineering
B	Choice (UVW): Environment, Transport, Water

**) removed from WS09/10

***) from WS09/10 28 CPS

Module BM1-1 Compact Course in Project Management – Schedule and Cost Management

Module: Course:	Compact Course in Project Management Schedule and Cost Management			Module code:	BM1-1	
Semester:	M1	Contact hours (per week/ total):	1	10	Credit points:	1
		E-learning (hours):		5		
		Private study (hours):		15		
		Work-load (hours):		30		

Course co-ordinator:	Prof. Dipl.-Ing.(Univ.) Franz Josef Krichenbauer
Lecturer(s):	Dipl.-Ing. Anton Josef Angermeier
Curriculum category:	Master
Course structure:	Seminar work (c. 70%) with accompanying lectures (c. 30%); E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course.

Learning/ skills objectives:

Students will learn how to calculate building and business costs and learn how projects can be financed. They will be able to recognise the importance of financial considerations.

Course content:

0. Defining projects and project participants
1. Building and business costs
2. Project financing
3. Processes, procedures and organisational structures
4. Determining the market, sources of cost, strategic allocation in price-setting and cost-planning

Pre-exam tasks (coursework):	Assignment
Exam:	Written exam: 30-minute section of an exam covering this module and modules BM1-2, BM1-3 and BM1-4
Frequency:	Winter semester only
Status:	Compulsory
Media:	Lecture notes, materials and worksheets available in digital form on the intranet and internet
Additional information:	
Reading:	Schelle: Wirtschaftlichkeitsrechnungen für die Angebotsbewertung im Bauwesen Möller: Planungs- und Bauökonomie Band 1 u. 2, An extended reading list will be available online prior to the start of the semester.
Last updated:	20.01.2010

Module BM1-2 Compact Course in Project Management

- Working methods

Module: Course:	Compact Course in Project Management Working methods			Module number:	BM1-2	
Semester:	M1	Contact hours (per week/ total):	1	10	Credit points:	1
		E-learning (hours):		5		
		Private study (hours):		15		
		Work-load (hours):		30		

Course co-ordinator:	Prof. Dipl.-Ing. (Univ.) Franz Josef Krichenbauer
Lecturer(s):	Prof. Dr. Krämer
Curriculum category:	Master
Course structure:	Lectures (70%) and seminar work (c. 30%) E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

Students will learn how to plan and manage their own time both alone and when working with others. They will become proficient in the arts of moderation and presenting. They will practise methods of brainstorming in combination with Mind Mapping.

Course content:

1. Personal work organisation
2. Time management
3. Facilitation/ moderation techniques and presenting
4. Mind Mapping

Pre-exam tasks (coursework):	Assignment
Exam:	Written exam: 30-minute section of an exam covering this module and modules BM1-1, BM1-3 and BM1-4
Frequency:	Winter semester only
Status:	Compulsory
Media:	Lecture notes, materials and worksheets available in digital form on the intranet and internet
Additional information:	
Reading:	Stroebe , Rainer W,: Arbeitsmethodik An extended reading list will be available online prior to the start of the semester.
Last updated:	08.08.2007

Module BM1-3 Compact Course in Project Management

– Negotiation techniques

Module: Course:	Compact Course in Project Management Negotiation techniques			Module number:	BM1-3	
Semester:	M1	Contact hours (per week/ total):	1	10	Credit points:	1
		E-learning (hours):		5		
		Private study (hours):		15		
		Work-load (hours):		30		

Course co-ordinator:	Prof. Dipl.-Ing. (Univ.) Franz Josef Krichenbauer
Lecturer:	Prof. Dr. Krämer
Curriculum category:	Master
Course structure:	Lectures (70%) and seminar work (c. 30%) E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course.

Learning/ skills objectives:

The students will learn the mechanisms of communication. They will understand the actions, reactions and role-playing which occur in the process of meetings and discussions. They will refine their communication style.

Course content:

1. What is communication?
2. Emotional influences
3. Communication and teamwork
4. Rhetoric and body language (kinesics)

Pre-exam tasks (coursework): Exam:	Assignment Written exam: 15-minute section of an exam covering this module and modules BM1-1, BM1-2 and BM1-4
Frequency:	Winter semester only
Status:	Compulsory
Media:	Supplementary lecture notes, materials and worksheets in digital form.
Additional information:	
Reading:	Reineke Wolfgang: Verhandlungstechniken für Manager Harris Thomas: Ich bin OK – Du bist OK Stingl Anton u. Marie-Luise: Verhandlungsstrategie An extended reading list will be available online prior to the start of the semester.
Last updated:	08.08.2007

Module BM1-4 Compact Course in Project Management – Moderation techniques and leadership skills

Module: Course:	Compact Course in Project Management Moderation techniques and leadership skills			Module number:	BM1-4	
Semester:	M1	Contact hours (per week/ total):	1	10	Credit points:	1
		E-learning (hours)		5		
		Private study (hours):		15		
		Work-load (hours):		30		

Course co-ordinator:	Prof. Dipl.-Ing. (Univ.) Franz Josef Krichenbauer
Lecturer:	Prof. Dr. Krämer
Curriculum category:	Master
Course structure:	Lectures (c. 70%) and seminar preparation (c. 30%) E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

Students will learn how employees should be managed and lead. They will understand the rationale and aims of staff appraisal interviews. They will learn that employees are the most important asset of a company, and must be adequately supported and encouraged.

Course content:

1. Definition of key terms and concepts
2. Staff appraisal interviews
3. Developing potential
4. Leadership and management of employees

Pre-exam tasks (coursework):	Assignment
Exam:	Written exam: 15-minute section of an exam covering this module and BM1-1, BM1-2 und BM1-3
Frequency:	Winter semester only
Status:	Compulsory
Media:	Supplementary lecture notes, materials and worksheets in digital form.
Additional information:	
Reading:	Martin Meyer: Mitarbeiterführung im lernenden Unternehmen: Analyse und Gestaltungsmöglichkeiten Rischar K.: Schwierige Mitarbeitergespräche erfolgreich führen, Verlag Moderne Industrie, 1986 Further reading will be listed on the internet prior to the start of the semester.
Last updated:	08.08.2007

Module BM2-1 Compact Course in Business Economics and Contract Law – Financing and balancing

Module:	Compact Course in Business Economics and Contract Law			Module number:	BM2-1	
Course:	Financing and balancing					
Semester:	M2	Contact hours (per week/ total):	2	20	Credit points:	2
		E-learning (hours):		10		
		Private study (hours):		30		
		Work-load (hours):		60		

Course co-ordinator:	Prof. Dipl.-Ing. (Univ.) Franz Josef Krichenbauer
Lecturer(s):	Thomas Fraulob
Curriculum category:	Master
Course structure:	Lectures (70%) and seminar preparation (c. 30%) E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives

Students will learn about the main forms of financing for companies. They will be able to understand the meaning and significance of a company rating as outlined by the BASEL II agreement and will be equipped to prepare themselves for a rating process. In addition students will learn how the invoicing process works from receipt of an invoice through to the publication of figures and how a company's accounting entries are made.

Course content:

Financing

- Basic terminology
- An overview of the standard forms of internal and external financing
- Loan securities
- Basel II and the rating process

Introduction to preparing the balance sheet

- The functions of cost accounting
- Basic terminology for internal cost accounting
- Different areas of accounting
- Annual statement of accounts
- Orderly book-keeping

Pre-exam tasks (coursework):	Assignment
Exam:	Written exam: 50-minute section of an exam covering this module and modules BM2-2 and BM2-3
Frequency:	Summer semester only
Status:	Compulsory
Media:	Supplementary lecture notes, materials and worksheets in digital form.
Additional information:	

Reading:	Handelsgesetzbuch (HGB), Dieter Jacob, Constanze Stuhr: Finanzierung und Bilanzierung in der Bauwirtschaft Further reading will be listed on the internet prior to the start of the semester.
Last updated:	08.08.2007

Module BM2-2 Compact Course in Business Economics and Contract Law – Specific business and contract law

Module:	Compact Course in Business Economics and Contract Law			Module number:	BM2-2	
Course:	Specific business and contract law					
Semester:	M2	Contact hours (per week/ total):	1	10	Credit points:	1
		E-learning (hours)		5		
		Private study (hours)		15		
		Work-load (hours):		30		

Course co-ordinator:	Prof. Dipl.-Ing. (Univ.) Franz Josef Krichenbauer
Lecturer(s):	Rita Herig
Curriculum category:	Master
Course structure:	Lectures E-learning: interactive material to accompany the lectures; advice and progress check via internet (email).

