Program description of the

Specialist in space technology postgraduate training

(V 1.0)

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Disclaimer

The original documents for the Specialist in space technology postgraduate training program were prepared in Hungarian in accordance with the national regulations. Automatic translation tools were used to create this English version.

Some sentences may have gender-specific alternatives. In these cases, we used a hymnal translation.

Translation errors can be reported to the Dean's Office of the Faculty of Electrical Engineering and Informatics.

Content

I. Training and outcome requirements

The training and outcome requirements of the specialized continuing education program for the space technology specialist

1. Name of the program in Hungarian: űrtechnológiai szakember szakirányú továbbképzés

The name of the specialist training in English is: specialist in space technology postgraduate training course

2. The title of the qualification that can be obtained in the specialized further training in the diploma: űrtechnológiai szakember

The name of the professional qualification that can be obtained in the specialized further training in the diploma in English: specialist in space technology

3. Classification of specialized continuing education:

3.1. classification according to training area: technical training area

3.2. classification of education level:
- **According to ISCED 1997: 5A**
- **According to ISCED 2011: 6**
- **according to the European framework: 6**
- **according to the Hungarian qualification framework: 6**

3.2. the study area classification of the vocational qualification according to the unified classification system of training areas:
- According to ISCED 1997: 54
- According to ISCED-F 2013: 0714

4. Admission condition(s):

At least a bachelor's degree in an agricultural, IT, engineering or natural science field of study

5. The training period is defined in semesters: 3 semesters

6. The number of credits to acquire the qualification: 90 credits

7. The purpose of the training and the professional competencies (knowledge, ability, attitude, autonomy and responsibility):

7.1. The purpose of the training:
The purpose of the training is to train specialists who have sound technical knowledge of the processes of space technological developments, the special system of requirements imposed on technical developments by the space environment. Professionals completing the training will know the operation of basic space and related ground systems. The professionals who complete the training are prepared for lifelong learning and expanding their knowledge.

7.2. Professional competences:

The space technology specialist

a) knowledge
- Knows the operation of the basic units of the space equipment, the technology of their implementation, the principles of reliability and quality assurance, and the practice of developing backup systems.
- Knows the hardware and software tools, programming languages and development platforms related to space technology.
- Knows the goals of space research and space technology, has knowledge of missions that have already taken place or are planned, and their scientific and commercial goals;
- Knows the basics of earth observation space technology, the physical laws of measurement technology.
- Knows the basics of satellite communication systems.
- Knows satellite orbits and their properties.
- Has an overview of basic material science knowledge and related measurement technology knowledge.
- Knows the standard specifications of the European Cooperation for Space Standardization (ECSS).
- Knows the special physical properties of outer space and the requirements for equipment to be operated in outer space.
- Knows the types of propulsion systems required to launch spacecraft into space.
- Understands the operating principles of currently used gear systems from a chemical and physical point of view, knows the concepts of future gear systems.
- Knows the technical basics of space robots and manipulators.
- Knows the advanced mathematical and physical principles and methods required for the cultivation of the field related to manipulators.
- Knows the operation of space equipment sensors, their implementation technology, and the principles of reliability.

b) abilities
- Able to use the learned procedures to perform certain planning, development and operational tasks of space equipment and related ground service units.
- Able to cooperate in group work with representatives of own and other fields of expertise to develop a solution to a given problem.
- Capable of continuous self-education, thereby keeping pace with the development of the space technology profession and industry.
- Able to apply the learned ground observation procedures to carry out technical and environmental assessment tasks.
- Able to review satellite systems at user level.
- Apply the relevant technical standards and legislation.
- Able to use the learned robotics procedures to perform certain design, development and application tasks of space robots and related ground service units.
- He is able to convey his thoughts and ideas in an understandable way to others using known presentation techniques and tools.

c) attitude
- Is open to learning new research and development methods and technological procedures and mastering them at a skill level, as well as being able to keep up with their development.
- Open to getting to know other fields that use space technology and solving technical problems that arise in cooperation with specialists in the given field.
- Strives for efficient and quality work.
- Is receptive to the use of methods and tools that provide effective solutions, with which he is capable of critical evaluation and for analysis.
- Open to group members with expertise in different fields to achieve common goals.

- Open to learning about different values and interests, tolerant of different points of view.

d) autonomy and responsibility
- It tries to eliminate the shortcomings and risks of the technologies used, and independently applies a wide range of methods and techniques in practice in contexts of varying complexity and to varying degrees of predictability.
- Performs his professional tasks independently, but requires coordination in certain level of work.
- Feels responsible for his own work and that of his colleagues. Uses the material assets entrusted to him/her responsibly.
- Takes responsibility for compliance with technical standards and legislation.
- Accepts the need for extensive professional cooperation and the responsibility resulting from joint interdisciplinary work.

