Bern University
of Applied Sciences

Master of Science in Engineering (MSE)

Study guide

MSE | MASTER OF SCIENCE IN ENGINEERING

Contents

The master's degree programme at a glance

As a Master of Science in Engineering, you benefit from close collaboration with research and industrial partners: you gain additional competences that enable you to assume responsibility for demanding projects after graduating and offer you more skills to participate in discussions on a technical and organisational level.

Profiles	Engineering and IT: – Business Engineering – Computer Science – Data Science – Electrical Engineering – Energy and Environment – Mechanical Engineering – Mechatronics and Automation – Medical Engineering – Photonics Construction and Planning: – Civil Engineering
Mode of study	Full-time: 3 semesters Part-time: max. 7 semesters
Tuition languages	German/French/English
Study locations	Biel, Burgdorf, Lausanne, Lugano, Zurich (depending on the profile)
Cost	One-time registration fee CHF 100.00 Semester fee CHF 750.00
Start of degree course	Week 38 (autumn semester) Week 8 (spring semester)
Admission	Bachelor's degree with good to very good academic standard. The degree must be related to the area of expertise of the chosen profile.
Application	31 July (autumn semester) 31 December (spring semester)
Title / degree	Master of Science BFH in Engineering with specialisation in …

Master of Science in Engineering (MSE)

Cooperation Master

The Master of Science in Engineering is a degree programme offered jointly by the Swiss Universities of Applied Sciences, providing personalised training in engineering and IT as well as in construction and planning. With a total of 14 areas of specialisation, termed 'profiles', a wide range of choices is available. Bern University of Applied Sciences offers master's degrees in ten profiles: in the field of Engineering and IT, students can choose between Business Engineering, Computer Science, Data Science, Electrical Engineering, Energy and Environment, Mechanical Engineering, Mechatronics and Automation, Medical Engineering and Photonics. In the domain of Construction and Planning, BFH offers the Civil Engineering profile. The practical focus is of prime importance in all profiles, accounting for two-thirds of the course; the training objectives depend very much on the needs of the future employers.

Future technologies and new working tools

The development of new technologies in the fields of Energy and Environment, Production and Manufacturing Technologies as well as Information and Communication Technologies (ICT) requires specifically trained specialists who have in-depth and practice-based know-how in these subjects. Companies are specifically looking for qualified specialists who, in addition to their in-depth technical know-how, already have gained practical experience in research projects. Knowledge in the development of new areas of business is also a sought-after skill in the economy, industry and the public sector.
In today's knowledge and technology society, civil engineers have to also be able to quickly apply new working tools and get to grips with new topics. As challenging and unconventional construction projects become increasingly common, civil engineers are required to make optimum use of these new tools to meet the challenges of social change.

As a Master of Science in Engineering, you have access to a wide range of subject areas in civil engineering and technology and to a national network of experts.

Career prospects/Occupational fields

As a Master of Science in Engineering, you will be equipped to work in leading positions in research and development departments. You will undertake challenging tasks in your area of expertise or generalist positions. After completing your studies, you will have well-defined methodological and management skills that enable you to further the development of new products and services as well as entire organisations.

Achieved competences

After graduation,

- you'll have more in-depth knowledge of mathematics
- you'll possess specialist knowledge of various engineering sciences
- you'll successfully apply your knowledge to calculation, simulation, analysis and verification
- you'll understand how to develop products and processes in research using the latest technology
- you'll be able to investigate complex cause-and-effect relationships with standard and proprietary methods
- you'll be in position to successfully communicate with business partners and position yourself internationally
- as a project leader or manager in the organisation, you'll be able to find solutions with others and implement them in practice

Studies/Profiles

The master's degree programme is practice-oriented and is based on one-third basic training (theory) and two-thirds specialist in-depth training (practice).

Basic training

The Master of Science in Engineering course teaches basic knowledge (30 ECTS credits), which is offered jointly by the Swiss Universities of Applied Sciences and divided into three module groups:

- Technical scientific modules TSM
- Extended fundamental theoretical principles FTP
- Context modules CM

Technical specialisation and profiles

You can complete the specialisation at a research unit – usually the BFH institute to which your workplace is assigned. The specialisation course comprises 60 ECTS credits and includes the following components:

- Project theses 1 and 2
- Master's thesis
- Supplementary events, supplementary modules

A matrix with our recommendations for your BSc specialisations can be found on our website.

