

**Bern University of Applied Sciences**  
Master of Science in Engineering  
Quellgasse 21  
2502 Biel

Phone +41 32 321 63 17

mse@bfh.ch  
ti.bfh.ch/mse



## Master of Science in Engineering (MSE)

Study guide

# Content

## Master of Science in Engineering

- 2 Future technologies  
Cooperation master
- 3 Perspective/occupational fields and achieved competences

## Studies/Specialisations

- 4 Basic training
- 5 Specialisation options and specialisations
- 6 MRU Engineering and Business Innovation
- 8 MRU Energy and Mobility
- 10 MRU Smart Industrial Technologies
- 12 MRU Technologies in Sport and Medicine
- 14 MRU Digital Society and Security
- 17 Practical relevance

## Curriculum

- 18 Module types
- 19 Curriculums  
Module language

## Studies information

- 20 Admission  
Place of study  
Mode of study  
Duration of study (full time/part time)  
Fellowship Master
- 23 Costs  
Beginning of studies  
Application  
International experience and competences

## Information days/Campus

- 24 Information days and further information  
Campus

# The Master's program at a glance

As a Master of Science in Engineering, you benefit from close collaboration with research and industrial partners: Additional competences that enable you to take on responsibility for demanding projects after your studies and offer you more than just the necessary skills to participate in discussions on a technical and organisational level.

<b>Specialisations</b>	<ul style="list-style-type: none"><li>- Business Engineering and Production</li><li>- Energy and Environment</li><li>- Industrial Technologies</li><li>- Information and Communication Technologies</li></ul>
<b>Mode of study</b>	<ul style="list-style-type: none"><li>- Full time: 3 Semester</li><li>- Part time: max 7 Semester</li></ul>
<b>Language of instruction</b>	German/French/English
<b>Place of study</b>	Bern, Biel, Burgdorf, Lausanne, Lugano, Zürich
<b>Costs</b>	One time registration fee CHF 100.00 Semester fee CHF 750.00
<b>Beginning of studies</b>	week 38 (autumn semester) week 8 (spring semester)
<b>Admission</b>	Bachelor's degree with good to very good academic achievements. The degree must be consistent to the area of competence of the chosen field of study.
<b>Application</b>	31. July (autumn semester) 31. January (spring semester)
<b>Title/Diploma</b>	Master of Science BFH in Engineering

# Master of Science in Engineering (MSE)

## 2 Future technologies

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 oriented know-how in these subjects. Companies are specifically looking for qualified specialists who, in addition to their in-depth technical know-how, already have 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.

## Cooperation Master

The Master of Science in Engineering is one of the joint studies offered by the Swiss Universities of Applied Science with a total of seven specialisations to choose from. The Department of Technology and Computer Science at the Bern University of Applied Sciences trains Masters in four specialisations: Business Engineering and Production, Energy and Environment, Industrial Technologies as well as Information and Communication Technologies. Practical orientation is central in all these areas, and the training objectives are strongly influenced by the needs of future employers.



As a Master of Science in Engineering, you have access to a wide variety of engineering disciplines (specialisations) and benefit from the know-how of a network of experts throughout Switzerland.

## Perspectives/Occupational fields

Graduates of the Master of Science in Engineering often work in leading positions in Research and Development departments. They undertake challenging tasks in their area of expertise or generalist positions. After completing their studies, they have a distinctive methodological and management competence, which enables them to develop new products and services as well as to further develop organisations.

## Achieved competences

Graduates

- have in-depth knowledge of mathematics;
- possess specialist knowledge of various engineering sciences;
- successfully apply their knowledge for calculation, simulation, analysis and verification;
- understand how to develop products and processes in research using the latest technology;
- are able to investigate complex cause-and-effect relationships with known and self-developed methods;
- are in position to successfully communicate with business partners and position themselves internationally;
- as project leaders or in charge of the organisation, they can find solutions with others and implement them into practice.

# Studies/Orientations

As a student of Master of Science in Engineering, you will be fully involved in a research unit and work on practical projects.

## 4 Basic training

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

- Extended fundamental theoretical principles
- Technical scientific modules
- Context modules (Management, Communication and Culture)

From each of these module groups, at least three modules must be selected in the basic training and a total of eleven modules must be completed. Each module is equivalent to three ECTS credits which equates to approximately 90 hours workload. A study advisor is available to assist in selecting the modules.