8. The professional characteristics of the specialized further training, the specialization areas leading to the qualification and the credit ratio of those from which the specialization is built:

8.1. Basic knowledge of general space research and space technology: 30 credits
basic knowledge of space science, basic knowledge of space physiology, basic knowledge of space law, basic knowledge of space technology

8.2. Professional core material: 40 credits
materials science, earth observation, thermodynamics, rocket technology, system development, space communication

8.3. Knowledge of related scientific fields: 20 credits
selected knowledge of social sciences, living natural sciences and non-living natural sciences

II. Description of the training program

1. The training system

Three-semester specialized training, students can take the final exam after completing the 90 credit subjects specified in the sample curriculum. The training requirements are in accordance with CCIV of 2011 on national higher education. Act and Act No. 87/2015 on the implementation of certain provisions of this Act. (IV.9.) According to the regulations of the Government Decree.

2. Organizational form of the training

The training is a part-time training, working by correspondence. During the training, the students take part in the lectures and exercises specified in the sample curriculum, and acquire the training competencies through independent work and study at home.

The number of contact hours in the three semesters is a total of 360 hours (1st semester: 120 hours, 2nd semester: 125 hours, 3rd semester: 115 hours), which is supplemented by the student's individual preparation at home, or with individual consultations.

The classes are held on Friday afternoons and Saturdays during the academic period (based on the guidance of the UniSpace consortium based on student needs, in accordance with the schedule principles of the university.

From the point of view of the organization of the training, a special aspect is that the first semester is a joint semester of further specialized training starting in four different scientific fields, i.e., the students of all four scientific fields study the same 8 subjects in the first semester. Based on the joint decision of the involved managing institutions, the first semester will be implemented in the framework of distance learning, and the related timetable will be jointly coordinated.

3. Sample curriculum and prerequisite system

3.1. Course obligations

Students can complete their 90-credit study obligations in three semesters. The half-yearly load is balanced based on credit value. Due to the specialty and nature of the training, there is no overlap between the compulsory subjects. Methods used for subject performance evaluation: exam grade and mid-semester grade. The credit value of the subjects is proportional to the student's time investment required to achieve the learning results of the given subject, including home studies and preparations.

3.2. Thesis work

Thesis work is not connected to the training.

3.4. The recommended sample curriculum of the training

The sample curriculum assigned to the training records the following data related to the subjects included in the sample curriculum:

- subject code,
- subject name,
- the type of performance assessment (quality assessment) of the subject,
- the hourly contact hour number,
- the number of hours of student time spent outside the timetable (during homework),
- credit value (credit number),
- the name and institution of the course coordinator
- the curricular role of the subject.

SAMPLE CURRICULUM 1st semester							
Code	**Name**	**Type**	**Contact hour / semester**	**Working hour at home / semester**	**Credits**	**Course coordinator**	**Type of subject**
	Basic space science	exam	20	130	5	Lichtenberger, János ELTE	compulsory
	History of the space research	midyear grade	10	80	3	Lichtenberger, János ELTE	compulsory
	Introduction to space technology	exam	20	130	5	Csurgai-Horváth, László BME	compulsory
	Space research and technology	midyear grade	10	80	3	Bacsárdi, László BME	compulsory
	Biology of the human body: Basic principles in a nutshell	exam	20	130	5	Magyar, János DE	compulsory
	Space nutrition, space food	exam	10	80	3	Friedrich, László MATE	compulsory
	Space Sector and Economic Development	exam	15	75	3	Parragh, Bianka NKE	compulsory
	Introduction to International Law	exam	15	75	3	Sulyok, Gábor SZE	compulsory
Total			**120 hours**	**780 hours**	**30 credits**		

SAMPLE CURRICULUM 2nd semester							
Code	**Name**	**Type**	**Contact hour / semester**	**Working hour at home / semester**	**Credits**	**Course coordinator**	**Type of subject**
	Earth Observation	exam	20	130	5	Földváry, Lóránt (BME ÉMK)	compulsory
	Flight hardware materials	exam	15	105	4	Bárczy, Pál (ME)	compulsory
	Space communications	exam	20	130	5	Vári, Péter (SZE)	compulsory
	Exercise of space missions with virtual tools	midyear grade	20	130	5	Kadocsa, László Gábor (DUE)	compulsory
	Basics Space Physics	midyear grade	20	130	3	Heilig, Balázs (ELTE)	compulsory
	International Space Organizations	midyear grade	10	140	3	Ganczer, Mónika (SZE)	compulsory
	Radiobiology	exam	20	130	5	Balkay, László (DE)	compulsory
Total			**125 hours**	**775 hours**	**30 credits**		