Profile: Business Engineering

From materials procurement to the finished product and from market analysis to product launch, to monitoring and optimisation of the entire life cycle: with the Business Engineering profile, you'll be ideally equipped to successfully take on challenging roles in industry or the services sector.

The Master of Science in Engineering degree programme with the Business Engineering profile will open up future career opportunities in industry and the services sector as well as with consultancy firms. Your future field of employment lies in product and service development as an innovation manager, in quality, production, process and project management. You will manage the technological development and implementation of innovative products, services and business models. In the Business Engineering specialisation, you can also focus on production and operations management, entrepreneurship, innovation management, supply chain management, process engineering, business analytics and sustainability or life cycle management.

Professional skills

As a Business Engineer with a master's degree, you are responsible for the management of products and services. You are familiar with the analytical methods and opportunities relating to the manufacture and use of industrial goods or systems. In particular, you can optimise and make effective use of data-based market research, innovation management, logistics, optimisation of supply chains (supply chain management), and life cycles of plants, products and business models. You are able to find sound solutions to technological and business problems and to implement them cost-effectively.

Profile: Computer Science

Digitalisation is making rapid advances in all spheres of life that make up our society. With the Computer Science profile, you gain the necessary qualifications to actively shape this development.

Career opportunities in computer science are found in the fields of software development, information and communication technologies (ICT) systems, cybersecurity, advanced user interfaces and embedded computing. You can apply your skills in research and development or management – with opportunities in all sectors of the world of work.

Professional skills

As a Master of Science in Engineering graduate with the Computer Science profile, you work closely with users and stakeholders to develop innovative ICT systems and architecture. You integrate these innovations into heterogeneous IT landscapes, taking account of all applicable security, quality and regulatory requirements. In addition to your technical expertise, you also possess the management skills required to lead development teams and assume responsibility for the management of ICT infrastructure.

Profile: Data Science

The Data Science profile provides you with knowledge of the key methods and tools for organising, processing and analysing data efficiently. The knowledge acquired will enable you to develop innovative, data-based products and services and to integrate them into larger systems.

As a data scientist, you possess the skills to design, develop and deploy a wide range of data products and data flows for industry and the services sector. In Switzerland, data engineers, data analysts and developers of data products are highly sought-after specialists and find professional challenges and opportunities in almost every sector of industry.

Professional skills

As a Master of Science in Engineering graduate with the Data Science profile, you are able to research, analyse and improve data and data flows using a wide range of statistical methods. You organise the recording and acquisition of application-specific data from heterogeneous sources. You also deploy data mining and machine learning in a targeted way. The development of applications for the content-related and economic improvement of data flows is also part of your professional skills set, likewise a general business understanding of data flows.

Profile: Electrical Engineering

Without electronics, there's no digitalisation. The Electrical Engineering profile provides you with the skills required to develop and create smart and innovative products for the future, from pacemakers to extensive grid architectures for energy transmission.

As an electrical engineer, you focus on electronic and embedded systems, signal processing, control technology, power electronics systems, power transport and distribution, communications and IT systems and drive systems, etc. You'll find career opportunities in many sectors of industry: whether it's spectroscopes, pacemakers, power stations, mobile applications, radar systems or communications satellites – you play a key role in developing a wide variety of systems and products.

Professional skills

As a Master of Science in Engineering graduate with the Electrical Engineering profile, you possess the skills required to provide power supply for a wide range of products as well as expertise in signal processing for machines and drive systems. You plan, create and inspect electronic systems and individual products.

Profile: Energy and Environment

Are you eager to know how to curb climate change long-term and which technologies can be used strategically to achieve this? As a graduate of the Energy and Environment profile, you have a good command of the technical principles that energy generation is based on.

As a Master of Science in Engineering graduate with the Energy and Environment specialisation, your future career opportunities lie in industry, the services sector and the public sector. Your professional role centres on traditional and sustainable energy generation, storage and conversion (renewable energy, demand-side management and prosumer and peer-to-peer concepts), where you incorporate the efficient use of natural resources as well as environmental protection.