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

Students will learn the various legal structures of businesses and be able to differentiate between them. They will be familiar with the liability issues relevant to a company. They will further their knowledge of the most important forms of construction contracts. They will learn how a construction contract should be drawn up and practise this.

Course content:

- Legal structures
- Contract law
- Contract forms

Pre-exam tasks (coursework):	Assignment
Exam:	20-minute section of a written exam covering this module, BM2-1 and BM2-3
Frequency:	Summer semester only
Status:	Compulsory
Media:	Lecture notes, materials and worksheets to supplement the course available in digital form.
Additional information:	
Reading:	Verdingungsordnung für Bauleistungen (VOB); Wilfried Braun: Unternehmenshandbuch Recht; Hans Eysel: Vertragsrecht für Architekten und Ingenieure Further reading will be listed on the internet prior to the start of the semester.
Last updated:	08.08.2007

Module BM2 - 3 Compact Course in Business Economics and Contract Law – Specific business and contract law

Module:	Compact Course in Business Economics and Contract Law			Module number:	BM2-3	
Course:	Specific business and contract law					
Semester:	M2	Contact hours (per week/ total):	1	10	Credit points:	1
		E-learning (hours)		5		
		Private study (hours)		15		
		Work-load (hours):		30		

Course co-ordinator:	Prof. Dipl.-Ing.(Univ.) Franz Josef Krichenbauer
Lecturer(s):	Rita Herig
Curriculum category:	Master
Course structure:	Lectures E-learning: interactive material to accompany the lectures; advice and progress check via internet (email).

Pre-requisites:

Standard entry requirements for the Masters course

Learning/ skills objectives:

Students will learn the various legal structures of businesses and be able to differentiate between them. They will be familiar with the liability issues relevant to a company. They will further their knowledge of the most important forms of construction contracts. They will learn how a construction contract should be drawn up and practise this.

Course content:

- Legal structures
- Contract law
- Contract forms

Pre-exam tasks (coursework):	Assignment
Exam:	20-minute section of a written exam covering this module, BM2-1 and BM2-2
Frequency:	Summer semester only
Status:	Compulsory
Media:	Lecture notes, materials and worksheets to supplement the course available in digital form.
Additional information:	
Reading:	Verdingungsordnung für Bauleistungen (VOB); Wilfried Braun: Unternehmenshandbuch Recht; Hans Eysel: Vertragsrecht für Architekten und Ingenieure Further reading will be listed on the internet prior to the start of the semester.
Last updated:	08.08.2007

**Module BM3A-I-1 Technical and economic project analysis (KIB)
 Methodological processing of project data and background information I**

Module: Course:	Technical and economic project analysis (KIB) Methodological processing of project data and background information I			Module number:	BM3A-I-1	
Semester:	M1	Contact hours (per week/ total):	2,	15	Credit points:	3
		E-learning (hours):		15		
		Private study (hours):	*)	60		
		Work-load (hours):		90		

Course co-ordinator:	Prof. Dr.-Ing. Günter Lumpe
Lecturer(s):	Prof. Dr.-Ing. Günter Lumpe Prof. Dipl.-Ing. (Univ.) Franz Josef Krichenbauer and visiting lecturers
Curriculum category:	Master
Course structure:	Seminar work (c. 70%) with accompanying lectures and workshops (c. 30%). E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

Students will acquire the skills to systematically and thoroughly identify, gather information on, and present all factors influencing a planning task.

Course content:

For the particular planning task selected, the relevant legal, managerial and economic issues are to be identified. Information on the interdependence and conflicts between the various influencing factors is to be compiled and presented. The preparation and compilation will be carried out through project discussions, teamwork and individual work. Time management and project management methods will be employed to guide the process. Role-play will be used to explore conflicts and their various possible resolutions.

Pre-exam tasks (coursework):	Assignment in combination with module BM3A-I-2
Exam:	Presentation and oral exam covering this module and BM3A-I-2
Frequency:	Winter semester only
Status:	Compulsory
Media:	Course material and worksheets available in digital form on the internet and intranet
Additional information:	
Reading:	Baugesetzbuch (BauGB) Further reading relevant to the particular project will be detailed on the internet prior to the start of the semester.
Last updated:	08.08.2007

*) Due to the high proportion of independent study required, 3 credit points are awarded for this course

**Module BM3A-I-2 Technical and economic project analysis
 (Construction Engineering - KIB) I**
- Handling projects: conception, design, calculation I

Module: Course:	Technical and economic project analysis (KIB) I Handling projects: conception, design, calculation I			Module number:	BM3A-I-2	
Semester:	M1	Contact hours (per week/ total):	1,5	23	Credit points:	5
		E-learning (hours):		22		
		Private study (hours):	*)	105		
		Work-load (hours):		150		

Course co-ordinator:	Prof. Dr.-Ing. Günter Lumpe
Lecturers:	Prof. Dr.-Ing. Günter Lumpe, Prof. Dipl.-Ing. (Univ.) Franz Josef Krichenbauer, Prof. Dipl.-Ing. Rolf Schrodi, and visiting lecturers.
Curriculum category:	Master
Course structure:	Seminar work (c. 70%) with accompanying lectures and workshops (c. 30%). E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites: General entry requirements for the Masters course plus more thorough knowledge of construction engineering (Bachelors degree or Diploma)

Learning/ skills objectives:

Students will become acquainted with the multi-layered and inter-related technical and economic issues connected with the construction and operation of a large-scale project (e.g. an airport) They will analyse, evaluate and modify specific sections taking into consideration conception and design as well as load-carrying capacity, thereby developing the skills to think and act in an independent and inter-disciplinary way. The specialist construction engineering skills gained during the Bachelors or Diploma course will be further developed.

Course content:

- Analysis, work on and presentation of the various demands of selected parts of large-scale projects (e.g. airport buildings, hangars) from both a technical and an economic point of view.
- Seminar-based and individual development of solutions. This will partly be carried out in groups of 2-3 students to help develop important soft skills (teamwork and interpersonal skills).
- Assessment of the technical quality of the individual construction, production and installation variables, structural-physical considerations.
- Determination and comparison of costs for the individual variables.
- Decision-making followed by completion of a detailed plan including supporting structures. Calculation of load-bearing structures using modern computer-aided processes such as CAD or FEM.
- Error analysis, evaluation and checking of the calculations
- Presentation of the results

Pre-exam tasks (coursework):	Assignment in combination with module BM3A-I-1
Exam:	Presentation and oral exam covering this module and BM3A-I-1
Frequency:	Winter semester only
Status:	Compulsory
Media:	Supplementary lecture notes, materials and worksheets in digital form.
Additional information:	The work on sub-project I is completed by the end of the winter semester. In the summer semester, the skills acquired will be further developed during work on a second, independent sub-project with related content.
Reading:	Project-specific literature. Reading list in the internet (e.g. for hangars: „Stahlbau-Handbuch“, Band 2, Stahlkonstruktionen, Stahlb.-Verl.-GmbH)
Last updated:	09.08.2007

*) Due to the high proportion of independent study required, 5 credit points are awarded for this course

Module BM3A-I-3 Technical and economic project analysis (KIB) I

- Project-relevant scientific work I

Module: Course:	Technical and economic project analysis (KIB) I Project-relevant scientific work I			Module number:	BM3A-I-3	
Semester:	M1	Contact hours (per week/ total):	1,5	23	Credit points:	5
		E-learning (hours):		22		
		Private study (hours):	*)	105		
		Work-load (hours):		150		

Course co-ordinator:	Prof. Dr.-Ing. Günter Lumpe
Lecturer(s):	Prof. Dr.-Ing. Günter Lumpe, Prof. Dr.-Ing. Rolf Wohlfahrt, Prof. Dipl.-Ing. Rolf Schrodi, and visiting lecturers
Curriculum category:	Master
Course structure:	Lectures (c. 70%) with integrated practical sessions (c. 30%) E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

The students will extend their range of skills for analysing technical questions which may arise during large-scale projects (e.g. airports) and working out possible solutions.