MSE students in action.

## Specialisation options and specialisations

The specialisation is the core of the study and is completed within the so-called Master Research Units (MRUs). At the BFH-TI, MRUs bundle the activities of one or more research groups from the research institutes of the BFH-TI thematically.

During the specialisation in MSE, students are integrated into the activities of the research institutes via their MRU.

There are four subject areas to choose from with their MRUs and specialisations:

<b>Specialisation Business Engineering and Production (BEP)</b>  MRU Engineering and Business Innovation (EBI)	<b>Specialisation Energy and Environment (EE)</b>  MRU Energy and Mobility (EM)  Specialisation options EM: - Transportation - Energy Systems
<b>Specialisation Industrial Technologies (INT)</b>  MRUs - Technologies in Sport and Medicine (TSM) - Smart Industrial Technologies (SIT)	<b>Specialisation Information and Communication Technologies (ICT)</b>  MRUs - Digital Society and Security (DSS) - Technologies in Sport and Medicine (TSM)
Specialisation options TSM: - Human Interface Technologies - Rehabilitation and Performance Technology Specialisation options SIT: - Application of laser technology - Modifying materials - Systems and procedures of machine, production and printing technology - Management of product and financial risks	Specialisation options DSS: - Mobile Communication - ICT-based Management - Security in the Information Society Specialisation options TSM: - Human Interface Technologies - Rehabilitation and Performance Technologies

The selected specialisation will be listed on the MSE diploma.



## 6 MRU Engineering and Business Innovation

In today's society, the real and digital worlds are increasingly merging. This is also evident in various areas of the economy. State-of-the-art technologies in the field of digitalization promise small, medium and large companies significant efficiency improvements in their value added chains. Our research supports implementation of these technologies in corporate practice.

The MRU «Engineering and Business Innovation» therefore trains interface experts to create and implement innovations in the field of digitalization. Graduates of this specialization combine the areas of economics, IT and technology in a productive way within a corporation. As a result, they will be able to steer their company towards a successful digital future. The MRU follows on from the learning content of the Bachelor degree programme in Industrial Engineering at BFH-TI.

The MRU Engineering and Business Innovation covers aspects of digitalization in production and services, often referred to as «Industry 4.0». Students learn innovative methods and concepts of innovation management, digital organizational transformation and data analysis with regard to products, services, processes and business models. Graduates of this specialization become product, services and business model architects. Among other things, they master systemic approaches with which technical and business innovations are generated, simulated, analysed and optimized. The solutions devised help companies to transform the challenges of digitalization into opportunities.



