APPROVED BY
Order No V-964 of the Minister of
Education and Science of the Republic
of Lithuania of 10 September 2015

DESCRIPTOR OF THE STUDY FIELD OF ENGINEERING

CHAPTER I
GENERAL PROVISIONS

1. The Descriptor of the study field of Engineering (hereinafter referred to as the "Descriptor") shall govern the special requirements applied to the study programmes of the study field of Engineering.

2. The Descriptor has been prepared in accordance with the Law on Higher Education and Research of the Republic of Lithuania taking into account Resolution No 535 of the Government of the Republic of Lithuania of 4 May 2010 "On the Approval of the Descriptor of the Lithuanian Qualifications Framework", Order No V-2212 of the Minister of Education and Science of the Republic of Lithuania of 21 November 2011 "On the Approval of the Descriptor of Study Cycles", Order No V-2463 of the Minister of Education and Science of the Republic of Lithuania of 15 December 2011 "On the Approval of Recommendations for Developing the Descriptor of a Study Field or Study Fields", Order No V-501 of the Minister of Education and Science of the Republic of Lithuania of 9 April 2010 "On the Approval of the Descriptor of General Requirements for Degree-Awarding First Cycle and Integrated Study Programmes", Order No V-826 of the Minister of Education and Science of the Republic of Lithuania of 3 June 2010 "On the Approval of the Descriptor of General Requirements for Master's Study Programmes", order No ISAK-1026 of the Minister of Education and Science of the Republic of Lithuania of 15 May 2009 "On the Approval of Descriptors of Full-time and part-time studies", and with regard to EUR-ACE accrediting standard of Engineering programmes (2008) (http://www.enaee.eu/).

3. This Descriptor aims to:

3.1. Formulate guidelines, which should be taken into account by the higher education institutions in preparing and assessing the study programmes;

3.2. Inform students and employers on competencies acquired during the provision of the study programme;

3.3. Assist institutions performing external assessment to assess the study programmes.

4. The Descriptor shall be applied to college and university study programmes of the study field of Engineering.

5. Engineering study field group is part of technological science study area. The following study fields are part of the group: General Engineering, Civil Engineering, Mechanical Engineering, Aeronautical Engineering, Marine Engineering, Electrical and Electronics Engineering, Manufacturing Engineering, Engineering of Chemical Processes and Land Transportation Engineering.

6. Upon completion of the studies of Engineering study field the higher education qualification shall be acquired:

6.1. After completing college studies, a Professional Bachelor's degree of one of the group's study fields is acquired by issuing a Professional Bachelor's diploma by the higher education institution;

6.2. After completing the first-cycle university studies, a Bachelor's degree of one of the group's study fields is acquired by issuing a Bachelor's diploma by the higher education institution;

6.3. After completing the second-cycle university studies or integrated studies, a Master's degree in one of the group's study fields is acquired by issuing a Master's diploma by the higher education institution;

6.4. After completion of studies of state regulated profession study programme, a diploma shall be supplemented by a statement of professional qualification awarding.

7. The granted Professional Bachelor's and Bachelor's degrees correspond to the sixth level of the Lithuanian Qualifications Framework and the European Qualifications Framework for Lifelong Learning, as well as the first cycle of the Framework for Qualifications of the European Higher Education Area, whereas the Master's degree corresponds to the seventh level of the Lithuanian Qualifications Framework and the European Qualifications Framework for Lifelong Learning, as well as the second cycle of the Framework for Qualifications of the European Higher Education Area.

8. In case studies of Engineering study fields are organised in different forms, the structure, scope (study credits, teaching and learning techniques), curriculum and learning outcomes of the study programme of the same qualification degree must stay equivalent.

9. The group of Engineering study fields of the first study cycle may involve two-field study programmes (the main study field and minor study field), upon completion of which a double qualification degree is awarded: of the main study field and of the minor study field. Requirements to candidates of the minor study programme of the engineering study field shall be established by the higher education institution.

10. General enrolment requirements shall be:

10.1. Persons with at least secondary education shall be enrolled in first cycle study programmes of Engineering study field group in an enrolment contest, taking into account their learning outcomes, entrance examinations or other criteria established by the higher education institution. Higher education institutions shall establish a list of competitive subjects by the field of study and principles for the award of contest points, the lowest possible entrance grade and other criteria, having received the assessment of student representation, and publish them no later than 2 years preceding the start of the school year.

10.2. Persons meeting the requirements established by the university shall be enrolled to the second cycle studies of technological study fields.

CHAPTER II
CONCEPT AND SCOPE OF THE STUDY FIELD

11. Engineering is a purposeful activity, which seeks to adopt tools, measures and systems of natural resources and natural phenomena to the human needs. Engineering activity is a systematic work based on knowledge, gained from research and practical experience, the purpose of which is to create new or essentially develop the existing materials, technologies, products, equipment, processes, services, design their installation, plan and organise production.

12. The main goal of all study fields of Engineering is to grant such an education to future specialists that they would:

12.1. hold knowledge and abilities necessary for engineering activity in global markets of use of high technologies;

12.2. develop a need for engineering knowledge, know how to apply them in different circumstances, be able to combine abilities of such application with principles of business and management, also with knowledge of humanitarian and social science, realise the influence and importance of engineering solutions to the development of the society;

12.3. be of extensive expertise, be able to think creatively and critically;

12.4. be able to support their competence by life-long learning.

13. The general aim of the university study field group of Engineering is to establish and ensure assumptions for the acquisition of sufficient knowledge in Mathematics and other Physical science, Engineering science and Engineering designing, to acquire abilities to apply such knowledge and create new knowledge. Particular goals of the study programmes must contain individual objectives of a higher education institution and meet the opportunities and needs of the industry and market.

14. College study field group of Engineering must target the application of science knowledge and technologies, not the development of new knowledge and technologies, also the implementation of projects and management of technological processes, not designing thereof.

15. Professional qualifications of Engineering are provided and diplomas or certificates thereof are granted by authorised institutions. The study programmes of Engineering of study field group must be developed in a way that students holding theoretical and primary practical knowledge, and having acquired additional required engineering practice and specific knowledge, would be able to seek certified engineering qualification.

16. Annexes to the Descriptor include descriptors of study fields of General Engineering, Civil Engineering, Mechanical Engineering, Aeronautical Engineering, Marine Engineering, Electrical and Electronics Engineering, Manufacturing Engineering, Engineering of Chemical Processes and Land Transportation Engineering.

CHAPTER III
GENERAL AND SPECIAL LEARNING OUTCOMES

17. In forming new study programmes the underlying study outcomes of the study programmes of Engineering study fields' group provided in this Chapter must be arranged in such a way that the study programme would meet specific requirements set to particular Engineering study field or branch thereof.

18. Upon completion of college studies, the following learning outcomes should be achieved:

18.1. Knowledge and its application:

18.1.1. Knowledge of basic fields of natural science and mathematical regularities and laws, necessary to understand fundamental basics of Engineering study field study programme;

18.1.2. Knowledge and understanding of basic Engineering study field concepts and contents thereof;

18.1.3. Key knowledge of study programme of the Engineering study field important in practice;

18.1.4. Knowledge of the context of problems and solutions thereof of adjacent study fields.

18.2. Ability to perform engineering analysis:

18.2.1. Ability to apply the knowledge and understanding in problem solving under the engineering field study programme using methods known.

18.2.2. Ability to apply the knowledge and understanding in analysing engineering tasks and solve them by selecting proper methods, experimental and production equipment;

18.2.3. Ability to apply analytical and modelling methods in solving engineering tasks of the engineering study programme.

18.3. Knowledge and ability necessary for the implementation of design works of the engineering study field meeting the study programme:

18.3.1. Ability to apply engineering knowledge and understanding of the engineering study field meeting the study programme and by implementing designing tasks according to the defined requirements;

18.3.2. Ability to understand designing methods and ability to apply them.

18.4. Ability to perform applied research:

18.4.1. Ability to find necessary professional information by using databases and other scientific and engineering information resources;

18.4.2. Ability to perform experiments necessary for the performance of engineering tasks, process results thereof and provide practical conclusions of such results;

18.4.3. Skills of work with equipment used in the engineering study field of the study programme.

18.5. Practical knowledge and skills in solving engineering tasks:

18.5.1. Ability to select engineering solutions, measures and equipment necessary for the implementation of these solutions;

18.5.2. Ability to synchronise theoretical and applied knowledge in solving engineering issues;

18.5.3. Understanding of ethical, environmental and commercial circumstances of engineering activity;

18.5.4. Understanding principles of organisation of engineering activity, knowledge of the key work and fire safety requirements.

18.6. To hold the following personal and social abilities:

18.6.1. Ability to solve engineering tasks individually and in a team;

18.6.2.Ability to communicate with engineering community and the public;

18.6.3. Understanding the impact of engineering solutions to the public and the environment, following norms of professional ethics and engineering activity, realising the responsibility for the results of engineering activity;

18.6.4. To understand the key aspects of project implementation and management on the level of engineering activity;

18.6.5. To understand the importance of individual life-long learning and be prepared for it.

19. Upon completion of the first cycle university studies, the following learning outcomes should be achieved:

19.1. Knowledge and abilities:

19.1.1. Knowledge and understanding of the basis of natural science and mathematics in order to understand fundamental principles of engineering study field of the study programme;

19.1.2. Knowledge and systematic understanding of theoretical and applicable basics and definitions of engineering study field of the study programme;

19.1.3. Coherent knowledge of engineering study field of the study programme;

19.1.4. Knowledge of a wider multidisciplinary engineering context, ability to adapt methods and processes of other science fields.

19.2. Ability to perform engineering analysis:

19.2.1. Ability to apply the acquired knowledge and understanding in formulating and solving problems of engineering study field of the study programme by selecting appropriate methods;

19.2.2. Ability to apply the acquired knowledge and understanding in formulating and analysing engineering tasks by selecting appropriate methods for solving them, as well as experimental and manufacturing equipment;

19.2.3. Ability to select and apply proper analytical and modelling methods for the engineering study field of the study programme.

19.3. To have knowledge and skills necessary for the implementation of designing works of the engineering study field of the study programme:

19.3.1. Ability to apply engineering knowledge of engineering study field of the study programme and understanding of the development and implementation of projects meeting the defined requirements;

19.3.2. Understanding of project methodologies and ability to apply them.

19.4. Ability to perform fundamental and applied research:

19.4.1. Ability to find necessary scientific and professional information by using databases and other information resources;

19.4.2. Ability to plan and perform necessary experiments, process and access data thereof, provide findings;

19.4.3. Holding skills of work with the equipment used in the engineering study field of the study programme.

19.5. Holding skills of practical work in solving engineering tasks:

19.5.1. Ability to select and apply proper methods, measures and equipment in the implementation of engineering solutions, knowledge of constructions, principles of operation and functions of such engineering equipment, having initial abilities of usage thereof;

19.5.2. Ability to combine theoretical and applied knowledge in solving engineering problems;

19.5.3. Understanding and assessment of ethical, environmental and commercial circumstances of the engineering activity;

19.5.4. Understanding principles of organisation of engineering activity, the importance of work and fire safety and the key requirements thereof, interaction of engineering activity links.