Professional skills

As a graduate, you possess comprehensive, interdisciplinary knowledge in the areas of energy, environment and process technology, providing a pragmatic decision-making basis for highly advanced energy and environmental technologies and systems. You systematically analyse, describe, model and simulate complex, technical processes across a range of specialist fields and work in interdisciplinary teams, manage large-scale projects and assume management roles in energy, process and environmental technology.

Profile: Mechanical Engineering

Switzerland is an ideal location for innovation and production in the mechanical, electrical engineering and metal processing industries. The Mechanical Engineering profile prepares you to take on a leadership role in one of the highest-exporting sectors of the Swiss economy.

The Mechanical Engineering profile covers all activities related to the development, manufacture, use and optimisation of machinery, materials, systems and products. You will find career opportunities in industry, science and the regulatory environment. As a graduate of this profile, executive roles in the fields of research, development or production are open to you, as you have a comprehensive understanding of processes and technical correlations.

Professional skills

As a Master of Science in Engineering graduate of the Mechanical Engineering profile, you are able to design, construct, model, validate and optimise components, modules or complete systems professionally and cost-effectively. You are familiar with methods and tools to create mechanical and mechatronic systems, including control and automation solutions. You solve complex problems by applying highly advanced methodical skills.

Profile: Mechatronics and Automation

Due to the need for mechatronic technologies and automation in many sectors of industry, there is great demand for qualified specialists. With the Mechatronics and Automation profile, a wide range of career opportunities is open to you.

In industry, mechatronics and automation are the engineer's core tasks, enabling companies to manufacture their products in a cost-effective and resource-saving way. However, the potential fields of application for the Mechatronics and Automation profile extend far beyond industry. Smart sensors and robots are used in aerospace, disaster protection and even rehabilitation technology.

Professional skills

As a graduate, you are in position to automate, optimise and enhance mechatronic systems. The systems you design perform complex manipulation tasks. Here you apply your expertise in signal processing, artificial intelligence, control technology and robotics.

Profile: Medical Engineering

As a graduate of the Medical Engineering profile, you improve the quality of life of many patients. You work on new medical technology products as well as improving existing devices and applications.

The degree of Master of Science in Engineering with the profile Medical Engineering opens up an exciting field of work at the intersection of medicine and engineering with plenty of contact with doctors and patients. At the same time, you work in future-oriented areas of healthcare, primarily in diagnostics, prevention and rehabilitation.

Professional skills

This profile provides you with the skills and knowledge you need to plan and carry out design studies and development projects for medical technology products, instruments and systems. It also covers the regulatory requirements for the approval process for medical products. The course enables you to recognise and analyse multidisciplinary problems and to develop engineering solutions on your own.

Profile: Photonics

As a graduate of the Photonics profile, you understand and master the physical principles and processes of photonics. You are able to resolve complex problems using suitable methods, assess the feasibility and market benefits of new photonics systems and lead multidisciplinary project teams.

Photonics is the future. Microscopy and spectroscopy form the basis of modern medical diagnostics. Lasers process every conceivable material with supreme efficiency. Fibre-optic technology is at the core of modern data communications. Near-infrared (NIR) measuring technology is helping to optimise the agricultural and food sectors. The Photonics profile of the Master of Science in Engineering degree programme enables you to play a part in shaping this future.

Professional skills

With a Master of Science in Engineering with the Photonics profile, you have a fundamental understanding of modern, laser-based precision manufacturing, optical metrology and imaging, optoelectronics and electro-optics and the design and modelling of photonic systems and microtechnology. You are an expert on the use of light and lasers in a wide range of applications, such as lighting, manufacturing, measuring and medical technology.

Profile: Civil Engineering

As a civil engineer, you shape the world in which we live and assume responsibility for society and the environment. The structures you plan and create shape our future living environments.

Civil engineers perform a wide variety of tasks; they are highly sought-after professionals in their field of expertise. As a student, you will learn to produce specific solutions to tackle complex problems, taking advantage of close cooperation with research and industry professionals.

Professional skills

As a Master of Science in Engineering graduate with the Civil Engineering profile, you identify complex causal relationships and are able to resolve the challenges they present. You also make a major contribution to innovative solutions in terms of analysis, design, technical solutions and planning. You have a firm grasp of business principles and possess extensive project management skills.

Specialisations

Round out your degree programme with specialisations, with a choice of six specialist fields.