These may include specific problems in the setting-up phase, the complex nature of the structural mechanics (both static and dynamic), material fatigue and resistance, the use of innovative materials such as super-strong steel, carbon-fibre compound materials, load-bearing glass constructions, fire safety: the natural fire safety concept.

Course content:

Content can vary according to the project.

- Mathematical and scientific bases
- Basic numerical methods
- Complex issues of structure and strength (non-uniform torsion, spatial stability, lateral torsional buckling)
- Use of numerical techniques (FEM) and the verification of calculations with regard to structural problems

Pre-exam tasks (coursework):	Assignment
Exam:	Oral exam
Frequency:	Winter semester only
Status:	Compulsory
Media:	Course material and worksheets available online in digital form
Additional information:	*) Due to the project nature of this course and relatively high amount of independent study required, this course is worth 5 credit points.
Reading:	Reading is project-specific, lists of suggested reading will be made available online. (e.g. Petersen, C., „Dynamik der Baukonstruktionen“ und „Statik und Stabilität der Baukonstruktionen“)
Last updated:	09.08.2007

Module BM3B-I-1 Technical and economic project analysis (UVW)
Methodological processing of project data and background information I

Module: Course:	Technical and economic project analysis (UVW) Methodological processing of project data and background information I			Module number:	BM3B-I-1	
Semester:	M1	Contact hours (per week/ total)	2	15	Credit points:	3
		E-learning (hours):		15		
		Private study (hours):	*)	60		
		Work-load (hours):		90		

Course co-ordinator:	Prof. Dr.-Ing. Jörg Hauptmann
Lecturer(s):	Prof. Dr.-Ing. Jörg Hauptmann Prof. Dr.-Ing. Helmut Kapp Prof. Dr.-Ing. Anton Nuding and visiting lecturers
Curriculum category:	Master
Course structure:	Seminar work (c. 70%) with accompanying lectures and workshops (c. 30%) E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

Students will acquire the skills to systematically and thoroughly identify, gather information on, and present all factors influencing a planning task.

Course content:

For the particular planning task selected, the relevant legal, managerial and economic issues are to be identified. Information on the interdependence and conflicts between the various influencing factors is to be compiled and presented. The preparation and compilation will be carried out through project discussions, teamwork and individual work. Time management and project management methods will be employed to guide the process. Role-play will be used to explore conflicts and their various possible resolutions.

Pre-exam tasks (coursework):	Assignment covering this module and module BM3B-I-2
Exam:	Presentation and oral exam covering this module and module BM3B-I-2
Frequency:	Winter semester only
Status:	Compulsory
Media:	Materials and worksheets in digital form available on ILIAS and the internet
Additional information:	
Reading:	Baugesetzbuch (BauGB) A further, project-specific reading list will be available on the internet prior to the start of the semester.
Last updated:	21.09.2011

*) Due to the particularly high proportion of independent study required, 3 credit points are awarded for this course

**Module BM3B-I-2 Technical and economic project analysis
 (Environment, Transport and Water - UVM) I**
- Handling projects: infrastructure planning I

Module: Course:	Technical and economic project analysis (UVM) I Handling projects: infrastructure planning I		Module number:	BM3B-I-2
Semester:	M1	Contact hours (per week/ total):	1,5 23	Credit points: 5
		E-learning (hours)	22	
		Private study (hours):	*) 105	
		Work-load (hours):	150	

Course co-ordinator:	Prof. Dr.-Ing. Jörg Hauptmann
Lecturers:	Prof. Dr.-Ing. Jörg Hauptmann Prof. Dr.-Ing. Helmut Kapp Prof. Dr.-Ing. Anton Nuding and visiting lecturers
Curriculum category:	Master
Course structure:	Seminar work (c. 70%) with accompanying lectures and workshops (c.30%) E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

Students will develop the ability to work through the plans for an infrastructure project stage by stage (initial planning, planning permission, execution) considering alternative solutions, and to present the results in teams.

Course content:

For the particular project selected further procedures and methods will be taught (e.g. special procedures related to hydrology of a catchment area, traffic engineering, water and wastewater management, and ecology).

Planning tasks worked through stage by stage, consideration of variants, decision-making leading to detailed drawing-up of the selected solution.

Pre-exam tasks (coursework):	Assignment covering this module and the module BM3B-I-1
Exam:	Presentation and oral exam covering this module and BM3B-I-3
Frequency:	Winter semester only
Status:	Compulsory
Media:	Materials and worksheets in digital form on ILIAS and the internet
Additional information:	
Reading:	Specialist literature for the respective subject area and further project-specific literature will be listed on the internet prior to the start of the semester.
Last updated:	21.09.2011

*) Due to the particularly high proportion of independent study required, 5 credit points are awarded for this course

Module BM3B-I-3 Technical and economic project analysis (UVW) I
- Project-relevant scientific work I

Module: Course:	Technical and economic project analysis (UVW) I Project-relevant scientific work I			Module number:	BM3B-I-3	
Semester:	M1	Contact hours (per week/ total):	1,5	23	Credit points:	5
		E-learning (hours):		22		
		Private study (hours):	*)	105		
		Work-load (hours):		150		

Course co-ordinator:	Prof. Dr.-Ing. Jörg Hauptmann
Lecturer(s):	Prof. Dr.-Ing. Jörg Hauptmann Prof. Dr.-Ing. Helmut Kapp Prof. Dr.-Ing. Anton Nuding and visiting lecturers
Curriculum category:	Master
Course structure:	Seminar work (c. 70%) with accompanying lectures and workshops (c.30%) E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

Students will develop the skills to develop various alternative solutions for complex infrastructure planning tasks taking into account the newest developments in the fields of: traffic engineering, wastewater management, hydraulic engineering and ecology. Problem-solving competence, economic evaluation (utility value analysis), the ability to develop an economically- and technically-optimised overall solution.

Course content:

Numerical methods of traffic analysis, 2-dimensional numerical water surface profile calculation, modelling of systems and operational procedures, applying them to project-specific issues.

Pre-exam tasks (coursework):	Assignment
Exam:	Presentation and oral exam
Frequency:	Winter semester only
Status:	Compulsory
Media:	Lecture notes and papers, scientific information, technical specifications and norms available digitally on the intranet and internet.
Additional information:	
Reading:	Specialist literature for the respective subject area and further project-specific literature will be listed on the internet prior to the start of the semester.
Last updated:	21.09.2011

*) Due to the particularly high proportion of independent study required, 5 credit points are awarded for this course

Module BM3A-II-1 Technical and economic project analysis (KIB)
Methodological processing of project data and background information I

Module: Course:	Technical and economic project analysis (KIB) II Methodological processing of project data and background information II			Module number:	BM3A-II-1	
Semester:	M2	Contact hours (per week/ total):	2,	15	Credit points:	3
		E-learning (hours):		15		
		Private study (hours):	*)	60		
		Work-load (hours):		90		

Course co-ordinator:	Prof. Dipl.-Ing. (Univ.) Franz Josef Krichenbauer
Lecturer(s):	Prof. Dr.-Ing. Günter Lumpe Prof. Dipl.-Ing. (Univ.) Franz Josef Krichenbauer and visiting lecturers
Curriculum category:	Master
Course structure:	Seminar preparation (c. 70%) with accompanying lectures and workshops (c.30%) E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

Students will acquire the skills to systematically and thoroughly identify, gather information on, and present all factors influencing a planning task.