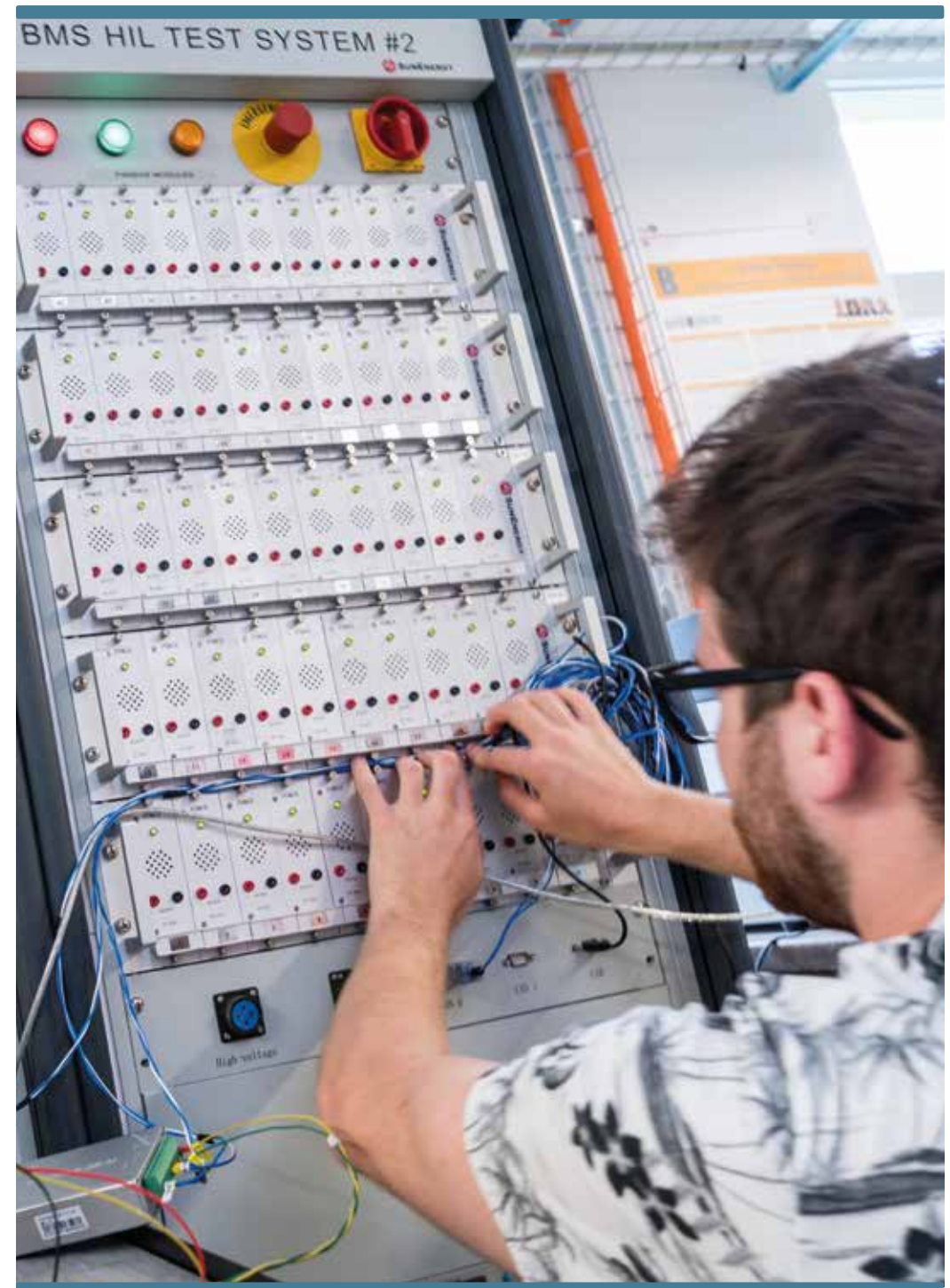
## 8 MRU Energy and Mobility

Ensuring energy supply and mobility on a sustainable basis is one of the central tasks of our society, and there are three routes that lead to this goal. Firstly, fossil fuels must be treated with care, then new environment-friendly forms of energy must be made available and finally, the potential for optimisation that exists on the consumer side must be fully exploited.

The Research of the BFH-TI contributes to this with future-oriented technologies for energy-efficient and reduced-emission drive systems, safe road and rail vehicles, renewable energies and effective energy management. Two specialisation options are available:

- **Transportation:** With research in the fields of vehicle safety and mechanics combustion engines and exhaust technology
- **Energy system:** With research in the fields decentralized and mobile energy systems and energy-efficient permanent magnet drives.

Both focal points are based on the knowledge of the engineers at BFH-TI and a unique infrastructure in Switzerland (exhaust gas testing centre and Dynamic Test Centre DTC, PEM fuel cell testing laboratory, photovoltaic system engineering laboratory and high-voltage laboratory). In addition, the BFH-CSEM Energy Storage Centre is working on practical innovations and questions relating to electrochemical energy storage systems.

