Óbuda University
Donát Bánki Faculty of Mechanical and Safety Engineering

TRAINING PROGRAM

Mechatronic Engineering
MSc

Budapest, 01 September 2017.

MECHATRONIC ENGINEERING DEGREE PROGRAM CURRICULUM

1. Degree program name:

Mechatronic Engineering

2. Field of training:

technical

3. Language of training:

English

4. Training schedule(s) and duration of courses in semesters, number of contact hours:

regular (full-time); 4 semesters, 1185 contact hours.

5. Optional specializations:

Vehicle Informatics

6. Number of credits to collect to earn degree:

120 credits

7. Level of qualification and professional qualification as indicated in the degree certificate:

- level of qualification: Master of science (abbreviated: MSc)
- professional qualification: Master in Mechatronic Engineering

8. Study area classification of professional qualification according to the standard classification system of training areas:

523

9. Educational objective:

The aim is to train mechatronic engineers capable to integrate mechanical engineering with electronics, electrotechnics and computer control synergically at world standards; to develop and model the concept of, and subsequently to produce the design and production design of mechatronic equipment, processes and systems and smart machines, as well as to operate and maintain them. They are capable to develop and introduce new technologies, procedures and materials as required for mechatronic systems; to perform higher-level duties of management, control and organization; to perform assignments involving technical development, research, design and innovation; to join and manage engineering projects of domestic and international level. They are prepared to continue their studies at a PhD course.

10. Professional competencies to be mastered:

a) **knowledge**

- Knowledge and application of the natural scientific and technical theoretical relations and causal relationships linked with the mechatronic engineering profession.
- Mastered a way of theoretically grounded, systemic and practice-oriented engineering thinking.
- Knowledge of the main features and areas of application of structural materials of mechanical and electrical engineering applied in the field of mechatronic engineering.
- Knowledge of domestic and international standards and regulations, applying them in their work and also requiring colleagues to do so.
- In possession of the mechanical and electrical measurement engineering skills related to the area of mechatronic engineering, as well as a thorough measurement theory grounding based on mathematics and IT.
- Knowledge of information and communication technologies as related to the special field.
- Knowledge of the tools and methods of the mathematical modelling and the computerized simulation of integrated mechanical, electrotechnical, and control engineering systems in various fields of mechatronic engineering.
- Theoretical and practical grounding, methodological and practical skills for the design, production, modelling, operation and control of synergically integrated equipment, processes, and systems in terms of mechanical engineering, electronics, electrical engineering, and computer control.
- Knowledge of the rules and means of producing technical documentation.
- Knowledge of management related organizational tools and methods, and of legal regulations required for pursuing the profession.
- Theoretical and practical grounding, methodological and practical skills for the design, production, modelling, operation and control of synergically integrated equipment, processes, and systems in terms of mechanical engineering, electronics, electrotechnics, and computer control.

Depending on the specialty selected, knowledge of one or more of the subject areas below in at least one of the following special fields:

- Comprehensive knowledge of robotics and adaptive mechatronic equipment.
- Knowledge of intelligent embedded systems, in possession of the knowledge required for their design.
- Knowledge of power electronics and motion control systems, the methods and means of mechatronic equipment power supply.
- Knowledge of optomechatronic systems, their design and development principles, as well as their methods of operation and maintenance.
- Knowledge of biomechatronic systems, their design and development principles, as well as their methods of operation and maintenance.
- Knowledge of vehicle mechatronic systems, their design and development principles, as well as their methods of operation and maintenance.
- Knowledge of building mechatronic systems, their design and development principles, as well as their methods of operation and maintenance.
- Knowledge of the methods of manufacturing systems automation and robotization, their development principles, as well as their methods of operation and maintenance.
- Knowledge of the methods of agro-mechatronics, their development principles, as well as their methods of operation and maintenance.

b) **capabilities**

- Able to perform laboratory testing and analysis of materials applied in the field of mechatronic engineering, as well as to statistically evaluate and document results, and to compare experimental and theoretical results.
- Able to process, systematize, analyze in various ways, and draw theoretical and practical conclusions from information collected in the course of the operation of mechatronic engineering systems and processes.
- Able to perform the global design of complex mechatronic systems based on a systemic approach and process-oriented thinking with thorough theoretical grounding.
- Able to apply comprehensive theoretical knowledge in practice as well, in the area of synergically integrated equipment, processes, and systems in terms of mechanical engineering, electronics, electrotechnics, and computer control.
- Able to extend theoretical knowledge independently in order to solve unusual problems in complex mechatronic design and to apply such new theory in the practical solution of the problem.
- Able to enrich the knowledge base of the special field by original ideas.
- Able to design and manage the use of technical, economic, environmental and human resources in a complex manner.
- Able to elaborate and further develop theoretical models for the processes and information technologies used in the design, organization and operation of mechatronic systems and processes.
- Able to ensure the quality assurance of mechatronic engineering systems, technologies and processes, as well as to formulate in theory and to solve in practice measurement technology and process control tasks.
- Able to review and understand the latest research results in mechatronic engineering, and apply them in their work.
- Develop an ability to cooperate with electrical engineering, mechanical engineering, IT and life science specialists in various fields.
- Able to handle problems creatively, to solve complex tasks in a flexible manner; ready for lifelong learning and commitment on a versatility and value basis.
- Prepared to produce publications and presentations and to conduct negotiations in their special field, both in their mother tongue and in at least one foreign language.
- Committed to health and safety culture and health promotion.