Course content:

For the particular planning task selected, the relevant legal, managerial and economic issues are to be identified. Information on the interdependence and conflicts between the various influencing factors is to be compiled and presented. The preparation and compilation will be carried out through project discussions, teamwork and individual work. Time management and project management methods will be employed to assist the process. Role-play will be used to explore conflicts and their various possible resolutions.

Pre-exam tasks (coursework): Exam:	Assignment covering this module and module BM3A-II-2 Presentation and oral exam in combination with module BM3A-II-2
Frequency:	Summer semester only
Status:	Compulsory
Media:	Materials and worksheets available digitally on the intranet and internet.
Additional information:	
Reading:	Baugesetzbuch (BauGB) A further, project-specific reading list will be available on the internet prior to the start of the semester.
Last updated:	08.08.2007

*) Due to the particularly high proportion of independent study required, 3 credit points are awarded for this course

Module BM3A-II-2 Technical and economic project analysis (KIB) II

- Handling projects: conception, design, calculation II

Module:	Technical and economic project analysis (KIB) II			Module number:	BM3A-II-2	
Course:	Handling projects: conception, design, calculation II					
Semester:	M2	Contact hours (per week/ total):	1,5	23	Credit points:	5
		E-learning (hours):		22		
		Private study (hours):	*	105		
		Work-load (hours):		150		

Course co-ordinator:	Prof. Dr.-Ing. Günter Lumpe
Lecturer(s):	Prof. Dr.-Ing. Günter Lumpe, Prof. Dipl.-Ing. (Univ.) Franz Josef Krichenbauer, Prof. Dipl.-Ing. Rolf Schrodi, and visiting lecturers
Curriculum category:	Master
Course structure:	Seminar preparation (c. 70%) with accompanying lectures and workshops (c. 30%); E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course plus more thorough knowledge of construction engineering (Bachelor's degree or Diploma)

Learning/ skills objectives:

Students will become acquainted with the multi-layered and inter-related technical and economic issues connected with the construction and operation of a large-scale project (e.g. an airport) They will analyse, evaluate and modify specific sections taking into consideration conception and design as well as load-carrying capacity, thereby developing the skills to think and act in an independent and inter-disciplinary way. The specialist construction engineering skills gained during the Bachelors or Diploma course will be further developed.

Course content:

- Analysis, work on and presentation of the various demands of selected parts of large-scale projects (e.g. airport buildings, hangars) from both a technical and an economic point of view.
- Seminar-based and individual development of solutions. This will partly be carried out in groups of 2-3 students to help develop important soft skills (teamwork and interpersonal skills).
- Assessment of the technical quality of the individual construction, production and installation variables, structural-physical considerations.
- Determination and comparison of costs for the individual variables.
- Decision-making followed by completion of a detailed plan including supporting structures. Calculation of load-bearing structures using modern computer-aided processes such as CAD or FEM.
- Error analysis, evaluation and checking of the calculations
- Presentation of the results

Pre-exam tasks	Assignment covering this module and module BM3A-II-1
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(coursework):	
Exam:	Presentation and oral exam in combination with module BM3A-II-1
Frequency:	Summer semester only
Status:	Compulsory
Media:	Materials and worksheets available digitally on the intranet and internet.
Additional information:	The skills developed during the winter semester in sub-project I will be extended and deepened during this sub-project II. The two projects are however separate and can be completed independently of one another.
Reading:	Project-specific literature – reading list available on the internet (for example for hangars: „Stahlbau-Handbuch“, Band 2, Stahlkonstruktionen, Stahlb.-Verl.-GmbH)
Last updated:	09.08.2007

*) Due to the particularly high proportion of independent study required, 5 credit points are awarded for this course

**Module BM3A-II-3 Technical and economic project analysis (KIB) II
 - Project-relevant scientific work II**

Module: Course:	Technical and economic project analysis (KIB) II Project-relevant scientific work II			Module number:	BM3A-II-3
Semester:	M2	Contact hours (per week/ total):	1,5	23	Credit points: 5
		E-learning (hours):		22	
		Private study (hours):	*	105	
		Work-load (hours):		150	

Course co-ordinator:	Prof. Dr.-Ing. Günter Lumpe
Lecturer(s):	Prof. Dr.-Ing. Günter Lumpe, Prof. Dr.-Ing. Rolf Wohlfahrt, Prof. Dipl.-Ing. Rolf Schrodi, and visiting lecturers
Curriculum category:	Master
Course structure:	Lectures (c. 70%) with integrated practical sessions (c. 30%) E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

The students will further extend their range of skills for analysing technical questions which may arise during large-scale projects (e.g. airports) and working out possible solutions. These may include specific problems in the setting-up phase, the complex nature of the structural mechanics (both static and dynamic), material fatigue and resistance, the use of innovative materials such as super-strong steel, carbon-fibre compound materials, load-bearing glass constructions, fire safety and the natural fire safety concept.

Course content:

Content can vary according to the project.

- Dynamic load on structures (free and forced vibration, damping, material fatigue)
- Application of numerical methods and the verification of calculations with regard to structural problems
- The use of innovative materials (e.g. carbon-fibre reinforced polymer – CFRP/CFP)
- Special foundations
- Fire prevention (natural fire safety concept, simulation)

Pre-exam tasks (coursework):	Assignment
Exam:	Oral exam
Frequency:	Summer semester only
Status:	Compulsory
Media:	Course material and worksheets available online in digital form
Additional information:	*) Due to the project-related nature of this course and relatively high amount of independent study, this course is worth 5 credit points.
Reading:	Reading is project-specific, a list of suggested reading will be made available online. (e.g. Petersen, C., „Dynamik der Baukonstruktionen“ und „Statik und Stabilität der Baukonstruktionen“)
Last updated:	09.08.2007

**Module BM3B-II-1 Technical and economic project analysis (UVW)
 Methodological processing of project data and background information II**

Module: Course:	Technical and economic project analysis (UVW) Methodological processing of project data and background information II			Module number:	BM3B-II-1
Semester:	M2	Contact hours (per week/ total):	2	15	Credit points: 3
		E-learning (hours):		15	
		Private study (hours):	*)	60	
		Work-load (hours):		90	

Course co-ordinator:	Prof. Dr.-Ing. Jörg Hauptmann
Lecturer(s):	Prof. Dr.-Ing. Jörg Hauptmann Prof. Dr.-Ing. Helmut Kapp Prof. Dr.-Ing. Anton Nuding Visiting lecturers
Curriculum category:	Master
Course structure:	Seminar work (c. 70%) with accompanying lectures and workshops (c.30%) E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

Students will acquire the skills to systematically and thoroughly identify, gather information on, and present all factors influencing a planning task.

Course content:

For the particular planning task selected, the relevant legal, managerial and economic issues are to be identified. Information on the interdependence and conflicts between the various influencing factors is to be compiled and presented. The preparation and compilation will be carried out through project discussions, teamwork and individual work. Time management and project management methods will be employed to guide the process. Role-play will be used to explore conflicts and their various possible resolutions.

