Course Handbook Civil and structural engineering Master

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Qualifikation Goals of Study Programme

Civil and structural engineering Master - mandatory courses (overview)

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Master Thesis	BMA105	T110-0108	3	-	24	Professor/innen des Studiengangs
Mathematics III	BMA101	P110-0153	1	4VU	6	Studienleitung
Planning Law and Approval Procedures	BMA103	P110-0158	2	4VU	6	Prof. Dr.-Ing. Thorsten Cypra
Project Management	BMA102	P110-0156	1	4VU	6	Prof. Dr. techn. Marcel Wiggert
Team Project	BMA104	P110-0160	2	4PA	6	Studienleitung

(5 modules)

Civil and structural engineering Master - optional courses (overview)

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Advanced	BMA212	P110-0166	1	4VU	6	Prof. Dr.-Ing.

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Wastewater Treatment						Joachim Dettmar
Building Dynamics: Earthquake-Proof Construction	BMA311	P110-0168	1	4VU	6	Prof. Dr.-Ing. Christian Lang
Building in Virtual Space	BMA401	P110-0171	1	6VU	6	Prof. Dr.-Ing. Peter Böttcher
Concrete and Prestressed Concrete Construction	BMA301	P110-0162	1	4VU	6	Studienleitung
Large Wind Energy Projects	BMA403	P110-0173	1	4VU	6	Prof. Dr. techn. Marcel Wiggert
Modern Traffic Planning	BMA202	P110-0154	1	4VU	6	Prof. Dr.-Ing. Thorsten Cypra
Numerical Flow Models	BMA201	P110-0155	2	4VU	6	Prof. Dr.-Ing. Alpaslan Yörük
Resource Management	BMA204	P110-0159	2	4VU	6	N.N.
Specialist Underground Civil Engineering and Tunnel Building	BMA313	P110-0170	2	4VU	6	Prof. Dr.-Ing. Stefan Jung
Steel Construction, Timber Construction and Composite Construction	BMA304	P110-0164	2	4VU	6	Prof. Dr. Markus Enders-Comberg
Support Systems for Construction Pits and Temporary Excavations	BMA303	P110-0161	2	4VU	6	Prof. Dr.-Ing. Stefan Jung
The Finite Element	BMA302	P110-0163	1	4VU	6	Prof. Dr.-Ing. Christian Lang

(12 modules)

Civil and structural engineering Master - mandatory courses

Master Thesis

Module name (EN): Master Thesis
Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022
Module code: BMA105
Hours per semester week / Teaching method: -
ECTS credits: 24
Semester: 3
Mandatory course: yes
Language of instruction: German
Assessment: [*still undocumented*]
Applicability / Curricular relevance: BIMA320 (T110-0107) Civil and structural engineering, Master, ASPO 01.04.2012 , semester 3, mandatory course BIMA320 (T110-0107) Civil and structural engineering, Master, ASPO 01.04.2015 , semester 3, mandatory course BIMA320 (T110-0107) Civil and structural engineering, Master, ASPO 01.10.2017 , semester 3, mandatory course BMA105 (T110-0108) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 3, mandatory course DFMCE-301 (T630-0167) Civil Engineering, Master, ASPO 01.10.2019 , semester 3, mandatory course
Workload: The total student study time for this course is 720 hours.
Recommended prerequisites (modules): BMA104 Team Project

[*updated 04.12.2024*]

Recommended as prerequisite for:

Module coordinator:
Professor/innen des Studiengangs

Lecturer: Professor/innen des Studiengangs

[*updated 30.11.2021*]

Learning outcomes:
After successfully completing this module, students will:
_ be able to work independently on a special or interdisciplinary topic from the field of civil engineering using scientific methods within a given time period and document their results in writing.

[*updated 28.09.2020*]

Module content:
_ Students are given approx. four months to write their Master thesis. It must be written independently and in the style of a scientific paper. The student´s personal contribution must be clearly recognizable in their thesis. The written thesis is an essential component of the assessment work. Both the approach and the result(s) of the work must be described.
_ The results will be presented by the student in a public lecture with a scientific discourse.
_ This presentatioon of the thesis by the resp. student shows that he/she has mastered not only the written but also the verbal presentation of their results within a given time period, in a clearly structured manner and that they can answer questions on their respective topic.
_ There will be a regular exchange between the student and his/her supervisor during the period in which the student is writing his/her thesis. This will allow the supervisor to take countermeasures in good time, should the student require guidance during the period in which they are writing their thesis.