19.6. To have the following personal and social abilities:

19.6.1. Ability to work effectively on an independent basis and in a team;

19.6.2. Ability to communicate with engineering community and the public;

19.6.3.To have a holistic understanding of the impact of engineering solutions to the public and the environment, to follow norms of professional ethics and engineering activity, to be aware of the responsibility for the engineering activity;

19.6.4. Knowledge of project management and business aspects, understanding of the links between technological solutions and economical consequences;

19.6.5. To understand the importance of individual life-long learning and be prepared for it.

20. Upon completion of the second cycle university studies and integrated studies, the following learning outcomes should be achieved:

20.1. Knowledge and abilities:

20.1.1. Good knowledge and ability to creatively apply basics of natural science and mathematics, comprehensive knowledge and understanding of principles of engineering study field of the study programme and ability to apply them for the solving of new engineering solutions;

20.1.2. Knowledge and critical assessment of new achievements in the engineering field.

20.2. Ability to perform engineering analysis:

20.2.1. Ability to solve atypical problems, which are not strictly defined and not thoroughly specified;

20.2.2.Perceiving standard and non-standard engineering problems, ability to formulate and solve them clearly;

20.2.3. Ability to use one’s own knowledge and understanding for solving practical engineering tasks by application of theoretical models and research methods, including mathematical analysis, calculation modelling and experimental methods of research;

20.2.4. Understanding the importance of social, health, work and fire safety, environmental and commercial requirements;

20.2.5. Ability to apply innovative methods for the solving of specific problems and implementation of solutions thereof.

20.3. Knowledge and skills necessary for the implementation of designing works of the engineering study field of the study programme:

20.3.1.Ability to apply one’s own acquired knowledge and understanding in the solving of atypical problems, also those related to other scientific and engineering fields;

20.3.2.Ability to innovatively develop new and original engineering ideas and methods;

20.3.3. Ability to make engineering decisions in coping with multipartite, technically undefined and accurately non-characterised problems;

20.4. Ability to perform fundamental and applied research:

20.4.1. Ability to identify, find and assess data necessary for the engineering work by using databases and other information resources;

20.4.2. Ability to plan and perform analytical, modelling and experimental research, also critically assess their data and provide conclusions;

20.4.3. Ability to explore the adaptability of new and newly evolving methods of solving problems of engineering study field of the study programme

20.5. Skills of practical work in solving engineering tasks:

20.5.1. Ability to aggregate the knowledge of different study fields and to solve multiple engineering problems;

20.5.2. Comprehensive understanding of applied methods and techniques and their limits, ability to select engineering equipment and software;

20.5.3.Be aware of ethical, environmental and commercial requirements of engineering activity;

20.5.4. Be aware of principles of organisation of engineering activity, understanding of interaction between its links, ability to assess the engineering activity in the aspects of work safety and environmental protection.

20.6. Personal and social abilities:

20.6.1. Ability to work effectively on an individual basis and in a team, ability to be a leader of a team of representatives of different study fields and levels.

20.6.2.Ability to communicate with engineering community and the public on a national and international scale;

20.6.3. To have a holistic understanding of the impact of engineering solutions to the public and the environment, to follow norms of professional ethics and engineering activity, to be aware of the responsibility for the engineering activity;

20.6.4. To have thorough knowledge of project management and business aspects, understanding of links between technological solutions and economical consequences thereof;

CHAPTER IV
TEACHING, LEARNING AND ASSESSMENT

21. Teaching, learning and assessment activities shall be organised in such a way that students can effectively achieve the intended learning outcomes of respective engineering study field of the study programme.

22. Teachers shall understand the subject taught, and follow research results, know the links and framework of other study and science fields, interdisciplinary opportunities.

23. Teaching and studying methods applied shall be clearly defined, regularly reviewed and developed in regards to state-of-the-art achievements of the engineering science, requirements of modern didactics and the changing labour market needs.

24. Teaching and studying strategy shall be developed in order to provide students topical knowledge on the subject, abilities and practical skills needed for work in engineering related fields. The teaching contents shall be constantly updated and developed by integrating new knowledge and innovative teaching methods, which comply with the concept of life-long learning, into the study process. Particularly important study component is the development of proper practical work skills of students.

25. Students shall be motivated and prepared to be responsible for their life-long learning process and learning outcomes.

26. Teachers shall know and understand didactical concept of the study programme, apply different teaching methods in order to optimally use available material resources.

27. Didactical concept of teaching and studying shall include a flexible application of various teaching and learning methods by looking for integrated didactical solutions and seeking that students would master knowledge and acquire special, social and personal skills.

28. Selection of teaching and learning methods shall ensure the acquiring of knowledge and abilities of the study field selected by the student. Gnoseological and actuation methods, methods stimulating independent studies, investigative methods, control and self-control methods shall be applied in the study process.

29. Equivalent methods of teaching and learning, which differ in the scope, complexity and expression of student's independence, may be applied in different study cycles. Forms of teaching and learning may be as follows:

29.1. Lectures;

29.2. Laboratory works;

29.3. Individual consultations;

29.4. Seminars (teaching in small groups);

29.5. Practicals;

29.6. Demonstrative classes;

29.7. Practical training (recommended to be conducted with an industrial company or any other scientific and study institution, in case of different legal regulation, practical training may be done at the same teaching institution);

29.8. Individual or team projects;

29.9. Distance teaching based on virtual teaching environment;

29.10. Educational excursions;

29.11. Case analysis;

29.12. Writing papers and written works;

29.13. Search of necessary information and summary thereof, reading of books and articles, preparation and giving verbal presentations;

29.14. Simulation of real situations in simulations, etc.

30. Teaching shall not be based on mechanical repetition of text of information sources. Students shall be oriented to the ability to seek for arguments in the solution of discussable issues. The key tasks of teaching:

30.1. Indication of the main studying material and short discussion by pointing out to the most important information;

30.2. Identification of main concepts of the studying material and discussion thereof in different aspects;

30.3. Identification and discussion of issues with the studying material;

30.4. Identification of studying sources suitable for the solution of issues raised.

31. Graduates of an Engineering study field shall have implemented projects during the period of their study. The purpose of the projects shall be training of research and knowledge application competences, most often in solving difficult engineering issues. The project shall be defined in the report, which will show abilities acquired by a student:

31.1. Understanding of literature published on the subject of the project, which includes both subjects known and limits of the knowledge held;

31.2. Selection of research methodology (technique);

31.3. Designing, research and creation;

31.4. Analysis and quantitave assessment of uncertainty of findings;

31.5. Provision of conclusions in a clear and concise manner;

31.6. Interpretation and discussion of conclusions in the context of knowledge held (common);

31.7. Generalisation of the main conclusions and provision of accurate summary of the work performed.

32. A highly valuable part of the study programme is work with the industrial company or any other place of practice, it shall be properly organised. Necessary integral parts of the study process shall be the following: preparation of students, cooperation of teachers and practice mentors within companies in preparing individual tasks for students, clarification of processes within practice companies, hearing and assessment of work reports of students.

33. Studying is associated to fundamental and applied research and spread thereof in practice. It may be reached by choosing such forms of teaching and studying as scientific-practical seminars, research implemented by students in practice institutions, presentation of final theses of graduates in places of practice, co-publications and presentations of students, teachers and practitioners or manufacturers at scientific conferences.

34. It would be good if during their study period the students take part in a team-work activity.

35. Study subjects shall be taught in a coherent manner by seeking consistency between the aspired results. University study programme of the second study cycle after completion of which a Master's degree of the study field (branch) is awarded, shall include subjects of the study field, subjects of higher problematic or innovative level context-wise in comparison to those of respective cognitive field in the first study cycle.

36. In the beginning of each semester teachers shall extensively present the curriculum and goals of the study subject to the students and links thereof to general goals of the study programme, expected learning outcomes, intended learning load, procedure of assessment of the learning achievements and criteria (influence of examination and interim tests/examinations) to final grade, procedure of examination, etc.).

37. Teaching and studying have to ensure the preparation of professionals meeting the needs of the labour market, therefore, the training of self-analysis (reflective) abilities in study programmes allows to develop the link between theory and practice (theoretical courses are supplemented with practices, supervisions or reflections for the consolidation of feedback) and for the dissemination of good practice (students analyse and publicly present implemented projects in practice and conferences, provides proposals concerning the organisation of practice, name professional expectations and achievements, graduates share their professional experience, provide proposals for the upgrade of the study progress, social partners are invited to take part in the lectures, conferences, discussions on the contents of professional activity).

38. Assessment system must include different methods of assessment, which allow to monitor achievements of the student on the basis of outcomes achieved, coherently assess theoretical knowledge and practical abilities.

39. Assessment criteria shall show whether the quality of the student's activity meets the established criteria. Higher education institution shall detail and approve its procedure of assessment of the students based on legal acts.

40. Student assessment system and procedure shall be based on the following principles:

40.1. Validity – assessment must measure the level of achievement of study results;

40.2. Fairness – assessment results shall be objective and non-dependent from the change of the assessor, assessment methods shall be equally relevant to all persons being assessed;

40.3. Clarity – assessment system shall be informative, understandable to assessors and those being assessed;

40.4. Usefulness – assessment shall be positively evaluated by students themselves and contribute to the implementation of goals of the study programme and achievement of study results.

41. Teachers shall have knowledge of different methods of assessment, methodical aspects of application thereof and role in the process of student's achievement of knowledge and abilities, related to the qualification of engineering field.

Teacher shall have the right to choose the most proper methods of assessment in respect of the size of the group of students, targets of assessment and training of the subject taught, intended

learning outcomes and other factors. In the process of assessment of students' achievements teachers shall follow principles of objectivity, clarity, fairness, mutual respect and goodwill.

42. Procedures of assessment of student achievements shall be based on clearly formulated criteria, allowing to properly and reliably reflect the level of knowledge, abilities and practical skills, which is achieved by the student during the period of studies. Assessment criteria shall be known in advance, they shall include work implementation conditions and available resources. Assessment of works and projects shall be accompanied by constructive feedback.

43. The following methods may be used for the assessment of students' achievements:

43.1. Written or oral examination;

43.2. Colloquiums;

43.3. Tests including open and/or closed tasks;

43.4. Solving of tasks;

43.5. Report and defence of laboratory works;

43.6. Oral and poster presentations;

43.7. Written works (literature review, essays, etc.);

43.8. Report on individual or team project;

43.9. Practice report;

43.10. Final thesis (project) and defence thereof.

44. Final thesis (project), defence and assessment thereof shall generalise general and specific competencies of the student that meet qualification requirements of Professional bachelors degree, Bachelor's degree and Master's degree.

45. Student achievements may be assessed by the following methods: diagnostic (performed for the purpose of finding student's achievements and progress made in the end of a subject topic or part of the course), formative (an on-going process during the studies), accumulative (performed by summing up assessment results of interim examinations) and generalising (formally approving student's achievements in the end of the study programme).

46. Individual or collegial assessment may be applied. In collegial assessment students are examined by a commission of teachers and/or engineering specialists-scientists, practice professionals and representatives of social partners.

47. Teachers must be encouraged to seek for new integrated methods of assessment.

48. Feedback of assessment of students' achievements allows constant research and reflection on the results of cooperation within the study process (in classes and in places of practical training) and foresee the perspective of development of the study process. Effective feedback is achieved by using different forms of ensuring it, including a possibility for the student to self-reflect on what results have been achieved. A feedback received by the teacher from students is very important.

49. System of assessment of students' achievements related to the study programme shall be clearly documented and allow higher education institutions make sure that students have achieved the learning outcomes.

50. The formulation of assessment criteria shall be based on threshold level criteria defining minimal binding outcome and allowing to rate students with minimal positive grade.

CHAPTER V
REQUIREMENTS FOR THE IMPLEMENTATION OF STUDY PROGRAMMES

51. Higher education institution organising the study programme of Engineering study field shall have sufficient numbers of academic and study ancillary staff, material, methodical and information resources.

