# Course information of Faculty of Civil Engineering, BME

# Master of Science program in Construction Information Technology Engineering

## 1. Foreword

Civil Engineers have been educated at Budapest University of Technology and Economics (and in its predecessor institutions) since 1782.
The engineering education structure, the courses, and the specialization curriculum have changed a lot in the last two and a half centuries. However, it has always been a high priority of the institution to teach the most up-to-date knowledge.
The Faculty of Civil Engineering was at the forefront of introducing the two-stage education, already joined the Bologna process in 2005, typical of the European Higher Education Area. The undergraduate program is eight semesters, and the master's program is three semesters, which has not changed since the start.
However, fifteen years have passed, new disciplines and technologies have become more prominent. The digitization of the construction industry is in full swing, and meeting expectations is a massive challenge for professionals.
The Construction Information Technology Engineering program is intended to reflect on these challenges by teaching students with the specialized knowledge required by the industry. It provides the opportunity to acquire competencies that enable graduates to solve multidisciplinary problems in their field, to apply new software-oriented solutions and models to complex construction activities and to support profession-specific software development effectively. None of the current master's courses contains this complex knowledge, and none prepares the students to apply this knowledge at the level of skills.
We cannot predict how far digitization will reach in the future, and so, a curriculum cannot possibly cover all the technologies that will exist in five or ten years. Graduates of the master's program can deepen their professional knowledge in one sub-field and continue their studies in doctoral schools in several disciplines to become leaders and scientists in their field.

The program offers exciting training in which new teaching methods support acquiring new curriculum content, and students can work and learn in outstanding educational conditions.

According to László Kozma, a Kossuth Prize-winning engineer and university lecturer: '*A good engineer is a creative person, an independent personality whose activity can be accurately measured and calculated.*'
That is the goal, and the new master's program of the Faculty of Civil Engineering gives the opportunity and ensures the conditions for becoming a creative engineer. It is worth embarking on this road. We wish everyone success during their university studies and also in their professional work after graduation!

Dr. László Dunai
Course coordinator, Dean

## 2. Main characteristics and objectives of the Master of Science program in Construction Information Technology Engineering

The objective of the Master of Science program is to transmit the specialized knowledge and competences that are necessary for dealing with information technologies and civil engineering work. Under the three semesters of the master's program, the students become engineers with competences of general informatics and software development who meet the requirements of the digitalized construction industry and are capable to design, create and analyze the information system of complex and special engineering facilities.

The Master of Science program in Construction Information Technology Engineering is a 90-credit program, to which students can apply with a BSc degree in Civil Engineering, Architectural Engineering, Mechanical Engineering, Energy Engineering, Mechatronics Engineering, Electrical Engineering or Computer Engineering.

The training is carried out in the cooperation of the Faculty of Civil Engineering, the Faculty of Architecture, the Faculty of Mechanical Engineering and the Faculty of Electrical Engineering and Informatics of BME, under the coordination of the Faculty of Civil Engineering. In the curriculum, the emphasis is placed on programming, interdisciplinary collaborations, communication, digitization software development, and BIM (Building Information Modeling). There is a significant demand for the Master of Science programs of the Faculty of Civil Engineering from many countries around the world, and an ever increasing proportion of master's programs are taught in English. All this encourages the Faculty to start the master's degree program in both Hungarian and English.

The Faculty is continuing negotiations with the Hungarian Chamber of Engineers on the integration of the acquired qualification into the licensure of professional work, especially by recognising that the competencies acquired in the master’s increase the efficiency by which the engineer performs its design and construction work processes significantly.

## 3. Requirements and regulations

During the master's program, students have to complete 90 credits from subjects given in the curriculum, including the diploma project. The master's program does not have different specializations; however, some content of the curriculum branches into two. Establishing two groups of students accounts for the differences in their previous studies. The curriculum presented in Section 5 demonstrates clearly the different obligatory recommended elective subjects.

The credit system provides some flexibility for the students to schedule their work individually, although following the schedule according to the curriculum can be recommended for everyone. Indeed, following the order of the subjects laid out in the curriculum ensures the development and the comprehension of the necessary competences, thus learning is more efficient and successful.

To obtain a master's degree, a state-recognized intermediate level (B2), oral and written language exam, or equivalent graduation certificate or diploma in any living foreign language is required. If this language is different from English, the student must have at least a B1 level, oral and written state-recognized English language exam.

The rules related to studies can be found in the Code of Studies of BME in force. Payment obligations and allowances for students are set out in the Regulation on Student Fees and Benefits.

