



Master of Science in Engineering – Studying from a different perspective

Bern University of Applied Sciences
Architecture, Wood and Civil Engineering



MSE

MASTER OF SCIENCE
IN ENGINEERING

01

In today's knowledge and technology-based society, civil engineers have to be able to adapt quickly to new tools and new subject areas. Because sophisticated and unconventional building projects are becoming increasingly common, civil engineers have to make optimal use of these new tools to meet the challenges presented by social change.

Civil engineers who see themselves merely as mathematical technicians cannot meet today's demands. The ability to quickly get to grips with new problems and starting points and close gaps in existing knowledge requires a flexible approach.

Ambitious graduates with a bachelor's degree or another degree from an institute of higher education can obtain these key qualifications by way of a master's course. The course offers students the opportunity to develop their analytical skills through scientific work and deepen their knowledge in a targeted way within specific specialisation areas. ●

02

What does the course offer?

Swiss-wide network. The Master of Science in Engineering (MSE) course is a training programme developed by the Swiss Universities of Applied Sciences. In the core modules the students benefit from optimal cooperation between the participating universities which focus on their respective strengths in the areas of specialisation. Thanks to this cooperation between all of the universities of applied sciences in Switzerland, and the resulting localisation of central modules on one campus, students have access to a Swiss-wide network of experts.

Access to attractive careers. The specialisation areas offered by the «Integral Planning and Construction» Master Research Unit are geared towards careers which will confront the future challenges of the construction industry and which have a high demand for specialised experts. The graduates therefore not only have good career opportunities, they also have access to attractive career areas.

Tailored study. The course can be completed on either a full-time or part-time basis. The modular structure of the course allows the mode of study to be individually adapted in order to meet a wide variety of needs. The amount of work to be completed can be varied during the course to take account of a varying workload.

Individual course agreement. Every student is assigned an advisor to assist them. Each student will determine their individual course plan in consultation with their advisor. The individual course agreement sets out the basic educational targets and the modules that the student will attend, stipulates objectives for the specialist subject-specific projects, defines suitable events and provides information about the independent study that is expected.

Educational targets. The students develop the ability to span the broad range between abstraction and application which is so important for innovation and to hone their abstract skills in on the application. Challenging, practice-oriented tasks and applied research projects provide students with in-depth methodical competence and expertise which allows them to take a very independent approach to their work. By participating in projects, they also develop their social and leadership skills.

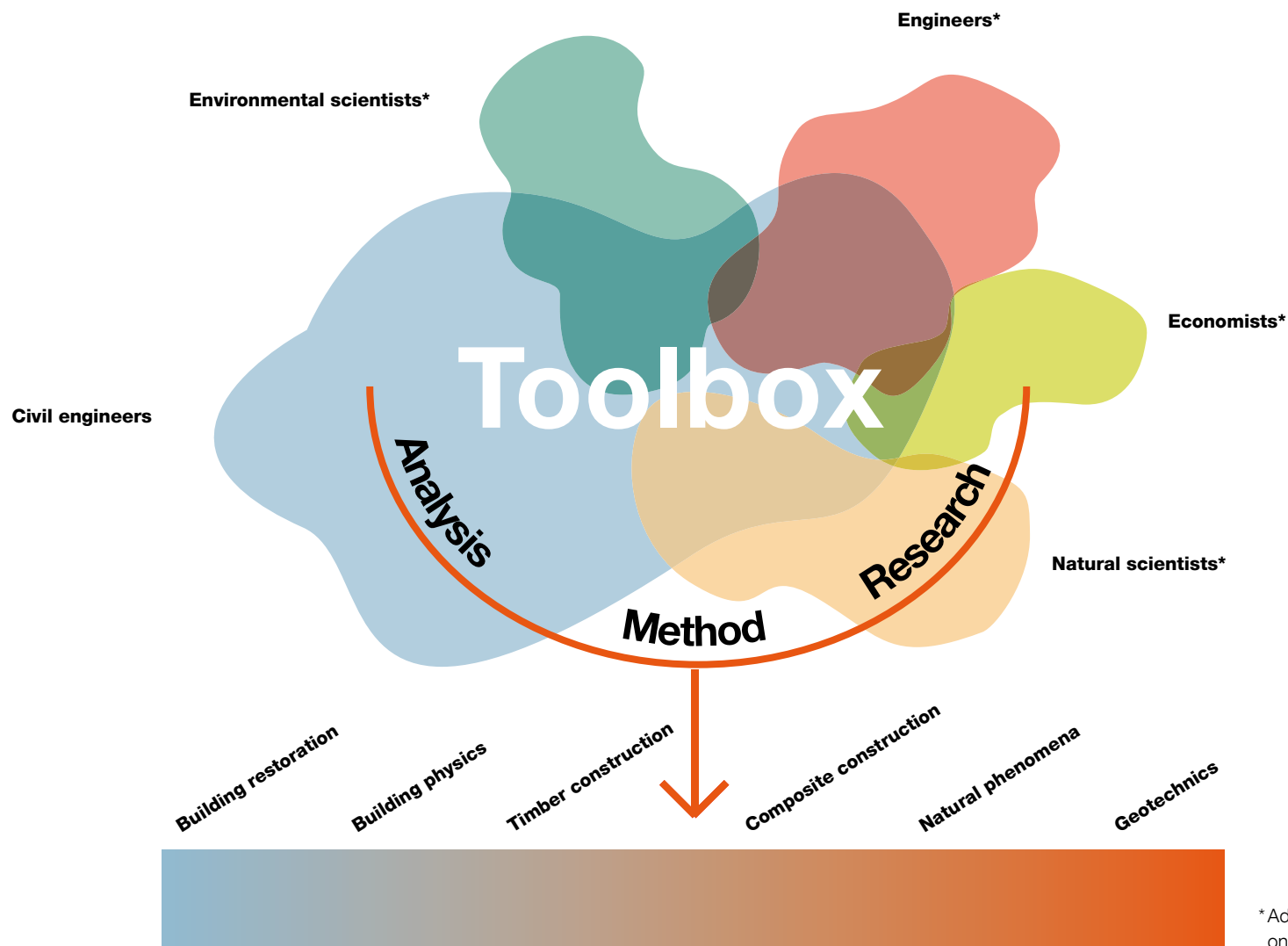
International cooperation. To encourage the international focus of the students, opportunities are provided to undertake periods of study abroad. Cooperation in international research projects within the subject specialisations is also promoted. Working together with international students and lectures by international guest lecturers, however, also offer opportunities for an international exchange of ideas within the course itself.