Built Environment and Structural Physics

Sustainable energy management is a major issue in civil engineering. People have growing expectations with respect to home comfort. Besides light and warmth, the need for quiet – and therefore sound insulation – is also a key requirement. The 'Built Environment and Structural Physics' specialisation focuses on these aspects which have a direct impact on structural design, structural engineering and implementation.

Wood and Composite Construction

Two major trends can currently be observed in both structural engineering and civil engineering and bridge construction: developers are increasingly relying on timber construction methods. In addition to traditional construction using steel, concrete and composites, other high-performance materials are also increasingly being intelligently combined.

Transport Infrastructure

The interdisciplinary nature of transport infrastructure projects means they cover a wide range of specialist areas, such as geology, geotechnics, hydraulic engineering, roadbuilding and bridge and tunnel construction. In the Transport Infrastructure specialisation, you focus on how to meet the need for cost-efficient and sustainable road infrastructure and develop innovative solutions. Certain topics in railway and airfield construction are also covered.

Geotechnics and Natural Phenomena

Major projects – such as the new road and rail links through the Alps, new traffic systems in cities and urban areas, large shopping centres, high-rise buildings but also structures to protect against avalanches or rockfall – cannot be implemented without the expertise of geotechnics engineers. The characteristics of subsoil, water and groundwater and their interpretation in relation to structural engineering present major uncertainty for planning. This means geotechnics specialists have key roles to play in the planning and building of structural projects.

Hydraulic Engineering

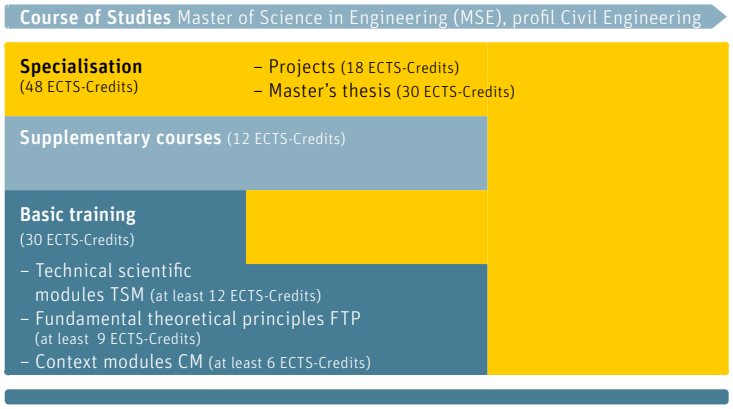
Hydraulic engineering is a challenging, multi-faceted specialist field. Climate change is increasing demand for sustainable solutions here and is making it difficult to predict and anticipate the nature of future events. River engineering presents various, sometimes contradictory challenges. Heavily developed urban areas and predominantly agricultural areas have differing interests in relation to land use. The revitalisation of rivers is also provided for by law to ensure high quality of habitats and more space and interconnectivity for communities of aquatic life. Bed load should be retained for flood prevention purposes, on the one hand, but further transported as part of revitalisation on the other. In addition, efforts are being made to generate more hydropower. Lakes are another contentious issue in hydraulic engineering. They are increasingly attracting public attention as drinking water reservoirs and heat exchangers with their ports and bank protection.

Supporting Structures

Supporting structure planning is a creative discipline. You produce creative ideas using statically and technically sound designs. Modern buildings are becoming ever higher, their spans ever wider and their forms increasingly free. New requirements in the fields of energy, building technology and building management must be incorporated at the supporting structure planning stage. The impressive structures created also mean greater demands are placed on the engineers responsible for planning and implementation. In addition to the key professional skills of structural engineering, the understanding of interdisciplinary cooperation with planning partners is also increasingly important.

Course of studies

In the chart below, the course of studies gives you an overview of the teaching and learning forms covered by modules in the Civil Engineering profile.



Practical relevance

The focus of the course is on practical experience, which distinguishes the MSE from a university education. The needs of the industry shape the educational goals of the MSE and flow directly into the classroom and the project work. As a rule, the master's thesis is also developed in collaboration with a company.

As an MSE student, you are fully involved in a research unit and work on real-life projects.