4. Faculties and departments involved in education

| FACULTY | DEPARTMENT | ADDRESS |
|---|---|---|
| Faculty of Civil Engineering | Department of Geodesy and Surveying | http://geod.bme.hu/?language=en |
| Faculty of Civil Engineering | Department of Construction Materials and Technologies | http://em.bme.hu/?language=en |
| Faculty of Civil Engineering | Department of Photogrammetry and Geoinformatics | http://fmt.bme.hu/?language=en |
| Faculty of Civil Engineering | Department of Engineering Geology and Geotechnics | http://gmt.bme.hu/?language=en |
| Faculty of Civil Engineering | Department of Structural Engineering | http://hsz.bme.hu/?language=en |
| Faculty of Civil Engineering | Department of Structural Mechanics | http://me.bme.hu/?language=en |
| Faculty of Civil Engineering | Department of Highway and Railway Engineering | http://uvt.bme.hu/?language=en |
| Faculty of Civil Engineering | Department of Hydraulic and Water Resources Engineering | http://vit.bme.hu/?language=en |
| Faculty of Civil Engineering | Department of Sanitary and Environmental Engineering | http://vkkt.bme.hu/?language=en |
| Faculty of Architecture | Department of Construction Technology and Management | http://www.ekt.bme.hu/index_en.shtml |
| Faculty of Mechanical Engineering | Department of Building Services and Process Engineering | http://www.epget.bme.hu/ |
| Faculty of Electrical Engineering and Informatics | Department of Electric Power Engineering | http://www.vet.bme.hu//?q=en |
| Faculty of Electrical Engineering and Informatics | Department of Electron Devices | http://eet.bme.hu |
| Faculty of Natural Sciences | Department of Stochastics | https://random.math.bme.hu/?language=en |