Real tasks. In order to guarantee practical teaching, the tools of the trade are used in a professional, project-based environment. The course therefore goes beyond the mere theory, by introducing students to real tasks so that they can directly apply their knowledge.

Recognised degree title. Successful completion of the degree will lead to the internationally recognised title «Master of Science BUAS in Engineering with Specialisation in Public Planning, Construction and Building Technology». ●

Toolbox

The course equips the students with the tools necessary for their later work. From the toolbox students can acquire those tools that are most suitable for them depending on their educational background and career aspirations. The course of studies integrates various fields. The main focus is clearly on civil engineering, but career changers from other areas (other engineering sciences, economics, natural sciences, environmental sciences) can also be admitted. Depending on the outcome of a written application, students who do not have a background in civil engineering may have to complete additional elements. Students broaden their range of skills using the tools on offer and can also develop them in a targeted way.





04

Course structure

The course comprises core modules (theoretical and contextual modules), subject specialisation within the scope of a Master Research Unit (MRU) and the master's thesis. The course is worth a total of 90 ECTS credits, of which the core modules account for approximately one third and the subject specialisations (including the master's thesis) making up the remaining two thirds. A high proportion of self-study promotes the ability to develop knowledge independently and to solve problems.

Core modules. The core modules are divided into theoretical modules (technical/scientific modules and theoretical fundamentals) and context modules. They are offered jointly for all seven universities at central campuses in Zürich. Students are able to choose options according to their requirements, in consultation with their advisor (a lecturer from the selected Master Research Unit).

The **theoretical modules** consist of technical/scientific modules and theoretical fundamentals. These provide long-term knowledge capital and encourage the ability to think in the abstract. Students must attend at least two technical/scientific modules and three teaching blocks from the theoretical fundamentals options.

The **context modules** serve to expand the students' knowledge and abilities in the areas of management, communication and culture. Students must attend at least two context modules. During the period in the spring semester when no lectures are held, there is an additional, compulsory block week. This engages students intensively in tackling a single, specific topic.

Subject specialisation and master's thesis. Students select one or more skill sets within the Master Research Unit (MRU), in which they would like to specialise. The subject specialisation comprises additional teaching units (seminars, presentations etc.), project work and the master's thesis. On the full-time course, the subject specialisation generally takes up two days each week in the first semester and three in the second semester.