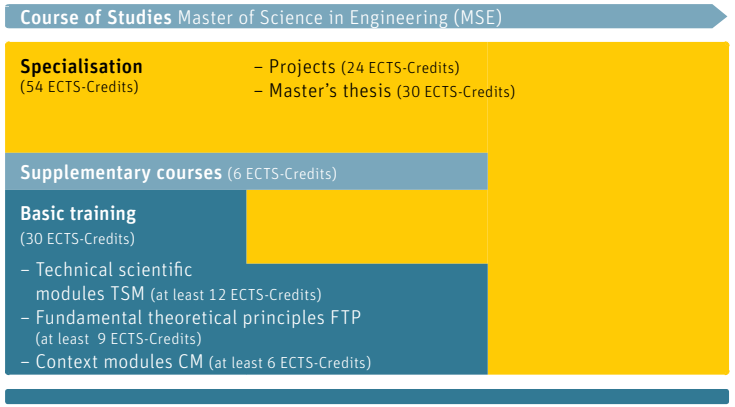
Curriculum and modules

Degree programme structure

The study programme is made up of learning units, the modules, and comprises 90 ECTS credits, which corresponds to a total of 2,700 working hours.
The master's degree programme consists of two parts: the basic training, which accounts for a third of the programme, and a specialisation that makes up two-thirds.

Course of studies

In the chart below, the course of studies gives you an overview of the teaching and learning forms covered by modules in the in the Master of Science in Engineering degree programme.



Types of theory modules

The choice of modules is made individually and based on the student's specialisation and individual needs in consultation with the advisor. Each theory module comprises 3 ECTS credits. The following module types are available to you:

Technical scientific modules TSM (basic training)

The Technical scientific modules teach skills and knowledge subdivided by profile. At least four TSM modules (12 ECTS credits) must be completed.

Fundamental theoretical principles FTP (basic training)
FTP modules provide long-term knowledge capital and train abstract thinking skills. At least three modules (9 ECTS credits) must be completed.

Context modules CM (basic training)
The CM modules build knowledge and skills in the non-technical areas of management, communication and culture. At least two modules (6 ECTS credits) must be successfully completed.

Project thesis and master's thesis (specialisation)
As a student, you will acquire knowledge and experience in your area of expertise through challenging projects. The practical relevance and currentness of the specialisation projects and the master's thesis are vital; the projects are geared towards making a significant contribution to a solution. For the specialisations in Technology and IT, project thesis 1 comprises 9 ECTS credits; project thesis 2 comprises 15 ECTS credits. In the profile Civil Engineering, 9 ECTS credits each can be earned with project thesis 1 and 2. The master's thesis is credited with 30 ECTS credits.

Supplementary events (specialisation)
Supplementary events provide the opportunity to acquire in-depth knowledge that cannot be covered in the basic training modules due to the high degree of specialisation. The modules are offered by BFH or partner universities and are conducted as courses, seminars and/or conferences. At least two modules (6 ECTS credits) must be completed.

As a student at Bern University of Applied Sciences, you structure your studies according to your personal needs and interests.

Module languages
Modules are offered in German, English and French. The lessons are held in the language of the respective region and/or in English.

Curriculum MSE, Engineering and IT profiles Full-time

Updated March 2021

Theory and project modules can also be scheduled differently depending on course parameters (semester, location) or personal options (amount of part-time work etc.).

Module subjects

- Project / Internship
- Specialist optional modules

Subject to amendment without notice.

Curriculum MSE, Civil Engineering profile Full-time

Updated March 2021

Theory and project modules can also be scheduled differently depending on course parameters (semester, location) or personal options (amount of part-time work etc.).