52. Teachers shall be assessed subject to their scientific, educational and practical experience, based on the following: participation in research, application of advanced teaching

methods, experience of practice in an international scientific and educational environment, ability of communication in foreign language, participation in conferences, participation in qualification development programmes and internships, acknowledgement in professional, scientific associations, professional insight, personal interest in study affairs of the students, ability to consult students on their study plans, professional career and criteria, based on which knowledge of the study programme and abilities are assessed.

53. Teachers shall be subject to the following requirements:

53.1. Only persons with a minimum of Master's qualification degree or an equivalent higher education qualification may teach in all study cycles;

53.2. At least fifty per cent of academic personnel teaching respective subjects in the Engineering study field shall have Master's qualification degree of particular Engineering study field or an equivalent higher education qualification;

53.3. Practice mentors shall have at least Master's qualification degree of the study field of respective Engineering study field or an equivalent higher education qualification and at least three years of experience in teaching subjects of the Engineering study field or practical performance;

53.4. All teachers of subjects of the study field shall link the subject taught to topics of respective Engineering study field, theoretical knowledge shall be illustrated by examples of this study field.

54. At least 10 percent of subjects of college study programme of the study field shall be taught by scientists holding a doctor's degree, performing research of respective Engineering study field and publishing findings thereof in scientific publications, also taking part in national and international scientific and practical events. At least 50 percent of programme teachers of the study field shall have an experience of practical work in the subject taught of at least three years, which shall be updated at least every five years by two months training or by practice in internship or in an in-service training, and in study programmes preparing specialists of state-regulated professions – also work experience of respective qualification related to the subject taught.

55. In the first study cycle university studies at least half of Engineering study field subjects shall be taught by scientists holding a doctor's degree, performing research of respective Engineering study field and publishing findings thereof in scientific publications, also taking part in national and international scientific events, and teachers of state regulated specialties shall have experience in respective qualification work in marine vessels, related to the subject taught. At least 10 percent of subjects of the study field of the first cycle studies shall be taught by teachers holding professor's position.

56. At least 80 percent (or 60 percent if study programme of respective Engineering study field is focused to practical performance) of teachers of the second study cycle of all study subjects shall hold a doctor's degree, out of which at least 60 percent (or 40 percent in case the study programme of respective Engineering study field is focused to practical performance) shall be engaged in scientific field, which corresponds to subjects taught by them. In case the study programme is orientated to practical performance, up to 40 percent of teachers teaching subjects of respective Engineering study field may be practitioners with at least 3 years of professional experience corresponding to specific subjects taught, gained during recent 7 years. Experience of professional performance indicated in this paragraph is binding to teachers of specialised subjects of programmes oriented to practical performance. At least 20 percent of the scope of study field subjects shall be taught by teachers holding professor's position.

57. Material and methodical base shall meet the following minimal requirements:

57.1. Auditoriums shall be equipped in a contemporary manner, include visual equipment (large auditoriums – audio equipment as well) and meet hygiene and safety requirements; the number of places in auditoriums shall coincide to the number of students of the first study cycle, not including selective and specific study subjects;

57.2. Also specialised premises, suitable for group work, and development of communication skills, etc., shall be available;

57.3. The number of computers for students' work shall satisfy the programme requirements. Computers shall include standard text and graphical software tools and an internet connection. It is necessary to have innovative teaching and engineering design software, which is not older than 5 years.

57.4. For the purpose of developing practical work abilities of respective engineering study field it is necessary to have stationary or mobile laboratories with required equipment;

57.5. Libraries and reading-rooms shall have sufficient number of scientific literature, textbooks, methodical publications, manuals in Lithuanian and foreign languages necessary to implement the study programme. Libraries shall be equipped with computers with access to internet connection and international databases, printing and copying equipment;

57.6. Higher education institutions shall have training tools (simulators and other teaching and assessment tools or equipment), which are necessary for the study programme, and employ teachers or instructors with required qualifications to work with such equipment;

57.7. Technical services shall provide sufficient conditions for formulation of practical skills of students and conditions for programme individualisation;

57.8. Studies related organisational information (study plans, subject descriptions, schedules, etc.) shall be publicly available on internet website of the higher education institution;

57.9. Measures adapted for special needs shall be contained.

58. Practice is an integral and necessary part of the first cycle studies and integrated studies. It shall guarantee the achievement of skills of practical performance foreseen by the study programme.

59. In the second study cycle, considering the nature of the study programme, either professional or scientific practice may be prescribed.

60. Practical training shall be organised in accordance with the procedure for professional practical training organisation developed by the higher education institution, which shall define the requirements for practical training, specific practical training tasks and the system for the assessment of learning outcomes (criteria used to recognise and assess the level of skills acquired by a student during the practical training), support for students during the practical training.

61. In the process of organisation of practical training, conditions of practical learning shall be provided by connecting professional activity, education and personal development.

62. The organisation of practice shall include cooperation with social partners:

62.1. Mentors assigned by social partners shall be included in the process of development of the contents of practical training tasks and organisation of practical training;

62.2. Higher education institution shall organise the training of practical training mentors (if needed), which shall ensure quality cooperation between higher education institution and the company or institution of practice, and development of integrity of theory and practice.

63. Higher education institution shall have entered into practice performance agreements with national or international industrial companies or undertakings offering modern technological basis and practical training places.

64. Higher education institutions preparing state regulated profession specialists shall perform its activity according to the requirements of standards of quality systems prepared by International Organization for Standardization.

65. The first and second cycle study programme of the study field of Engineering shall be completed by the public defence of a final thesis (project), and studies of state regulated specialties when professional qualification is awarded – by qualification awarding examination or qualification awarding examination and a public defence of a final thesis (project).

66. First study cycle final thesis (project) shall be based on independent applied or theoretical research. With the final thesis (project) a student shall demonstrate that he/she has

sufficient knowledge and has acquired necessary skills as well as sufficient experience of analytical and designing work in the study field (branch). With the final thesis (project) and defence a student shall show his/her in-depth understanding of the subject in question, ability to solve arising issues, his/her creativity, ability to use contemporary engineering analysis, measures and methods of designing and research, properly formulate conclusions, demonstrate the level of his/her understanding of social and commercial environment, legal acts and financial aspects, skills of search of information sources and analysis thereof, abilities of use of information technologies and written communications, as well as correct language use.

67. Second cycle and integral study final thesis (project) shall be based on independent scientific or applied research, application of knowledge or prepared as a project revealing the abilities conforming to programme aims. With the final thesis (project), a postgraduate shall demonstrate the level of knowledge and understanding, the ability to discuss the chosen topic, to assess the works previously performed by other individuals in the respective study field (branch), to self-study and carry out research of respective study field (branch), to describe the performed research work, to clearly and reasonably formulate research conclusions.

68. Final thesis (project) evaluation and specialty qualification awarding examination assessment Commission should consist of competent professionals of the study field – scientists, practice mentors, representatives of social partners. The final thesis (project) defence Commission shall include at least one member of other academic and research institutions.

CHAPTER VI
DESCRIPTOR OF LEVELS OF ACHIEVED LEARNING OUTCOMES

69. The following learning outcomes are divided into three achievement levels: threshold (minimal requirements), typical (standard, average requirements) and excellent (above average requirements). Threshold level shall be understood as a level that must be achieved by all students acquiring higher education qualification.

70. Levels of learning outcomes achieved by the students of the first cycle college studies:

70.1. Excellent achievement level:

70.1.1. Respective knowledge of engineering study field and practical abilities related thereto are comprehensive, it outreaches the information given during the studies;

70.1.2. Original conclusions and excellent perception of respective engineering activity is demonstrated in the analysis and discussion of work results;

70.1.3. Knowledge and practical skills of respective study field of engineering are quickly adapted to on-going and usually unpredictable changes determined by progress of knowledge and technologies;

70.1.4. Routine calculations, explanations, interpretations and analyses are performed quickly, fluently and precisely. Ability to apply analytical and modelling methods is demonstrated;

70.1.5. New knowledge in the engineering field is acquired quickly and definitely. Holds excellent general abilities and perfectly manages agenda;

70.1.6. Upon acquiring of professional experience a graduate must be an excellent engineering practitioner. Career perspectives are related to engineering activity of a respective study field and to managing responsibility.

70.2. Typical achievement level:

70.2.1. Knowledge and practical skills of respective study field of engineering are good, however, are limited to those provided during the study programme;

70.2.2. Analysing and considering work results a graduate understands what type of knowledge and abilities may be applied in new situations of a respective engineering study field activity;

70.2.3. Ability to apply problem solving methods of respective engineering study field, based on which pre-known changes and engineering progress is assessed;

70.2.4. Ability to precisely perform routine preparation and control actions of engineering equipment and processes;

70.2.5. Ability to easily acquire new knowledge, hold good general perceptions and being able to manage agenda. External assistance will be needed in the beginning of the career;

70.2.6. Upon acquiring of professional experience a graduate shall be a good engineer practitioner. Career perspectives are related to engineering activity of a respective study field and to management responsibility.

70.3. Threshold achievement level:

70.3.1. Basic level of knowledge and practical abilities of a respective engineering study field;

70.3.2. A graduate understands the type of general knowledge that may be applied in new situations, however, does not have abilities and self-confidence to use them;

70.3.3. A student is ready to implement traditional activity of a respective engineering study field, however, he requires help and control;

70.3.4. Is able to perform uncomplicated calculations, explain general results, however, requires help and control;

70.3.5. A graduate of this level should be able to take a position of a technical or general manager (assistant). Upon acquiring of respective professional experience could become a good practitioner of a particular field, which essentially requires knowledge and understanding of materials and typical or ordinary technologies, but does not require regular application of fundamental knowledge.

71. Levels of learning outcomes achieved by the students of the first cycle university studies:

71.1. Excellent achievement level:

71.1.1.Respective knowledge of engineering study field, systemic perception and practical abilities related thereto are comprehensive, it outreaches the information given during the studies;

71.1.2. Original systematic thinking, excellent knowledge of literature and perception of respective practical engineering activity is demonstrated in the analysis and discussion of work results;

71.1.3. Knowledge and practical skills of respective study field of engineering are quickly adapted to on-going and usually unpredictable changes determined by progress of knowledge and technologies;

71.1.4. Routine calculations, interpretations, analyses and explanations are performed quickly, fluently and precisely. Ability to choose and apply suitable analytical and modelling methods is demonstrated; critical assessment of issues and solutions thereto;

71.1.5. New knowledge in the engineering field is acquired quickly and definitely. Holds excellent general abilities and perfectly manages agenda;

71.1.6. A graduate of this level is recommended to continue studies in the second cycle studies;

71.1.7. Upon acquiring of professional experience a graduate must be an excellent engineer-innovator. Career perspectives include research, innovation development, management of activities of a respective field of engineering and significant managing responsibility.

71.2. Typical achievement level:

71.2.1. Knowledge, systematic understanding as well as related practical skills of respective study field of engineering are good, however, are limited to those provided during the study programme;

71.2.2. Analysing and considering work results a graduate understands what type of knowledge and abilities may be applied in new situations of a respective engineering study field activity. Is able to use scientific literature for a task of engineering activity;

71.2.3. Is able to quickly apply problem solving methods of a respective engineering study field, based on which pre-known changes and engineering progress is assessed;

71.2.4.Is able to precisely perform regular calculations, interpretations, analysis and explanations, is able to apply mastered analytical and modelling methods;

71.2.5. Is able to easily acquire new knowledge, holds good general perceptions and well manages agenda. External assistance will be needed in the beginning of the working career;

71.2.6. Graduates of this level may study in the second cycle studies;

71.2.7. Upon acquiring of professional experience a graduate should be a good engineer. Career perspectives include research, innovation development, management of activities of respective field of engineering and significant managing responsibility.

