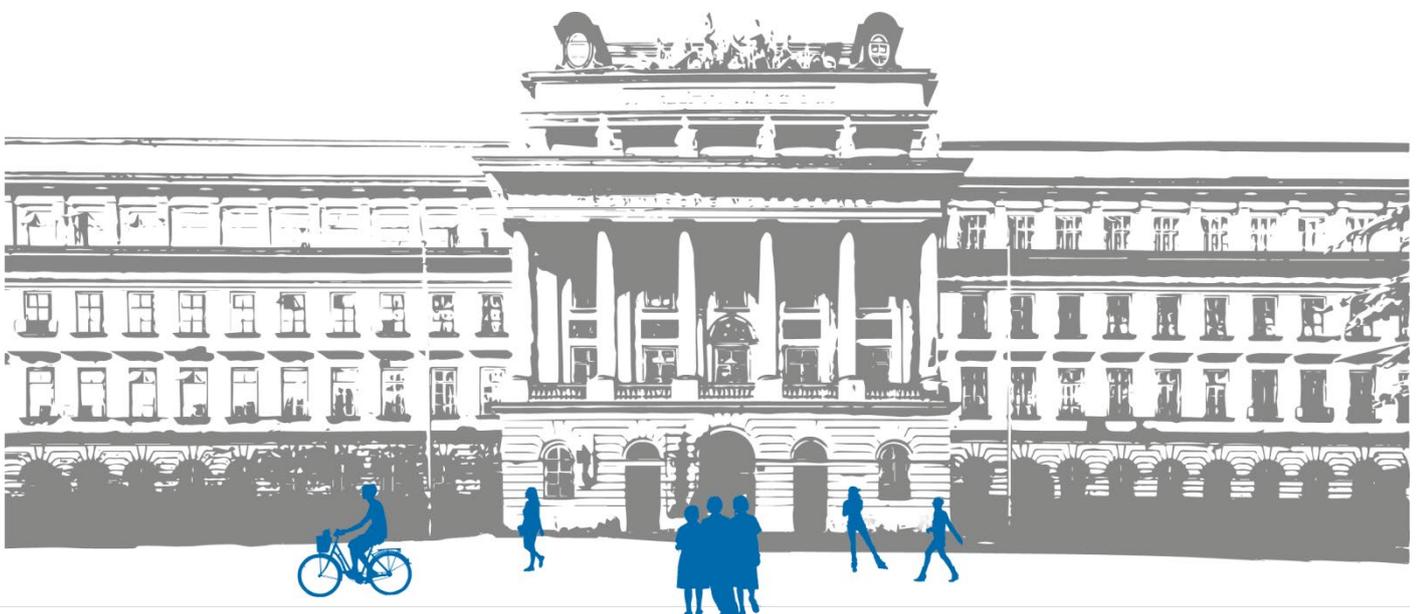


# Development Plan 2025<sup>+</sup>

## Faculty of Civil Engineering

Science of  
Civil and Environmental Engineering





DOCUMENT HISTORY		
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# Executive Summary

The present Development Plan 2025+ of the Faculty of Civil Engineering is the result of an extensive, participatory discussion process and contains the essential strategic development goals of the faculty in teaching, research and organizational development for the next two performance agreement periods until 2028.

In this context, the future challenges and necessary developments of the Faculty of Civil Engineering are closely related to current and emerging socio-political, ecological and economic as well as technological trends.

It should be noted that the inclusion of environmentally relevant issues in teaching and research in recent decades has also been significantly initiated and driven by civil engineers. The faculty wants to make this fact visible to the outside world and rename itself the Faculty of **Civil and Environmental Engineering**.

In scientific **research**, the following cross-sectional topics, which are to be treated as interdisciplinary, will be continued at the faculty accordingly

- Big Data in Civil Engineering
- Bionics and Green Building
- Risk and Disaster Mitigation

with the aim of establishing new research fields in these areas with international visibility or expanding existing expertise and assuming leadership in these topics.

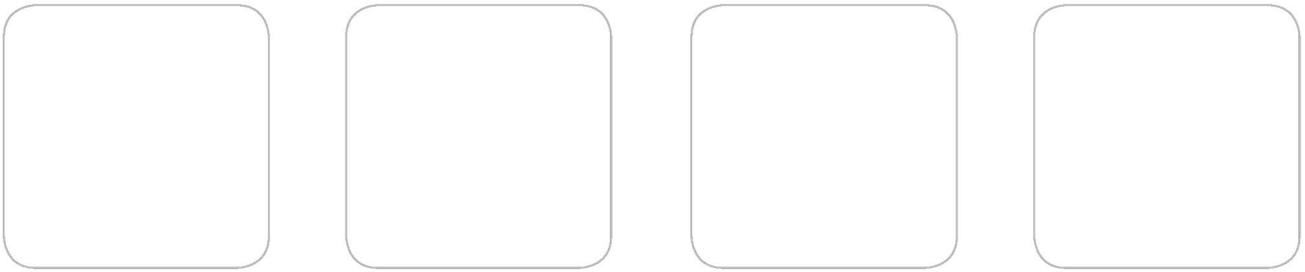
Research-led **teaching** already characterizes the basic structure of the bachelor's program as an essential unique selling point of university education at the faculty and is consistently implemented in the master's program. In the next few years, the following main development goals will be pursued:

- Digitization of teaching and knowledge transfer
- Increased internationalization through expansion of exchange programs and development of an English-language degree program
- Coordinating the content and form of courses to improve the studyability of the degree programs offered
- Expansion of support programs for women, first-year students and gifted students

To achieve the goals in research and teaching, the following key **strategic measures** are planned in personnel and organizational development:

## Enhance structural engineering subjects

By filling the professorships "Reinforced Concrete and Solid Construction" and "Steel Construction", the structural engineering subjects are to be further consolidated as the core competence of the faculty and positioned internationally. The existing professorship for construction mechanics will be rededicated to construction mechanics and dynamics. Two new career positions will open up innovative research fields in the areas of "Monitoring and Maintenance of Engineering Structures" and "Bionic Support Structures".



#### Expanding environmental & sustainability expertise

Additional strategic strengthening of environmentally relevant topics is happening with the funding priorities Risk & Disaster Mitigation and Bionics & Green Building, and through the creation of three new career positions in the research fields "River Basin Management", "Hydrology" and "Hydraulic Engineering"

#### Creating an excellent environment for holistic "Civil & Architectural Engineering".

Technical design in modern building and industrial construction requires a holistic view, with civil engineers working closely with architects & building services engineers in the design process. The existing research units "Building Construction and Maintenance" and "Integral Construction Planning and Industrial Building" as well as a new professorship "Integral Building Technology" will therefore be organizationally combined in a new institute for "Structural and Industrial Construction".

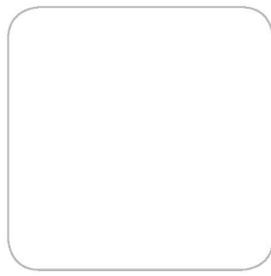
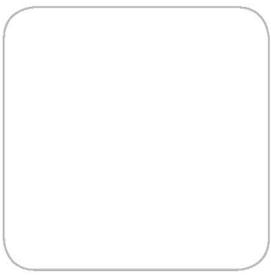
#### Construction Economics and Management as a unique selling proposition and driver of digitization

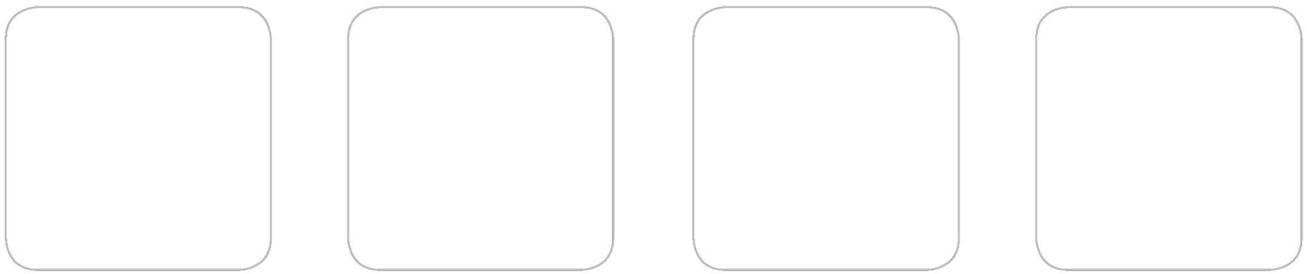
Driven by the need to increase efficiency, construction economics and management are experiencing a sustained surge in digitization. This development is taken into account by the creation of a new research unit "Digital Construction Process", the refilling and corresponding orientation of the professorship for Construction Economics and Management in the research area of the same name, as well as by the current and future focus in the area of digitization at the research area Construction Process and Methods. In addition, the creation of a career position with a focus on "Digital Construction in Civil Engineering" is planned. In terms of organization, the three future research areas will be embedded in a new Institute for Construction Operations and Construction Economics.

#### Create meeting places

Scientific excellence, interdisciplinarity and internationality will be further developed through the promotion of established research clusters, the establishment of new interfaculty research centers and the establishment of joint doctoral programs. New formats for informal exchange will promote and enhance networking and cooperation within the faculty.

With regard to the **spatial infrastructure**, the faculty will receive new excellent opportunities in the course of the "TU UniverCity" project by bringing all institutes together at the Karlsplatz main building location, approximately by the end of 2023.





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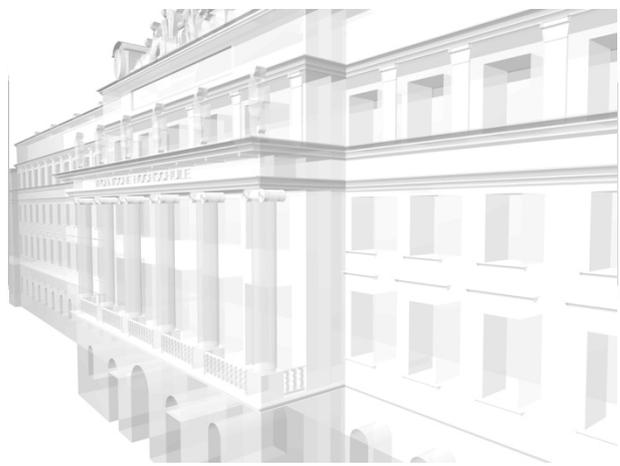
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# Preamble



We created our Development Plan 2025+ in accordance with the currently valid Development Plan of TU Wien. We added points that guide us in our faculty's strategical direction and strengthen our priorities. Our mission statement forms the foundation for our Development Plan 2025+. It was worded by all faculty members after intensive and engaging discussions and it precedes the Development Plan below.

