

# SFPE EUROPE



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## **The new Master of Advanced Studies Program of Fire Safety Engineering at ETH Zurich**

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ETH Zurich started a new master of advanced studies (MAS) on Fire Safety Engineering in 2020. The MAS is a two years program and was developed on the basis of the SFPE curriculum in cooperation with the International Master of Science in Fire Safety Engineering (IMFSE). The participants of our program graduated a first study program already and attend this MAS as Continuing Education Program in parallel to their job. The program runs successfully at the moment with very positive feedback by participants and great support by lecturers and also authorities.

### **Current state of application of fire safety engineering in Europe**

Fire safety in Europe is mostly planned according to prescriptive rules. For common standard buildings, prescriptive rules are usually well applicable. For unusual or existing buildings, prescriptive rules sometimes lead to unsuitable, unsafe or disproportionate solutions. In such cases, a performance or even risk-based design by a fire engineer is preferable.

The majority of designers working in fire safety in central Europe have an education in a related discipline (such as architecture, civil or mechanical engineering). For fire safety design, they have often passed further training in the application of prescriptive rules. Engineers or natural scientists from related fields sometimes design specific individual aspects using performance-based engineering methods.

At present, there are relatively few fire safety designers or authorities having jurisdiction (AHJ) in Europe with specialization in fire engineering and who are able to develop holistic risk- or performance-based fire safety concepts and to comprehensively assess their effectiveness. For this reason, fire safety concepts often tend to rely on the application of prescriptive rules rather than the development and choice of appropriate measures. Often, the focus of fire safety design is more on building permits than on the safety of people. Even unconventional buildings are designed according to prescriptive rules for which they are not intended. Fire safety designers often work like lawyers, interpreting regulations, and negotiating with the AHJ. Physical principles, risk considerations, the effectiveness of measures and their feedback effects are therefore of secondary importance.

In the field of fire safety there is a great demand for comprehensively trained fire engineers. The fire engineering profession must be better established and more widely recognized. SFPE develops a decisive basis for fire engineering. For example, SFPE has defined Recommended Minimal Technical

Competencies for the Practice of Fire Protection Engineering as well as the model curricula for university studies. The current state of knowledge is recorded in SFPE publications, above all the Handbook of Fire Protection Engineers. Currently, the fundamentals of performance-based design are defined and international design standards are drawn up.

All these great resources can only be effective if young people are educated as fire engineers. Ten years ago, the Universities of Ghent, Lund and Edinburgh took the initiative and launched the International Master in Fire Safety Engineering (IMFSE). This master's program meets the comprehensive and broad requirements of SFPE.

In Switzerland, we have recognized the need for action in fire engineering. Therefore, we founded the Swiss Chapter of the SFPE and are engaged in standardization and training. We realized that ETH Zurich conducts research in many different areas of fire protection – however, there was hardly any exchange between the individual research groups. Engineering companies from the private sector encouraged ETH to make use of its broad competences and become active in teaching fire safety. During the development of the Master of Advanced Studies in Fire Safety Engineering (MAS FSE), we conducted in 2019 a broad market survey on current needs in Switzerland, Germany and Austria. We were pleasantly surprised by the very large response and the broad agreement that such a MAS program is necessary and becomes more and more important in the future, see Figure 1. In German speaking countries there seems to be a large consensus that fire safety must be increasingly operated according to first principles and that ETH should train engineers for this purpose. This is certainly most advanced in Switzerland but Germany and Austria are starting this process as well. Further, the participants of the survey found the SFPE curriculum as very meaningful and purposeful to be applied. We found a great willingness on all sides to support the program.

*Survey question: How do you see the demand of fire safety engineering methods (today/ in 5 years/ in 10 years)?*

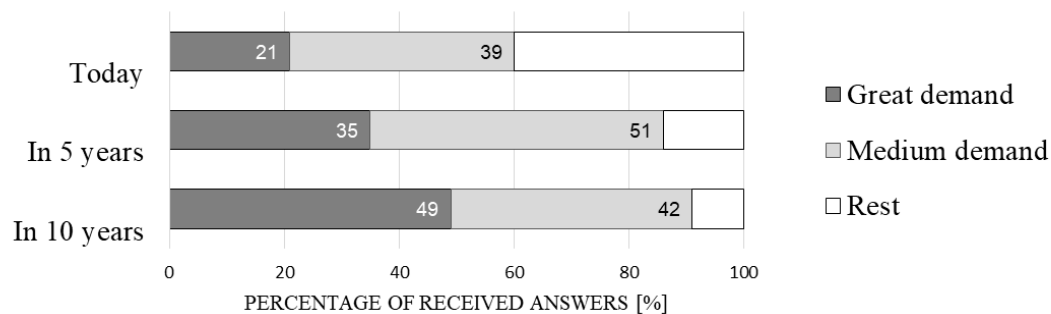


Figure 1. Survey result of the question “How do you see the demand of fire safety engineering methods?” showing that most of the about 600 survey participants indicated the increasing demand of fire safety engineering approaches in the near future.