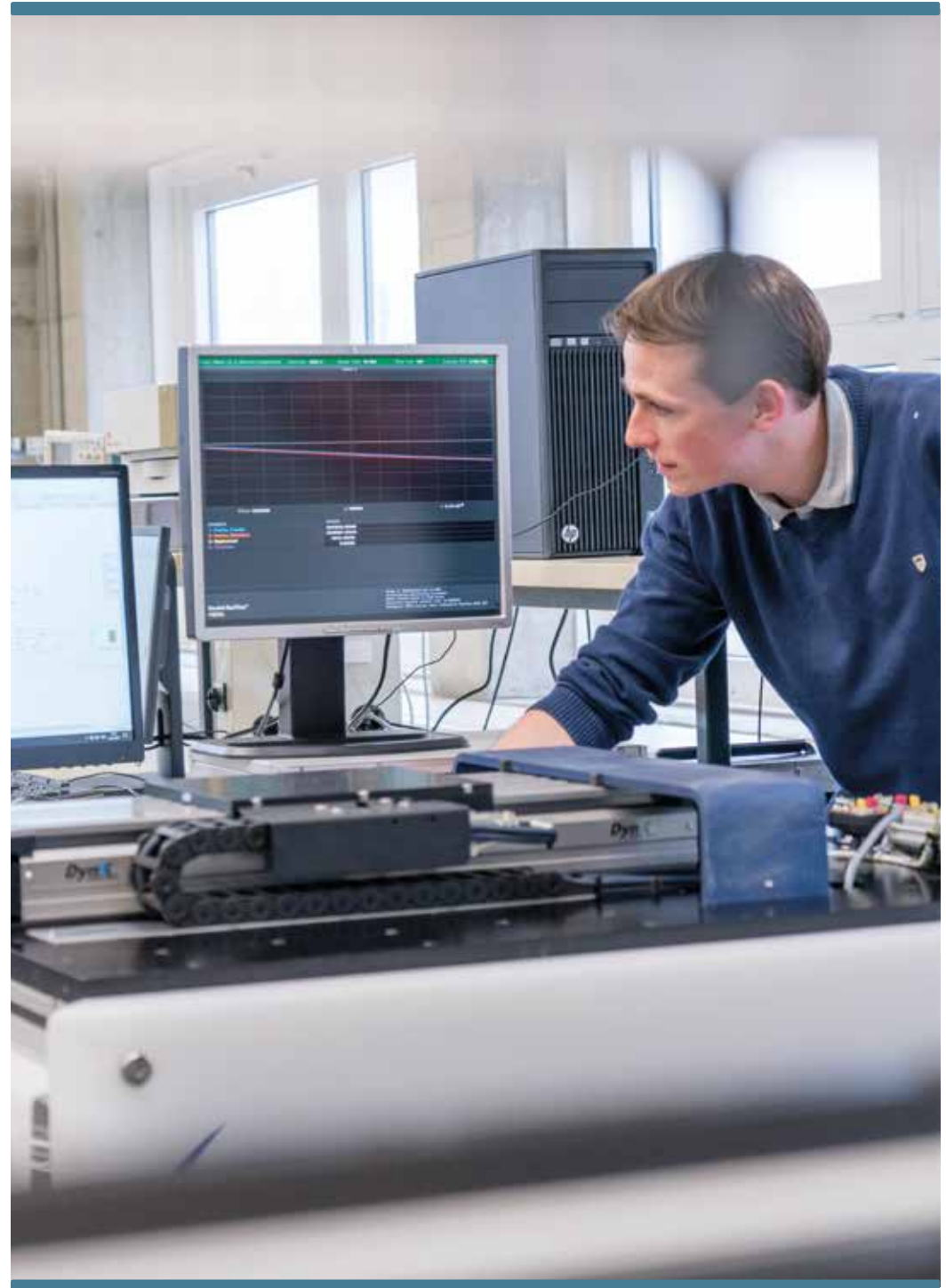




## 10 MRU Smart Industrial Technologies

Modern industrial technologies make it possible to manufacture products using state-of-the-art processes and manufacturing techniques for the benefit of society and industry. The development of new products and production technologies requires the interaction of many different disciplines, such as additive manufacturing processes in printing technology, innovative material development and intelligent automation including communication systems and the most modern simulation techniques. Topics such as Industry 4.0, (Industrial) Internet of Things (IIoT) and process optimisation are implemented in a practical way. BFH-TI is involved in interesting and application-oriented projects and offers MSE students the opportunity to be part of a research group in an attractive research environment with state-of-the-art infrastructure and close proximity to industrial practice. The students of MRU «Smart Industrial Technologies» can choose from the following specialisation options:

- **Application of laser technology:** Cutting and structuring surfaces, ensuring quality in measuring engineering, using fibre lasers in processing machinery.
- **Modification of materials:** With the aid of heat treatment or thin-film technologies (chemical and structural), with plasma-supported processes.
- **Systems and processes of mechanical, manufacturing and printing engineering:** Mechatronic systems including their automation by means of control and bus systems; development of Mobile Embedded Systems.
- **Management of product and financial risks:** Analysis of the technical feasibility of products and processes and mastery of the technical, social-ecological (man and the environment) as well as economic risks of manufacture and application.