Analogous to TU Wien's development plan and due to legal requirements, we consider the two coming performance periods (2022/24 and 2025/27) in which the faculty will face substantial strategical and personnel decisions. These decisions depend on financial funds, existing faculty and ongoing infrastructure projects.

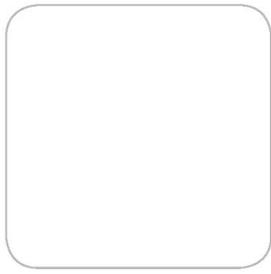
Our research aims to continuously develop our scientific unique features and focus on our selected strengths. In a time of socio-technical change we also have to recognize new developments, expand in the relevant research fields or create new positions, to meet our standard as driver of national and international innovation. This is to be made visible to the outside world by the intended renaming to Faculty of Civil and Environmental Engineering.

In teaching, we have to ensure that we continue to offer students excellent conditions for their education. The Faculty of Civil Engineering at TU Wien stands for challenging university curricula with research-led courses and high practical relevance. The future viability of the education is to be ensured by supplementing the classical civil engineering subjects especially in those areas which are affected by new technical and social developments.

The research, teaching, organizational and personnel development concepts formulated in this Development Plan take contemporary gender and diversity aspects into account. In this context, the declared goal for the next few years is to attract and retain more highly qualified women for academic careers at our faculty and to promote our internationalization.

The concrete implementation of the goals formulated in our faculty's Development Plan must take place through the three-year target agreements between the dean and the rectorate. Their feasibility is thus essentially dependent on the financial and structural framework conditions at TU Wien during this period.

Univ.-Prof. Dipl.-Ing. Dr.techn. Ronald Blab  
Dean of the Faculty of Civil Engineering



# A. Our faculty's mission statement

## Science of Civil and Environmental Engineering

Civil and environmental engineers capture, understand, design, calculate, plan and maintain systems in a constant interplay of natural and built environments. In doing so, they assume societal, ecological and economic responsibilities.

At the Faculty of Civil Engineering teaching and research are linked closely and pursued at the highest level. We educate future leaders and advise decision makers on socially relevant issues. Civil and environmental engineers thereby play a vital role in improving quality of life and creating a sustainable world in times of change.

Moving beyond the human scale, civil and environmental engineers enter both very small scales (e.g. building material optimization) and very large scales (e.g. transport planning). People are always the center of our actions, as is proclaimed by TU Wien's mission statement: Technology for people.

As a faculty of TU Wien, we commit fully to this statement and pay special attention to gender and diversity competences being introduced, implemented and maintained sustainably on all hierarchical levels of the faculty. Through this, the Faculty of Civil Engineering will continue to support diversity and equal opportunities at TU Wien.

What defines us:

- A culture of mutual appreciation

Treating one another respectfully and with appreciation is the basis of our challenging and independent research and teaching duties. We distinguish ourselves by our ability to handle conflicts and build relationships, by bravery, collegiality and knowledge of ourselves and those next to us.

- Applied interdisciplinarity

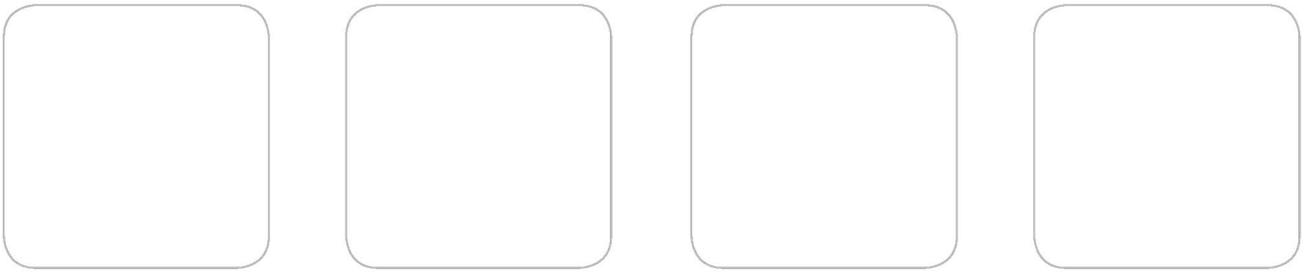
In a world of ever increasing complexity, we believe interdisciplinarity is an indispensable means to improving our ability of understanding the world. Applied interdisciplinarity is therefore an essential part of our continuing learning process. To this end we continue to expand the spectrum of applications for civil engineering competences and support the emergence of new disciplines in research and practice.

- Building bridges between fundamental research, application and practice

Our research is focused on generating scientific knowledge based on questions arising from engineering practice. We thereby build bridges in our research and teaching between fundamental science and technical applications, which are essential for our societal development. Civil and environmental engineers guide this process towards implementation of technical applications in everyday use.

- Pioneers in mathematical modelling

We aim to make the world more calculable, as this was the starting point for civil engineering as a discipline. The increasing influence of mathematics in our society helps us maintain, shape and develop our world, and also further mathematics and natural sciences themselves.



- Fusing experimental and theoretical research

We connect theoretical models, which represent artefacts and processes as modelled reality, with empirical data gathered from measurements from nature and experiments. The latter require theoretical frameworks; and also the nature of the experimental data influences the form of the theory.

- Advancing innovation

We advance innovation and performance processes in civil engineering on the basis of our research-driven focus through the individual skills, expertise and abilities of our employees and students. We thus substantially foster the competitive potentials of domestic enterprises and the construction industry as a whole.

- Leadership in times of technological, ecological and socio-economic challenges

We are profound problem solvers and take on a leading role in a world that is becoming more complex and fast-paced through our technical expertise and academic reputation.

# B. Development of the faculty

## B.1 DEVELOPMENT PRINCIPLES

According to the mission statement of the Faculty of Civil Engineering and in full agreement with the values lived at TU Wien, the development of the Faculty of Civil Engineering is based on the following general principles.

- Freedom of research and teaching

The faculty is fully committed to the constitutionally guaranteed freedom of science, scientific creation and teaching. Research staff are fundamentally free in their choice of research questions, in their methodical approach as well as in the evaluation and dissemination of their research results. The staff members adhere to the rules for safeguarding good scientific practice (Code of Conduct<sup>1</sup>) at TU Wien.

Those who teach are free to design their courses (lectures, exercises, seminars, etc.) in terms of content and method and are entitled to freely express their scientific opinion. However, this does not release them from the obligation to hold courses in accordance with the valid study regulations and to adapt the teaching content to the didactic objectives of the curriculum.

- Trust, esteem and respect

Trust, esteem and respect form the basis of good cooperation at the Faculty of Civil Engineering. Employees can trust in it and actively contribute to mutual trust and respect by treating each other respectfully and observing the rules of good cooperation.

- Excellence in science and engineering

As a representative of an application-oriented engineering discipline, the Faculty of Civil Engineering at TU Wien is committed to excellence in scientific research and research-led teaching as well as to excellence in engineering. The basic prerequisite for excellence is the creative thinking of our staff members. A diligent appointment policy and personnel planning consider the balance of application-oriented engineering performance and fundamental scientific work at the faculty.

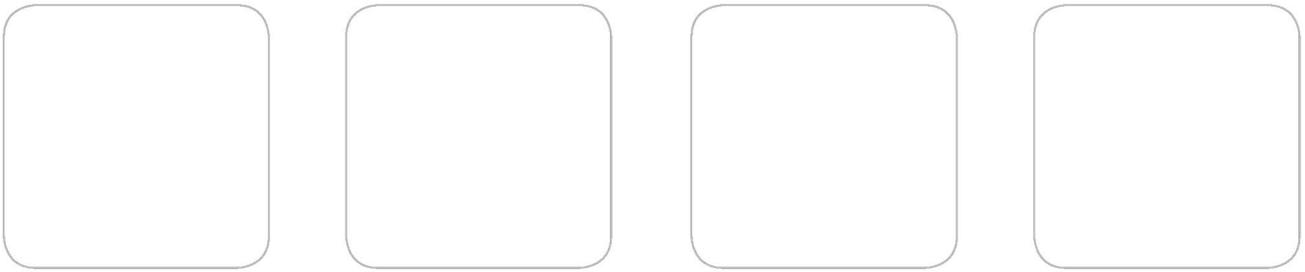
In addition to teaching practical application, the university education at the faculty particularly encourages independent research work based on methods taught in system competences and scientific perspectives. Through the development of research-led teaching, students should learn to approach complex problems of civil engineering and to solve them with scientific methods even beyond the current limits of knowledge.

- Participation and transparency

At the Faculty of Civil Engineering the participatory cooperation of the collegial bodies is realized according to UG 2002. Decision-making processes are made transparent through institutional communication within the collegial bodies and between the curia. The participation of the students, especially in study matters and in the quality assurance of teaching, is explicitly

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<sup>1</sup> Code of Conduct der TU Wien, published in the University Gazette nr. 26/2007 (Ifd. Nr. 257). Available at <https://www.tuwien.at/index.php?eID=dms&s=4&path=Richtlinien%20und%20Verordnungen/Code%20of%20Conduct%20fuer%20wissenschaftliches%20Arbeiten.pdf>



supported.

Faculty staff are entitled to participate in decisions that affect them, as well as to secure appropriate working conditions and appropriate access to available resources. The faculty is committed to grading the extent of participation and access to resources according to proven performance and willingness to assume responsibility in the sense of qualification-related co-responsibility. The basis for this is an evaluation carried out on the basis of transparent benchmarks.

- Gender equality and diversity

The Faculty of Civil Engineering is aware of its responsibility with regard to contemporary gender equality and diversity issues and actively supports the advancement of women at TU Wien<sup>2,3</sup>, and works towards implementing the social equality of women and men in all areas.