SAMPLE CURRICULUM 3rd semester							
Code	**Name**	**Type**	**Contact hour / semester**	**Working hour at home / semester**	**Credits**	**Course coordinator**	**Type of subject**
	Design thinking in the space industry	midyear grade	20	130	5	Húnfalvi, András (MOME)	compulsory
	Space robots and manipulators	midyear grade	20	130	5	Haidegger, Tamás (ÓE)	compulsory
	Thermodynamics of space equipment	midyear grade	20	130	5	Kovács, Róbert Sándor (BME GPK)	compulsory
	Rocket technology	exam	25	155	6	Feszty, Dániel (SZE)	compulsory
	European Union Space Policy	midyear grade	10	140	3	Aradi, Norbert (NKE)	compulsory
	The European Space Agency and its programmes	exam	10	140	3	Bartóki-Gönczy, Balázs (NKE)	compulsory
	Space Weather and Near Earth Object	midyear grade	10	140	3	Kis, Árpád (ELTE)	compulsory
Total			**115 hours**	**785 hours**	**30 credits**		

Used acronyms

BME: Budapest University of Technology and Economics
DE: University of Debrecen
DUE: University of Dunaújváros
ELTE: Eötvös Loránd Science University
GDE: Dennis Gábor University
ME: University of Miskolc
MATE: Hungarian University of Agriculture and Life Sciences
MOME: Moholy-Nagy University of Art and Design
NKE: Ludovika University of Public Service
ÓE: Óbuda University
PPKE: Pázmány Péter Catholic University
SZE: Széchenyi University

BME ÉMK: BME Faculty of Civil Engineering
BME GPK: BME Faculty of Mechanical Engineering
BME KJK: BME Faculty of Transportation Engineering and Vehicle Engineering
BME VIK: BME Faculty of Electrical Engineering and Informatics

4. Evaluation and control methods

4.1. General rules

The general rules of evaluation and control methods are determined by higher faculty and university regulations. The relevant parts of the applicable regulations are presented below.

4.2. Class attendance

Attendance at practical classes is mandatory, a maximum of 30% absence is allowed.

4.3. Mid-term performance

The rules for determining mid-semester marks, as well as the conditions for obtaining a signature in the case of a subject ending with an exam, are defined in the subject requirements.
The theses and assignments are corrected and graded by the lecturer of the subject.

4.4. Subject exams

In the case of subjects ending with an exam, the condition for admission to the exam is the signature, the rules for creating the exam mark are laid down in the subject requirements.

4.5. Thesis

A thesis is not prepared during the program.

4.6. Final exam

The student can only be admitted to the final exam with a final certificate (90 credits according to the sample curriculum).

The final subject exam consists of oral answers to item-type questions from the knowledge material of three pre-selected final exam subjects.

The subjects of the final exam are chosen by the student, subject to the following restrictions:

- one subject to be chosen from the technical subjects of the first semester (Introduction to space technology, Space research and technology)
- one subject to be chosen from the technical subjects of the second semester (Earth Observation, Flight hardware materials, Space communications, Exercise of space missions with virtual tools)
- one subject to be chosen from the technical subjects of the third semester (Design thinking in the space industry, Space robots and manipulators, Thermodynamics of space equipment, Rocket technology)

The result of the final exam (ZVE) is the arithmetic average of the grades of the subject exams. If the result of one of the subject exams is insufficient, then the result of the final exam is unsuccessful. The failed final exam can be repeated in the next final exam period, taking the final exam from the subject(s) with insufficient merit.

In the case of a successful final exam, the value of the diploma result (OE) calculated to two decimal places can be calculated in the following relation between the arithmetic mean (ZT) of the grades of the subject exams and the cumulative weighted academic average (STÁ) calculated for the entire study period:

$$OE = 0.5*ZT + 0.5*ST$$

The final exam is organized by the Faculty of Electrical Engineering and Information Technology (as faculty).

5. Recognition of previously acquired knowledge and practices

CCIV of 2011 on national higher education. according to Section 49 (6) of the Act and the applicable university regulations.

III. Description of subjects

The description of the subjects can be found in Appendix A.