Pre-exam tasks (coursework): Exam:	Assignment in combination with module BM3B-I-2 Presentation and oral exam in combination with module BM3A-II-2
Frequency:	Summer semester only
Status:	Compulsory
Media:	Materials and worksheets available digitally on the intranet and internet.
Additional information:	
Reading:	Baugesetzbuch (BauGB) A further, project-specific reading list will be available on the internet prior to the start of the semester.
Last updated:	21.09.2011

*) Due to the particularly high proportion of independent study required, 3 credit points are awarded for this course

Module BM3B-II-2 Technical and economic project analysis (UVW) II

- Handling projects: infrastructure planning II

Module: Course:	Technical and economic project analysis (UVW) II Handling projects: infrastructure planning II		Module number:	BM3B-II-2
Semester:	M2	Contact hours (per week/ total):	1,5	23
		E-learning (hours)		22
		Private study (hours):	*)	105
		Work-load (hours):		150
		Credit points:	5	

Course co-ordinator:	Prof. Dr.-Ing. Jörg Hauptmann
Lecturers:	Prof. Dr.-Ing. Jörg Hauptmann Prof. Dr.-Ing. Helmut Kapp Prof. Dr.-Ing. Anton Nuding Visiting lecturers
Curriculum category:	Master
Course structure:	Seminar work (c. 70%) with accompanying lectures and workshops (c.30%) E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

Students will acquire the skills required to manage a complex infrastructure building project including tendering, calculating, the awarding and issuing of contracts (in a simulated setting).

Course content:

Determining quantities based on the planning of project sections, drawing up bidding documents, scheduling the project stages, construction management of the complete project, calculating and drawing up quotations, schedule and cost-control, on-going management

Pre-exam tasks (coursework): Exam:	Assignment covering this module and the module BM3B-II-1 Presentation and oral exam covering this module and the module BM3B-II-1
Frequency:	Summer semester only
Status:	Compulsory
Media:	Materials and worksheets in digital form available on ILIAS and the internet
Additional information:	
Reading:	Specialist literature for the respective subject area and further project-specific literature will be listed on the internet prior to the start of the semester.
Last updated:	21.09.2011

*) Due to the particularly high proportion of independent study required, 5 credit points are awarded for this course

Module BM3B-II-3 Technical and economic project analysis (UVW) II
- Project-relevant scientific work II

Module: Course:	Technical and economic project analysis (UVW) II Project-relevant scientific work II		Module number:	BM3B-II-3
Semester:	M2	Contact hours (per week/ total):	1,5	23
		E-learning (hours)		22
		Private study (hours):	*)	105
		Work-load (hours):		150
		Credit points:	5	

Course co-ordinator:	Prof. Dr.-Ing. Jörg Hauptmann
Lecturer(s):	Prof. Dr.-Ing. Jörg Hauptmann Prof. Dr.-Ing. Helmut Kapp Prof. Dr.-Ing. Anton Nuding Visiting lecturers
Curriculum category:	Master
Course structure:	Seminar work, lab. and field work (c. 70%) with accompanying lectures and workshops (c. 30%) E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

Students will further develop the skills required for dealing with project-specific problems and questions using various methods of calculation and analysis; planning, carrying out and evaluating programmes of investigation.

Course content:

Numerical methods such as:

Numerical modelling of ground water, finite elements in geotechnics, numerical node point calculations, Operations Research.

Project-specific experiments carried out using the facilities available at the institutes and test sites.

Pre-exam tasks (coursework):	Assignment
Exam:	Presentation and oral exam
Frequency:	Summer semester only
Status:	Compulsory
Media:	Lecture notes and papers, scientific information, technical specifications and norms available digitally on the intranet and internet.
Additional information:	
Reading:	A list of project-specific literature will be made available on the internet prior to the start of the semester.
Last updated:	21.09.2011

*) Due to the particularly high proportion of independent study required, 5 credit points are awarded for this course

Module BM4-1 Computer science for the construction sector - Foundation VBA and structured programming

Module: Course:	Computer science for the construction sector Foundation VBA and structured programming			Module number:	BM4-1	
Semester:	M1	Contact hours (per week/ total)	2,	20	Credit points:	2
		E-learning (hours):		10		
		Private study (hours):		30		
		Work-load (hours):		60		

Course co-ordinator:	Prof. Dr.-Ing. Hans Quasnitza
Lecturer(s):	Prof. Dr.-Ing. Hans Quasnitza
Curriculum category:	Master
Course structure:	Lectures (50%) with hands-on practice on the computer (50%) E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

Students will learn how to automate engineering-specific tasks using Visual Basic and Visual Basic for Applications. They will be able to enlarge and upgrade commonly-used programmes with the use of add-ins.

Course content:

Language elements of VB and VBA, programming techniques with VB and VBA, structured programming; examples of use in connection with Excel; practical application in the construction and planning areas of structural engineering

Pre-exam tasks (coursework): Exam:	Assignment
Frequency:	Winter semester only
Status:	Compulsory
Media:	Materials and worksheets available digitally in the intra- and internet
Additional information:	
Reading:	Michael Kofler: Excel-VBA programmieren Schriftenreihe des Regionalen Rechenzentrums Niedersachsen / Uni Hannover: VBA-Programmierung Integrierte Lösungen mit Office 2003 Further reading will be listed online prior to the start of the semester.
Last updated:	13.08.2007

Module BM4-2 Computing in civil and building engineering

- Network planning technique and project management software

Module: Course:	Computing in civil and building engineering Network planning technique and project management software			Module number:	BM4-2	
Semester:	M2	Contact hours (per week/ total):	2	20	Credit points:	2
		E-learning (hours):		10		
		Private study (hours):		30		
		Work-load (hours):		60		

Course co-ordinator:	Prof. Dipl.-Ing. Franz Josef Krichenbauer
Lecturer(s):	Prof. Dipl.-Ing. Franz Josef Krichenbauer
Curriculum category:	Master
Course structure:	Lectures (50%) with hands-on practice on the computer (50%) E-learning proportion: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course

Learning/ skills objectives:

The students will be introduced to the network planning technique and, using network planning programmes, shown how to set out the procedure for structured and complex projects. They will be introduced to the electronic preparation of progress/time diagrams with resource and cost determination and put these into practise on a project. They will also be introduced to the process of tendering, awarding contracts and invoicing for construction work. They will then be able to compile a schedule of works and other documents related to contracts and tenders.

Course content:

- Microsoft Project
- Tilos (software for linear schedules)
- ORCA AVA and dynamic construction data

Pre-exam tasks (coursework): Exam:	Assignment
Frequency:	Summer semester only
Status:	Compulsory
Media:	Materials and worksheets available digitally in the intra- and internet
Additional information:	
Reading:	Gerster: Baubetrieb in Beispielen RZ Hannover: Microsoft Project Handbücher MS-Project, TILOS und ORCA Further reading will be listed online prior to the start of the semester.
Last updated:	08.08.2007

Module BM4A-I-1 Computing in civil and building engineering: specialist IT applications (KIB) I
- Scientific basis of linear and non-linear Finite Element methods I

Module:	Computing in civil and building engineering: specialist IT applications (KIB) I			Module number:	BM4A-I-1	
Course:	Scientific fundamentals of linear and non-linear Finite Element methods I					
Semester:	M1	Contact hours (per week/ total)	3	22,5	Credit points:	4
		E-learning (hours):		22,5		
		Private study (hours):		75		
		Work-load (hours):		120		

Course co-ordinator:	Prof. Dr.-Ing. Günter Lumpe
Lecturer(s):	Prof. Dr.-Ing. Günter Lumpe, and visiting lecturers
Curriculum category:	Master
Course structure:	Lectures (c. 70%) with integrated practical content (c. 30%); E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Master's course plus more thorough knowledge of construction engineering (Bachelor's degree or Diploma)

Learning/ skills objectives:

Students will be taught the mathematical and mechanical principles necessary for a practical FE-analysis.