## 12 MRU Technologies in Sport and Medicine

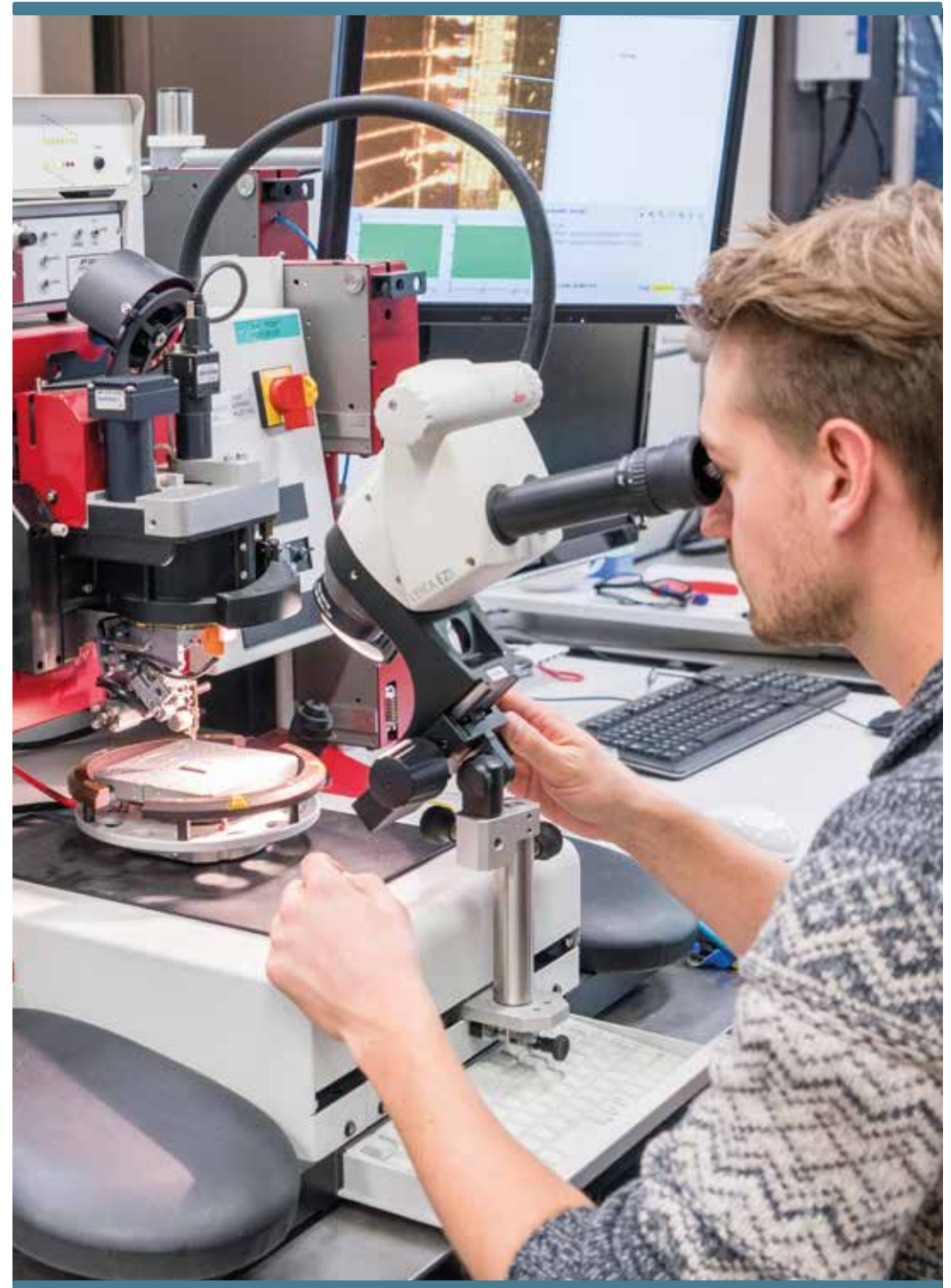
In today's society, handling electronic appliances is an everyday aspect of life. State-of-the-art technologies and their meaningful application are intended to provide support for people and facilitate their daily lives. In order to achieve this goal, we conduct research in Biomedical Engineering and Human Interface Technologies.

The specialisation option Human Interface Technologies teaches advanced technologies such as Computer Perception and Virtual Reality, Signal Processing, Sensor technology, Biometrics and Authentication as well as Hardware Algorithmic in Microelectronics.