Our aim is to achieve an appropriate gender balance, especially in management functions and professorships, as there are still significant career differences between women and men. In the pre- & post-doctoral field, in teaching and research as well as in administration and in all collegial bodies, a balanced numerical ratio should be achieved in the medium term.

In order to ensure a consistent implementation of the principle of gender mainstreaming in all decision-making processes and in the planning of all measures relating to personnel and organizational development, the Faculty of Civil Engineering actively involves the Arbeitskreis für Gleichbehandlungsfragen (Working Group for Equal Treatment Issues) and calls in experts as external advisors when necessary.

- Internationality and mobility

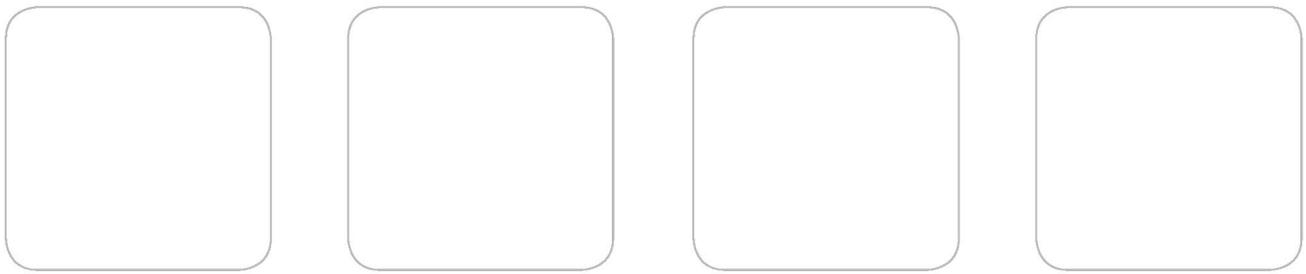
The Faculty of Civil Engineering is committed to the four strategic principles of TU Wien's International Strategy Concept<sup>4</sup>, in particular to promoting the national and international mobility of students, graduates and academic staff. This is to be facilitated in particular by promoting strategic, bilateral university partnerships and by setting regional and thematic priorities. Our faculty values internationally networked and competitive research as an essential characteristic of excellence.

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<sup>2</sup> Plan for advancement of woman at TU Wien: <https://www.tuwien.at/en/tu-wien/organisation/central-divisions/gender-competence/gender-resources/female-trailblazers>

<sup>3</sup> Strategies for realization of the plan for advancement of woman at TU Wien, Faculty of Civil Engineering, January 2016

<sup>4</sup> TU Wien International – Strategy Concept - Global Strategy 2013+  
[https://www.tuwien.at/fileadmin/Assets/studium/welcome\\_centre/Images/TU\\_Wien\\_International\\_Global\\_Strategy\\_2013](https://www.tuwien.at/fileadmin/Assets/studium/welcome_centre/Images/TU_Wien_International_Global_Strategy_2013)



## B.2 RESEARCH

### Setting and future trends

The future challenges and necessary developments of the Faculty of Civil Engineering must be seen within the narrow context of the current and emerging socio-political, ecological and economic as well as technological framework conditions. The following significant trends are identified here:

- *Information society and digitization:* Information and knowledge will become the capital of the future and increasingly determine the competitiveness and prosperity of our society. Digitization is increasingly entering every area of the economy and technology. This will also fundamentally change work and production processes in the construction industry.
- *Climate and energy change:* The current climate change is scientifically proven and affected by anthropogenic developments. The use of fossil fuels and large-scale deforestation influence the concentration of greenhouse gases in the atmosphere and drives global warming and thus climate change. The building industry must therefore make significant contributions to the expansion of renewable energies, the development of resilient systems and the adaptation of the built environment to the consequences of climate change.
- *Demographic development:* In the next 20 years, far-reaching demographic developments are to be expected, which will also be clearly visible in the construction of tomorrow. In Austria and Europe, the proportion of people over the age of 60 is growing steadily, resulting in an increased need for new forms of housing, infrastructure, mobility and care, especially in urban agglomerations.
- *Intelligent materials and substances:* Composites, nanomaterials and bionic building materials are becoming increasingly important in the construction industry and are developing into a key technology. A central aspect is the interdisciplinary development of not only high-strength and durable, but also environmentally friendly, recyclable and health-compatible building materials and structures.

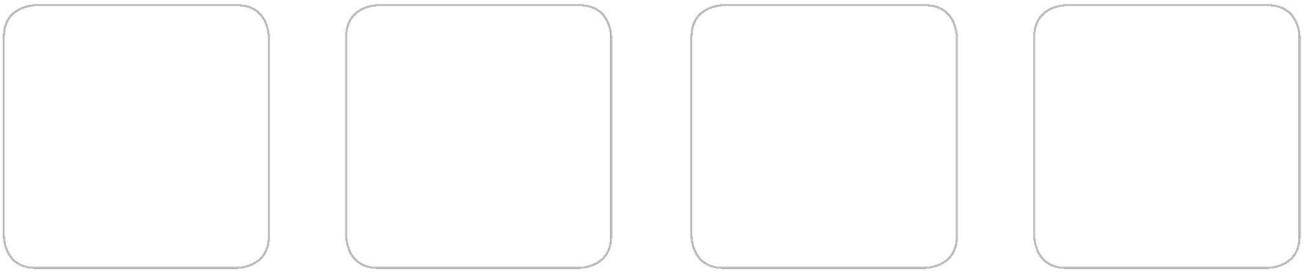
These developments are particularly reflected in the primary research areas of our faculty as well as in the determination of future funding priorities.

### Strategy

Civil engineering has evolved over the last decades from a classical construction discipline to a field in the interplay of the natural and built environment. In addition to participatory processes of citizen involvement, in which ecological concerns often come to the fore (noise, emissions, water balance and -pollution, etc.), many aspects of environmental impact assessments are now part of the topics and tasks of civil and environmental engineers.

The Faculty of Civil Engineering is facing up to these future challenges and wants to take responsibility in both the classical constructive and environmental engineering subjects. It focuses on safety, environmental compatibility and economic efficiency of structural facilities as well as the sustainable use of our natural resources.

The special strength of the Faculty of Civil Engineering lies in the combination of basic and application-oriented research based on the broad professional competence of the scientists



working at the faculty and their good national and international networking.

Our faculty will meet future challenges in scientific research with the following fundamental strategies:

#### **Enhance structural subjects**

With the subsequent appointments of the professorships "Structural Concrete" and "Steel Construction", the structural engineering subjects are to be further consolidated as the core competence of the faculty and positioned internationally. The existing professorship "Construction Mechanics" will be rededicated to "Construction Mechanics and Dynamics" and organizationally assigned to the Institute for Structural Engineering in a separate research unit.

The creation of two new tenure track positions at this institute will also open up and fill new innovative research fields in the areas of "Monitoring and Maintenance of Engineering Structures" and "Bionic Support Structures".

#### **Increase visibility of environmental expertise by renaming our faculty**

The Faculty of Civil Engineering at TU Wien comprises many disciplines that operate at the interface between civil and environmental engineering. The holistic inclusion of environmentally relevant issues in teaching and research was initiated and implemented by civil engineers and contributes to the fact that the professional image has changed in many areas and is perceived in a differentiated way within society today. More than 50% of the SCI publications at the faculty are already assigned to the research focus of energy and environment. The faculty wants to give this fact visibility to the outside world as well and rename itself the Faculty of Civil and Environmental Engineering.

With the funding priorities Risk & Disaster Mitigation and Bionics & Green Building and through the creation of three new career positions in the research fields "River Basin Management", "Hydrology" and "Hydraulic Engineering", an additional strategic strengthening of environmentally relevant topics is taking place.

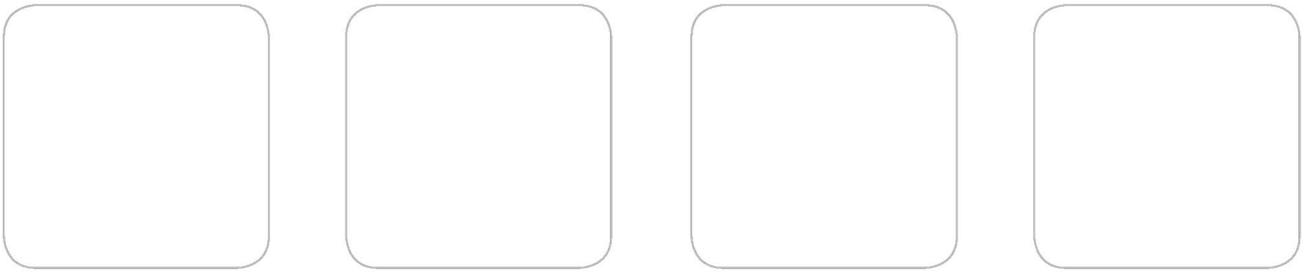
#### **Creating an excellent environment for holistic "Civil & Architectural Engineering"**

Technical design in modern building and industrial construction requires a holistic view, with civil engineers working closely with architects and building technicians in the design process. The focus in civil engineering is on the technical, scientific penetration of the design in connection with the chosen building materials, the supporting structure as well as the building physics and modern, "smart" building technologies.

The existing research units "Building Construction and Maintenance" and "Integral Construction Planning and Industrial Building" as well as a new research unit for "Integral Building Technology" will therefore be organizationally combined in a new institute for "Structural and Industrial Construction". This should create an excellent organizational environment at the faculty, in which the interdisciplinarity and holism as well as the upcoming digital development in these research fields can be successfully lived and continued.

#### **Construction Economics and Management as a unique selling proposition and driver of digitization**

To date, construction operations and the construction industry have been among the sectors of the economy least affected by digitization. Driven by the necessary increase in efficiency, new digital tools will be used in the future in the planning and tendering of construction services, but also on the construction site, which require to a large extent an interdisciplinary research approach in a close interaction between classical civil engineering knowledge, project organization, contract law and excellent IT skills.