71.3. Threshold achievement level:

71.3.1. Basic level of knowledge, perception and related practical abilities of a respective engineering study field;

71.3.2. A graduate understands the type of general knowledge that may be applied in new situations, however, lacks abilities and self-confidence to use such knowledge;

71.3.3.Is able to apply problem solving methods of a respective engineering study field, however, requires help and control;

71.3.4. Is able to perform regular calculations, interpretations, result analysis and explanations, however, requires help and control;

71.3.5. Is minimally prepared for second cycle studies;

71.3.6. A graduate of this level should be good at technical or general managing (assistant) position. Upon acquiring of respective professional experience could become a good engineer particular fields, which do not require regular application of fundamental knowledge and systematic perception.

72. Levels of learning outcomes achieved by the students of the second cycle and integrated university studies:

72.1. Excellent achievement level:

72.1.1. Fundamental understanding of the studied and relating fields and practical abilities related thereto are comprehensive, it outreaches the information given during the studies;

72.1.2. Original analytical thinking, excellent knowledge of literature and perception of respective practical engineering activity is demonstrated in the analysis and discussion of work results;

72.1.3. Is able to plan and implement research;

72.1.4. Knowledge and practical skills of the studies and relating study fields are quickly adapted in practice even in cases when practice and its environment immensely varies, changes are difficult to anticipate, practice is based on constantly changing combinations of tasks;

72.1.5. Calculations, interpretations, analyses and explanations, which require deeper knowledge, are performed quickly, fluently and insightfully, by applying theoretical models and methods of research to the solution and critical assessment of issues and solutions thereto;

72.1.6. New knowledge in the engineering field is acquired quickly and definitely. Holds excellent general abilities and perfectly manages agenda;

72.1.7. Graduates of this level are recommended to continue with their doctoral studies;

72.1.8. Upon acquiring of professional experience a graduate must be an excellent engineer-analyst, able to demonstrate high expert abilities. Career perspectives include research, innovation development, management of activities of studied and relating study fields and significant managing responsibility.

72.2. Typical achievement level:

72.2.1. Fundamental perception of the studied and relating study fields and practical skills related thereto are good, however, are limited to those provided during the study programme;

72.2.2. Analysing and considering work results a graduate understands what type of knowledge and abilities may be applied in new activity situations of the studied and relating study fields, is able to understand scientific literature, is able to plan and implement research;

72.2.3. Is able to apply knowledge and practical abilities in engineering activity of the studied and relating study fields to constant, usually unpredictable changes occurring due to the progress in knowledge and technologies;

72.2.4. Is able to precisely perform calculations, interpretations, analysis and explanations, which require deeper knowledge, applies theoretical models and research techniques in making solutions;

72.2.5. Is able to acquire new knowledge, holds good general perceptions and knows how to manage agenda;

72.2.6. Graduates of this level may continue to the doctoral studies;

72.2.7. Upon acquiring of professional experience a graduate should be a good engineer, able to show goods analytical knowledge. Career perspectives include research, innovation development, management of activities of respective and relating study fields of engineering and significant managing responsibility.

72.3. Threshold achievement level:

72.3.1. Basic level of fundamental perception and related practical abilities of the studied and relating study fields;

72.3.2. A graduate understands the type of general knowledge that may be applied in new situations, however, lacks abilities and self-confidence to use such knowledge;

72.3.3. Is able to apply problem solving methods of the studied engineering study field, which are used for assessment of pre-known changes and engineering progress;

72.3.4. Is able to perform calculations, which require deeper knowledge, interpretations and result analysis , however, requires support and control;

72.3.5. Upon acquiring of minimal preparation is suitable for further doctoral studies;

72.3.6. A graduate of this level should be suitable for higher technical or general managing position. Upon acquiring of respective professional experience could become a good engineer of a particular field.

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Annex 1 to the
Descriptor of the Group of Study
Fields of Engineering

DESCRIPTOR OF THE STUDY FIELD OF GENERAL ENGINEERING

CHAPTER I
GENERAL PROVISIONS, CONCEPT AND SCOPE OF THE STUDY FIELD

1. The Descriptor of the Study Field of General Engineering (hereinafter referred to as the "Descriptor") shall govern the special requirements applied to the study programmes of the study field of General Engineering.

2. The Descriptor shall apply to college and first and second cycle university study programmes of the study field of General Engineering.

3. The Descriptor shall apply to the following branches of the study field of General Engineering: Integrated Engineering, Safety Engineering, Engineering Design, Measurement Engineering, Biomechanical Engineering, Biomedical Engineering, Environmental Engineering, Biosystem Engineering.

4. General engineering is an interdisciplinary scientific and practical area of engineering aimed at creating tools, instruments and systems to meet the needs of an individual and society, efficiently using natural resources, assessing and managing the risks caused by materials and phenomena. It applies the principles of technologies and the science of engineering when creating, planning, designing technological equipment, tools and systems targeted at improving life quality, and evaluating them from the technological, technical, safety, environmental, economical, managerial and other aspects. Studies of the study field of General Engineering shall provide a person with higher education which, combined with practical experience, forms a sufficient basis of engineer's professional activity.

CHAPTER II
GENERAL AND SPECIAL LEARNING OUTCOMES

5. When developing new study programmes, the main learning outcomes of study programmes of the study field of General Engineering, provided in this chapter, should be specified in such a way that the study programme best meets the specific requirements for the study field or branch of General Engineering.

6. College and first cycle university study programmes of the study field of General Engineering, which aim at preparing engineers, are based on the same knowledge of fundamental science necessary for engineering activities, provide the same main engineering abilities, aim at providing and improving general engineering competences, yet college studies are more targeted at the application of scientific knowledge and typical engineering solutions verified in practice, whereas the objectives of university study programmes also cover perception and application of latest knowledge, solving non-typical tasks in non-typical settings, and finding new engineering solutions.

7. Upon completion of college studies, persons shall:

7.1. Acquire the following knowledge and abilities:

7.1.1. Knowledge of the general consistent patterns and laws of natural sciences and mathematics, which is required for understanding of the fundamentals of the study field of General Engineering;

7.1.2. Knowledge of the key concepts of the study field and branches of General Engineering and understanding of their content;

7.1.3. Basic knowledge of general engineering;

7.1.4. Knowledge of the context of the problems of adjacent fields of study and their solutions.

7.2. Be able to perform engineering analysis:

7.2.1. Ability to apply their knowledge and understanding when solving the problems of the study field of General Engineering and ability to creatively apply familiar methods;

7.2.2. Ability to apply their knowledge and understanding when analysing engineering tasks and choosing appropriate methods, experimental and industrial equipment to solve them;

7.2.3. Ability to apply analytical and modelling methods when solving engineering tasks of the study field of General Engineering.

7.3. Have knowledge and skills necessary to perform design works of the study field of General Engineering:

7.3.1. Ability to apply engineering knowledge and understanding when formulating and performing design tasks according to the defined requirements;

7.3.2. Understanding of design methodologies and ability to apply them.

7.4. Be able to conduct applied research:

7.4.1. Ability to find necessary professional information in databases and other scientific and engineering information sources;

7.4.2. Ability to carry out experiments when solving engineering tasks, process their findings and present practical conclusions of these findings;

7.4.3. Skills of working with equipment used in the study field of General Engineering.

7.5. Have practical knowledge and skills when solving engineering tasks:

7.5.1. Ability to choose engineering solutions as well as tools and equipment necessary to implement these solutions;

7.5.2. Ability to combine theoretical and applied knowledge when solving engineering problems;

7.5.3. Understanding of the ethical, environmental and commercial circumstances of engineering activities;

7.5.4. Understanding of engineering activity organisation principles, knowledge of the main requirements for occupational and fire safety.

7.6. Have the following personal and social abilities:

7.6.1. Ability to solve engineering tasks individually and in a team;

7.6.2. Ability to communicate with engineering community and the general public;

7.6.3. Understanding of the impact of engineering solutions on society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for the outcomes of engineering activities;

7.6.4. Knowledge of the key aspects of project implementation and management on the level of engineering activities;

7.6.5. Perception of the importance of individual lifelong learning and preparation thereof.

8. Upon completion of first cycle university studies, persons shall:

8.1. Acquire the following knowledge and abilities:

8.1.1. Knowledge and understanding of the basics of natural sciences and mathematics required for understanding of the fundamentals of the study field of General Engineering;

8.1.2. Knowledge and systematic understanding of the key theoretical and applied basics and concepts of the study field of General Engineering;

8.1.3. Basic coherent knowledge of the study field of General Engineering, which corresponds to the study programme;

8.1.4. Knowledge of a wider multidisciplinary engineering context, ability to apply methods and processes of other fields of science.

8.2. Be able to perform engineering analysis:

8.2.1. Ability to apply their knowledge and understanding when formulating and solving the problems of the study field of General Engineering, choosing appropriate methods;

8.2.2. Ability to apply their knowledge and understanding when formulating and analysing engineering tasks and choosing appropriate methods, experimental and industrial equipment to solve them;

8.2.3. Ability to choose and apply appropriate analytical and modelling methods of the study field of General Engineering.

8.3. Have knowledge and skills necessary to perform design works of the study field of General Engineering:

8.3.1. Ability to apply engineering knowledge and understanding of the study field of General Engineering when developing and implementing projects which comply with the defined requirements;

8.3.2. Understanding of design methodologies and ability to apply them.

8.4. Be able to conduct fundamental and applied research:

8.4.1. Ability to find necessary scientific and professional information in databases and other information sources;

8.4.2. Ability to plan and carry out necessary experiments, process and evaluate their data and present conclusions;

8.4.3. Skills of working with equipment used in the study field and branches of General Engineering.

8.5. Have the abilities of practical work when solving engineering tasks:

8.5.1. Ability to choose and apply appropriate methods, tools and equipment for the implementation of engineering solutions, knowledge of the structures, principles of operation and functions of this engineering equipment, as well as basic abilities to use it;

8.5.2. Ability to combine theoretical and applied knowledge when solving engineering problems;

8.5.3. Understanding and evaluation of the ethical, environmental and commercial circumstances of engineering activities;

8.5.4. Understanding of the principles of organisation of engineering activities, the importance of occupational and fire safety as well as the key requirements and engineering activity chain interaction.

8.6. Have the following personal and social abilities:

8.6.1. Ability to efficiently work individually and in a team;

8.6.2. Ability to communicate with engineering community and the general public;

8.6.3. Holistic understanding of the impact of engineering solutions on society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for engineering activities;

8.6.4. Knowledge of the aspects of project management and business, understanding of the connections between technological solutions and their economic outcomes;

8.6.5. Perception of the importance of individual lifelong learning and preparation for it.

9. Upon completion of second cycle university studies, persons shall:

9.1. Acquire the following knowledge and abilities:

9.1.1. Good knowledge and ability to creatively apply the basics of natural sciences and mathematics, thorough knowledge and understanding of the principles of the study field of General Engineering and ability to apply them when solving new engineering tasks;

9.1.2. Knowledge and critical evaluation of the latest achievements in engineering.

9.2. Be able to perform engineering analysis:

9.2.1. Ability to solve non-typical, non-strictly defined and non-exhaustively described problems;

9.2.2. Ability to envisage standard and non-standard engineering problems, clearly formulate and solve them;

9.2.3. Ability to use their knowledge and understanding when solving practical engineering tasks by applying theoretical models and research methods, including mathematical analysis, computational modelling and experimental research methods;

9.2.4. Understanding of the importance of social, health, occupational and fire safety, environmental and commercial requirements;

9.2.5. Ability to apply innovative methods when solving specific problems and implementing their solutions.

9.3. Have knowledge and skills necessary to perform design works of the study field of General Engineering:

9.3.1. Ability to apply their knowledge and understanding when solving non-standard problems, including those related to other fields of science and engineering studies;

9.3.2. Ability to innovatively develop new and original engineering ideas and methods;

9.3.3. Ability to make engineering decisions, having encountered multiple, technically undefined and not clearly described problems.