In the third semester, students concentrate exclusively on their subject specialisation and prepare their master's thesis. This final piece of work is intended to demonstrate that students are able to deal with a complex problem and to present their solution on a well-founded scientific basis. ●

05

Integral Planning and Construction

Planning and building processes, which underlie the laws of global development, are becoming increasingly more complex. Furthermore, building projects are becoming increasingly more sophisticated and unconventional. The diversification and the complexity of these processes demands an integral approach. This is where the strength of the Bern University of Applied Sciences Architecture, Wood and Civil Engineering (BUAS-AWCE) lies: it covers all areas of planning and construction from analysis to the completed project and from design to production. This integral teaching approach is unique in Switzerland. The «Integral Planning and Construction» Master Research Unit (MRU) covers all these areas. The MRU is organised in three specialisation areas:

- Building restoration and building physics
- Timber and composite construction
- Natural phenomena and geotechnics

Within these specialisation areas the students deepen their knowledge in one or more skill sets. The skill sets can also be combined with skill sets from another specialisation area within the MRU «Integral Planning and Construction». The specialisation areas are based on the research units of the BUAS-AWCE, which are at the forefront of industrial and technical development and work in direct cooperation with national and international institutions and companies in the industry. The master students are involved in research projects and research teams. They develop their knowledge through direct practical experience with the parallel back-up of theoretical units. ●

Building restoration and building physics

Sustainable energy use is one of the key issues in the world of construction. People are also demanding ever-greater levels of comfort in their homes. Light and comfortable temperatures are important, as is the need for quietness, with its associated sound insulation. The specialisation entitled «Building restoration and building physics» concentrates on these aspects, which have a direct effect on building design, construction technology and execution.

Course contents. During the course, students work on project-related tasks that require them to consider aspects of construction physics across a broad spectrum. They analyse building materials and elements, as well as the signs and causes of damage, and develop practice-oriented solutions.

Students acquire a thorough knowledge of materials technology; of the development and uses of building elements; of quality management; and of the maintenance of the fabric of buildings.

As part of the specialisation in «Building restoration and building physics», students acquire greater expertise in one or more of the skill sets below.

Building restoration. Much future construction work will be carried out on existing buildings. Not only will greater demands on the part of the users have to be taken into consideration, so too will stricter requirements regarding the indoor climate and energy efficiency.

Specialists in building restoration conduct project-specific analyses to determine the condition of buildings in the light of their architectural and structural qualities, as well as their quality in terms of historical preservation. They develop innovative practical solutions. Their knowledge of applied building physics and of structural systems enables them to apply suitable solutions and concepts to this field of construction.

Building physics. The area of building physics is facing challenges that will require the services of specialists who grasp the changing needs of society and will be able to develop new ways of meeting them. Specialists in building physics, deal with the physical characteristics of construction materials and elements as well as of structures. The classic areas of building physics are structural design; thermal, damp, sound and fire insulation; and the ecology of buildings. ●



Timber and composite construction

At present, two trends in particular are influencing construction methods in structural engineering and bridge building. First, a growing interest in sustainability is leading builders to use wood construction methods more often. Second, high-performance materials other than the classic steel-concrete composite are increasingly being combined in an intelligent way.

Course contents. Students will be taught the principles of wood and composite construction by means of both the theoretical fundamentals and current research projects. They learn to develop effective details and understand how they function. They learn more about the characteristics of the various materials and how to apply each one correctly in construction.

They will be initiated in the correct techniques for modelling building elements in composite materials and wood, learning the numerical approach, as well as the proper technique for each material. This will enable students to draw up concepts for unusual planning tasks and carry them out optimally in terms of building techniques. They conduct research in the areas of materials technology, joining and adhesion techniques as well as applied building physics.

As part of the specialisation in «Timber construction and composite construction», students acquire greater expertise in one or more of the skill sets below.

Timber construction. Both private individuals and public authorities are turning increasingly to building in wood in the light of stricter requirements for energy efficiency and sustainable construction. There is also an awareness that wood is the only building material that can be re-grown and replaced sustainably. This heightened demand requires more well-trained specialists capable of taking on the challenging planning work involved.

Specialists in wood construction apply all their expertise to designing and measuring challenging wood construction projects. They are ideally qualified to prove their talents in consulting engineering firms, or in other parts of the wood industry.