This development is acknowledged by creating a new research unit "Digital Construction Process", refilling and corresponding orientation of the professorship Construction Economics and Management in the research unit of the same name, as well as the current and future focus in the area of digitization at the research area Construction Process and Methods. In order to open up new innovative research fields, the creation of a career position with a focus on "Digital Construction in Civil Engineering" is also planned. In terms of organization, the three future research units will be embedded in a new Institute for Construction Operations.

### **Create meeting places**

Scientific excellence, interdisciplinarity and internationality will be further developed through the promotion of established research clusters, the establishment of new interfaculty research centers (ICC Water & Health, GCD, Energy & Environment, Mobility & Digitization) and the establishment of joint doctoral schools.

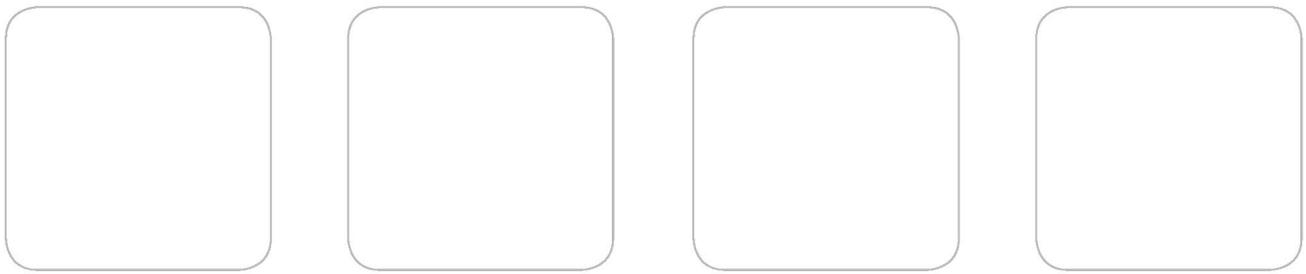
New formats for informal exchange will promote and enhance networking and cooperation within the faculty. These serve the further development of continuous exchange and networking within the faculty but also cooperation with the national and international research community and industry.

By focusing on these strategic goals in combination with an increased integration of research into the international scientific community, the successful further development of the faculty's positive research record should be ensured. This applies both to the basic subjects, which are already well integrated internationally, and to all application-oriented research units.

## **Research priorities**

On the basis of the priorities listed in the Development Plan 2019+ and new accents in research, the following three research priorities will lead the further scientific development and profiling of our faculty (see figure 16). These three research priorities can be assigned to the respective research priorities of TU Wien (listed below).

- 1) Modelling in civil engineering  
(TUW: Computational Science and Engineering)
  - Development of innovative structural systems
  - Planning, optimization and computational modelling of engineering structures
  - Economic analysis of construction methods, processes and resources
  - Management of construction projects and processes, life cycle analysis (cost and environmental impacts) and construction contract issues
- 2) Smart building constructions and materials  
(TUW: Material Science and Matter)
  - Characterization of traditional and biogenic materials and composite materials
  - Development of high-performance materials
  - New materials and bionics
  - Mechanical and building physics fundamentals of material modelling



3) Sustainable systems and resources  
(TUW: Energy and Environment)

- Structural and operational concepts for transport infrastructure
- Condition assessment and monitoring of engineering structures and systems
- Event forecasting and risk analysis
- Sustainable water and material cycle management



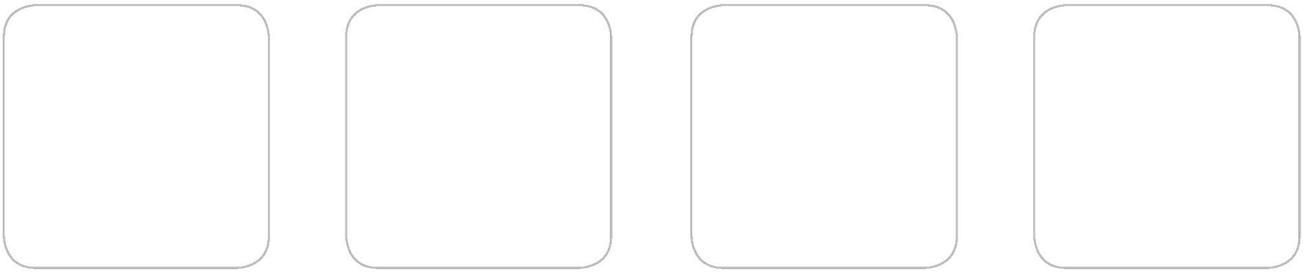
Figure 1: Research priorities of the Faculty of Civil Engineering

Within the research priorities identified in the Development Plan, selected funding priorities will be defined with the aim of achieving the following objectives:

- Priority funding for the establishment or further development of existing research fields with high relevance
- Promotion and motivation of young excellent scientists
- Establishment and self-financing of the priority field after one to a maximum of two performance periods

## Funding priorities

In the present Development Plan 2025+, which covers the two performance periods 2022-24 and 2025-28, the following funding priorities are defined within the framework of the research priorities of the faculty.



### ***Big Data in Civil Engineering***

The value chain in construction projects (planning, construction and operation) will experience a further productivity boost in the coming years due to digitization and data integration.

The currently prevailing framework conditions of construction projects (e.g. heterogeneous, fragmented company structures, disruptive changes, processes with interfaces and "silo thinking" of the project participants) often result in information loss, collisions, as well as necessary adaptations due to rescheduling during construction. The result is high costs and loss of time as well as quality. Largely unstructured data formats, inconsistent standards, different types of project presentations and increasing data density from phase to phase contribute to these partially inefficient processes.

The use of digital tools and technologies has enormous potential for improvement, such as:

- Increased process integration
- Optimization of construction projects over the entire life cycle through modelling, simulation of execution management and operating processes
- Creation of integrated data structures along the value chain from project development to termination
- Use of data for urban mining activities

On the one hand, costs and construction time can be reduced, on the other hand, significant quality improvements can be achieved and a sustainable infrastructure can be ensured.

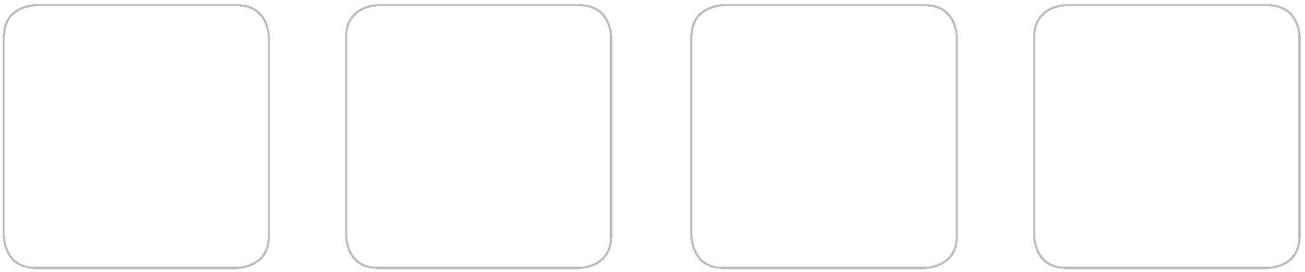
A special research focus will be on the investigation of the use of building information modeling and other digital tools for the automated coupling of planning, design, construction and operation. Another focus will be the investigation and development of simulation tools for prediction, analysis and optimization of the life cycle performance of construction projects in terms of cost, time or eco-efficiency.

### ***Bionics and Green Building***

Bionics deals with the transfer of phenomena of nature to technology and the associated fruitful interactions: on the one hand, structures and systems occurring in nature can inspire new technical solutions, and on the other hand, technological methods developed by civil engineers can help to better understand, grasp and even computationally represent nature. This understanding is to be strengthened and expanded in the funding priority.

One priority will be set at the interface between civil engineering and medicine, as a new facet of health engineering. The TU-wide initiative "ViCEM - Vienna Center for Engineering in Medicine", in cooperation with MedUni Vienna, also adds to this, whereby "Civil Engineering in Medicine" comprises the development of modern simulation tools for the evaluation of organic structures and systems (e.g. risk of fracture of osteoporotic bones) on the basis of an engineering understanding of the materials of biology and their genesis. Their understanding is gained by experiments from civil engineering which are adapted to meet medical challenges in connection with multi-scale theories in engineering science. This complements existing biomedical technologies in image processing and control engineering and thus represents an important building block for the establishment of the "Virtual Physiological Human" as a new instrument in diagnosis and therapy, especially in the fields of traumatology and tissue engineering.

A further priority is set in the area of Green Building. Green Building comprises ecological and sustainable building adapted to the environment and its changes such as climate change, with special consideration given to the interaction between people and the environment. Maintaining



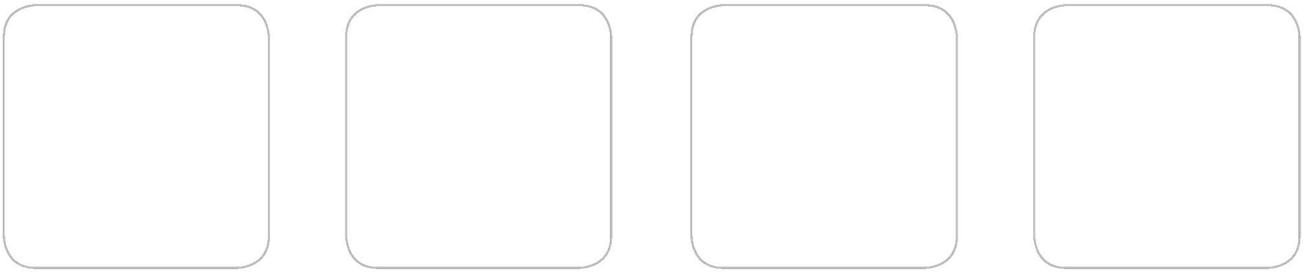
the quality of life, especially in the cities of the future, requires innovative system solutions using multifunctional, sustainable, environmentally compatible but at the same time mechanically robust building materials and technologies. Such solutions include, for example, photovoltaics, the greening of roofs and facades, the use of biological and bio-inspired load-bearing elements and structures, and the use of green elements indoors. This leads to resource conservation, energy efficiency, resilience and healthier living.