9.4. Be able to conduct fundamental and applied research:

9.4.1. Ability to recognise, find and evaluate data necessary for engineering work using databases and other information sources;

9.4.2. Ability to plan and conduct analytical, modelling and experimental research, critically evaluate its data and present conclusions;

9.4.3. Ability to explore applicability of new methods and ways of solving engineering problems of the study field of General Engineering.

9.5. Have the abilities of practical work when solving engineering tasks:

9.5.1. Ability to combine the knowledge of different study fields and solve multiple engineering problems;

9.5.2. Thorough understanding of applied methods and methodologies as well as their limitations, ability to select engineering equipment and software;

9.5.3. Knowledge of ethical, environmental and commercial requirements of engineering equipment;

9.5.4. Knowledge of engineering activity organisation principles, understanding of its chain interaction, ability to evaluate engineering activities from the aspects of occupational safety and environment protection.

9.6. Have the following personal and social abilities:

9.6.1. Ability to efficiently work individually and in a team, be leader of a team which may consist of representatives of various study fields and levels;

9.6.2. Ability to communicate with engineering community and the general public on both national and international level;

9.6.3. Holistic understanding of the impact of engineering solutions on society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for engineering activities;

9.6.4. Very good knowledge of the aspects of project management and business, understanding of the connections between technological solutions and their economic outcomes.

CHAPTER III
TEACHING, LEARNING, ASSESSMENT, REQUIREMENTS FOR THE IMPLEMENTATION OF STUDY PROGRAMMES AND DESCRIPTOR OF LEVELS OF ACHIEVED LEARNING OUTCOMES

10. The requirements for teaching, learning, assessment and implementation of study programmes comply with the requirements presented in the Descriptor of the Group of Study Fields of Engineering.

11. The achieved level of learning outcomes is the description of student's knowledge and practical abilities, related to academic and/or professional career opportunities.

12. The following study achievement levels of graduates of the study field of General Engineering shall be distinguished: threshold (minimum requirements), typical (standard, average requirements) and excellent (higher than average requirements). The threshold achievement level is the level to be achieved by all students who acquire a higher education qualification.

13. The levels of the learning outcomes of college studies are the following:

13.1. Excellent achievement level**:**

13.1.1. General engineering knowledge and related practical abilities are comprehensive and are not limited to information gained during studies;

13.1.2. Analysis and consideration of work results clearly reveals original thinking and excellent knowledge of general engineering activities;

13.1.3. Knowledge and practical abilities are quickly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

13.1.4. Common calculations, explanations, interpretations and analyses are performed quickly, smoothly and accurately; analytical and modelling methods are applied;

13.1.5. New knowledge of general engineering is acquired quickly and with certainty. Excellent general abilities, good agenda management;

13.1.6. Graduates of this level may enrol in Master's studies;

13.1.7. Upon acquisition of professional experience, graduates should be excellent engineers-practitioners. Career prospects are related to engineering activities of the study field (branch) of General Engineering and managerial responsibility. They may quickly occupy the position of a high-level operator.

13.2. Typical achievement level**:**

13.2.1. General engineering knowledge and related practical abilities are good, yet limited to what is provided by the programme;

13.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of General Engineering;

13.2.3. Ability to apply methods of solving problems of the study field of General Engineering, which help to evaluate changes known in advance and the progress of general engineering;

13.2.4. Common actions of preparation and operation of general engineering equipment and processes are performed accurately;

13.2.5. Ability to quickly acquire new knowledge, good general abilities and ability to manage the agenda. External assistance needed at the beginning of career;

13.2.6. Graduates of this level may enrol in Master's studies;

13.2.7. Upon acquisition of professional experience, graduates should be good engineers-practitioners. Career prospects are related to engineering activities of the study field (branch) of General Engineering and managerial responsibility. They may occupy the position of a higher-level operator.

13.3. Threshold achievement level:

13.3.1. Basic general engineering knowledge and practical abilities;

13.3.2. Graduates understand which general knowledge could be applied in new situations, yet they do not have abilities and confidence how to use it;

13.3.3. Students are ready to perform common activities of the study field of General Engineering, yet they need assistance and control;

13.3.4. Ability to perform simple calculations, explain typical results, yet assistance and control is needed;

13.3.5. Minimum preparation for further studies;

13.3.6. Graduates of this level should be suitable for the position of a technical or general operator (assistant). Upon acquisition of professional experience in general engineering, graduates should become good practitioners of the specific field which requires knowledge and understanding of materials, typical and common technologies, yet does not require regular application of fundamental knowledge.

14. The levels of the learning outcomes of first cycle university studies are the following:

14.1. Excellent achievement level:

14.1.1. General engineering knowledge and systematic understanding as well as related practical abilities are comprehensive and are not limited to information gained during studies;

14.1.2. Analysis and consideration of work results clearly reveals original systematic thinking and excellent knowledge of theoretical material and practical general engineering activities;

14.1.3. Knowledge and practical abilities are quickly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

14.1.4. Typical calculations, interpretations, analyses and explanations are performed quickly, smoothly and accurately; ability to select and apply adequate analytical and modelling methods; the problem and its solutions are evaluated critically;

14.1.5. New general engineering knowledge is acquired quickly and confidently; excellent general abilities and good management of the agenda;

14.1.6. Graduates of this level are recommended to enrol in Master's studies;

14.1.7. Upon acquisition of professional experience, graduates should be excellent engineers-innovators. Career prospects cover research, creation of innovations, administration of engineering activities of the study field (branch) of General Engineering as well as significant managerial responsibility. Graduates may quickly occupy the position of a high-level operator or engineering administrator.

14.2. Typical achievement level:

14.2.1. General engineering knowledge and systematic understanding as well as related practical abilities are good yet limited to information gained during studies;

14.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of General Engineering. Graduates are able to use scientific literature to perform an engineering activity task of the study field of General Engineering;

14.2.3. Ability to quickly apply methods of solving problems of the study field of General Engineering, which help to evaluate changes known in advance and the progress of general engineering;

14.2.4. Typical calculations, interpretations, analyses and explanations are performed accurately; ability to apply mastered analytical and modelling methods;

14.2.5. Ability to quickly acquire new knowledge, good general abilities and good ability to manage the agenda. External assistance needed at the beginning of career;

14.2.6. Graduates of this level may enrol in Master's studies;

14.2.7. Upon acquisition of professional experience, graduates should be good engineers. Career prospects cover research, creation of innovations, administration of engineering activities of the study field (branch) of General Engineering; significant managerial responsibility and career development to the position of a higher-level operator may be expected.

14.3. Threshold achievement level:

14.3.1. Basic knowledge and understanding of the study field of General Engineering, practical abilities;

14.3.2. Graduates understand which general knowledge could be applied in new situations, yet they lack abilities and confidence how to use it;

14.3.3. Ability to apply methods of solving problems of the study field of General Engineering, yet assistance and control is needed;

14.3.4. Ability to perform typical calculations, interpretations, result analyses and explanations, yet assistance and control is needed;

14.3.5. Graduates are prepared for Master's studies to a minimum extent;

14.3.6. Graduates of this level should be suitable for the position of a technical or general operator (assistant). Upon acquisition of professional experience of the study field (branch) of General Engineering, graduates should become good engineers of the specific field which does not require regular application of fundamental knowledge and systematic understanding.

15. The levels of the learning outcomes of second cycle university studies are the following:

15.1. Excellent achievement level:

15.1.1. Fundamental understanding of the study field of General Engineering and adjacent study fields and related practical abilities are comprehensive and are not limited to information gained during studies;

15.1.2. Analysis and consideration of work results clearly reveals original analytical thinking, excellent knowledge of literature and appropriate general engineering activities;

15.1.3. Graduates are able to plan and conduct scientific research;

15.1.4. Ability to quickly apply knowledge and practical abilities also in intensively changing activities and setting, when changes are hard to predict and activities consist of constantly changing task combinations;

15.1.5. Calculations, interpretations, analyses and explanations that require deeper knowledge are performed quickly, smoothly, accurately and with insight; theoretical models and research methods are applied, and the problem and its solution are evaluated critically;

15.1.6. New general engineering knowledge is acquired quickly and confidently; excellent general abilities and good management of the agenda;

15.1.7. Graduates of this level are recommended to enrol in doctoral studies;

15.1.8. Upon acquisition of professional experience, graduates should be excellent engineers-analysts able to demonstrate good expert competences. Career prospects cover scientific research, creation of innovations, administration of engineering activities of the study field of General Engineering and adjacent study fields as well as significant managerial responsibility. Graduates may quickly occupy the position of a top level operator or engineering administrator.

15.2. Typical achievement level:

15.2.1. Fundamental understanding of the study field of General Engineering and adjacent study fields as well as related practical abilities are good, yet limited to what is provided by the programme;

15.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of General Engineering and adjacent study fields and are able to understand scientific literature, plan and conduct scientific research;

15.2.3. Knowledge and practical abilities are adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

15.2.4. Calculations, interpretations, analyses and explanations that require deeper knowledge are performed accurately; mastered theoretical models and research methods are applied for problem solving;

15.2.5. Ability to acquire new knowledge; good general abilities and ability to manage the agenda;

15.2.6. Graduates of this level may enrol in doctoral studies;

15.2.7. Upon acquisition of professional experience, graduates should be good engineers able to demonstrate good analyst competences. Career prospects cover scientific research, creation of innovations, administration of engineering activities of the study field of General Engineering and adjacent study fields as well as significant managerial responsibility. Graduates are ready to occupy the position of a high-level operator or engineering administrator.

15.3. Threshold achievement level:

15.3.1. Basic understanding of the study field of General Engineering and adjacent study fields as well as practical abilities;

15.3.2. Understanding which general knowledge could be applied in new situations, yet lack of knowledge and confidence how to use this knowledge;

15.3.3. Ability to apply methods of solving problems of the study field of General Engineering, which help to evaluate changes known in advance and the progress of engineering;

15.3.4. Ability to perform calculations, interpretations and result analyses that require more thorough knowledge, yet assistance and control is needed;

15.3.5. Minimum preparation for further doctoral studies;

15.3.6. Graduates of this level will be suitable for the position of a senior technical or general operator. Upon acquisition of professional experience in general engineering, graduates should become good engineers of the field.

Annex 2
To the Descriptor of the Group of Study Fields of Engineering

DESCRIPTOR OF THE STUDY FIELD OF CIVIL ENGINEERING

CHAPTER I
GENERAL PROVISIONS, CONCEPT AND SCOPE OF THE STUDY FIELD

1. The Descriptor of the Study Field of Civil Engineering (hereinafter referred to as the "Descriptor") shall govern the special requirements applied to the study programmes of the study field of Civil Engineering.
2. The Descriptor shall apply to higher education college, first cycle and second cycle university study programmes of the study field of Civil Engineering.
3. The study field of Civil Engineering belongs to the area of technological sciences. The study field consists of the following branches: Structural Engineering, Road Engineering, Water Engineering, Building Services Systems, Geotechnical Engineering, Geodesy and Urban Engineering.
4. Civil Engineering is a focussed activity aimed at design, efficient and safe use of equipment, other means and systems that require natural resources and phenomena in order to meet people's needs for housing, work and recreation in built-up environment. Engineering activities are systematic works based on research and practical experience that are aimed at the development of new building materials, constructions of structures, technologies for their construction or major improvement of already existing ones, designing, planning and organisation of construction. During the studies of the study field of Civil Engineering, the person shall acquire higher education which along with practical experience shall form a sufficient basis for the professional activities as a civil engineer. Civil Engineering includes residential and non-residential buildings, special and hydro-technical structures, buildings used for sports and other purposes, communications and engineering networks.