[*updated 28.09.2020*]

Teaching methods/Media:
_ Independent work

[*updated 28.09.2020*]

Recommended or required reading:
Independent research

[*updated 28.09.2020*]

Mathematics III

Module name (EN): Mathematics III

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA101

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
6

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

[*updated 28.09.2020*]

Applicability / Curricular relevance:

BIMA110 (P110-0108) Civil and structural engineering, Master, ASPO 01.04.2012 , semester 1, mandatory course
BIMA110 (P110-0108) Civil and structural engineering, Master, ASPO 01.04.2015 , semester 1, mandatory course
BIMA110 (P110-0108) Civil and structural engineering, Master, ASPO 01.10.2017 , semester 1, mandatory course
BMA101 (P110-0153) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 1, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Studienleitung

Lecturer:
Petra Baumann, M.Sc.

[*updated 04.12.2024*]

Learning outcomes:
After successfully completing this module, students will:
_ be familiar with selected chapters of higher mathematics, which are important for mechanical tasks.
_ be well-practiced in solving problems in numerical mathematics.
_ be able to use the possibilities of higher mathematics in solving technical tasks on a scientific basis.

[*updated 28.09.2020*]

Module content:
_ Partial differential equations
_ Solving non-linear equations (numerical)
_ Solving linear systems of equations and eigenvalue problems (numerical)
_ Solving ordinary differential equations (numerical)
_ Probability calculus

[*updated 28.09.2020*]

Recommended or required reading:
Sanal, Z.: Mathematik für Bauingenieure mit Maple und C++,Teubner Verlag, Stuttgart
Kreyszig, E.: Advanced Engineering Mathematics; 9. Auflage, John Wiley & Sons, 2005.

[*updated 28.09.2020*]

Planning Law and Approval Procedures

Module name (EN): Planning Law and Approval Procedures

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA103

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
6

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

[*updated 28.09.2020*]

Applicability / Curricular relevance:

BIMA210 (P110-0111) Civil and structural engineering, Master, ASPO 01.04.2012 , semester 2, mandatory course
BIMA210 (P110-0111) Civil and structural engineering, Master, ASPO 01.04.2015 , semester 2, mandatory course

BIMA210 (P110-0111) Civil and structural engineering, Master, ASPO 01.10.2017 , semester 2, mandatory course
BMA103 (P110-0158) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 2, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Thorsten Cypra

Lecturer:
Dr. Gerald Kallenborn

[*updated 04.12.2024*]

Learning outcomes:
After successfully completing this module, students will:
_ have comprehensive and integrative knowledge about the legal foundations and their contents, which are the prerequisite for carrying out projects involving interference with the rights of third parties.
_ be familiar with the procedures required to obtain a building permit and be able to apply scientific findings to solve specific problems.

[*updated 28.09.2020*]

Module content:
_ Building and planning law and procedures
_ Conservation law
_ Water rights
_ Waste legislation
_ Noise pollution laws
_ Public building law
_ Procedural law
_ Interaction of the above using selected examples

[*updated 28.09.2020*]

Recommended or required reading:
Legislative texts

[*updated 28.09.2020*]

Project Management

Module name (EN): Project Management

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA102

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
6

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Project work (70%), oral examination (30%)

[*updated 28.09.2020*]

Applicability / Curricular relevance:

BIMA120 (P110-0112) Civil and structural engineering, Master, ASPO 01.04.2012 , semester 1, mandatory course
BIMA120 (P110-0112) Civil and structural engineering, Master, ASPO 01.04.2015 , semester 1, mandatory course
BIMA120 (P110-0112) Civil and structural engineering, Master, ASPO 01.10.2017 , semester 1, mandatory course
BMA102 (P110-0156) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 1, mandatory course
DFBCE-612 (P630-0066) European Civil Engineering, Bachelor, ASPO 01.10.2019 , semester 6, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. techn. Marcel Wiggert

Lecturer:
Prof. Dipl.-Ing. Michael Scheuern
Prof. Dr. techn. Marcel Wiggert

[*updated 04.12.2024*]

Learning outcomes:
Proficiency _ After successfully completing this module, students will have expanded their specialist knowledge regarding the planning and controlling of projects.