The Rehabilitation and Performance Technology specialisation option focuses on methods applied to improve the rehabilitation process of people after accidents or illnesses.

The results of our research in computer perception and virtual reality are already being used in large numbers of applications in medicine, biometrics and the consumer goods sector.

In biometrics, the focus is on the development of authentication algorithms based on fingerprint and iris, with particular focus on the «encapsulated biometry» method. The growing demand for high computing capacities and energy efficiency in portable applications has led to hardware algorithms and combined hardware and software algorithms that are focused on microelectronic system-on-chip solutions.





#### 14 MRU Digital Society and Security

Services and applications linking Information Technology with Communications Technology (ICT) are increasingly shaping both our professional and private environment. In this field of application between Mobile Communication Technologies, Applications and (mobile) users, lies the core competence of the MRU.

In the specialisation option Mobile Communication, concepts and solutions for mobile applications with hardware and software components are developed.

They flow into systems and everyday goods that constantly exchange and process information digitally in the sense of «ubiquitous and pervasive computing», be this in business processes or in private everyday life.

In the ICT-based Management specialisation option, students deal with the advancing IT support provided along the value chain, which is nowadays also available on a mobile basis. This creates new productivity potentials in companies and institutions, which can be realized with IT-supported company management.

The Security in the Information Society specializes in addressing and solving security issues and problems. The solutions found create the necessary trust so that the digitisation of business and society can be successfully and profitably implemented for all parties involved.





«For me, the attraction of the MSE was the interdisciplinary approach and the associated opportunity to get to know new facets of information technology. The knowledge gained during my studies allows me to work as an IT Architect at the Bern University of Applied Sciences.»

**Gian Rossetti**  
MSc BFH in Engineering

**Practical relevance**

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

# Curriculum

- 18 The study programme is built up of learning units, the so-called modules, and comprises 90 ECTS credits, which corresponds to an amount of 2,700 working hours. One ECTS credit equals 30 study hours. The Master's programme consists of two parts – a basic training, which comprises approx. 1/3 of the programme and a specialisation, which takes up approx. 2/3 of the programme.

As a student at the Berne University of Applied Sciences, you design your studies according to your personal needs and interests.

## Module types

The MSE degree program conveys Specialisation, Theoretical and Contextual knowledge. Different modules are offered for each of the three areas. The selection is made in consultation with the advisor.

### Specialisation

The core of the study is the specialisation. The students apply their knowledge in their area of specialisation in practice-oriented and current projects and use it in their Master's thesis.

The scientific work makes a substantial contribution to the solution of a current problem from practice.

### Theoretical module

The MSE university community offers about 100 theoretical modules. In each area of expertise, there are suitable modules to choose from. The Advisors will assist in the compilation of the timetable.

### Context module

An introduction to Management and Communication complements the curriculum. The offer includes courses on Business management, Law, Complex process management, Communication, Ethics or International markets and Globalization.

## Curriculum

Example of a full-time study plan and standard allocation layout distribution

1. Semester	2. Semester	3. Semester
Theory and Context Module 18 ECTS	Theory and Context Module 15 ECTS	Master thesis 27 ECTS
Specialisation (Project work, complement performance presentation) 12 ECTS	Specialisation (Project work, complement performance presentation) 18 ECTS	

## Module language

Modules are offered in German, English and French.

The lessons are held in the language of the respective region and/or in English. Theory and context modules can be visited optionally at one or more central locations.

While the Theory and Context Modules at centres in Zurich and Lugano are mainly held in English, the focus in Lausanne is on French-speaking modules.



## 20 Study requirement

Graduates of a Bachelor's or Diploma degree program of a University of Applied Sciences with good to very good academic achievements are admitted to the Master's program.

The field of study must be related to the area of competence of the selected specialist subject. Holders of an equivalent certificate can also be admitted to study.

The BFH's MSE Admission Committee will carry out an aptitude assessment once the application has been submitted. If necessary, a supplementary interview can be arranged.

### Study location

Berne, 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. The full-time course of study lasts at least three semesters and does not permit employment during this period. Part-time study usually lasts five to six semesters, and employment is possible under certain conditions.