Course content:

- Vectors and matrices, hypermatrices, standard specifications, condition number
- Linear systems of equations: elimination method (GAUSS, CHOLESKY), iterative method, conditioning of the system of equations
- Equations for the linear elasticity theory for beams, membranes and panels
- Exemplified working- und variational principles of linear elastomechanics
- Numerical errors and checks

Pre-exam (coursework):	
Exam:	Oral exam
Frequency:	Winter semester only
Status:	Compulsory
Media:	Materials and worksheets available digitally in the intra- and internet
Additional information:	
Reading:	Dankert, J., Numerische Methoden der Mechanik, Werkle, H., Finite Elemente in der Baustatik; Link, M., Finite Elemente in der Statik und Dynamik; Meißner/ Maurial, Die Methode der finiten Elemente; Bathe, K.-J., Finite-Element-Methoden; Kindmann/ Kraus, Finite-Elemente-Methoden im Stahlbau
Last updated:	2.02.2010

Module BM4A-I-2 Computing in civil and building engineering: specialist IT applications (KIB) I
- Application and checking of special Finite Element Models I

Module:	Computing in civil and building engineering: specialist IT applications (KIB) I			Module number:	BM4A-I-2	
Course:	Application and checking of special Finite Element models I					
Semester:	M1	Contact hours (per week/ total):	3	22,5	Credit points	4
		E-learning (hours):		22,5		
		Private study (hours):		75		
		Work-load (hours):		120		

Course co-ordinator:	Prof. Dr.-Ing. Günter Lumpe
Lecturer(s):	Prof. Dr.-Ing. Günter Lumpe, and external lecturers
Curriculum category:	Master
Course structure:	Lectures (c. 70%) with integrated practical content (c. 30%); E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course plus more thorough knowledge of construction engineering (Bachelor's degree or Diploma)

Learning/ skills objectives:

Students will learn the theoretical and mechanical background as well as the critical and responsible handling of Standard Finite Element software for **linear** structural frameworks. Particular emphasis will be placed on recognising the numerous possibilities for error and the checks associated with today's unavoidable use of „Black Box Programmes“.

This practically-oriented course runs in co-operation with two leading German software development companies.

Course content:

- Overview, possible application and approximate nature of FEM.
- Approximation for the displacements of elements
- Derivation of linear force vectors and stiffness matrices employing differential equations and the Law of the Minimum Total Potential Energy using the example of members
- Transformation and interconnection of the elements through overall balance at the nodes
- Calculation of linear equations and back-substitution
- Application (and checking) of the method using self-developed VBA software (source code) and standard FE software for member and surface elements
- Potential for error, quality assurance, checking outcomes
- Interpretation and documentation of results

Pre-exam tasks (coursework):	Assignment
Exam:	
Frequency:	Winter semester only
Status:	Compulsory

Media:	Materials and worksheets available in digital form in the intranet and internet
Additional information:	Derivation and simple examples will be demonstrated using interactive scientific software („MathCAD“, „Scientific-Workplace“) and self-developed software. The source code for this software in VBA will be made available. Complex, practically-oriented application will be carried out using standard FE-software in co-operation with 2 leading software development companies.
Reading:	Werkle, H., Finite Elemente in der Baustatik; Link, M., Finite Elemente in der Statik und Dynamik; Bathe, K.-J., Finite-Element-Methoden; Kindmann/ Kraus, Finite-Elemente-Methoden im Stahlbau
Last updated:	2.02.2010

Module BM4B-I-1 Computing in civil and building engineering: specialist IT applications (UVW) I
- Scientific basics of special IT models I

Module:	Computing in civil and building engineering: specialist IT applications (UVW) I			Module number:	BM4B-I-1	
Course:	Scientific basics of special IT models I					
Semester:	M1	Contact hours (per week/ total):	3	22,5	Credit points:	4
		E-learning (hours):		22,5		
		Private study (hours):	*)	75		
		Work-load (hours):		120		

Course co-ordinator:	Prof. Dr.-Ing. Jörg Hauptmann
Lecturer(s):	Prof. Dr.-Ing. Jörg Hauptmann Prof. Dr.-Ing. Helmut Kapp Prof. Dr.-Ing. Anton Nuding and visiting lecturers
Curriculum category:	Master
Course structure:	Lectures (30 %); practical sessions in the computer centre (70 %) Homework exercises with e-learning elements. E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course. Basic IT skills.

Learning/ skills objectives:

To become familiar with various IT models in construction, their specific features, their use, their base data, interpretations and results.

Course content:

General practise exercises with the programmes STRATIS, ARRIBA: basics, data formats, road construction, infrastructure planning, canalisation planning

Pre-exam tasks (coursework):	Assignment
Exam:	
Frequency:	Winter semester only
Status:	Compulsory
Media:	E-learning, digital information on the internet and intranet
Additional information:	
Reading:	Handbooks, notes from the producers/ developers
Last updated:	21.09.2011

*) Due to the particularly high proportion of independent study required, 4 credit points are awarded for this course

Module BM4B-I-2 Computing in civil and building engineering: specialist IT applications (UVW) I
- Application and checking of special Finite Element Models I

Module:	Computing in civil and building engineering: specialist IT applications (UVW) I			Module number:	BM4B-I-2	
Course:	Application and checking of special Finite Element Models I					
Semester:	M1	Contact hours (per week/ total):	3	22,5	Credit points:	4
		E-learning (hours):		22,5		
		Private study (hours):	*)	75		
		Work-load (hours):		120		

Course co-ordinator:	Prof. Dr.-Ing. Jörg Hauptmann
Lecturer(s):	Prof. Dr.-Ing. Jörg Hauptmann Prof. Dr.-Ing. Helmut Kapp Prof. Dr.-Ing. Anton Nuding and external lecturers
Curriculum category:	Master
Course structure:	Lectures (30 %), workshops in the computer centre (70 %) E-learning components E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course
Basic IT skills

Learning/ skills objectives:

Becoming familiar with and learning to use project-related IT models.

Course content:

Working on sub-projects with the programmes STRATIS, ARRIBA in the planning, preliminary construction and building periods. Use of technical models such as hydraul. Pipeline calculations, water surface profile calculations, soil mechanics programmes.

Pre-exam tasks (coursework):	Assignment
Exam:	
Frequency:	Winter semester only
Status:	Compulsory
Media:	E-learning, workshops
Additional information:	
Reading:	A further reading list will be available on the internet
Last updated:	21.09.2011

*) Due to the particularly high proportion of independent study required, 4 credit points are awarded for this course

Module BM4A-II-1 Computing in civil and building engineering: specialised IT applications (KIB) II
- Scientific basis of linear and non-linear Finite Element Methods II

Module:	Computing in civil and building engineering: specialised IT applications (KIB) II			Module number:	BM4A-II-1	
Course:	Scientific basics of linear and non-linear Finite Element Methods II					
Semester:	M2	Contact hours (per week/ total):	3	22,5	Credit points:	4
		E-learning (hours):		22,5		
		Private study (hours):		75		
		Work-load (hours):		120		

Course co-ordinator:	Prof. Dr.-Ing. Günter Lumpe
Lecturer(s):	Prof. Dr.-Ing. Günter Lumpe, zus. Lehrbeauftragte
Curriculum category:	Master
Course structure:	Lectures (c. 70%) with integrated practical content (c. 30%); E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course plus more thorough knowledge of construction engineering (Bachelor's degree or Diploma)

Learning/ skills objectives:

Students will be taught the mathematical and mechanical basics necessary for a practical FE analysis.