Skills _ After successfully completing this module, students will be able to break down multi-dimensional tasks and problems in the planning and control of construction projects into components, interpret them and check them (analysis).

Competences _ After successfully completing this module, students will be able to,
_ understand and classify extensive and complex issues and boil them down to the most important core aspects (ability to analyze),
_ communicate and represent the central results of their project within the framework of a presentation (communication skills),
_ understand and control communication processes in construction projects, even in a supranational context,

[*updated 28.09.2020*]

Module content:
_ Project management framework
_ Project management processes
_ Project management knowledge areas
_ Communication management in the construction process and as Ts of the parties involved
_ Leading discussions with project stakeholders
_ Representing and managing projects in public space

[*updated 28.09.2020*]

Recommended or required reading:
_ Project Management Institute Inc.; A Guide to the Project Management Body of Knowledge; 3. Ausgabe (deutsch); Project Management Institute Inc; Pennsylvania; 2004
_ Cronenbroek, Wolfgang: _Internationales Projektmanagement_, Cornelsen, Berlin, 2004

[*updated 28.09.2020*]

Team Project

Module name (EN): Team Project

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA104

Hours per semester week / Teaching method:

4PA (4 hours per week)

ECTS credits:
6

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Project with presentation

[*updated 28.09.2020*]

Applicability / Curricular relevance:

BIMA220 (P110-0121) Civil and structural engineering, Master, ASPO 01.04.2012 , semester 2, mandatory course
BIMA220 (P110-0121) Civil and structural engineering, Master, ASPO 01.04.2015 , semester 2, mandatory course
BIMA220 (P110-0121) Civil and structural engineering, Master, ASPO 01.10.2017 , semester 2, mandatory course
BMA104 (P110-0160) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 2, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
BMA105 Master Thesis

[*updated 04.12.2024*]

Module coordinator:
Studienleitung

Lecturer:
Professor/innen des Studiengangs

[*updated 05.12.2024*]

Learning outcomes:
After successfully completing this module, students will:

_ be able to solve and present interdisciplinary problems in a group.
_ improve their teamwork and communication skills and be able to present and defend projects in public.
_ be introduced to the methods of independent scientific work.

[*updated 28.09.2020*]

Module content:
_ Students will be assigned a practice-oriented project based on the content of at least two modules from the Master program.
_ The work will be carried out durng the seminar and at home in the assigned group (at least three students per group).

[*updated 28.09.2020*]

Teaching methods/Media:
The project must be presented to the class at the end of the semester.
_ Team work

[*updated 28.09.2020*]

Recommended or required reading:
Independent selection of literature depending on the project task.

[*updated 28.09.2020*]

Civil and structural engineering Master - optional courses

Advanced Wastewater Treatment

Module name (EN): Advanced Wastewater Treatment

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA212

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
6

Semester: 1

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam

[*updated 28.09.2020*]

Applicability / Curricular relevance:

BIMA150 (P110-0122) Civil and structural engineering, Master, ASPO 01.04.2012 , semester 1, optional course
BIMA150 (P110-0122) Civil and structural engineering, Master, ASPO 01.04.2015 , semester 1, optional course,
BIMA150 (P110-0122) Civil and structural engineering, Master, ASPO 01.10.2017 , semester 1, optional course,
BMA212 (P110-0166) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 1, optional course,

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Joachim Dettmar

Lecturer:
Dipl.-Ing. Ralf Hasselbach

[*updated 05.12.2024*]

Learning outcomes:
After successfully completing this module, students will:
_ be able to recognize and understand the biological, physical, chemical and process-technical interrelations of different kinds of wastewater treatment, based on the lectures Wastewater Treatment II and III.
_ be able to apply this knowledge to non-standardized areas that are not described in regulations and thus, where necessary, develop solutions that go beyond the generally accepted rules of technology, in interdisciplinary project groups.
_ have acquired the skills to apply scientific methods and scientific findings to solve new problems and work on practice-oriented tasks.