## The MAS ETH Fire Safety Engineering

On basis of the SFPE curriculum and in cooperation with IMFSE, it was possible to launch a comprehensive engineering course at ETH Zurich within a short time. The first MAS FSE students have been studying at ETH Zurich since autumn 2020 and will graduate in 2022. In order to achieve the high ethical goals of SFPE, it is to be hoped that other countries and universities will follow these examples and that the profession of fire protection engineering will soon be widely established all over Europe.

The contents of the MAS ETH Fire Safety Engineering cover all topics of fire safety engineering. The MAS is currently taught mainly (80%) in German language and is divided into five modules (see Figure 2). The core topics of these modules are the physical and chemical fundamentals for the fire action, the fundamentals for performance and risk-based verification in fire protection and organizational (e.g. evacuation), structural (e.g. structural performance-based fire design) and technical fire protection. Lecturers from ETH Zurich, from partner universities and engineers from practice teach the basis of fire safety engineering and the direct application of theory and methods.

We found that especially the module 2 (Fire Safety Design) added an important and unique aspect to our MAS. This module deals with performance-based design and risk management topics. Within this module, key knowledge regarding the development of fire protection engineering solutions from first principles to achieve performance goals, objectives, and criteria from specific quantified fire scenarios are taught. This includes the concepts of goals, objectives and criteria, design fires, fire safety analysis, concepts for evaluating design options, concepts of uncertainty quantification, sensitivity analysis and documentation. Further to this, an overview of acceptance criteria for risk-based analysis and knowledge in the areas of probability and statistics is content of this module. This module also brings researchers from different disciplines within ETH Zurich together and proves again how inter-disciplinary fire safety is.

All modules integrate practical project work in groups and self-study time. Each module is completed directly with a performance assessment on the last day of the module. The program is completed with a master's thesis, which can be carried out in cooperation with the participants' own employer or a (foreign) university. Detailed information is given on the programs website [www.mas-brandschutz.ethz.ch](http://www.mas-brandschutz.ethz.ch).

We have been learning from the first run of the MAS and improved the lectures, organization and content already. The start of this MAS during the pandemic was challenging but with close communication with both the lecturers and participants we successfully applied new learning forms and learning management systems. Positive feedback showed us that there are many opportunities and advantages in online teaching forms for everyone involved. Our experience so far shows us that we are on the right track and we look forward to exciting next steps within this new master of advanced studies of Fire Safety Engineering at ETH Zurich.

For interested readers and possible new participants: The second run of the program starts in autumn 2022. The application window is open from January to April 2022.

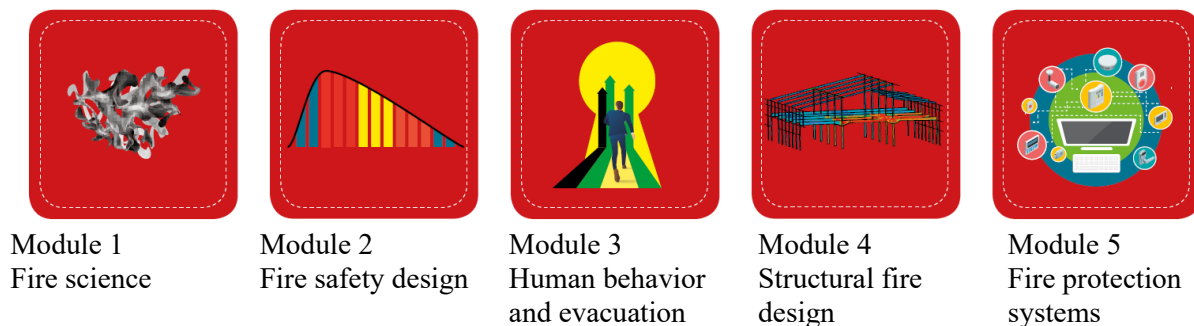


Figure 2. The master of advanced studies Fire Safety Engineering at ETH Zurich is taught in five modules over a timeframe of two years.