Course content:

- Revision, special course for beginners: overview of matrices, vectors and linear equations.
- Eigen-value and eigenmode of symmetrical matrices.
- Basic comparison of linear and non-linear theories of elasticity for beams with bending, normal force and thrust
- The Law of the Minimum Total Potential Energy of linear and non-linear elastomechanics using the examples of beams with bending, normal force and thrust
- Calculation of non-linear equations: Newton-Raphson iteration

Pre-exam tasks (coursework):	Assignment
Exam:	
Frequency:	Summer semester only
Status:	Compulsory
Media:	Materials and worksheets available in digital form on the intra- and internet
Additional information:	All examples and derivations will be demonstrated using interactive scientific software ("MathCAD" and "Scientific-Workplace")
Reading:	Dankert, J., Numerische Methoden der Mechanik, Werkle, H., Finite Elemente in der Baustatik; Link, M., Finite Elemente in der Statik und Dynamik; Bathe, K.-J., Finite-Element-Methoden; Kindmann/ Kraus, Finite-Elemente-Methoden im Stahlbau
Last update:	2.02.2010

Module BM4A-II-2 Computing in civil and building engineering: specialised IT applications (KIB) II
- Application and checking of special Finite Element Models II

Module:	Computing in civil and building engineering: specialised IT applications (KIB) II			Module number:	BM4A-II-2	
Course:	Application and checking of special Finite Element Models II					
Semester:	M2	Contact hours (per week/ total):	3	22,5	Credit points:	4
		E-learning (hours):		22,5		
		Private study (hours):		75		
		Work-load (hours):		120		

Course co-ordinator:	Prof. Dr.-Ing. Günter Lumpe
Lecturer(s):	Prof. Dr.-Ing. Günter Lumpe, visiting lecturers
Curriculum category:	Master
Course structure:	Lectures (c. 70%) with integrated practical content (c. 30%); E-learning proportion: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course plus more thorough knowledge of construction engineering (Bachelor's degree or Diploma)

Learning/ skills objectives:

Students will learn the theoretical and mechanical background as well as the critical and responsible handling of Standard Finite Element software for **non-linear** structural frameworks. Particular emphasis will be placed on recognising the numerous possibilities for error and the checks associated with today's unavoidable use of „Black Box Programmes“.

Inhalt:

- Revision, special course for beginners: overview, possible applications and approximate nature of FEM.
- Base functions and derivation of non-linear force vectors and stiffness matrices employing the Law of the Minimum Total Potential Energy using the example of members/ beams (elastic material behaviour)
- Overview/ revision: transformations, interconnection of the elements
- Calculation of non-linear equations: Newton-Raphson iteration
- Back-substitution
- Application (and checking) using self-developed VBA software (source code) focussing on simple members
- Application (and checking) using standard FE software for members/ beams focussing on complex structures
- Examination and discussion of various levels of accuracy of the geometric non-linear kinematic relationships; influence on the convergence behaviour and the quality of the results
- Determinant procedure of the stiffness matrix, critical load conditions, eigen-values and eigen mode
- The influence of geometrical replacement imperfections
- Potential for error, quality assurance, checking outcomes
- Interpretation and documentation of results

Pre-exam tasks (coursework):	Assignment
Exam:	
Frequency:	Summer semester only

Status:	Compulsory
Media:	Materials and worksheets available in digital form in the intranet and internet
Additional information:	Derivation and simple examples will be demonstrated using interactive scientific software („MathCAD“, „Scientific-Workplace“) and self-developed software. The source code for this software in VBA will be made available. Complex, practically-oriented application will be carried out using standard FE-software in co-operation with 2 leading software development companies.
Reading:	Link, M., Finite Elemente in der Statik und Dynamik; Bathe, K.-J., Finite-Element-Methoden; Kindmann/ Kraus, Finite-Elemente-Methoden im Stahlbau; Lumpe, G., Zur Stabilität und Biegetorsion großer Verformungen von räumlichen Stabwerken, Bauingenieur, Heft 3, 2005; Gensichen/ Lumpe, Zur Leistungsfähigkeit, korrekten Anwendung und Kontrolle räumlicher Stabwerksprogramme, Vortrag Gensichen: Stahlbauseminar Rheine, Mai 2007
Last updated:	2.02.2010

Module BM4B-II-1 Computing in civil and building engineering: specialised IT applications (UVW) II
- Scientific basics of specialist IT models II

Module:	Computing in civil and building engineering: specialised IT applications (UVW) II			Module number:	BM4B-II-1	
Course:	Scientific basics of specialist IT models II					
Semester:	M2	Contact hours (per week/ total):	3	22,5	Credit points:	4
		E-learning (hours):		22,5		
		Private study (hours):	*)	75		
		Work-load (hours):		120		

Course co-ordinator:	Prof. Dr.-Ing. Jörg Hauptmann
Lecturer(s):	Prof. Dr.-Ing. Jörg Hauptmann Prof. Dr.-Ing. Helmut Kapp Prof. Dr.-Ing. Anton Nuding and visiting lecturers
Curriculum category:	Master
Course structure:	Lectures (30 %); practical sessions in the computer centre (70 %) Homework exercises with e-learning elements E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course. Basic IT skills.

Learning/ skills objectives:

To become familiar with various IT models in construction, in particular in the preliminary construction phase, their specific features, their use, their base data, interpretations and results.

Course content:

General practise exercises with the programme ARRIBA, programmes for the creation of specifications/ bills of quantity, calculation and determination of quantity: basic data, data format, road construction, infrastructure planning, canalisation planning.

Pre-exam tasks (coursework):	Assignment
Exam:	
Frequency:	Summer semester only
Status:	Compulsory
Media:	E-learning, digital information on the internet and intranet
Additional information:	
Reading:	Handbooks, notes from the producers/ developers Further reading lists will be made available online.
Last updated:	21.09.2011

*) Due to the particularly high proportion of independent study required, 4 credit points are awarded for this course

Module BM4B-II-2 Computing in civil and building engineering: specialised IT applications (UVW) II
- Application and checking of special IT models II

Module:	Computing in civil and building engineering: specialised IT applications (UVW) II			Module number:	BM4B-II-2
Course:	Application and checking of special IT models II			Credit points:	4
Semester:	M2	Contact hours (per week/ total):	3	22,5	
		E-learning (hours):		22,5	
		Private study (hours):	*)	75	
		Work-load (hours):		120	

Course co-ordinator:	Prof. Dr.-Ing. Jörg Hauptmann
Lecturer(s):	Prof. Dr.-Ing. Jörg Hauptmann Prof. Dr.-Ing. Helmut Kapp Prof. Dr.-Ing. Anton Nuding and visiting lecturers
Curriculum category:	Master
Course structure:	Lectures (30 %), workshops in the computer centre (70 %) E-learning components E-learning: interactive material to accompany the lectures; advice, guidance and progress check via internet (e-mail)

Pre-requisites:

General entry requirements for the Masters course. Basic IT skills

Learning/ skills objectives:

Students will become familiar with and learn to use project-specific IT models in the preliminary construction phase

Course content:

Working on sub-projects with the programmes STRATIS, ARRIBA in the planning, preliminary construction and building periods. Quantity determination with STRATIS, specifications with ARRIBA, quotations, calculations and construction management with ARRIBA

Pre-exam tasks (coursework):	Assignment
Exam:	
Frequency:	Summer semester only
Status:	Compulsory
Media:	E-learning, workshops
Additional information:	
Reading:	Further reading lists will be made available online
Last updated:	21.09.2011

*) Due to the particularly high proportion of independent study required, 4 credit points are awarded for this course

Module BM5-1 Foreign languages

– Business English I

Module:	BM5-1 Foreign languages			Module number:	BM5-1	
Course:	Business English I					
Semester:	M1	Contact hours (per week/ total):	2	10	Credit points:	3
		E-learning (hours):		20		
		Private study (hours):	*)	60		
		Work-load (hours):		90		

Course co-ordinator:	Prof. Dipl.-Ing. (Univ.) Franz Josef Krichenbauer
Lecturer(s):	Fr. Rustler, MBA
Curriculum category:	Master
Course structure:	Communication via Blackboard (weekly discussion in discussion forum, tasks), telephone conference, closing event (final class day)

Pre-requisites:

General entry requirements for the Masters course.
 Basic knowledge of English both oral and written; internet access, telephone connection.

Language skills: Improvement of listening, reading, writing and speaking abilities in English.