***c)* attitude**

- Based on the knowledge acquired, playing an integrator role in the integrated application of technical sciences (primarily mechanical engineering, electrical engineering, and informatics), as well as in the technical support of any area of science where specialists of the given special field require engineering applications and solutions.
- Checking for possibilities of setting research, development, and innovation goals and efforts to achieve them in their work; committed to enrich the field of mechatronic engineering by new knowledge and scientific results.
- Efforts to perform work based on a complex systemic approach and process-oriented thinking.
- Efforts to enforce the requirements of sustainability and energy efficiency.
- Efforts to plan and execute tasks at high professional standards, individually or as part of a team.
- Efforts to improve professional competencies.
- Efforts to study actively in an independent autonomous fashion for self-education and self-improvement.

- Committed to quality work at high standards, and efforts to transmit this approach to colleagues as well.
- Compliance with the applicable requirements set out in technical, economic and legal regulations and engineering ethics in their work and decisions.
- Compliance with the requirements of quality management, consumer protection, and product liability in their professional work.
- Following the basic regulations of environment protection, health and safety at work in their activities.
- Sufficiently open, knowing and applying the principle of access with equal opportunities.

***d)* autonomy and responsibility**

- Sharing the knowledge and experience acquired with fellow professionals by way of formal, non-formal and informal information transfer.
- Assessment of subordinates' work, promoting their professional development by sharing critical remarks.
- Taking individual initiatives in solving professional problems.
- Taking the initiative in solving technical problems.
- Encouraging colleagues and subordinates to pursue their profession responsibly and ethically.
- Responsibility for sustainability, health and safety culture at work, and environmental consciousness.
- Making prudent decisions independently, by consultation with experts in other areas (primarily law, economics, energetics, electrical engineering, informatics and medical science), and taking responsibility for them.
- Efforts to make decisions by fully taking legal regulations and ethical norms into consideration even in strategic decision making situations requiring a new complex approach and in unexpected life situations as well.
- Decisions taking into account the principles and applications of environment protection, quality management, consumer protection, product liability, equal access opportunities, as well as the basic requirements of health and safety at work, technical, economic, and legal regulations, and engineering ethics.

11. Main training areas:

Training scopes	Required credits
Basic sciences	27 credits
Professional core material	39 credits
Economic and human knowledge	10 credits
Differentiated professional knowledge	14 credits
Thesis work	30 credits
Total	**120 credits**

12. Criteria prescribed:

Professional traineeship: The duration of the internship is four (4) weeks. The completion of the internship outside the institute is a requirement.

In a special case the internship may be completed in one of the institutes of the university with the authorization of the faculty's dean. Professional traineeship is included in the criteria prescribed.

13. Knowledge verification:

a) during the study period, by written or verbal reports, written (classroom) tests, by the evaluation of home assignments (designs, measurement records, etc.), mid-semester grading or signature,
b) by preliminary examination passed in the study period,
c) by examination or comprehensive examination passed in the examination period, and
d) by final examination.

15. Criteria for admission to a final examination:

a) Final completion certificate (absolutorium) granted,

b) Degree project /thesis accepted by a supervisor.

Admission to a final examination is subject to a final completion certificate being granted. A final completion certificate is issued by a higher education institution to a student who has complied with the study and examination requirements prescribed in the curriculum and completed the professional traineeship required – except for meeting the foreign language requirement and completion of the degree project / thesis –, and has acquired the credits prescribed.

16. Parts of the final examination:

The final examination consists of defending the degree project / thesis and oral examinations taken on the subjects prescribed in the curriculum (time allowed for preparation: at least 30 minutes per subject), to be passed by the student consecutively within the same day.
Subjects (subject groups) comprising, in the aggregate, a body of knowledge corresponding to at least 20 and up to 30 credit points may be designated for the final examination.

The list of questions of the oral examination is made available to candidates 30 days before the date of the final examination.

Candidates may start the examination if their degree project / thesis has been accepted by the final examination board with at least sufficient (2) qualification. Criteria for correcting a failed degree project / thesis are defined by the competent institute.

17. Result of the final examination:

The result of the final exam (F) is the average of the marks given for the degree project (Dp) and the subjects, as follows:

$$F = (Dp+F1+F2+\ldots+Fm)/(1+m)$$

18. Criteria for issuing a diploma:

Successful final examination

21. Date of entry into effect: 01 September 2017.

Dated in Budapest, 28 November 2016.

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