[*updated 28.09.2020*]

Module content:
_ Scientific principles and interrelationships of physical, chemical and biological wastewater treatment
_ Methods and processes of advanced wastewater treatment (e.g. Phosphorus removal and membrane activated sludge processes, two-stage activated sludge plants)
_ Cleaning industrial waste water

[*updated 28.09.2020*]

Recommended or required reading:
Abwassertechnologie (Springer Verlag)
Hartmann: Biologische Abwasserreinigung (Springer Lehrbuch)
Mudrack / Kunst: Biologie der Abwasserreinigung (G. Fischer Verlag)
versch.: Anaerobtechnik (Springer Verlag)
Henze / Harremoes / la Cour Jansen / Arvin: Wastewater Treatment (Springer Verlag)
Bever / Teichmann: Weitergehende Abwasserreinigung (R. Oldenbourg Verlag)

[*updated 28.09.2020*]

Building Dynamics: Earthquake-Proof Construction

Module name (EN): Building Dynamics: Earthquake-Proof Construction

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA311

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
6

Semester: 1

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam

[*updated 28.09.2020*]

Applicability / Curricular relevance:

BIMA391 (P110-0093) Civil and structural engineering, Master, ASPO 01.10.2017 , semester 3, optional course
BMA311 (P110-0168) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 1, optional course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Christian Lang

Lecturer:
Prof. Dr.-Ing. Christian Lang

[*updated 04.12.2024*]

Learning outcomes:
After successfully completing this module, students will:
_ be familiar with questions pertaining to building dynamics.
_ have learned the basic concepts of structural dynamics such as natural frequency, normal modes, resonance, dynamic load factor, tuning, time integration, modal analysis
_ be able to model systems with regard to their stiffness and mass distribution and calculate them by means of manual calculation methods or EDP.
_ be able to perform earthquake verifications using simplified procedures and assess the limits of their use.

[*updated 28.09.2020*]

Module content:
_ Single degree of freedom system, natural frequency
_ Forced oscillations (harmonic loads, impact loads)
_ Resonance, tuning, dynamic load factor
_ Analytical/numerical solution of the equation of motion for a single degree of freedom system
_ Multiple degree of freedom system, lumped mass matrix and consistent mass matrix
_ Modal analysis, direct time integration methods
_ Earthquake excitation, calculation of earthquake actions on building structures
_ Response-spectrum analysis

[*updated 28.09.2020*]

Recommended or required reading:
_ Meskouris: Baudynamik
_ Werner: Baudynamik
_ Mehlhorn: Der Ingenieurbau
_ Clough / Penzien: Dynamics of Structures

[*updated 28.09.2020*]

Building in Virtual Space

Module name (EN): Building in Virtual Space

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA401

Hours per semester week / Teaching method:
6VU (6 hours per week)

ECTS credits:
6

Semester: 1

Mandatory course: no

Language of instruction:
German

Assessment:
Project with presentation

[*updated 28.09.2020*]

Applicability / Curricular relevance:

BIMA194 (P110-0094) Civil and structural engineering, Master, ASPO 01.10.2017 , semester 1, optional course
BMA401 (P110-0171) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 1, optional course
DFMCE-130 (P630-0135) Civil Engineering, Master, ASPO 01.10.2019 , semester 1, mandatory course

Workload:
90 class hours (= 67.5 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 112.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Peter Böttcher

Lecturer:
Dr. Hilko Hoffmann
Dr. Peter Nattermann
Petra Baumann, M.Sc.

[*updated 10.12.2024*]

Learning outcomes:
Knowledge _ After successfully completing this module, students will:
_ be able to use scientific methods to deepen their knowledge of organizational theory, virtual realities, digital building models (BIM) and their interaction.
Skills _ After successfully completing this module, students will:
_ be able to combine construction site processes into one and design a new concept on the basis of digital

building models (synthesis),
_ be able to evaluate, explain and discuss comprehensive subject-specific concepts and plans. They will be able to form an opinion in order to solve a task correctly (evaluation).
Competences _ After successfully completing this module, students will be able to,
_ plan independently and with foresight, set priorities and adhere to a given time frame (organization),
_ understand and classify extensive and complex issues and boil them down to the most important core aspects (analysis),
_ work independently on specific tasks and problems (independence),
_ examine their own organizational structures and covert it into a portfolio of tasks with varying degrees of difficulty (management),
_ Foreign students will be able to deal with the cultural differences in Germany and operate successfully in the country using their country-specific and linguistic skills and knowledge.

