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Policy in Higher Education – Case Study – Czech Republic

Higher education is provided by university type institutions ("*vysoká škola univerzitní*" in Czech language) and non-university type institutions ("*vysoká škola neuniverzitní*" in Czech language). The non-university higher education institutions are not divided into faculties and offer mainly bachelor study programmes. Higher education institutions of university type offer bachelor, master and doctoral study programmes. Higher education institutions offer courses in the humanities, social sciences, natural sciences, engineering, medicine and pharmacy, theology, as well as in economics, veterinary medicine, and agriculture, teacher training and arts. There are 45 higher education institutions: 24 public, 17 private and 4 state institutions. The majority of higher education institutions are public institutions. There are 6 higher education institutions in the field of EIE, all of them are public university type institutions. Public institutions are financed by the state budget by the Ministry of Education, Youth and Sports. The private higher education institutions could be partially financed by the state. In addition, the Czech higher education system includes 4 state higher education institutions. There are three military higher education institutions and a police academy. These institutions are financed by the Ministry of Defence and the Ministry of the Interior. All higher education institutions provide accredited study programmes.

The quality of higher education in the Czech Republic is supervised by the Accreditation Commission (see <http://www.akreditacnikomise.cz/en>). The standards characterise the general minimum requirements of the Accreditation Commission Czech Republic (ACCR) for processing the applications for granting, expanding and extending accreditation of study programmes and their fields of study. If the study programme is divided into fields of study, the requirements apply to the particular fields of study. Besides these general standards other criteria can be specified for the particular groups of fields of study.



There are three university levels of studies:

- Bachelor studies (*Bc.* = "*Bakalář*"):

The standard length of study including practical training is at least three years and at most four years. According to the Higher Education Act there is no difference between bachelor studies at university and non-university type institutions. The bachelor study programmes cover all main disciplines, except in medicine, veterinary medicine, pharmacy, architecture and law. It is conceived either as an independent course whose graduates are fully qualified for particular professions, or as the first stage of longer studies whose graduates can continue towards the magistr degree. This cycle leads to the academic degree of "*Bakalář*" (*Bc.*) or "*Bakalář umění*" (*BcA.*) in the field of arts which was introduced in January 1999. Students must sit for a final state examination, part of which is also the defence of the bachelor thesis.

- Master studies (*Mgr.* = "*Magistr*"):

The standard length of study is at least four and at most six years. Master study programmes may represent a continuation of bachelor study programmes; should this be the case, the standard length of study is at least two and at most three years. The master study programmes in the humanities, education and social sciences, natural sciences, pharmacy, theology, law and art last for five years and lead to the title of "*Magistr*" (*Mgr.*). In economics, agriculture and chemistry, studies last for five years and lead to the academic degree of "*Inženýr*" (*Ing.*). In engineering, studies last between five and five-and-a-half years and also lead to the degree of "*Inženýr*" (*Ing.*). In architecture, veterinary medicine and medicine, studies last for six years. Graduates in medicine obtain the degree of "*Doktor medicíny*" (*MUDr.*) and of "*Doktor veterinární medicíny*" (*MVDr.*) in veterinary medicine. According to the 1998 Act, graduates of master programmes in architecture are awarded the title of "*Inženýr architekt*" (*ing. arch.*) and graduates in the arts the academic degree of "*Magistr umění*"



(MgA). The new Act enables holders of the title of *magistr* to sit for a state examination in the same field and defend a dissertation to acquire the academic degree of Doktor followed by the name of the field "*Doktor práv*" (JUDr), "*Doktor filosofie*" (PhDr), "*Doktor přírodních věd*" (RNDr), "*Doktor farmacie*" (Phar.Dr.) and "*Doktor teologie*" (ThDr).

- Doctoral studies (*Dr.* = "*Doktor*");

The standard length of study is three years. The third and highest level of higher education consists in studies for the doctorate which take place under the guidance of a tutor. The programme is aimed at scientific research and independent study. Holders of the master's degree may apply. Studies last for three years (four to five years part-time) and lead to the academic degree of "*Doktor*" (PhD) or "*Doktor teologie*" (Th.D.) in the field of theology. Studies end with the state doctorate examination and the defence of a dissertation.

Degrees in EIE in the Czech Republic

- Bachelor (Bakalář – Bc.): three years of higher education studies after the end of secondary school).
- Master (Inženýr – Ing.): five years of university studies after the end of secondary school or – when the Bologna-BMD model is applied – two years of university studies after the end bachelor studies.
- Doctor (Doktor – Ph.D.): three years of university studies after the end of master studies.