Composite construction. Specialists in the area of composite construction are in a position to help build successful and fine structures in the areas of structural engineering and bridge building. They are able to design buildings that are fast to build and have flexible ground plans. Their work consists not only of determining the required cross-sections and systems in keeping with the relevant regulations, but also of designing all the connections that play a large part in ensuring the efficiency of composite structures. ●



Natural phenomena and geotechnics

Major projects such as the New Alp Transversal road and rail routes, new road systems in towns and agglomerations, large shopping centres or apartment blocks, as well as avalanche or rockfall shelters would not be possible without the sound knowledge of geotechnical engineers. There are great planning uncertainties involved in the properties of the subsoil, the water and the groundwater and in how they are interpreted from a structural engineering point of view. Geotechnical engineers therefore hold important key positions in the planning, development and construction of buildings.

Course contents. During the course, students learn how to analyse geotechnical tasks on the basis of current research projects by gathering, evaluating and rating the fundamentals. Project work teaches students about the instruments used in geotechnical engineering for scientific drafting, enabling them to compare them and apply them to sample problems. They are introduced to various measurement tools (e.g., analytical, numerical or empirical methods), so that they are able to translate projects into practice.

As part of the specialisation in «Natural phenomena and geotechnics», students acquire greater expertise in one or more of the skill sets below.

Natural phenomena. Specialists in natural phenomena concentrate their activities on structures aiming to protect people from natural phenomena, such as unstable mountainsides, avalanches and rock falls. The aim of their work is identifying and neutralising dangers. They achieve this not only by designing protective structures that absorb impact, but also by developing concepts and models for reducing the effects and implications of natural events. These will simplify whatever engineering measures are required and increase their effectiveness.

Geotechnics. Geotechnical engineers work at the interface between geosciences and civil engineering. The «building materials» they deal with on site have been placed at their disposal by nature herself. As the scope for influencing these building materials is fairly limited, the tools at the disposal of the geotechnical engineer are specifically limited by the constraints of each situation and can only be used within those constraints.



«We shape our buildings,
thereafter they shape us.»

Winston Churchill (British Prime Minister, 1874–1965)

Course start dates

Autumn	calendar week 38
Spring	calendar week 7

Course duration

Full-time	3 semesters
Part-time	4–6 semesters

Course fees

Course fees	CHF 600 per semester
Matriculation	CHF 100
Social/cultural/sport	CHF 24 per semester
Infrastructure and copying costs charged according to usage	

Admission requirements

- Bachelor in Engineering Sciences
- Engineering degree from an institute of higher education or equivalent training
- Minimum ECTS grade «B» or overall mark «very good»
or
- Decision on the basis of a written application
- Assessment of suitability (recommendation by advisor)

Application must be made to the university that hosts the Master Research Unit.

European Credit Transfer System.

The Bern University of Applied Sciences uses the European Credit Transfer System (ECTS) in accordance with the Bologna Treaty. Full-time study counts as 30 credits per semester. This is the equivalent of approximately 900 hours of work. The workload will be reduced accordingly for a part-time course. 90 ECTS credits are required for successful completion of the master's course.

Advice and information events

A printed prospectus is not always able to answer every question. Each year, a number of events are held to present information about the various courses of study available. Individual meetings can also be arranged to provide advice on the personal requirements necessary to undertake a course. Both the information events and individual meetings are free of charge and without obligation. Further information can be found on our homepage: www.ahb.bfh.ch

Course administration

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Courses at the Bern University of Applied Sciences Architecture, Wood and Civil Engineering

Bachelor

- of Arts in Architecture
- of Science in Civil Engineering
- of Science in Wood Engineering

Master

- of Arts in Architecture (collaboration with the Fachhochschule Westschweiz HES-SO)
- of Engineering in Wood Technology (collaboration with University of Rosenheim D)
- of Science in Engineering (collaboration with Swiss University of Applied Sciences)

Master of Advanced Studies

- MAS Preservation and Conversion
- MAS Timber Construction
- MAS Sustainable Construction

Certificates of Advanced Studies (CAS)

Courses at the Higher Technical Schools HF Wood Biel

Advanced technical courses

- Technical specialist Diploma HF in Timber Construction
- Technical specialist Diploma HF in Woodworking Industry
- Technical specialist Diploma HF in Lumber Industry
- Postgraduate HF in Management Studies

Professional and advanced technical certificate courses

- Timber Construction Supervisor
- Timber Construction Senior Supervisor (Site supervisor with Swiss specialist certificate)
- Swiss Master's certificate in Timber Construction
- Wood specialist with Swiss specialist certificate

Research and Development Services

- Practice-oriented Research and Development in all divisions
- Contract services
- Accredited testing: All our laboratories are certificated to ISO/IEC 17025 standard and have SAS (Schweizerische Akkreditierungsstelle) accreditation. The tests are recognised internationally.
- Knowledge and Technology Transfer (WTT – KTT)

www.ahb.bfh.ch