[*updated 28.09.2020*]

Module content:
_ Business process management
_ Business process management, ARIS and EPC nets, process modeling
_ Digital building models
_ BIM, analysis of operating systems, 3D models in SketchUp, interfaces used during the planning and construction process
_ Virtual reality
_ 3-D technology, 3-D planning processes, data flow Revit to 3-D web, structure of 3-D models, working in a virtual reality, Compass planning platform

[*updated 28.09.2020*]

Teaching methods/Media:
_ The students will develop a business process with a digital building model and demonstrate its functionality via virtual reality. They must do this independently and then apply the corresponding operational structures

[*updated 28.09.2020*]

Recommended or required reading:
_ A current list of literature will be made available to students at the beginning of the semester.

[*updated 28.09.2020*]

Concrete and Prestressed Concrete Construction

Module name (EN): Concrete and Prestressed Concrete Construction

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA301

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
6

Semester: 1

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam

[*updated 28.09.2020*]

Applicability / Curricular relevance:

BIMA290 (P110-0096) Civil and structural engineering, Master, ASPO 01.10.2017 , semester 2, optional course
BMA301 (P110-0162) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 1, optional course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Studienleitung

Lecturer: Studienleitung

[*updated 30.11.2021*]

Learning outcomes:
After successfully completing this module, students will:
_ have advanced knowledge about building materials and design in reinforced concrete,
_ have basic knowledge about prestressed concrete construction,
_ will be able to carry out verifications for prestressed concrete construction and implement them constructively,
_ improve their use of calculation programs for structural analysis,
_ be able to scientifically analyze and process problems and interpret the results.

[*updated 28.09.2020*]

Module content:
_ Stiffness calculations in concrete construction, crack formation, creep and shrinkage
_ Verification management: Shear force, torsion
_ Modelling and calculating internal forces - Structural frame and truss analysis and finite element method programs
_ Principles of prestressed concrete: Prestressing methods, loss of prestress, decompression check, deflection

force method, bending design in ultimate limit states (ULS)

[*updated 28.09.2020*]

Teaching methods/Media:
_ Interdisciplinary approach to statics and its application in concrete construction
_ Modeling and interpreting computer applications

[*updated 28.09.2020*]

Recommended or required reading:
_ Meiss, Avak: Spannbetonbau, Theorie, Praxis, Berechnungsbeispiele nach EC2
_ Krüger, Mertzsch: Spannbetonbau-Praxis nach Eurocode2, mit Berechnungsbeispielen
_ Albert, Denk, Mertens, Nitsch: Spannbeton, Grundlagen und Anwendungsbeispiele
_ Rossner, Graubner: Spannbetonbauwerke, Teil 4: Bemessungsbeispiele nach EC2
_ Maurer, Arnold: DBV-Arbeitstagungen 2004, Beispiel Plattenbalkenbrücke
_ Röhling: Zwangsspannungen infolge Hydratationswärme
_ Zilch, Zehetmaier Uni München, Bemessung im konstruktiven Betonbau
_ Djouahra: Stahlbetonbauteile unter einer kombinierten Beanspruchung aus Last und Zwang, Dissertation TU Dortmund

[*updated 28.09.2020*]

Large Wind Energy Projects

Module name (EN): Large Wind Energy Projects

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA403

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
6

Semester: 1

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam (50%)
Term paper (50%)

[*updated 21.06.2021*]

Applicability / Curricular relevance:

BIMA137 (P110-0151) Civil and structural engineering, Master, ASPO 01.10.2017 , semester 1, optional course, general subject
BMA403 (P110-0173) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 1, optional course, general subject

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. techn. Marcel Wiggert

Lecturer:
Prof. Dr. techn. Marcel Wiggert

[*updated 05.12.2024*]

Learning outcomes:
Knowledge After successfully completing this module, students will have acquired basic knowledge about and be familiar with the methods and concepts pertaining to:
- onshore and offshore wind energy.
- the construction of wind turbines and offshore wind farms and their essential components.
- the construction of offshore wind farms.
- the analysis and evaluation of the economic viability of wind farms.
- the operation and maintenance of wind farms.

Skills After successfully completing this module, students will be able to:
- analyze basic aspects of site evaluations.
- develop basic concepts for the installation of wind farms.
- perform and evaluate basic analyses of weather risk.