# 5. MSc in Construction Technology Engineering – Curriculum and Course Design

**MSc program in Construction Information Technology Engineering**

| | English Name | Hungarian Name | Code | Credit | Lecture | Seminar | Laboratory | Consultation | Day | M/E**** | Semester**** | Prerequisite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Core Subjects** | | | | | | | | | | | | |
| **Common Core Subjects** | | | | | | | | | | | | |
| | Numerical Methods | Numerikus módszerek | BMEEOAFMB51 | 4 | | | 2 | | | E | 1 | |
| | Construction Information Technology Mathematics | Építmény-informatikai matematika | BMETE90MX__63 | 3 | 2 | | | | | E | 1 | |
| | Building Information Modelling | Építmény-információs modellezés | BMEEOFTMB51 | 3 | 2 | | | | | M | 1 | |
| | Decision Support Methods | Döntéstámogató módszerek | BMEEPEKMB51 | 2 | 2 | | | | | M | 1 | |
| | Construction Information Technology Engineering Project | Építmény-informatikai Projektfeladat | BMEEODHMB5P | 6 | | | | 2 | | M | 1 | |
| | BIM Modelling and Design | BIM rendszerépítés | BMEEOFTMB52 | 5 | | | 4 | | | E | 2 | BMEEOFTMB51 |
| | Civil Engineering Automation, Modelling | Építőmérnöki automatizálás, modellezés | BMEEOHSMB51 | 5 | 1 | 2 | | | | E | 2 | |
| | Construction Information Technology Programming | Építmény-informatikai programozás | BMEVIAUM___B51 | 6 | 1 | 4 | | | | M | 2 | BMEVIEEM___B-1 |
| | Complex Construction IT project | Komplex építmény-informatikai projektfeladat | BMEEODHMB5K | 6 | | | | 2 | | M | 2 | BMEEODHMB5P |
| | Argumentation, Negotiation, Presentation | Érvelés, tárgyalás, előadás | BMEGT41M___B51 | 3 | 2 | | | | | M | 3 | |
| | Technology Assessment | A technológia hatáselemzése | BMEGT41M___B52 | 2 | 2 | | | | | M | 3 | |
| *** | Diploma Project | Diplomamunka | BMEEODHMB-D | 20 | | | | 1 | | M | 3 | |
| **Recommended Elective Subjects of Student Group I.** | | | | | | | | | | | | |
| | 1st Recommended Elective Subject of Student Group I.* | Hallgatói csoport 1. kötelezően választható tárgya* | | 8 | 2 | 4 | | | | E | 1 | |
| | 2nd Recommended Elective Subject of Student Group I.* | Hallgatói csoport 2. kötelezően választható tárgya* | | 4 | 1 | 2 | | | | M | 1 | |
| | 1st Recommended Elective Subject of Student Group II.* | Hallgatói csoport 1. kötelezően választható tárgya* | | 4 | 2 | 1 | | | | M | 2 | |
| | 2nd Recommended Elective Subject of Student Group II.* | Hallgatói csoport 2. kötelezően választható tárgya* | | 4 | 2 | 1 | | | | M | 2 | |
| | Optional subjects | Szabadon választható tárgyak | BMEEO | 5 | | | | | | M | 3 | |
| | | | 1st semester | 30 | 9 | 6 | 2 | 2 | 0 | | | |
| | | | 2nd semester | 30 | 6 | 8 | 4 | 2 | 0 | | | |
| | | | 3rd semester | 30 | 4 | 0 | 0 | 1 | 0 | | | |
| | | | Σ | **90** | **19** | **14** | **6** | **5** | **0** | | | |
| ***Students with a BSc degree in Civil Engineering or Architecture (Student Group I.)** | | | | | | | | | | | | |
| | **Recommended Elective Subjects (at least 20 credits to complete)** | | | | | | | | | | | |
| | Programming | Programozás | BMEVIEEM___B-1 | 8 | 2 | 4 | | | | E | 1 | |
| | Database Systems | Adatbázis rendszerek | BMEEOFTMB-1 | 4 | 1 | 2 | | | | M | 1 | |
| | Structural Dynamics | Szerkezetek dinamikája | BMEEOTMMN-1 | 4 | 2 | 1 | | | | M | 2 | |
| | Stability of Structures | Szerkezetek stabilitása | BMEEOHSMT-2 | 4 | 2 | 1 | | | | E | 2 | |
| | FEM for Engineers | Végeselemmódszer mérnököknek | BMEEOTMMB-2 | 4 | 1 | 2 | | | | M | 2 | |
| | Numerical Methods in Geotechnics | Geotechnikai numerikus módszerek | BMEEOGMMB61 | 4 | 1 | | 1 | | | M | 2 | |
| | Automated Survey Systems | Geodéziai automatizálás | BMEEOAFMB61 | 4 | 1 | 2 | | | | M | 2 | BMEVIEEM___B-1 |
| | Electrical Systems in Buildings | Épületvillamossági ismeretek | BMEVIVEM___B61 | 4 | 2 | | | | | E | 2 | |
| | HVAC Basics | Épületgépészeti alapismeretek | BMEGEÉEM___B61 | 4 | 2 | | | | | M | 2 | |
| ***Students with a BSc degree in Mechanical Engineering/ Energy Engineering/ Mechatronics Engineering/ Electrical Engineering/ Computer Science (Student Group II.)** | | | | | | | | | | | | |
| | **Recommended Elective Subjects (at least 20 credits to complete)** | | | | | | | | | | | |
| | Building Constructions | Magasépítési szerkezetek | BMEEOEMMB-1 | 8 | 2 | 4 | | | | M | 1 | |
| | Finite Element Modelling | Végeselem modellezés | BMEEOTMMB-1 | 4 | 1 | 2 | | | | E | 1 | |
| | Construction Management | Építési projektek szervezése | BMEEPEKMB61 | 4 | 2 | 1 | | | | M | 2 | BMEEOEMMB-1 |
| | Civil Engineering Structures and Modelling | Építmények szerkezete, modellezése | BMEEOHSMB61 | 4 | 2 | 1 | | | | M | 2 | BMEEOEMMB-1 |
| | Constructions of Buildings and Structures | Épületek és műtárgyak szerkezetei | BMEEOEMMB61 | 4 | 2 | 1 | | | | M | 2 | BMEEOEMMB-1 |
| | Modelling of Hydrosystems | Vízrendszerek modellezése | BMEEOVVMV-1 | 4 | 2 | 1 | | | | M | 2 | |
| | Electrical Systems in Buildings | Épületvillamossági ismeretek | BMEVIVEM___B61 | 4 | 2 | | | | | M | 2 | |
| | HVAC Basics | Épületgépészeti ismeretek | BMEGEÉEM___B61 | 4 | 2 | | | | | M | 2 | |
| **Optional Subjects** | | | | | | | | | | | | |
| ** | Optional subject - internship (at company) | Szabvál - cégnél végezhető gyakorlat | BMEEODHMV02 | 5 | | | | | 20 | M | 3 | |
| ** | Optional subject 1. | Szabvál 1. | BMEEO | 2 | 2 | | | | | M | 1 | |
| ** | Optional subject 2. | Szabvál 2. | BMEEO | 2 | 2 | | | | | M | 2 | |
| ** | Optional subject etc. | Szabvál | BMEEO | 2 | 2 | | | | | M | 1 | |

*The committee of the MSc program divides the students into groups according to their previous BSc studies in order to unify the output competences that are acquired with the completion of the master's program

**Any subject from other MSc programs of the University can be chosen.

***Taking the Diploma project subject is only possible if the student accomplished 33 credits from the mutual Core Subjects, 12 credits from the subjects of their own Student Group and at least 51 credits as a sum of the above mentioned two types of subjects.

**** The listed numbers of the semesters present the suggested schedule according to the curriculum.

*****Midterm grade/ Exam