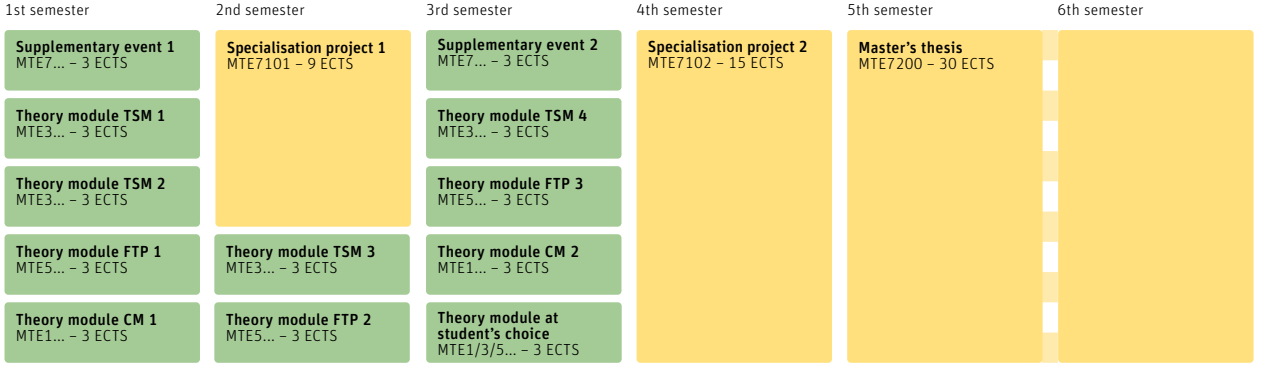
Module subjects

- Project / Internship
- Specialist optional modules

Subject to amendment without notice.

Curriculum MSE, Engineering and IT profiles
Part-time

Updated March 2021



Theory and project modules can also be scheduled differently depending on course parameters (semester, location) or personal options (amount of part-time work etc.).

Module subjects

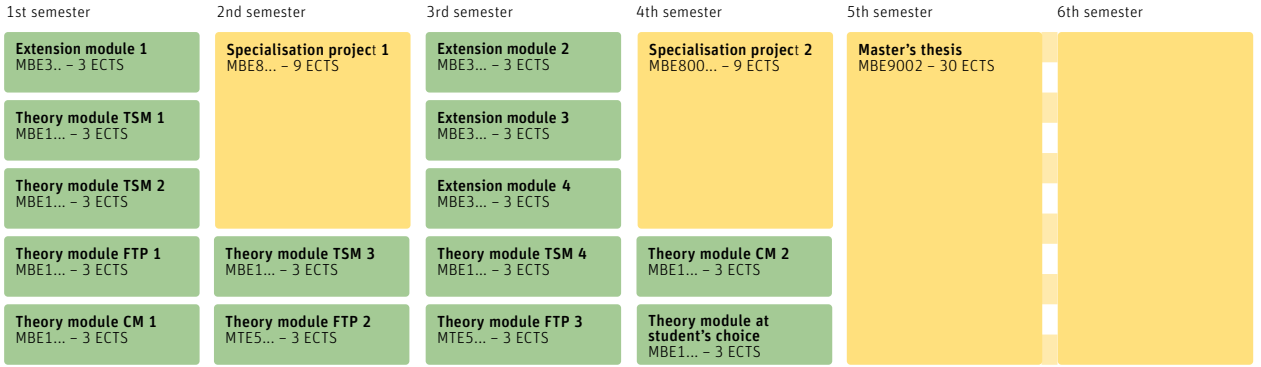
- Project / Internship
- Specialist optional modules

Example, 50%, no specialisation projects during 1st and 3nd semesters

Subject to amendment without notice.

Curriculum MSE, Civil Engineering profile
Part-time

Updated March 2021



Theory and project modules can also be scheduled differently depending on course parameters (semester, location) or personal options (amount of part-time work etc.).

Module subjects

- Project / Internship
- Specialist optional modules

Example, 50%, no specialisation projects during 1st and 3rd semesters

Subject to amendment without notice.

Study information

Study requirement

Graduates of a bachelor's or diploma degree programme of a University of Applied Sciences with good to very good academic achievements are admitted to the master's programme. The field of study must be related to the area of expertise of the selected specialisation. Holders of an equivalent certificate can also be admitted to study. BFH's MSE Admissions Committee will carry out an aptitude assessment once the application has been submitted. If necessary, a supplementary interview can be arranged.

Study locations

Biel, Burgdorf, Lausanne, Lugano and Zurich

Mode of study/duration of study

The MSE can be completed on a full-time or part-time basis. Full-time study usually lasts three semesters. Part-time study lasts a maximum of seven semesters, which allows for professional employment or other activities alongside studies.