Competences After successfully completing this module, students will be able to:
- apply various aspects of project management under the conditions of large-scale projects, e.g.: use the principles of planning a construction site facility for the development of a deck layout for installation vessels.
- critically question and evaluate existing installation concepts and develop suggestions for improvement.
- work independently on subject-specific tasks and problems.

[*updated 21.06.2021*]

Module content:
- Basics of onshore and offshore wind energy
- Basic environmental conditions (wind, waves, currents)
- Constructing wind turbines, balancing plant and offshore wind farms
- Basic evaluations of economic efficiency
- Basic concepts for the installation of offshore wind farms
- Overview of the operational phases of wind farms

[*updated 21.06.2021*]

Teaching methods/Media:
Students will apply the methods developed to a virtual offshore wind farm in the course of the module.

[*updated 21.06.2021*]

Recommended or required reading:
At the beginning of the semester resp. during the lecture, students will be provided with an current literature list for module.

[*updated 21.06.2021*]

Modern Traffic Planning

Module name (EN): Modern Traffic Planning

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA202

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
6

Semester: 1

Mandatory course: no

Language of instruction:
German

Assessment:
Project work

[*updated 27.01.2023*]

Applicability / Curricular relevance:

BMA202 (P110-0154) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 1, optional course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Thorsten Cypra

Lecturer:
Prof. Dr.-Ing. Thorsten Cypra

[*updated 04.12.2024*]

Learning outcomes:
After successfully completing this module, students will:
have improved their subject-specific knowledge in traffic analysis and traffic planning.
understand the relationships between macroscopic and microscopic traffic models.
be able to set up and run microscopic traffic simulations in constructed environments.
be familiar with the possibilities of holistic traffic and mobility planning.
be able to to apply scientific methods and scientific knowledge to solving new problems, as well as processing practice-oriented tasks.

[*updated 27.01.2023*]

Module content:
Basics of traffic analysis
Mobility planning
Macroscopic and microscopic traffic flow models
Training in the microscopic, multi-modal traffic flow simulation software VISSIM
A practice-oriented project with a final presentation

[*updated 27.01.2023*]

Teaching methods/Media:
Use of automated tools

[*updated 27.01.2023*]

Recommended or required reading:
Current FGSV regulations

[*updated 27.01.2023*]

Numerical Flow Models

Module name (EN): Numerical Flow Models

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA201

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
6

Semester: 2

Mandatory course: no

Language of instruction:
German

Assessment:
Project work

[*updated 27.01.2023*]

Applicability / Curricular relevance:

BMA201 (P110-0155) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 2, optional course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Alpaslan Yörük

Lecturer:
Prof. Dr.-Ing. Alpaslan Yörük

[*updated 09.12.2024*]

Learning outcomes:
After successfully completing this module, students will:
have improved their knowledge about the fundamentals of fluid mechanics.
be able to build hydrodynamic-numerical models, as well as carry out simulations and evaluate/analyze model results.
be able to apply their knowledge and understanding, as well as their problem-solving skills scientifically to new, unfamiliar situations and in interdisciplinary projects
be able to carry out their own application-oriented projects and independent research activities.

[*updated 27.01.2023*]

Module content:

Theoretical foundations of hydrodynamic-numerical (HN) models
Fundamentals of HN model solutions
Using HN models (incl. pre- and post-processing)

[*updated 27.01.2023*]

Teaching methods/Media:

Tutorial in the PC room

[*updated 27.01.2023*]

Recommended or required reading:

Recommendations will be made within the framework of the course

[*updated 27.01.2023*]

Resource Management

Module name (EN): Resource Management

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA204

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
6

Semester: 2

Mandatory course: no

Language of instruction:
German

Assessment:
Exam

[*updated 27.01.2023*]

Applicability / Curricular relevance:

BMA204 (P110-0159) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 2, optional course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).

There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
N.N.

Lecturer:
N.N.