### ***Risk and Disaster Mitigation***

People and infrastructures are threatened by numerous external risks and environmental influences (climate change, earthquakes, floods, epidemics, scarcity of resources, accumulation of pollutants, etc.) that can lead to severe crises. In the funding priority Risk and Disaster Mitigation, approaches are being developed for the foresighted handling of such events which reliably describe the behavior of the overall system, consisting of technical, natural and social components, and expand the understanding of the interactions of these system components. On this basis, models, methods and practically feasible concepts for the design of civil engineering systems will be developed while taking risk into account, and implemented under realistic conditions. These risks are to be recorded, evaluated, avoided or their effects significantly reduced by proactive measures.

The behavior of buildings is monitored with regard to risks over their life cycle, and through ongoing monitoring and assessment of their condition in order to positively influence operating decisions (e.g. closing, repairing or demolishing buildings) within the framework of the adaptive management concept. Concepts and methods are developed which help to ensure a sufficient supply of raw materials in quantitative and qualitative terms. This must also be achieved in an environmentally compatible manner, which requires, for example, the sufficient availability of suitable last sinks and means that a profound understanding of the system is necessary in order to develop counter-strategies for the reduction of risks and impacts of natural hazards. In addition to the relation to the direct use or usability of water by humans, the concepts/methods/models developed there serve as a basis for the scientific investigation of aquatic systems. The knowledge gained in this way is used to derive effective and sustainable management measures (e.g. for flood and water resource management). The interfaculty Research Centre (ICC) Water and Health and the FWF Doctoral College Water Management Systems are part of this funding priority.

The funding priority is a cross-cutting topic that brings together various areas of civil engineering, including building mechanics, structural engineering, geotechnics and transport, water, resource and construction industries.



## B.3 TEACHING

### Strategy

The faculty is responsible for the studies in Civil Engineering and Environmental Engineering and is committed to "research-led teaching". In the bachelor's programs, a comprehensive basic education is provided in mathematics and natural sciences as well as in engineering subjects. This broad, scientifically and methodologically high-quality basic education, which is designed to provide lasting knowledge, offers ideal conditions for the further qualification of graduates.

The master's programs are characterized by a wide range of options for subject-specific specialization. The combination of bachelor's and master's programs unites the knowledge profiles of generalists and specialists in the sense of a new generation of engineers. They are able to work effectively in interdisciplinary teams and to develop innovative and sustainable solutions in their special fields.

In the sense of the previously discussed research-led teaching, but also in connection with the organizational design of the teaching, the university civil and environmental engineering education differs in essential points from other educational paths of the tertiary sector. In connection with the organization of teaching, it should be noted that the principle of imparting knowledge as freely as possible with a minimum of formal requirements (such as subject-related access restrictions and compulsory attendance of lectures) is consistently implemented, especially in the master's program.

### Development goals

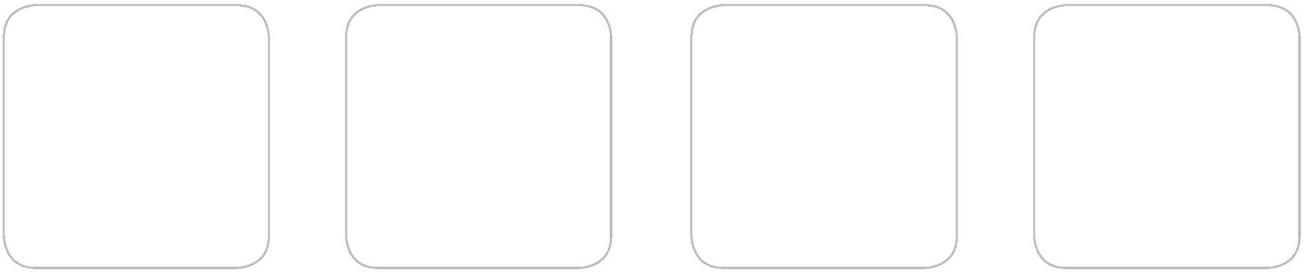
#### *Mentoring and coaching*

The goal is to develop measures (mentoring & coaching systems) that will lead to a reduction in the number of dropouts and an improvement in graduation rates. In the introductory and orientation phase, students from higher semesters will continue to accompany and advise new students in the context of introductory tutorials. For advanced students with low examination activity, additional offers (online examinations, additional examination places, etc.) will be provided to enable the fastest possible path to graduation.

#### *Curricula development*

The curricula for the bachelor's and master's programs at the faculty are very up-to-date and therefore already consistently formulated in a learning outcomes-oriented manner. Minor re-sharpenings will be integrated into the curricula with other editorial changes in the short term. In the interest of planning security for students and a certain continuity, no major changes are planned until the implementation of the guidelines for the evaluation of studies at the TU Wien.

The faculty is actively involved in the preparation of the guidelines for the evaluation of studies at the TU Wien by participating in the working group Quality Management in Teaching of the Vice Rectorate for Studies and Teaching. The resulting guidelines for evaluation are aimed very strongly at studyability and teachability, in addition to the quality of the curriculum and the quality of content implementation. The evaluation process includes self-documentation by the faculties as well as a query of the external view. This is unreservedly welcomed by the faculty, as it



institutionalizes and intensifies the consultations with representatives of industry, planners and authorities, which have so far been held at irregular intervals, in order to be able to respond to the wishes of the graduates' future employers in a timely and goal-oriented manner. As soon as the guidelines for the evaluation of studies at TU Wien are adopted and the necessary key figures for the evaluation process for the studies are available, the faculty will proactively initiate corresponding processes in the relevant study commissions.

In the course of any major changes to the curriculum, the integration of the new research fields represented by new professorships (e.g. ecological construction technologies, building services engineering) will then also be evaluated. Here, it is a great concern to integrate these topics already into the teaching of the bachelor's programs without, however, negatively influencing the studyability.

The interfaculty study of environmental engineering should be used to achieve a stronger networking of the teachers in the environmentally relevant fields of TU Wien and to achieve, for example, cooperation in research and doctoral studies. Corresponding networking events such as the UIW GetTUgether have already been successfully established and are to be consistently continued and further developed.

The coordination of teaching contents with the other leading civil and environmental engineering faculties in the German-speaking area, which has been cultivated for years within the framework of the Faculty Day, is to be continued and the results of the dialogue are to be used for the further development of the studies at the faculty.

### ***Digitization of teaching***

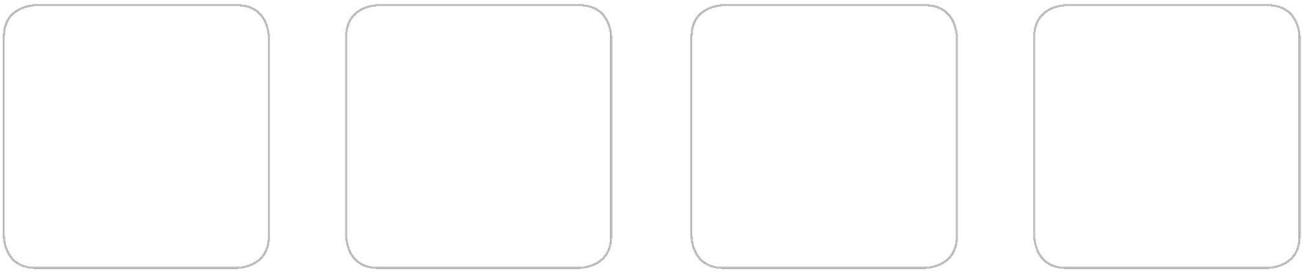
Due to profound changes as a result of the Covid-pandemic, the topicality of digitizing teaching has come to the fore. This means that the methods of imparting knowledge are subject to fundamental change. The partly new formats and digital media used in distance learning have to be evaluated continuously. For this purpose, it is planned to convene a feedback round consisting of lecturers and student representatives every semester.

The medium-term goal of the faculty, however, is to use the positively evaluated methods of digitization optimally even after the pandemic, depending on the requirements of the respective courses. Hybrid forms will also play an essential role in this.

For example, streaming formats are to be implemented as comprehensively as possible in selected lectures with a large number of listeners, above all in order to offer (some) part-time students the opportunity to follow the lectures with a time delay.

Partially automated knowledge tests in online formats (e.g. via TUWEL) are offered for exercises and selected written exams. Since the experience with these measures has been positive throughout, such additions are to be made to other subjects.

In the context of modernization and digitization, individual fields from the "Studium 4.0" offering are to be increasingly adopted in teaching. However, this is by no means intended to replace the existing range of direct teaching, but rather to be understood as a selective supplement to the synchronous teaching offer. Particularly in the area of blended learning, the possible media offerings are to be specifically examined for their use and then tested in practical implementation.



### ***Mixed Reality (MR) in teaching***

In the future, the faculty's MR Lab and various BIM activities will give students the opportunity to learn these relevant skills in their civil engineering studies. In addition to this training aspect, there is great potential in using MR in teaching to convey the content of other courses. It is planned to test the technical possibilities for integrating MR in teaching in cross-sectional subjects of civil and environmental engineering in order to provide students with a low-threshold introduction and to demonstrate the technical possibilities. For example, virtual field trips are envisioned to provide students with unusual insights into facilities, including a better understanding of how they operate and basic design approaches. Depending on the resources available to prepare content in a way that is suitable for teaching, excursions in urban areas are also conceivable, during which students can visualize the underground infrastructure using MR on tablets or cell phones.

### ***Internationalization of teaching***

Since the Covid-pandemic has all but wiped out opportunities for study abroad for students and faculty exchanges of varying lengths, setting internationalization far back, mobility must be rebuilt as soon as circumstances permit. This includes, above all, new contracting with partner universities. An important addition to this is the expansion of offers for students of Environmental Engineering.