Study/ professional skills: Training in methods of reading for main information, summarising and explaining. The use of various presentation tools such as PowerPoint; podcasts, audio conferences.

Social skills: development of team-work skills and the ability to interact and present in English.

Course content:

1. Insight into selected economic themes using authentic texts.
2. Improvement of reading for main ideas and summarising.
3. Building vocabulary in various subject areas.
4. Improvement of communication skills and ability to give several short talks in English.
5. Ability to produce a written portfolio on a particular theme in English

Pre-exam tasks (coursework):	E-mail (discussion forum) and participation in teleconference.
Exam:	Project presentation
Frequency:	Winter semester only
Status:	Compulsory
Media:	Lecture notes, materials and worksheets available in digital form on the intranet and internet.
Additional information:	
Reading:	Further reading will be listed on the internet prior to the start of the semester.
Last updated:	08.08.2007

*) due to the particularly high proportion of out-of-class work required, 3 credit points are awarded for this course.

Module BM5-2 Foreign languages

– Business English II

Module: Course:	Foreign languages Business English II			Module number:	BM5-2	
Semester:	M2	Contact hours (per week/ total):	2	10	Credit points:	3
		E-learning (hours):		20		
		Private study (hours):	*)	60		
		Work-load (hours):		90		

Course co-ordinator:	Prof. Dipl.-Ing. (Univ.) Franz Josef Krichenbauer
Lecturer(s):	Fr. Rustler, MBA
Curriculum category:	Master
Course structure:	Communication via Blackboard (weekly discussion in discussion forum, tasks), telephone conference, closing event (final class day)

Pre-requisites:

General entry requirements for the Masters course.
 Basic knowledge of English both oral and written; internet access, telephone connection.

Language skills: Improvement of listening, reading, writing and speaking abilities in English.

Study/ professional skills: Training in methods of reading for main information, summarising and explaining. The use of various presentation tools such as PowerPoint; podcasts, audio conferences.

Social skills: development of team-work skills and the ability to interact and present in English.

Course content:

6. Insight into selected economic themes using authentic texts.
7. Improvement of reading for main ideas and summarising.
8. Building vocabulary in various subject areas.
9. Improvement of communication skills and ability to give several short talks in English.
10. Ability to produce a specific written portfolio in English

Pre-exam tasks (coursework):	E-mail (discussion forum) and participation in teleconference.
Exam:	Project presentation
Frequency:	Summer semester only
Status:	Compulsory
Media:	Lecture notes, materials and worksheets available in digital form on the intra- and internet.
Additional information:	
Reading:	Further reading will be listed on the internet prior to the start of the semester.
Last updated:	08.08.2007

*) due to the particularly high proportion of out-of-class work required, 3 credit points are awarded for this course.

Module BM6 Master's Thesis

Module: Course:	Master's Thesis			Module number:	BM6
Semester:	M3	Contact hours (per week/ total):		Credit points:	28
		E-learning (hours):			
		Private study (hours):	810		
		Work-load (hours):	810		

Course co-ordinator:	Dean of the School
Lecturer(s):	Various professors and visiting lecturers as relevant
Curriculum category:	Master
Course structure:	Lectures, seminars, workshops and e-learning components.

Pre-requisites:

Successful completion of M1 und M2

Learning/ skills objectives:

Students will show that they can, with the aid of scientific methods, address and work through a specific, appropriate technical issue.

Course content:

- Basic scientific approaches
- The structure of a scientific thesis
- Academic writing (scientific working with word-processing programmes)
- Representative opinion polls, surveys and enquiries.
- Professional internet research
- Analysis and tools for analysis
- Legal parameters

Pre-exam tasks (coursework):	Regular (4-weekly) oral or written report on methodology and progress status to the thesis supervisor.
Exam:	
Frequency:	
Status:	
Media:	
Additional information:	
Reading:	Duden: Verfassen einer wissenschaftlichen Arbeit Further reading will be suggested prior to the start of the semester.
Last updated:	02.02.2010

Module BM7-2 Compulsory electives

- Public-Private-Partnerships and other models of co-operation

Module: Course:	Compulsory electives Public-Private-Partnerships and other models of co-operation			Module number:	BM7-2	
Semester:	M3	Contact hours (per week/ total):	1	15	Credit points:	1
		E-learning (hours):				
		Private study (hours):		15		
		Work-load (hours):		30		

Course co-ordinator:	Dean of the School
Lecturer(s):	Karl Heinz Brunner
Curriculum category:	Master
Course structure:	Lectures (40%) Seminars (60%) in block form

Pre-requisites:

None

Learning/ skills objectives:

Students will learn about the use of co-operation models such as Public-Private-Partnerships. They will be introduced to the legal and economic realities of these forms of co-operation. Using examples, they will be familiarised with the organisation, the contracts and the realisation of such models.

Course content:

- Varieties of PPP
- Co-operation model
- Operator model
- Management models (concession models)
- Lease agreements
- BOT Model
- Risks
- Uses
- The German "ÖPP Beschleunigungsgesetz" (law for speeding up the process of Public Private Partnerships)

Pre-exam tasks (coursework):	
Exam:	
Frequency:	
Status:	
Media:	OHT, flipchart, black/whiteboard, projector
Additional information:	2 out of 3 compulsory electives must be selected from module BM7
Reading:	Further reading will be available online prior to the start of the semester.
Last updated:	03.02.2010

Module BM7-3 Compulsory electives

- Business plans and setting up a company

Module:	Compulsory electives			Module number:	BM7-3	
Course:	Business plans and setting up a company					
Semester:	M3	Contact hours (per week/ total):	1	15	Credit points:	1
		E-learning (hours):				
		Private study (hours):		15		
		Work-load (hours):		30		

Course co-ordinator:	Dean of the School
Lecturer(s):	Artur Nägele
Curriculum category:	Master
Course structure:	Lectures (40%) Seminars (60%) in block form

Pre-requisites:

None

Learning/ skills objectives:

Students will learn how to go about setting up their own business. They will be taught how to draw up a business plan and how to use this to secure outside sources of financing. They will be shown the variety of loans available to people setting up their own business

Course content:

Business plans

- Different kinds
- Structure
- Scope
- Source

Setting up a business

- Assistance
- Issues associated with support from institutions
- Contests for new businesses
- Simulation of the process of founding a new business
- Background research
- Tax incentives for new businesses

Pre-exam tasks (coursework):	
Exam:	
Frequency:	
Status:	
Media:	OHT, flipchart, black/whiteboard, projector
Additional information:	2 out of 3 compulsory electives must be selected from module BM7
Reading:	Further reading will be available online prior to the start of the semester.
Last updated:	03.02.2010

Modul BM7-4 Compulsory electives
 - Getting published in scientific publications

Module:	Compulsory electives			Module number:	BM7-4
Course:	Getting published in scientific publications			Credit points:	1
Semester:	M3	Contact hours (per week/ total):	1	15	
		E-learning (hours):			
		Private study (hours):		15	
		Work-load (hours):		30	

Course co-ordinator:	Dean of the school
Lecturer(s):	Herr Wegner
Curriculum category:	Master
Course structure:	Lectures (40%) Seminars (60%) in block form

Pre-requisites:

None

Learning skills/ objectives:

In connection with their Master's thesis, students will learn how to correctly go about being published in scientific publications. They will have mastered a style that will allow them to produce clear and suitable papers for publication in journals.

Course content:

- Organisation
- Structure
- Sections
- Quotes and footnotes
- Subject index and index of names
- Tables and list of illustrations
- etc.

Pre-exam tasks (coursework):	
Exam:	
Frequency:	
Status:	
Media:	OHT, flipchart, black/whiteboard, projector
Additional information:	2 out of 3 compulsory electives must be selected from module BM7
Reading:	Further reading will be listed online prior to the start of the semester.
Last updated:	03.02.2010