### Fellowship Master

Particularly talented and qualified students have the opportunity to apply for one of the two Fellowship Master models:

#### Industry Fellowship Master MSE

The Industry Fellowship Master MSE offers the highest possible practical relevance and best future prospects. Students can be employed for two years as part-time research assistants at the MRU of the BFH-TI, which is responsible for the Master's programme. During this time, the students complete their Master's studies and work in a research project defined by the MRU 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 industrial partner amounts to approximately CHF 25000 pre-tax per semester.

Students benefit from the following advantages:

- practical questions and industrial working environment for project and master thesis
- smooth entry into working life
- competitive advantage in finding a job after graduation due to additional industry experience

#### Research Fellowship Master MSE

Those interested can apply for a part-time position as a research associate at the MRU responsible for the Master's programme for a period of two years. During this time they complete their studies and work in a research project defined by the MRU. 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 costs incurred from his project funds.

With both fellowships, the students are employed part-time as research assistants at the BFH-TI. This extends the study duration from three to four semesters. The holiday entitlement is 4 weeks. Lesson-free time is used for project work. The first two semesters correspond to the full-time study of MSE. The Master thesis will be extended to 2 semesters. Those who complete the [Industry Fellowship Master's degree](#) can also devote their time to the discontinued industrial projects during this time and can work on them directly at the company as long as they spend at least one day a week at the BFH-TI for project control. This enables the integration of the Master's students into the industrial partner's company as well as ensuring the scientific and educational quality of the work.

Participants of the [Research Fellowship Masters](#) already work at least one day (1. semester) or two days (2. semester) on practical projects at the beginning of their studies; the complementary events organized by the MRUs guarantee the professional specialisation. During the second year of their studies, they devote themselves entirely to the Master's thesis and applied research at the MRU. All projects and Master topics take place in the team of the MRU or at the business partner in order to ensure the quality of the work.

The BFH-TI constantly evaluates the quality of the training and performance of the Master's students. An interim evaluation after the first semester decides on the continuation of the study program or industrial support.

## 22 Fellowship-Studies structure

1. Semester	2. Semester	3. Semester	4. Semester
18 ECTS 6 Core modules	12 ECTS 4 Core modules	R&D Industry	R&D Industry
	3 ECTS*		
	15 ECTS Project 2	3 ECTS* 1 Core module	15 ECTS Master thesis
3 ECTS*		12 ECTS Master thesis	
9 ECTS Project 1			

\* Complementary events

Research Fellowship:	Centralized theory (Berne, Zurich, Lausanne, Lugano)
Industry Fellowship:	Theory organised throughout Switzerland
Research Fellowship:	ETCS- relevant research work
Industry Fellowship:	Certificate- relevant work at the industrial partner
Research Fellowship:	R&D at the BFH Institute
Industry Fellowship:	Certificate- relevant work at the industrial partner

≈ 25% of the studies
≈ 5% of the studies
≈ 40% of the studies
≈ 30% of the studies

## Cost

One time registration fee CHF 100.00  
Semester fee CHF 750.00

## Beginning of studies

Week 38 (autumn semester)  
Week 8 (spring semester)

## Registration

Online registration at [ti.bfh.ch/mse](http://ti.bfh.ch/mse)  
Registration deadline  
31. July (autumn semester)  
31. January (spring semester)

## International experience and competence

Study visits abroad are possible during the Master's programme. They promote the internationalization of the Master's students as well as the participation in international research projects offered by some MRUs as part of their within the framework of the professional specialisation. The BFH-TI decides on admission to the exchange programme and on crediting of services rendered during the stay abroad.

# Information days

- 24 The Bern University of Applied Sciences provides further information on the Master of Science in Engineering at special information events in spring. Our students and lecturers will personally answer to questions during a tour of the laboratories and at lunch.

We are looking forward to your visit!

## Dates and registration information days

[ti.bfh.ch/master](https://ti.bfh.ch/master)

Further information to studies

[ti.bfh.ch/mse](https://ti.bfh.ch/mse)

# Campus

At the campus Biel/Bienne, the technical disciplines of the Bern University of Applied Sciences BFH will be merged in 2022 at a central location near the station. This step lays the foundation for an efficient teaching and research operation of the two departments «Engineering and Information Technology» and «Architecture, Wood and Civil Engineering» in a common, modern building. The locations in Bözingen and Vauffelin will be retained.

Legal notice:

This brochure is for general orientation. In case of doubt, the wording of the statutory provisions and regulations shall prevail. We reserve the right to make changes without prior notice.

2. edition: 300 copies (e) 2018