The medium-term strategy of the faculty pursues several goals:

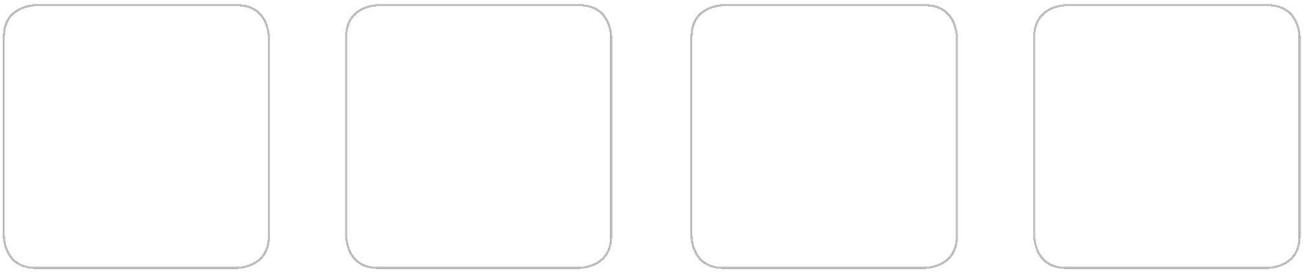
- Motivation of the students to participate,
- Coordination with industry partners and representatives of the chambers of commerce to optimize the range of offers,
- Expansion of exchange programs, especially with attractive partner universities.

In the context of the promotion and intensification of the cooperation with partner universities, our efforts focus on closer coordination of the course content of the most popular courses in order to avoid problems with crediting in advance. The increase of English-language courses in master's courses is also planned for the next few years.

In addition, stays abroad are to be given special weighting and evaluation in consultation with the university management in order to compensate for disadvantages resulting from the extension of the duration of study with regard to the awarding of scholarships and prizes.

Efforts are also being made to expand the English-language courses already offered for the master's programs of both Civil Engineering and Environmental Engineering in order to increase the modest number of incoming students to date. In addition, the following measures are planned to increase the attractiveness of our faculty for students from abroad:

- Combination of several courses in priority areas in terms of time and content, which are specifically offered at the faculty;
- Expansion of the services offered in connection with student counselling and in coordination with the International Office of TU Wien;
- Involvement of interested industrial partners to offer not only university courses but also practical supplements (within the framework of small group excursions, short internships, etc.).



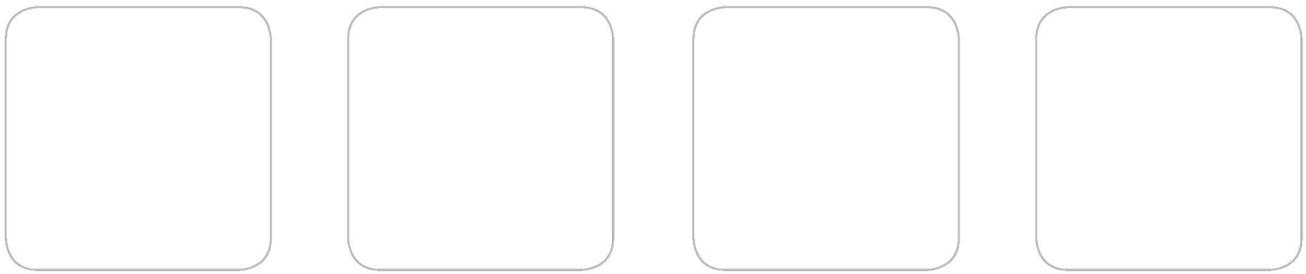
### ***English-language master's program***

The foundations for an English-language master's program in a (sub)field of "Civil Engineering" were laid in the last period of the performance agreements by researching and analyzing in detail international master's programs from excellent European universities in civil engineering. Based on this information, gaps in the content of existing international master's programs are now being compared with the core expertise of the faculty. From this, a concept will be developed which, complementary to the existing offer, has the potential to bind excellent students from other countries to the faculty. The concept will be discussed and coordinated with representatives from interest groups, contractors and clients. Interdisciplinary connections that enable a future-oriented Master's program will be considered. Cooperation with comparable faculties at top universities will be explored in order to put the master's program to be developed on a solid foundation.

### ***Talent development program***

In order to additionally support excellent master's students of the Faculty of Civil Engineering, a specific talent program is to be set up in cooperation with the TU Career Center. As part of the talent promotion program, selected students are prepared for the demands of professional life through internships in participating companies (planners, clients and contractors). This shortens the training phase in companies and provides participants with additional qualifications. The successful format will be expanded to the program Environmental Engineering.

Students will also be able to make early contact with companies and potential employers.



## B.4 PERSONNEL

The ongoing changes in the science system and the legal framework conditions at universities place high demands on the sustainable personnel development of the faculty. The following personnel development measures are planned to achieve our development goals in research and teaching.

### Professorships

An essential requirement for the appointment policy of the Faculty of Civil Engineering is the scientific orientation of the new professorships. This is to be achieved through the appointment of excellent, nationally and internationally networked scientists and research engineers. In addition to the required specialist knowledge, leadership and social skills must also be considered in the appointment process. The focus of the professional activities of the new professors must in any case be on the Faculty of Civil Engineering.

Furthermore, the establishment of women professors is a major concern from the faculty's point of view and must be a fundamental medium- to long-term goal as part of a future-oriented social process. All those responsible have the unrestricted understanding that diversity in leadership has a positive influence on culture and that the social and professional skills acquired must be a central concern of the curia.

#### *Period 2021 - 2024*

In the period 2021-24 of the current and next performance period, six professorships are planned to be established or filled according to § 98 and § 99 UG.

#### *Period 2025 - 2027*

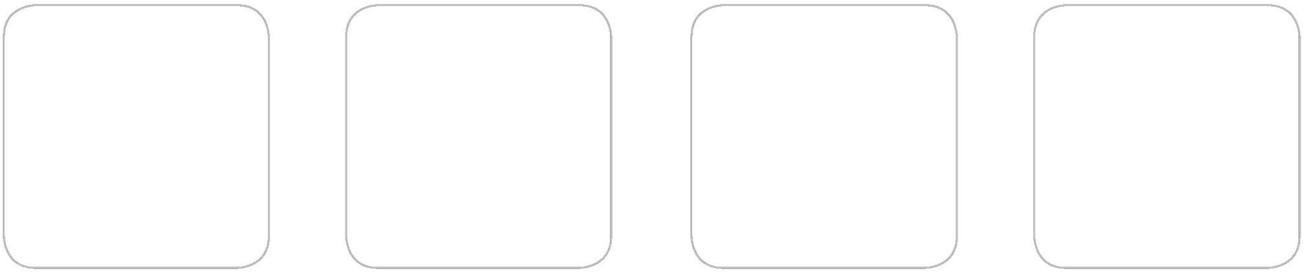
For the performance period 2025 to 2027, three professorships are provisionally envisaged in accordance with § 98 resp. § 99 according to UG.

### Tenure-track positions

By establishing tenure-track positions for excellent scientists, the faculty pursues the following basic goals.

- Improving scientific visibility of the faculty through hiring of established researchers
- Opening of career opportunities for the own scientific staff (Post-Docs)
- Developing new research fields at the faculty by filling two to three of the planned tenure-track positions with external researchers
- Increasing the proportion of women in the professorial ranks
- Boosting for international scientific careers

Therefore, candidates are required to have an excellent scientific reputation and international visibility related to their scientific age. The selection process of the candidates and the performance evaluation is carried out by internal and external evaluation according to the valid



guidelines of the rectorate<sup>5</sup>.

A habilitation in the respective scientific subject must be included in the qualification agreement provided for the career positions. This must meet the requirements for submission for habilitation at the Faculty of Civil Engineering<sup>6</sup>.

For the next two performance periods until the end of 2027, the establishment of four to a maximum of seven additional tenure-track positions is planned, subject to financial feasibility, Two of this tenure track positions are for women.

## Scientific personnel

The scientific staff members financed by the global budget form the basic staff of the institutes to guarantee the research and teaching activities. In order to maintain or further expand research activities, it is necessary to hire additional research assistants financed by third-party funds.

The allocation of personnel resources for academic staff to the individual organizational units from the global budget by the dean is based on the following principles:

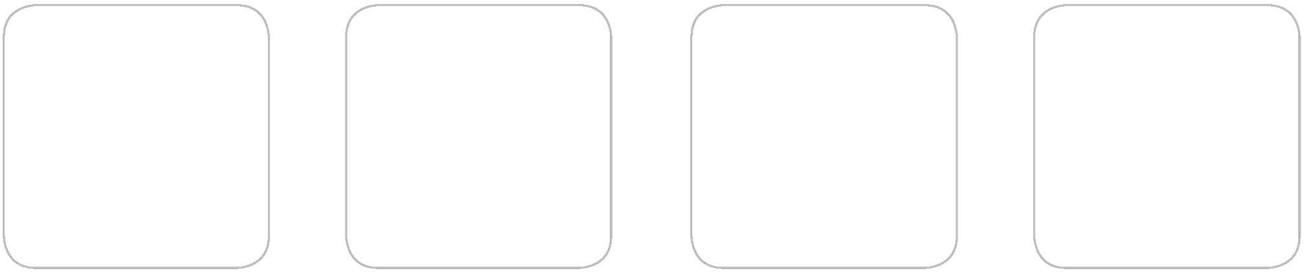
- Ensure basic endowment of research departments with temporary pre-doctoral positions based on research performance and teaching load based on three-year evaluation
- Organizational units with affiliated laboratory areas in the Science Center should retain or be given the opportunity in the medium to long term to establish a permanent post-doctoral position (senior scientist) to ensure continuous laboratory operations
- Maintaining an appropriate ratio of temporary to permanent scientific staff to ensure the availability of young scientists in the organizational unit
- Allocation of any remaining personnel budget for temporary pre-doc positions via performance agreements with the head of the organizational unit
- Fundamental compliance with the legal framework, in particular the valid chain contract regulation in the course of fixed-term employment contracts, even if this means that the career model practiced at TU Wien is not feasible

When hiring additional (scientific) staff financed by third-party funds, the responsibility for personnel planning and for ensuring financial viability lies with the organizational units of the faculty. Employees financed by third-party funds can generally only be employed on a temporary basis. In particular, the labor law framework conditions for the conclusion of fixed-term employment contracts must be observed.