CHAPTER II
GENERAL AND SPECIAL LEARNING OUTCOMES

5. Higher education college and first cycle university study programmes of the study field of Civil Engineering shall build on the same knowledge of fundamental sciences required for engineering activities, provide the same key engineering abilities and aim at providing and improving the competences of the study field of Civil Engineering, yet higher education college studies shall be more targeted at the application of scientific knowledge and typical engineering solutions verified in practice, whereas the objectives of university study programmes shall also include acquisition and application of latest knowledge, solving untypical tasks in untypical environment, and finding new engineering solutions.
6. After completing higher education college studies, the person shall:
6.1. Acquire the following knowledge and abilities:
6.1.1. Know general consistent patterns and laws of natural sciences and mathematics required for understanding the fundamentals of the study field of Civil Engineering corresponding to the study programme;
6.1.2. Know the key concepts of the study field of Civil Engineering and understand their content;
6.1.3. Have major knowledge of Civil Engineering which is important in practical work;
6.1.4. Know the context of problems of adjacent study fields and their solutions.
6.2. Be able to perform engineering analysis:

6.2.1. Be able to apply their knowledge and understanding when solving the problems of the study field of Civil Engineering through creative application of familiar methods;
6.2.2. Be able to apply their knowledge and understanding in the analysis of the tasks of the study field of Civil Engineering and choose appropriate methods, experimental and industrial equipment to fulfil them.
6.2.3. Be able to apply analytical and modelling methods when fulfilling engineering tasks of the study field of Civil Engineering;
6.3. Have knowledge and skills required for design works of the study field of Civil Engineering:
6.3.1. Be able to apply engineering knowledge and understanding when formulating and performing design tasks of the study field of Civil Engineering in accordance with the defined requirements;
6.3.2. Understand design methodologies and be able to apply them.
6.4. Be able to conduct applied research:
6.4.1. Be able to find required professional information in databases and other sources of scientific and engineering information;
6.4.2. Be able to carry out experiments intended for fulfilment of engineering tasks, process their findings and present practical conclusions of the findings;
6.4.3. Have skills of operating equipment used in the study field of Civil Engineering;
6.5. Have the following practical knowledge and skills required for fulfilling engineering tasks:
6.5.1. Be able to choose engineering solutions, tools and equipment required for the implementation of these solutions;
6.5.2. Be able to combine theoretical and applied knowledge when solving engineering problems of the construction sector;
6.5.3. Understand ethical, environmental and commercial circumstances of engineering activities;
6.5.4. Understand the principles of organisation of engineering activities, know the main occupational and fire safety requirements.
6.6. Have the following personal and social abilities:
6.6.1. Be able to fulfil engineering tasks individually and in a team;
6.6.2. Have good skills of communication with the engineering community and the general public;
6.6.3. Understand the impact of engineering solutions on society and environment, adhere to the standards of professional ethics and engineering activity, and understand responsibility for the outcomes of engineering activities;
6.6.4. Know well the key aspects of project implementation and management at the level of engineering activities;
6.6.5. Understand the importance of individual life long learning and prepare for it.
7. After completing first cycle university studies, the person shall:
7.1. Acquire the following knowledge and abilities:
7.1.1. Know and understand the fundamentals of natural sciences and mathematics required for understanding the fundamentals of the study field of Civil Engineering;
7.1.2. Know and systematically understand the key theoretical and applied fundamentals and concepts of the study field of Civil Engineering;
7.1.3. Have basic coherent knowledge of Civil Engineering;
7.1.4. Know a broader multidisciplinary context of engineering, be able to adapt methods and processes of other scientific fields.
7.2. Be able to perform engineering analysis:

7.2.1. Be able to apply knowledge and understanding when formulating and solving the problems of the study field of Civil Engineering by choosing appropriate methods;
7.2.2. Be able to apply their knowledge and understanding when formulating and analysing of the tasks of the study field of Civil Engineering and choose appropriate methods, experimental and industrial equipment to fulfil them;
7.2.3. Be able to choose and apply appropriate analytical and modelling methods of the study field of Civil Engineering.
7.3. Have knowledge and skills required for design works of the study field of Civil Engineering:
7.3.1. Be able to apply engineering knowledge and understanding of the study field of Civil Engineering when developing and implementing projects in accordance with the defined requirements;
7.3.2. Understand design methodologies and be able to apply them.
7.4. Be able to conduct fundamental and applied research:
7.4.1. Be able to find required scientific and professional information in databases and other sources of scientific and engineering information;
7.4.2. Be able to plan and carry out required experiments, process and evaluate their data as well as present conclusions;
7.4.3. Have skills required for operating equipment used in the study field of Civil Engineering.
7.5. Have abilities of practical work when fulfilling engineering tasks:
7.5.1. Be able to choose and apply appropriate methods, tools and equipment for the implementation of engineering solutions, know structures of engineering equipment and principles of its functioning, have basic abilities to use it;
7.5.2. Be able to combine theoretical and applied knowledge when solving engineering problems;
7.5.3. Understand and evaluate ethical, environmental and commercial circumstances of engineering activities;
7.5.4. Understand the principles of organisation of engineering activities, the importance of occupational and fire safety as well as key requirements, the interaction between the links of engineering activities.
7.6. Have the following personal and social abilities:
7.6.1. Be able to efficiently work individually and in a team;
7.6.2. Have good skills of communication with the engineering community and the general public;
7.6.3. Have holistic understanding of the impact of engineering solutions on society and environment, adhere to the standards of professional ethics and engineering activity, understand responsibility for engineering activities;
7.6.4. Know well the aspects of project management and business, understand the links between technological solutions and their economic outcomes;
7.6.5. Understand the importance of individual life long learning and prepare for it.
8. After completing the second cycle studies, the person shall:
8.1. Acquire the following knowledge and abilities:
8.1.1. Know well and be able to creatively apply the fundamentals of natural sciences and mathematics, have through knowledge and understanding of the principles of the study field of Civil Engineering and be able to apply them when fulfilling new engineering tasks;
8.1.2. Know and critically evaluate the latest achievements in the area of Civil Engineering.
8.2. Be able to perform engineering analysis:
8.2.1. Be able to solve problems that are not typical, defined strictly and exhaustively described;

8.2.2. Be able to envisage standard and non-standard engineering problems, formulate them clearly and solve them;
8.2.3. Be able to use their knowledge and understanding when fulfilling practical tasks of the study field of Civil Engineering by adapting theoretical models and research methods, including mathematical analysis, computational modelling and experimental research methods;
8.2.4. Understand the importance of social, health, occupational and fire safety, environmental and commercial requirements;
8.2.5. Be able to apply innovative methods when solving specific problems and implementing their solutions.
8.3. Have knowledge and skills required for design works of the study field of Civil Engineering:
8.3.1. Be able to apply their knowledge and understanding when solving non-standard problems, including the ones related to other scientific and engineering study fields;
8.3.2. Be able to innovatively develop new and original engineering ideas and methods;
8.3.3. Be able to make engineering decisions having encountered multi-faceted, technically undefined and clearly undescribed problems.
8.4. Be able to conduct fundamental and applied research:
8.4.1. Be able to recognise, find and evaluate the data required for engineering work by using databases and other sources of scientific and engineering information;
8.4.2. Be able to plan and conduct analytical, modelling and experimental research, be able to critically evaluate its data and provide conclusions;
8.4.3. Be able to explore applicability of new methods and ways for solving engineering problems of the study field of Civil Engineering.
8.5. Have skills of practical work to fulfil engineering tasks of the study field of Civil Engineering:
8.5.1. Be able to combine knowledge of different study fields into a whole and solve multi-faceted engineering problems;
8.5.2. Understand thoroughly applied methods and methodologies and their limitations, be able to select engineering equipment and software;
8.5.3. Know well ethical, environmental and commercial requirements for engineering activities;
8.5.4. Know the principles of organisation of engineering activities, understand the interaction between its links, be able to evaluate engineering activities from occupational safety and environmental perspectives.
8.6. Have the following personal and social abilities:
8.6.1. Be able to efficiently work individually and in a team, be able to lead a team which may consist of representatives of different study fields and levels;
8.6.2. Have good skills of communication with the engineering community and the general public at the national and international level;
8.6.3. Understand holistically the impact of engineering solutions on society and environment, adhere to the standards of professional ethics and engineering activity, understand responsibility for engineering activities;
8.6.4. Have very good knowledge of the aspects of project management and business, understand the links between technological solutions and their economic outcomes.

CHAPTER III
TEACHING, LEARNING, ASSESSMENT, REQUIREMENTS FOR THE IMPLEMENTATION OF STUDY PROGRAMMES AND DESRIPTOR OF LEVELS OF ACHIEVED LEARNING OUTCOMES

9. The requirements for teaching, learning, assessment and implementation of study programmes shall comply with the requirements provided in the Descriptor of the Group of Study Fields of Engineering.
10. The following achievement levels of learning outcomes attained by graduates of the study field of Civil Engineering shall be distinguished: threshold (minimum requirements), typical (standard, average requirements) and excellent (higher than average requirements). The threshold achievement level shall be the level to be achieved by all students who acquire a higher education qualification.
11. The levels of the learning outcomes achieved in higher education college studies shall be the following:
11.1. Excellent achievement level:
11.1.1. Civil engineering knowledge and related practical abilities are comprehensive and not limited to information gained during studies;
11.1.2. Analysis and consideration of work results clearly reveal original thinking and excellent knowledge of civil engineering activities;
11.1.3. Knowledge and practical abilities are rapidly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;
11.1.4. Ordinary calculations, explanations, interpretations and analyses are performed rapidly, smoothly and accurately; analytical and modelling method are applied;
11.1.5. New knowledge of civil engineering is acquired quickly and with certainty, graduates have excellent general abilities and the ability to manage the agenda well;
11.1.6. Graduates of this level may enrol in Master's studies;
11.1.7. Upon acquisition of professional experience, the graduate should become an excellent civil engineer. Career prospects are related to civil engineering activities and managerial responsibility.
11.2. Typical achievement level:
11.2.1. Civil engineering knowledge and related practical abilities are good, yet limited to the material provided during studies;
11.2.2. While analysing and considering the results of work, the graduate understands what knowledge and abilities may be adapted in new situations of civil engineering activities;
11.2.3. The graduate is able to apply the methods for solution of problems in the study field of Civil Engineering which help to evaluate changes that are known in advance and the progress of civil engineering;
11.2.4. Ordinary actions related to preparation and operation of civil engineering equipment and processes are performed accurately;
11.2.5. The graduate is able to acquire new knowledge easily, has good general abilities and the ability to manage the agenda. At the start of the career, external assistance will be needed;
11.2.6. Graduates of this level may enrol in Master's studies;
11.2.7. Upon acquisition of professional experience, the graduate should become a good civil engineer. Career prospects are related to civil engineering activities and managerial responsibility.
11.3. Threshold achievement level:
11.3.1. Civil engineering knowledge and practical abilities are basic;
11.3.2. The graduate understands which general knowledge could be applied in new situations, yet does not have abilities and confidence to use it;
11.3.3. The student is prepared to perform ordinary civil engineering activities, yet assistance and control are needed;
11.3.4. The graduate is able to perform simple calculations, explain ordinary results, yet assistance and control are needed;
11.3.5. The graduate is minimally prepared for further studies;

11.3.6. The graduate of this level should be suitable for the position of a technical or general operator/assistant. Upon acquisition of respective professional experience, the graduate should become a good practitioner of a specific area which requires knowledge and understanding of materials and typical or conventional technologies.