Fellowship Master

With the Engineering and Information Technology profiles (TI department), you also have the option of completing a fellowship degree programme: with both fellowships, you are employed part-time as a research assistant at BFH-TI. This extends the study duration from three to (at least) four semesters. The holiday entitlement is four weeks. The tuition-free time is used for work on research or industry projects. The first two semesters correspond to the full-time MSE course. The master's thesis is extended to two semesters.

Industry Fellowship Master MSE

The Industry Fellowship Master's MSE offers you the highest possible practical relevance and best prospects. You can be employed for two years as a part-time research assistant at the institute or laboratory of BFH-TI, which is responsible for the master's programme. During this time, you complete your master's degree and work in a research project defined by the institute or laboratory and the industry partner. The mode of study allows an average of 70% work performance in favour of the industrial partner.

The financial commitment of the partner company amounts to approximately CHF 25,000 pre-tax per semester.

If you find a company that is willing to collaborate with you as a working student, you will enjoy the following benefits:

- practical questions and industrial working environment for project and master's thesis
- gradual transition into professional life
- competitive advantage in finding a job after graduation due to additional industry experience

When you complete the Industry Fellowship Master's degree, you can also devote yourself to the submitted industrial projects during this tuition-free time and can work on them directly at the company, as long as you spend at least one day a week at BFH-TI for project supervision. This facilitates your integration into the company's operations and ensures the scientific and educational quality of the work.

Research Fellowship Master MSE

You can be employed for two years as a part-time research assistant at the institute or laboratory which is responsible for the master's programme. During this time, you complete your studies and work in a research project defined by the institute or laboratory. The studies, as well as the employment, are financed by project and research funds. Prerequisites are a GPA of over 75 points in the bachelor's degree and an advisor who finances 50% of the cost from project funds.

As a participant of the Research Fellowship Master's, you already work at least one day (1st semester) or two days (2nd semester) on research projects right at the beginning of your course; the complementary events organised by the institute or laboratory guarantee your technical specialisation. During the second year of your studies, you devote yourself entirely to your master's thesis and the applied research within the relevant profile. All projects and master's topics are carried out either in the profile team or at the business partner, in order to ensure the quality of the work. BFH-TI constantly evaluates the quality of the training and your performance. An interim evaluation after the first semester decides on the continuation of the study programme or industrial support.

Fellowship Master MSE

1st semester	2nd semester	3rd semester	4th semester
18 ECTS 6 Core modules	12 ECTS 4 Core modules	R&D Industry	R&D Industry
	3 ECTS*		
	15 ECTS Project 2	15 ECTS Master's thesis	15 ECTS Master's thesis
3 ECTS*			
9 ECTS Project 1			

* Complementary events

Theory centralized and organised throughout Switzerland (Zürich, Lausanne, Lugano)

Supplementary courses

R&D at the industrial partner, resp. at the BFH-Institute (Certificate-relevant work)

R&D at the industrial partner (Not certificate-relevant work)

Thanks to the modular structure of the MSE, you can combine your studies with employment in the private sector or in research at BFH.

Cost
One-time registration fee CHF 100.00
Semester fee CHF 750.00

Start of degree course
Week 38 (autumn semester)
Week 8

Application
Online registration at bfh.ch/mse
Registration deadline
31 July (autumn semester)
31 December (spring semester)

International experience and competences
Study visits abroad are possible during the master's programme. They boost your international skills in a similar manner to the participation in international research projects offered by some profiles as part of the in-depth specialisation. BFH decides on admission to the exchange programme and on the crediting of activities pursued during the stay abroad.

With the additional certificate 'Certificate of Global Competence' you have the opportunity to explicitly acquire intercultural and transcultural skills during your studies, for which a certificate is issued. Further information can be found at bfh.ch/international.

Doctorates
As a graduate of the Master of Science in Engineering, in some cases you may be able to pursue a doctorate at a university. A dissertation can also be written at BFH in cooperation with a university. The relevant university decides on admissions in each case. BFH will advise you on finding the right partner university and selecting the research topic.

Information sessions

Bern University of Applied Sciences provides further information on the Master of Science in Engineering at special information events held on-site and online. Students and lecturers are pleased to personally answer questions during a tour of the laboratories and while refreshments are served.

We look forward to meeting you!

Dates and registration for information sessions
bfh.ch/mse

Office hours
Outside the information sessions, consultations by phone or in person are also available upon request. The relevant contact persons are listed at bfh.ch/mse.

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