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<sup>5</sup> Guideline of the rectorate regarding tenure track positions and qualification agreement, 09.08.2019  
[https://www.tuwien.at/fileadmin/Assets/dienstleister/universitaetsentwicklung\\_und\\_qualitaetsmanagement/Dokumente/Richtlinie\\_Laufbahnstellen\\_und\\_Qualifizierungsvereinbarung.pdf](https://www.tuwien.at/fileadmin/Assets/dienstleister/universitaetsentwicklung_und_qualitaetsmanagement/Dokumente/Richtlinie_Laufbahnstellen_und_Qualifizierungsvereinbarung.pdf)

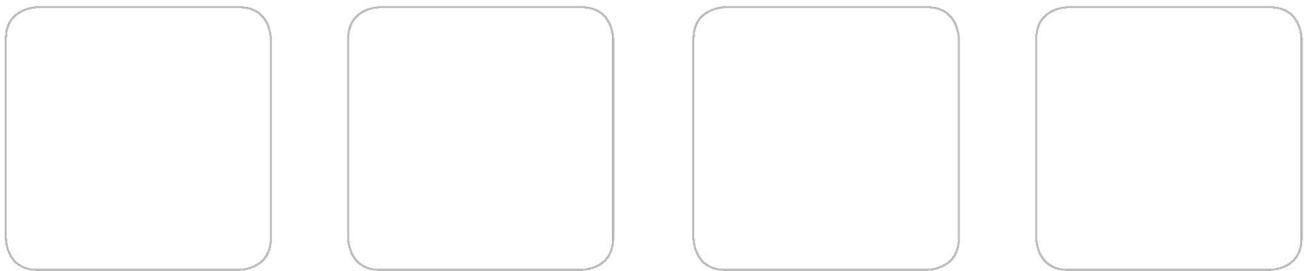
<sup>6</sup> Requirements to achieve the habilitation at the Faculty of Civil Engineering, TU Wien, internal area of the website of the Faculty: <https://colab.tuwien.ac.at/pages/viewpage.action?pageId=32843452>



## Non-scientific personnel

Non-scientific university personnel are an essential support in the administration and laboratory facilities of the organizational units. In recognition of the services to be rendered in this context, the Faculty of Civil Engineering, in close cooperation with the Human Resources Department, strives for a job-related classification and performance-related remuneration of the non-scientific staff.

In order to determine and further develop job satisfaction and to take stock of previous work goals and results, mandatory annual staff appraisals (MAG) are to be offered, as is the case for scientific staff. The MAGs are included in the evaluation of the organizational units. The professional development of non-scientific staff is supported by the organizational units and TU Wien's Human Resources Development in the course of special training programs.



## B.5 ORGANIZATION 2025+

### Development of organizational units

As of January 2021, our faculty comprises 9 institutes with 22 research centers, the Civil Engineering Services with the Dean's Office, the Civil Engineering Training Centre - bi.f and the Computer Laboratory Civil Engineering (Figure 1).

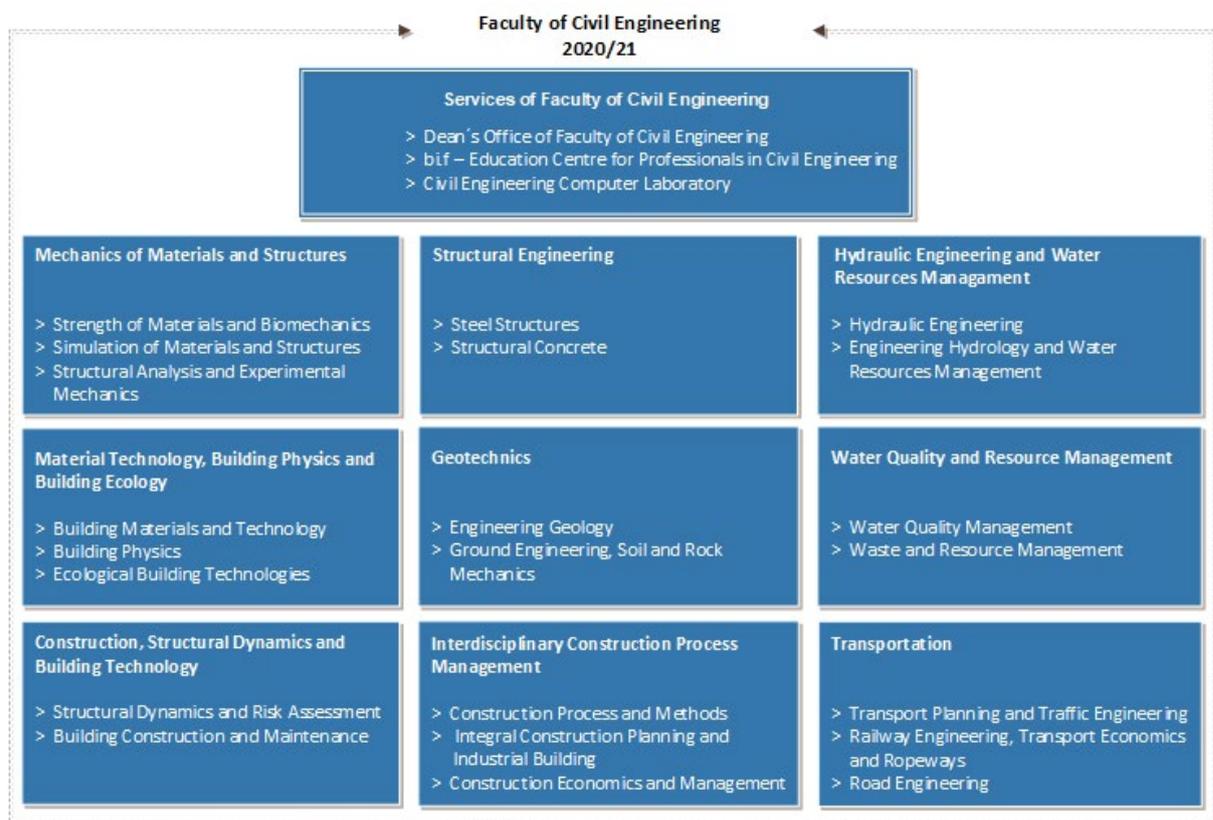
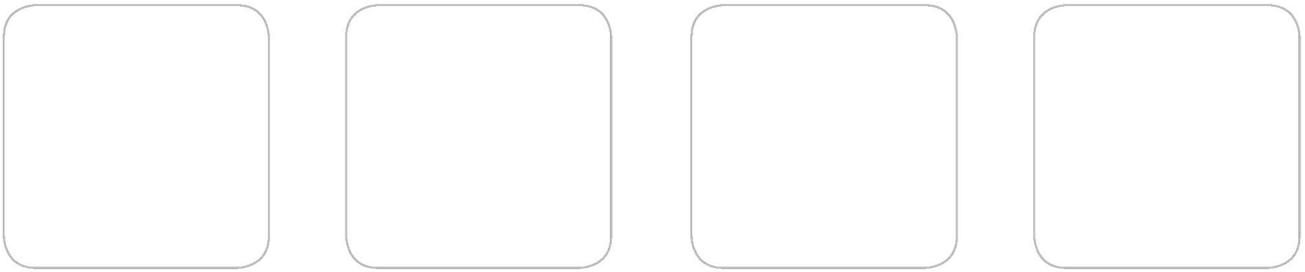


Figure 2: Faculty organizational chart (as of January 2021)

In close connection with the personnel development planned under item C4, the organization of the faculty with the perspective of 2025+ is to be redesigned according to Table 5.



## Research cluster

Parallel to the organizational units, the dean can set up research clusters at the faculty for one to a maximum of two performance periods. These do not appear as separate organizational units.

In a research cluster, research topics within current funding priorities of the faculty are researched and financed. The task and aim of these faculty-internal research clusters is to promote interdisciplinary cooperation between scientists from different institutes and research areas and to establish innovative research fields at the faculty in the medium to long term. In a research cluster, scientists from at least three research areas of different institutes work together and nominate a responsible head.

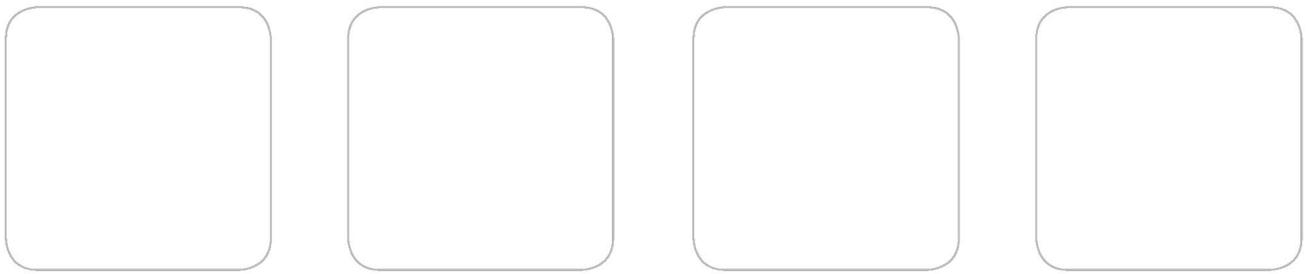
The dean funds research clusters with his own personnel resources and budget funds for innovative projects in connection with performance agreements.

## TU Cooperation Center

The instrument "Inter-faculty Cooperation Center"<sup>7</sup> serves as a springboard for further research cooperation for interdisciplinary and inter-faculty cooperation of research groups at TU Wien, possibly also involving researchers from other universities. In order to promote interdisciplinary research, the participation in such cooperation centers, which are located in the funding priorities of the faculty defined according to C.2, is therefore to be supported and further expanded in the 2025+ period.

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<sup>7</sup> Further information: <https://www.tuwien.at/forschung/tuw-interne-foerdermoeglichkeiten/tu-kooperationszentren>



## B.6 LOCATION DEVELOPMENT

In the course of the project "TU UniverCity", TU Wien expands its spatial environment and adapts it to modern requirements. The Faculties of Civil Engineering and Architecture and Spatial Planning will find their home in the main building at Karlsplatz.