12. The levels of learning outcomes achieved in first cycle university studies shall be the following:

12.1. Excellent achievement level:

12.1.1. Civil engineering knowledge and systematic understanding as well as related practical abilities are comprehensive, not limited to information gained during studies;

12.1.2. Analysis and consideration of work results clearly reveal systematic thinking and excellent knowledge of literature as well as practical civil engineering activities;

12.1.3. Knowledge and practical abilities are rapidly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

12.1.4. Ordinary calculations, interpretations, analyses and explanations are performed rapidly, smoothly and accurately. Graduates are able to select and use adequate analytical and modelling methods; the problem and its solutions are evaluated critically;

12.1.5. New civil engineering knowledge is acquired quickly and with certainty; graduates have excellent general abilities and the ability to manage the agenda;

12.1.6. Graduates of this level are recommended enrolling in Master's studies;

12.1.7. Upon acquisition of professional experience, the graduate should become an excellent engineer-innovator. Career prospects cover research, creation of innovations, management of engineering activities in a respective study field of Civil Engineering and great managerial responsibility.

12.2. Typical achievement level:

12.2.1. Civil engineering knowledge and its systematic understanding as well as related practical abilities are good, yet limited to information gained during studies;

12.2.2. While analysing and considering work results, the graduate understands what knowledge and abilities may be adapted in new situations of activities in the study field of Civil Engineering. Graduates are able to use scientific literature when a task of civil engineering activities is assigned to them;

12.2.3. The graduate is able to rapidly apply the methods for solution of problems in the study field of Civil Engineering which help to evaluate changes known in advance and the progress of engineering;

12.2.4. Ordinary calculations, interpretations, analyses and explanations are performed accurately. Graduates are able to use mastered analytical and modelling methods;

12.2.5. New civil engineering knowledge is acquired easily; graduates have good general abilities and the ability to manage the agenda well. At the start of the career, external assistance will be needed;

12.2.6. Graduates of this level may enrol in Master's studies;

12.2.7. Upon acquisition of professional experience, the graduate should become a good engineer. Career prospects cover research, creation of innovations and management of engineering activities in the study field of Civil Engineering.

12.3. Threshold achievement level:

12.3.1. Knowledge and understanding of civil engineering as well as practical abilities are basic;

12.3.2. The graduate understands what general knowledge may be applied in new situations, yet lacks abilities and confidence to use it;

12.3.3. The graduate is able to apply the methods for solution of problems in the study field of Civil Engineering, yet assistance and control are needed;

12.3.4. The graduate is able to perform ordinary calculations, interpretation, analyses and explanations of results, yet assistance and control are needed;
12.3.5. The graduate is minimally prepared for Master's studies;
12.3.6. The graduate of this level should be suitable for the position of a technical or general operator/assistant. Upon acquisition of respective professional experience, the graduate may become a good engineer in a specific area which does not require regular application of fundamental knowledge and systematic understanding.
13. The levels of learning outcomes achieved in second cycle university studies shall be the following:
13.1. Excellent achievement level:
13.1.1. Fundamental understanding of Civil Engineering and adjacent study fields as well as related practical abilities are comprehensive, not limited to information gained during studies;
13.1.2. Analysis and consideration of work results clearly reveal original analytical thinking, excellent knowledge of literature and respective civil engineering activities;
13.1.3. The graduate is able to plan and conduct research;
13.1.4. The graduate is able to rapidly apply knowledge and practical abilities even in intensively changing activities and setting, when changes are hard to predict and activities consist of constantly changing combinations of tasks;
13.1.5. Calculations, interpretations, analyses and explanations requiring deeper knowledge are performed rapidly, smoothly, accurately and with insight by adapting theoretical models and research methods for the solution; the problem and its solution are evaluated critically;
13.1.6. New civil engineering knowledge is acquired quickly and with certainty. The graduate has excellent general abilities and the ability to manage the agenda well;
13.1.7. Graduates of this level are recommended enrolling in doctoral studies;
13.1.8. Upon acquisition of professional experience, the graduate should become an excellent engineer-analyst able to demonstrate good expert competences. Career prospects cover research, creation of innovations, management of engineering activities in the study field of Civil Engineering and adjacent study fields as well as significant managerial responsibility.
13.2. Typical achievement level:
13.2.1. Fundamental understanding of Civil Engineering and adjacent study fields as well as related practical abilities are good, yet limited to information gained during studies;
13.2.2. While analysing and considering the results of work, the graduate understands what knowledge and abilities may be adapted in new situations of activities in the study field of Civil Engineering and adjacent study fields, is able to understand scientific literature, plan and conduct research;
13.2.3. The graduate is able to rapidly adapt knowledge and practical abilities to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;
13.2.4. Calculations, interpretations, analyses and explanations requiring deeper knowledge are performed accurately; mastered theoretical models and research methods are applied to solutions;
13.2.5. The graduate is able to acquire new knowledge, has good general abilities and the ability to manage the agenda;
13.2.6. Graduates of this level may enrol in doctoral studies;
13.2.7. Upon acquisition of professional experience, the graduate should become a good engineer able to demonstrate good analytical competences. Career prospects cover research, creation of innovations, management of engineering activities in the respective and adjacent study fields as well as significant managerial responsibility.
13.3. Threshold achievement level:
13.3.1. Knowledge and fundamental understanding of civil engineering and the adjacent study fields as well as practical abilities are basic;

13.3.2. The graduate understands what general knowledge may be applied in new situations, yet lacks knowledge and confidence to use it;
13.3.3. The graduate is able to apply the methods for solution of problems in the study field of Civil Engineering which help to evaluate changes known in advance and the progress of engineering;
13.3.4. The graduate is able to perform calculations, interpretations and analysis of results requiring deeper knowledge, yet assistance and control are needed;
13.3.5. The graduate is minimally prepared for further doctoral studies;
13.3.6. Graduates of this level should be suitable for the position of a senior technical or general operator. Upon acquisition of respective professional experience, the graduate may become a good engineer of a specific area.

Annex 3
to the Descriptor of the Group of Study Fields of
Engineering

DESCRIPTOR OF THE STUDY FIELD OF MECHANICAL ENGINEERING

CHAPTER I
GENERAL PROVISIONS

1. The Descriptor of the Study Field of Mechanical Engineering (hereinafter referred to as the "Descriptor") shall govern the special requirements applied to the study programmes of the study field of Mechanical Engineering.

2. The Descriptor shall apply to higher education college, first cycle and second cycle university study programmes of the group of engineering study fields.

3. The study field of Mechanical Engineering belongs to the area of technological sciences. The study field consists of the following branches: Dynamics, Mechanisms and Machines, Mechanics, Acoustics and Vibration, Agricultural Machinery and Electromechanical Engineering.

CHAPTER II
CONCEPT AND SCOPE OF THE STUDY FIELD

4. Mechanics is a science exploring the simplest form of matter movement, i.e. mechanical movement (the change of the body's position with respect to other bodies). Mechanical Engineering means systematic activities based on cognition accumulated through research and practical experience which is aimed at maintenance of technically operational mechanisms and machinery and creation of new mechanisms and machinery or making major improvements to already existing mechanisms and machinery intended for using natural resources and phenomena in order to meet people's needs. During the studies of the study field of Mechanical Engineering, persons shall acquire higher education which along with practical experience shall form a sufficient basis for their professional activities as engineers.

5. In planning and delivery of the studies of the study field of Mechanical Engineering, the fact that engineering is based on mathematics and other physical sciences, is closely related to fundamental and applied research, technological methods and processes, tangible or intangible computational and information processing tools are used has to be taken into account.

CHAPTER III
GENERAL AND SPECIAL LEARNING OUTCOMES

6. In designing new study programmes, the main learning outcomes of the study field of Mechanical Engineering provided in the present chapter should be specified thoroughly in the way that enables the study programme to comply best with the special requirements of the study field of Mechanical Engineering or its branch.

7. Higher education college and first cycle university study programmes of the study field of Mechanical Engineering where engineers are trained shall build on the same knowledge of fundamental sciences required for engineering activities, provide the same key engineering abilities and aim at providing and improving the competences of the study field of Mechanical Engineering, yet higher education college studies shall be more targeted at the application of scientific knowledge and typical engineering solutions verified in practice, whereas the goals of university study programmes shall also include acquisition and application of latest knowledge, solving untypical tasks in untypical environment, and finding new engineering solutions.

8. After completing higher education college studies, the person shall:

8.1. Acquire the following knowledge and abilities:

8.1.1. Know general consistent patterns and laws of natural sciences and mathematics required for understanding the fundamentals of the study field of Mechanical Engineering;

8.1.2. Know the key concepts of the study field of Mechanical Engineering and understand their content;

8.1.3. Have main knowledge of Mechanical Engineering which is important in practical work;

8.1.4. Know the context of problems of adjacent study fields and their solutions.

8.2. Be able to perform engineering analysis:

8.2.1. Be able to apply their knowledge and understanding when solving the problems of the study field of Mechanical Engineering through creative application of familiar methods;

8.2.2. Be able to apply their knowledge and understanding in the analysis of engineering tasks and choose appropriate methods, experimental and industrial equipment to fulfil them;

8.2.3. Be able to apply analytical and modelling methods when fulfilling engineering tasks of the study field of Mechanical Engineering.

8.3. Have knowledge and skills required for design works of the study field of Mechanical Engineering:

8.3.1. Be able to apply engineering knowledge and understanding when formulating and performing design tasks in accordance with the defined requirements;

8.3.2. Understand design methodologies and be able to apply them.

8.4. Be able to conduct applied research:

8.4.1. Be able to find required professional information in databases and other sources of scientific and engineering information;

8.4.2. Be able to carry out experiments intended for fulfilment of engineering tasks, process their findings and present practical conclusions of the findings;

8.4.3. Have skills for operating equipment used in the study field of Mechanical Engineering.

8.5. Have the following practical knowledge and skills required for fulfilling engineering tasks:

8.5.1. Be able to choose engineering solutions, tools and equipment required for the implementation of these solutions;

8.5.2. Be able to combine theoretical and applied knowledge when solving engineering problems;

8.5.3. Understand ethical, environmental and commercial circumstances of engineering activities;

8.5.4. Understand the principles of organisation of engineering activities, know the main occupational and fire safety requirements.

8.6. Have the following personal and social abilities:

8.6.1. Be able to fulfil engineering tasks individually and in a team;

8.6.2. Have good skills of communication with the engineering community and the general public;

8.6.3. Understand the impact of engineering solutions on society and environment, adhere to the standards of professional ethics and engineering activities, understand responsibility for the results of engineering activities;

8.6.4. Know well the key aspects of project implementation and management at the level of engineering activities;

8.6.5. Understand the importance of individual life long learning and prepare for it.

9. After completing first cycle university studies, the person shall:

9.1. Acquire the following knowledge and abilities:

9.1.1. Know and understand the fundamentals of natural sciences and mathematics required for understanding the fundamentals of the study field of Mechanical Engineering;

9.1.2. Know and systematically understand the key theoretical and applied fundamentals and concepts of the study field of Mechanical Engineering;

9.1.3. Have basic coherent knowledge of Mechanical Engineering;

9.1.4. Know a broader multidisciplinary context of engineering, be able to adapt methods and processes of other scientific fields.