Bachelor level

Standard length of studies is six semesters, which represents 180 credits (ECTS) with the following average distribution of subjects:

- fundamentals (mathematics, physics etc.): 35 %
- computer and information systems: 15 %



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- specialized courses in a given EIE field: 40 %
- languages (mainly English and German): 5 %
- projects: 5 %

Master level

Standard length of studies is four semesters (358 model), which represents 120 credits (ECTS) with the following average distribution of subjects:

- fundamentals (mathematics, physics etc.): 7 %
- computer and information systems: 14 %
- specialized courses in a given EIE field: 60 %
- languages (mainly English and German): 7 %
- projects: 12 %

There is no central list of engineering fields of study, but as an example we can use study programs accredited at the Faculty of Electrical Engineering of the Czech Technical University in Prague (see <http://www.fel.cvut.cz/en/education/study-programs.html>).

The FEE has long tradition and experience in education in the areas of electrical engineering and information technology. Based on that and feedback from the industry and services FEE decided several years ago to restructure completely the study programs. Currently it offers following bachelor programs: Electrical Engineering, Power Engineering and Management; Communications, Multimedia and Electronics; Cybernetics and Robotics; Open Informatics; Open Electronic Systems. In Master study there are the following programs: Electrical Engineering, Power Engineering and Management; Communications, Multimedia and Electronics; Cybernetics and Robotics; Biomedical Engineering and Informatics; Open Informatics; Open Electronic Systems. In addition, there is one special master program taught



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jointly by FEE, Faculty of Civil Engineering and Faculty of Mechanical Engineering, namely Intelligent Buildings. Some of the programs represent the “classical” engineering programs. Communications, Multimedia and Electronics; Cybernetics and Robotics, and Biomedical Engineering and Informatics are more interdisciplinary oriented in the sense they go beyond engineering disciplines.

Communications, Multimedia and Electronics

The study program in Communication, Multimedia and Electronics (CME) offers wide theoretical and application-oriented fundamentals and the specialization in one of the four branches containing the problems of communication (information transmission), multimedia (interconnection of audiovisual and computer technology), and electronics (construction of related devices and appliances).

The bachelor and the master study programs in Communication, Multimedia and Electronics cover extensive area of advanced electronic technologies of information processing considering both sides, namely hardware and software. This area contains following topics: data transmission (communication), interaction with human subject and physical reality (multimedia), and design and construction of corresponding appliances and devices (electronics). Study of this integrated program brings the graduates the advantage and versatility at the labour market with regard to the synergic effect of its particular parts.

Cybernetics and Robotics

The graduates’ profile of the program Cybernetics and Robotics results from a collection of courses that prepare students to be able to solve theoretical and practical tasks in the area of application of information technology in engineering practice. The program Cybernetics and Robotics prepares graduates to be able to solve wide spectrum of tasks starting from simple automation, over technological data measurement, collection and transmission and processing in the automatic control systems, up to design and application of robotic systems.



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Thus the graduates can find jobs practically in all areas, in particular engineering. The curricula were prepared with the consideration of recommendations of IFAC and IEEE international societies.

Bachelor program

The courses of bachelor program introduce students in cybernetics and robotics and then systematically develop broad fundamentals and simultaneously deeper knowledge in selected areas. Creative work in laboratories, individual projects and potential participation in research learn them analysis principles and methods, design, simulations and experiments in different areas. Then the students select one of three specializations: Systems and Control, Sensors and Technology, and Robotics. In elective courses they can deepen or extend their specialization. The students can acquire industrial experience while working on industrial projects at the university or in frame of long-term cooperation with partner companies.

Master program

The aim of the master program Cybernetics and Robotics is to educate professionals able to create and utilize intelligent machines equipped with sensors perceiving surrounding environment and applying methods of dynamic control. One of the profiling areas is robotics that integrates knowledge and skills from many disciplines. The program offers following specializations: Systems and Control; Sensors and Devices; Robotics; Aircraft and Spacecraft Systems. The curricula are flexible and thus the students can select additional minor specializations in other areas (telecommunications, informatics, management). The graduates can find jobs as developers, system integrators, researchers, process engineers, application programmers, technical support professionals, technical department heads, and managers on different levels.



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Biomedical Engineering and Informatics

The study program Biomedical Engineering and Informatics is taught as master program. It covers extensive area of advanced biomedical technologies, both of hardware and software. It concerns signal theory, methods of system modelling and simulation, image processing, complex medical data processing and interpretation, design and implementation of large health care information systems, design and realization of complex medical devices; complex view on the whole chain starting from a patient (measurement, examination methods) over data analysis to evaluation and interpretation and successive storage in health care records; engineering design and construction of medical devices, measurement, transmission and processing of electric and non-electric quantities. The students acquire very good theoretical fundamentals with strong interdisciplinary structure. Thanks to this they are flexible and have competitive advantage on the labour market.

References

The information provided in this document is based on the following resources:

- <http://www.msmt.cz/> (Ministry of Education, Youth and Sports)
- <http://www.msmt.cz/Files/vysokeskoly/Legislativa/HigherEduAct.htm> (Higher Education Act)
- http://www.csvs.cz/_en/ (Centre for Higher Education Studies)
- <http://www.czso.cz> (Czech Statistical Office)
- <http://www.fel.cvut.cz/en/education/study-programs.html>