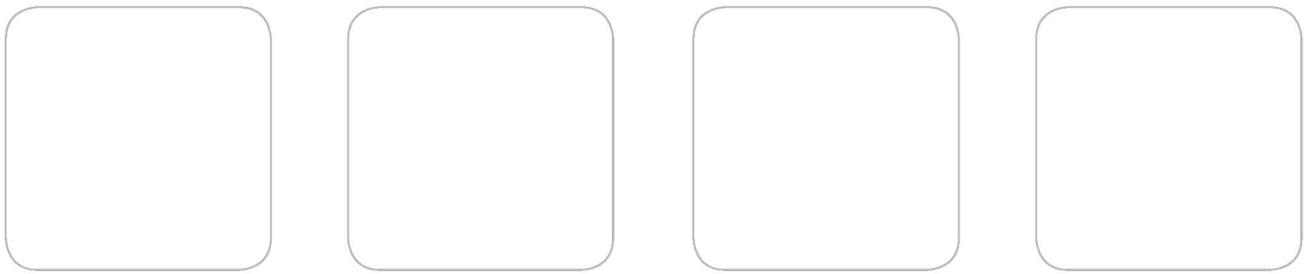
### Safety refurbishment Karlsplatz

BIG is carrying out a comprehensive safety renovation of the main building of TU Wien until approximately 2023, paying special attention to safety technology and fire protection, which will secure the continued operation of the Karlsplatz site as a university building for the next decades.

In the course of this security renovation, a revision of the utilization concept will be carried out as part of the accompanying measures and the sub-project TU post-utilization. The goal is to use the main building in the future as the location of the two faculties "Architecture and Spatial Planning" and "Civil Engineering" as well as some central service providers.

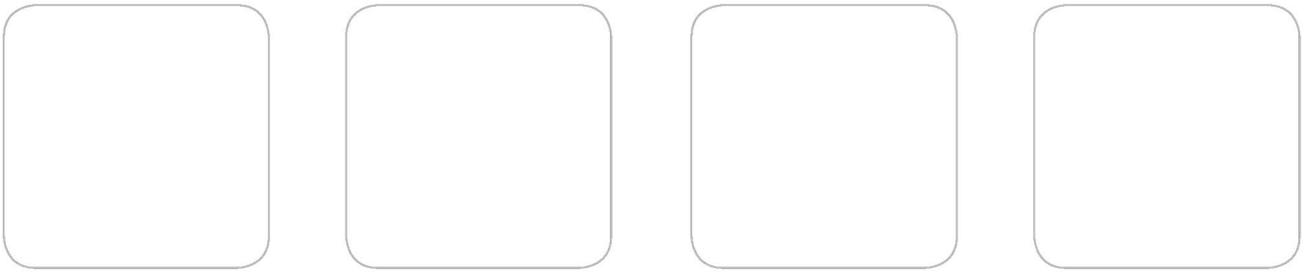
The Faculty of Civil Engineering will use these conversion measures, which are planned in three construction phases, to consolidate the premises of all institutes and to integrate those institute areas that are currently located outside the main building. The planned development of the organizational structure according to C5, Table 5, is already considered.

In the course of this restructuring, an objective reallocation of the institute areas will also be carried out on the basis of TU Wien's area ratio model, taking into account the areas occupied by the institutes at the Science Center in the Arsenal in Vienna's 3<sup>rd</sup> district.



Organizational Units, January 2021		Organizational Units 2025+	
No.	Institute/Research Units	No.	Institute/Research Units
<b>E249</b>	<b>Services Civil Engineering</b>	<b>E249</b>	<b>Services Civil Engineering</b>
E249-01	Dean's Office	E249-01	Dean's Office
E249-02	Civil Engineering Computer Laboratory	E249-02	Civil Engineering Computer Laboratory
E249-03	Education Centre for Professionals in Civil Engineering	E249-03	Education Centre for Professionals in Civil Engineering
<b>E202</b>	<b>Mechanics of Materials and Structures</b>	<b>E202</b>	<b>Mechanics of Materials and Structures</b>
E202-01	Strength of Materials and Biomechanics	E202-01	Strength of Materials and Biomechanics
E202-02	Simulation of Materials and Structures	E202-02	Structural Simulation and Timber Engineering
E202-03	Structural Analysis and Experimental Mechanics	E202-03	Structural Analysis and Experimental Mechanics
<b>E207</b>	<b>Material Technology, Building Physics and Building Ecology</b>	<b>E207-01</b>	<b>Material Technology, Building Physics and Building Ecology</b>
E207-01	Building Materials and Technology	E207-01	Building Materials
E207-02	Building Physics	E207-02	Building Physics
E207-03	Ecological Building Technologies	E207-03	Ecological Building Technologies
<b>E208</b>	<b>Construction, Structural Dynamics and Building Technology</b>	<b>E210</b>	<b>Building and Industrial Construction</b>
E208-01	Structural Dynamics and Risk Assessment	E210-01	Integrated Planning and Industrial Building
E208-02	Building Construction and Maintenance	E210-02	Building Construction and Building Preservation
		E210-03	Integral Building Technology
<b>E212</b>	<b>Structural Engineering</b>	<b>E212</b>	<b>Structural Engineering</b>
E212-01	Steel Structures	E212-01	Steel Structures
E212-02	Structural Concrete	E212-02	Structural Concrete
		E212-03	Mechanics and Structural Dynamics
<b>E220</b>	<b>Geotechnics</b>	<b>E220</b>	<b>Geotechnics</b>
E220-01	Engineering Geology	E220-01	Engineering Geology
E220-02	Ground Engineering, Soil and Rock Mechanics	E220-02	Ground Engineering, Soil and Rock Mechanics
<b>E222</b>	<b>Hydraulic Engineering and Water Resource Management</b>	<b>E222</b>	<b>Hydraulic Engineering and Water Resource Management</b>
E222-01	Hydraulic Engineering	E222-01	Hydraulic Engineering and Environmental Hydromechanics
E222-02	Engineering Hydrology and Water Resource Management	E222-02	Engineering Hydrology and Water Resource Management
<b>E226</b>	<b>Water Quality and Resource Management</b>	<b>E226</b>	<b>Water Quality and Resource Management</b>
E226-01	Water Quality Management	E226-01	Water Quality Management
E226-02	Waste and Resource Management	E226-02	Waste and Resource Management
<b>E230</b>	<b>Transportation</b>	<b>E230</b>	<b>Transportation</b>
E230-01	Transport Planning and Traffic Engineering	E230-01	Transport Planning and Traffic Engineering
E230-02	Railway Engineering, Transport Economics and Ropeways	E230-02	Railway Engineering, Transport Economics and Ropeways
E230-03	Road Engineering	E230-03	Road Engineering
<b>E234</b>	<b>Interdisciplinary Construction Process Management</b>	<b>E235</b>	<b>Construction Process and Construction Economics</b>
E234-01	Construction Process and Methods	E235-01	Construction Process and Methods
E234-02	Integral Construction Planning and Industrial Building		
E234-03	Construction Economics and Management	E235-02	Construction Economics and Management
		E235-03	Digital Building Process

Table 1: Planned development of the organizational structure 2025+ of the faculty



## B.7 INTERNATIONALIZATION

In the implementation of TU Wien's strategy concept, "TU Wien International"<sup>8</sup>, it is a declared goal of the faculty to further advance internationalization in the coming years. Four directions are being followed according to TU guidelines:

- *International exchange relations with excellent universities:* We plan to select strategic partner universities and establish relations. The process can be supported by concluding partnership agreements at faculty level and by applications for establishing strategic networks (e.g. EU programs). Scientific excellence, thematic/methodological adaptability and development potential are criteria for selection. On this basis, concrete cooperation projects are developed for the formation of strategic research and teaching alliances with top universities.
- *Strengthening an attractive, intercultural research and study environment:* We plan to increase the proportion of English-language courses in the master's curriculum. In the medium to long term, English-language master's and PhD programs are planned. In addition, joint courses are to be established with the strategic partner universities, such as summer schools, or, if appropriate, master's programs and PhD programs.
- *International mobility of students and academic staff:* International mobility should be further pursued and strengthened. Building on the existing networks for scientific staff, the existing exchange programs, and future partnership agreements with strategic partner universities, the mobility of lecturers and the exchange of doctoral students is to be increased in the medium term.
- *Improvement of international competitiveness, visibility, and marketing abroad:* An important component of the promotion of internationality is the increased awareness of the importance of internationally networked and internationally competitive research within the faculty. It is planned to promote "international competitiveness", "international visibility" and "foreign marketing" through various incentives in order to increase and improve activities in this direction at the faculty.

These four directions will be further elaborated on in a faculty-specific internationalization concept, with respect to TU Wien's strategy. For this purpose, a working group will be established at the faculty. A faculty representative for international affairs ensures a targeted flow of information within our faculty, between the faculty and the rectorate as well as to the central services for international affairs of TU Wien.

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<sup>8</sup> TU Wien International – Strategy Concept - Global Strategy 2013

<sup>+</sup> [https://www.tuwien.ac.at/aktuelles/news\\_detail/article/8896/](https://www.tuwien.ac.at/aktuelles/news_detail/article/8896/)

# C. Appendix

## List of figures & tables

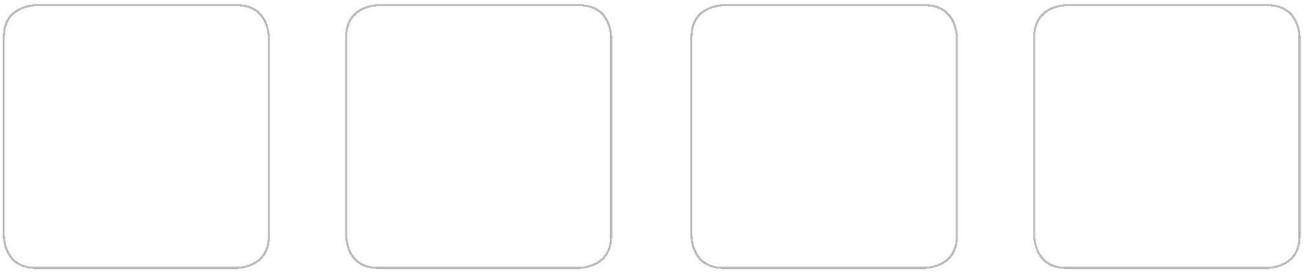
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