[*updated 04.12.2024*]

Learning outcomes:
After successfully completing this module, students will:
have acquired additional scientific knowledge in the field of energy management and energy technology issues with a special focus on renewable energies, based on the fundamentals of environmental technology they acquired in the Bachelor´s degree program.
be able to develop renewable energy projects conceptually and to evaluate them economically/ecologically, on the basis of their previously acquired scientific skills.
have developed an economic and strategic understanding of the global interrelationships of resource availability and the regional possibilities of integrated waste management in terms of regional material flow management.
be able to apply their knowledge and understanding, as well as their problem-solving skills scientifically to new, unfamiliar situations and in interdisciplinary projects

[*updated 27.01.2023*]

Module content:
Global resource budget
Systemic investigation of regional material budgets (material flow analysis)
Potential in the field of secondary raw materials
Conceptual development of regional waste management structures under consideration of sustainability criteria (economic, ecological and social effects)
Scenarios for a future energy supply
Renewable energies (RE) and associated potentials and effects (wind power, solar energy, biomass, etc.)
Planning-related questions pertaining to energy supply
Possible barriers to the implementation of RE installations (e.g. acceptance issues)
Implementation of a case study

[*updated 27.01.2023*]

Teaching methods/Media:
Study trips
Use of automated tools (e.g. UMBERTO)

[*updated 27.01.2023*]

Recommended or required reading:

Baccin: Regionaler Stoffhaushalt
Bringezu: Navigation zu den Ressourcen der Zukunft
Johnke: Abfall, Energie und Klima
Wietschel, M., et al.: Energietechnologien der Zukunft: Erzeugung, Speicherung, Effizienz und Netze

[*updated 27.01.2023*]

Specialist Underground Civil Engineering and Tunnel Building

Module name (EN): Specialist Underground Civil Engineering and Tunnel Building

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA313

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
6

Semester: 2

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam

[*updated 28.09.2020*]

Applicability / Curricular relevance:

BIMA280 (P110-0117) Civil and structural engineering, Master, ASPO 01.04.2012 , semester 2, optional course
BIMA280 (P110-0117) Civil and structural engineering, Master, ASPO 01.04.2015 , semester 2, optional course,
BIMA280 (P110-0117) Civil and structural engineering, Master, ASPO 01.10.2017 , semester 2, optional course,
BMA313 (P110-0170) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 2, optional course,
DFMCE-172 (P110-0170) Civil Engineering, Master, ASPO 01.10.2019 , semester 2, optional course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Stefan Jung

Lecturer:
Prof. Dr.-Ing. Stefan Jung

[*updated 05.12.2024*]

Learning outcomes:
After successfully completing this module, students will:
_ have advanced knowledge in the methods of foundation engineering and the geological/geotechnical constraints of tunnel construction.
_ be able to coordinate tunnelling technology and rock behavior.
_ have basic knowledge in the fields of tunnel construction and tunnel equipment.
_ be able to contribute their technical competence in both disciplines to team projects.
_ be able to develop solutions for open, complex problems using scientific methods.

[*updated 28.09.2020*]

Module content:
_ Specialized Underground Civil Engineering: Diaphragm walls, underpinnings, injection technology, jet grouting, vibratory tamping columns, subsoil improvement
_ Tunnel Building: Geological basics, design criteria, construction methods, blasting, mechanical tunnel driving, securing and lining, tunnel equipment, fire protection, stress conditions in the rock, excavation classes, basics of calculation

[*updated 28.09.2020*]

Recommended or required reading:
_ Eichler et al.: Spezialtiefbau
_ Maybaum et al.: Verfahrenstechnik und Baubetrieb im Grund- und Spezialtiefbau
_ Kolymbas: Tunnelbau und Tunnelmechanik
_ Maidl: Tunnel- und Stollenbau
_ Müller-Salzburg: Der Felsbau _ Tunnelbau

[*updated 28.09.2020*]

Steel Construction, Timber Construction and Composite Construction

Module name (EN): Steel Construction, Timber Construction and Composite Construction

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA304

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
6

Semester: 2

Mandatory course: no

Language of instruction:
German

Assessment:
Exam

[*updated 26.01.2023*]

Applicability / Curricular relevance:

BMA304 (P110-0164) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 2, optional course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Markus Enders-Comberg

Lecturer:
Prof. Dr. Markus Enders-Comberg

[*updated 04.12.2024*]

Learning outcomes:
After successfully completing this module, students will:
be familiar with the planning processes typical for timber construction
be able to design multi-storey timber buildings in a wide range of construction variants, as well as design joinery details
be able to identify and design relevant stiffening members
be able to independently develop and apply subject-related content

[*updated 26.01.2023*]

Module content:

Planning processes
Supporting structures and structural elements
Multi-storey residential and office buildings in timber construction
Contemporary engineered timber construction (cross laminated timber, timber panels)
Fire protection and building regulations
Innovations and scientific approaches
Construction processes from the perspective of a structural engineer, an industry representative, a test engineer and a construction company

[*updated 26.01.2023*]

Recommended or required reading:

Kaufmann, H./Krötsch, S./Winter, S.: ATLAS Mehrgeschossiger Wohnungsbau
Sandhaas, C./Blaß, H. J.: Ingenieurholzbau Grundlagen der Bemessung
Wallner-Novak, M./Koppelhuber, J./Pock, K.: pro:Holz - Brettsperrholz Bemessung I und II

[*updated 26.01.2023*]

Support Systems for Construction Pits and Temporary Excavations

Module name (EN): Support Systems for Construction Pits and Temporary Excavations

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA303

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
6

Semester: 2

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam

[*updated 28.09.2020*]

Applicability / Curricular relevance:

BIMA170 (P110-0095) Civil and structural engineering, Master, ASPO 01.04.2012 , semester 1, optional course
BIMA170 (P110-0095) Civil and structural engineering, Master, ASPO 01.04.2015 , semester 1, optional course,
BIMA170 (P110-0095) Civil and structural engineering, Master, ASPO 01.10.2017 , semester 1, optional course,
BMA303 (P110-0161) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 2, optional course,

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Stefan Jung

Lecturer:
Prof. Dr.-Ing. Stefan Jung

[*updated 04.12.2024*]

Learning outcomes:
After successfully completing this module, students will:
_ deepen and expand the knowledge they acquired in the Bachelor´s program.
_ have a comprehensive, detailed and critical understanding of engineering based on the current state of (construction) technology.
_ be able to take account complex foundation engineering interrelationships into account for interdisciplinary projects and develop them within a team.
_ be able to develop application-oriented solutions to problems using (engineering) scientific methods and integrate them into research and development work.

[*updated 28.09.2020*]

Module content:
_ Trench shoring
_ Soldier pile and lagging
_ Sheet piling
_ Bored pile walls
_ Anchors
_ Drainage

[*updated 28.09.2020*]

Recommended or required reading:
_ Lecture notes (passed out at the beginning of the semester), Internet research
_ Kempfert/Raithel: Bodenmechanik und Grundbau
_ Möller: Geotechnik _ Grundbau
_ Simmer: Grundbau 2
_ Weißenbach/Hettler. Baugruben-Berechnungsverfahren

[*updated 28.09.2020*]

The Finite Element

Module name (EN): The Finite Element

Degree programme: Civil and structural engineering, Master, ASPO 01.04.2022

Module code: BMA302

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
6

Semester: 1

Mandatory course: no

Language of instruction:
German

Assessment:
Project work

[*updated 28.09.2020*]

Applicability / Curricular relevance:

BIMA260 (P110-0102) Civil and structural engineering, Master, ASPO 01.04.2012 , semester 2, optional course
BIMA260 (P110-0102) Civil and structural engineering, Master, ASPO 01.04.2015 , semester 2, optional course,
BIMA260 (P110-0102) Civil and structural engineering, Master, ASPO 01.10.2017 , semester 2, optional course,
BMA302 (P110-0163) Civil and structural engineering, Master, ASPO 01.04.2022 , semester 1, optional course,

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Christian Lang

Lecturer:
Prof. Dr.-Ing. Günter Schmidt-Gönner

[*updated 04.12.2024*]

Learning outcomes:
After successfully completing this module, students will:
_ be familiar with the theory of the FE method.
_ be able to calculate spatial structures on the PC.
_ be able to use FE method to solve practical building problems (also with regard to non-linear problems).
_ have practiced working scientifically.

[*updated 28.09.2020*]

Module content:
_ Theory of finite elements
_ Static systems and modeling spatial supporting structures (e.g. folding structures, shells)
_ Using an FE program
_ Controlling and evaluating calculation results
_ Calculating non-linear systems (for example: stability, large deformations, plasticity, ropes and cables)

[*updated 28.09.2020*]

Recommended or required reading:
Bathe, K.J.: Finite-Element-Methoden, Springer Verlag, Berlin, 1986
O. Zienkiewicz, Methode der finiten Elemente, Hanser Verlag 1984
Werkle, Horst: Finite Elemente in der Baustatik, Vieweg Verlag, 2007

[*updated 28.09.2020*]