9.2. Be able to perform engineering analysis:

9.2.1. Be able to apply knowledge and understanding when formulating and solving the problems of the study field of Mechanical Engineering by choosing appropriate methods;

9.2.2. Be able to apply their knowledge and understanding when formulating and analysing engineering tasks and choose appropriate methods, experimental and industrial equipment to fulfil them;

9.2.3. Be able to choose and apply appropriate analytical and modelling methods of the study field of Mechanical Engineering.

9.3. Have knowledge and skills required for design works of the study field of Mechanical Engineering:

9.3.1. Be able to apply engineering knowledge and understanding of the study field of Mechanical Engineering in developing and implementing projects in accordance with the defined requirements;

9.3.2. Understand design methodologies and be able to apply them.

9.4. Be able to conduct fundamental and applied research:

9.4.1. Be able to find required scientific and professional information in databases and other sources of scientific and engineering information;

9.4.2. Be able to plan and carry out required experiments, process and evaluate their data as well as present conclusions;

9.4.3. Have skills required for operating equipment used in the study field of Mechanical Engineering.

9.5. Have abilities of practical work when fulfilling engineering tasks:

9.5.1. Be able to choose and apply appropriate methods, tools and equipment for implementation of engineering solutions, know structures of engineering equipment and principles of its functioning, have basic abilities to use it;

9.5.2. Be able to combine theoretical and applied knowledge when solving engineering problems;

9.5.3. Understand and evaluate ethical, environmental and commercial circumstances of engineering activities;

9.5.4. Understand the principles of organisation of engineering activities, the importance of occupational and fire safety as well as key requirements, the interaction between the links of engineering activities.

9.6. Have the following personal and social abilities:

9.6.1. Be able to efficiently work individually and in a team;

9.6.2. Have good skills of communication with the engineering community and the general public;

9.6.3. Have a holistic understanding of the impact of engineering solutions on society and environment, adhere to the standards of professional ethics and engineering activities, understand responsibility for engineering activities;

9.6.4. Know well the aspects of project management and business, understand the links between technological solutions and their economic outcomes;

9.6.5. Understand the importance of individual life long learning and prepare for it.

10. After completing second cycle studies, the person shall:

10.1. Acquire the following knowledge and abilities:

10.1.1. Know well and be able to creatively apply the fundamentals of natural sciences and mathematics, have thorough knowledge and understanding of the principles of the study field of Mechanical Engineering and be able to apply them in fulfilling new engineering tasks;

10.1.2. Know and critically evaluate the latest achievements in the area of engineering.

10.2. Be able to perform engineering analysis:

10.2.1. Be able to solve problems that are not typical, strictly defined and exhaustively described;

10.2.2. Be able to envisage standard and non-standard engineering problems, formulate them clearly and solve them;

10.2.3. Be able to use their knowledge and understanding when fulfilling practical engineering tasks by adapting theoretical models and research methods, including mathematical analysis, computational modelling and experimental research methods;

10.2.4. Understand the importance of social, health, occupational and fire safety, environmental and commercial requirements;

10.2.5. Be able to apply innovative methods when solving specific problems and implementing their solutions.

10.3. Have knowledge and skills required for design works of the study field of Mechanical Engineering corresponding to the study programme:

10.3.1. Be able to apply their knowledge and understanding when solving non-standard problems, including the ones related to other scientific and engineering study fields;

10.3.2. Be able to innovatively develop new and original engineering ideas and methods;

10.3.3. Be able to make engineering decisions having encountered multi-faceted, technically undefined and clearly undescribed problems.

10.4. Be able to conduct fundamental and applied research:

10.4.1. Be able to recognise, find and evaluate the data required for engineering work by using databases and other sources of scientific and engineering information;

10.4.2. Be able to plan and conduct analytical, modelling and experimental research, critically evaluate its data and provide conclusions;

10.4.3. Be able to explore applicability of new methods and ways for solving engineering problems of the study field of Mechanical Engineering corresponding to the study programme.

10.5. Have the following skills of practical work to fulfil engineering tasks:

10.5.1. Be able to combine knowledge of different study fields into a whole and tackle multi-faceted engineering problems;

10.5.2. Understand thoroughly applied methods and methodologies, their limitations, be able to select engineering equipment and software;

10.5.3. Know well ethical, environmental and commercial requirements for engineering activities;

10.5.4. Know the principles of organisation of engineering activities, understand the interaction between its links, be able to evaluate engineering activities from occupational safety and environmental perspectives.

10.6. Have the following personal and social abilities:

10.6.1. Be able to efficiently work individually and in a team, be able to lead a team which may consist of representatives of different study fields and levels;

10.6.2. Have good skills of communication with the engineering community and the general public at the national and international level;

10.6.3. Understand holistically the impact of engineering solutions on society and environment, adhere to the standards of professional ethics and engineering activity, and understand responsibility for engineering activities;

10.6.4. Have very good knowledge of the aspects of project management and business, understand the links between technological solutions and their economic outcomes.

CHAPTER IV
TEACHING, LEARNING, ASSESSMENT, REQUIREMENTS FOR THE IMPLEMENTATION OF STUDY PROGRAMMES AND DESRIPTOR OF LEVELS OF ACHIEVED LEARNING OUTCOMES

11. The requirements for teaching, assessment and implementation of study programmes shall comply with the requirements provided in the Descriptor of the Group of Study Fields of Engineering.

12. The following achievement levels of learning outcomes attained by graduates of the study field of Mechanical Engineering shall be distinguished: threshold (minimum requirements), typical (standard, average requirements) and excellent (higher than average requirements). The threshold achievement level shall be the level to be achieved by all students who acquire a higher education qualification.

13. The levels of learning outcomes achieved in higher education college studies shall be the following:

13.1. Excellent achievement level:

13.1.1. Mechanical engineering knowledge and related practical abilities are comprehensive and not limited to information gained during studies;

13.1.2. Analysis and consideration of work results clearly reveal original thinking and excellent knowledge of mechanical engineering activities;

13.1.3. Knowledge and practical abilities are rapidly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

13.1.4. Ordinary calculations, explanations, interpretations and analyses are performed rapidly, smoothly and accurately; analytical and modelling methods are applied;

13.1.5. New knowledge of mechanical engineering is acquired quickly and with certainty; graduates have excellent general abilities and the ability to manage the agenda well;

13.1.6. Graduates of this level may enrol in Master's studies;

13.1.7. Upon acquisition of professional experience, the graduate should become an excellent engineer-practitioner. Career prospects are related to engineering activities in the study field of Mechanical Engineering and managerial responsibility. Graduates are able to quickly take a high-level executive position.

13.2. Typical achievement level:

13.2.1. Mechanical engineering knowledge and related practical abilities are good, yet limited to the material provided in the study programme;

13.2.2. While analysing and considering the results of work, the graduate understands what knowledge and abilities may be adapted in new situations of mechanical engineering activities;

13.2.3. The graduate is able to apply the methods for solution of problems in the study field of Mechanical Engineering which help to evaluate changes known in advance and the progress of mechanical engineering;

13.2.4. Ordinary actions related to preparation and operation of mechanical engineering equipment and processes are performed accurately;

13.2.5. The graduate is able to acquire new knowledge easily, has good general abilities and the ability to manage the agenda. At the start of the career, external assistance will be needed;

13.2.6. Graduates of this level may enrol in Master's studies;

13.2.7. Upon acquisition of professional experience, the graduate should become a good engineer-practitioner. Career prospects are related to engineering activities in the study field of

Mechanical Engineering and managerial responsibility. The graduate can take a higher-level executive position.

13.3. Threshold achievement level:

13.3.1. Mechanical engineering knowledge and practical abilities are basic;

13.3.2. The graduate understands which general knowledge may be applied in new situations, yet does not have abilities and confidence to use it;

13.3.3. The student is prepared to perform ordinary activities in the study field of Mechanical Engineering, yet assistance and control are needed;

13.3.4. The graduate is able to perform simple calculations, explain ordinary results, however, assistance and control are required;

13.3.5. The graduate is minimally prepared for further studies;

13.3.6. The graduate of this level should be suitable for the position of technical or general operator/assistant. Upon acquisition of professional mechanical engineering experience, the graduate should become a good practitioner of a specific area which requires knowledge and understanding of materials and typical or conventional technologies, yet regular application of fundamental knowledge is not required.

14. The levels of learning outcomes achieved in first cycle university studies shall be the following:

14.1. Excellent achievement level:

14.1.1. Mechanical engineering knowledge and systematic understanding as well as related practical abilities are comprehensive, not limited to information gained during the studies in the programme;

14.1.2. Analysis and consideration of work results clearly reveal original systematic thinking and excellent knowledge of literature as well as practical mechanical engineering activities;

14.1.3. Knowledge and practical abilities are rapidly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

14.1.4. Ordinary calculations, interpretations, analyses and explanations are performed rapidly, smoothly and accurately. Graduates are able to select and use adequate analytical and modelling methods; the problem and its solutions are evaluated critically;

14.1.5. New mechanical engineering knowledge is acquired quickly and with certainty; graduates have excellent general abilities and the ability to manage the agenda;

14.1.6. Graduates of this level are recommended enrolling in Master’s studies;

14.1.7. Upon acquisition of professional experience, the graduate should become an excellent engineer-innovator. Career prospects cover research, creation of innovations, management of engineering activities in the study field of Mechanical Engineering and significant managerial responsibility. The graduate can take a high-level executive or engineering administration position.

14.2. Typical achievement level:

14.2.1. Mechanical engineering knowledge and its systematic understanding as well as related practical abilities are good, yet limited to information gained in the study programme;

14.2.2. While analysing and considering work results, the graduate understands what knowledge and abilities may be adapted in new situations of activities in the study field of Mechanical Engineering;

14.2.3. Graduates are able to use scientific literature when a task of mechanical engineering activities is assigned to them;

14.2.4. The graduate is able to rapidly apply the methods for solution of problems in the study field of Civil Engineering which help to evaluate changes known in advance and the progress of engineering;

14.2.5. Ordinary calculations, interpretations, analyses and explanations are performed accurately. Graduates are able to use mastered analytical and modelling methods;

14.2.6. New knowledge is acquired easily; graduates have good general abilities and the ability to manage the agenda well. At the start of the career, external assistance will be needed;

14.2.7. Graduates of this level may enrol in Master's studies;

14.2.8. Upon acquisition of professional experience, the graduate should become a good engineer. Career prospects cover research, creation of innovations and management of engineering activities in the study field of Mechanical Engineering; significant managerial responsibility and promotion to a senior executive position may be expected.

14.3. Threshold achievement level:

14.3.1. Knowledge and understanding of mechanical engineering as well as practical abilities are basic;

14.3.2. The graduate understands what general knowledge may be applied in new situations, yet lacks abilities and confidence to use it;

14.3.3. The graduate is able to apply the methods for solution of problems in the study field of Mechanical Engineering, yet assistance and control are needed;

14.3.4. The graduate is able to perform ordinary calculations, interpretation, analyses and explanations of results, yet assistance and control are needed;

14.3.5. The graduate is minimally prepared for Master's studies;

14.3.6. The graduate of this level should be suitable for the position of a technical or general operator/assistant. Upon acquisition of professional mechanical engineering experience, the graduate may become a good engineer in a specific area which does not require regular application of fundamental knowledge and systematic understanding.

15. The levels of learning outcomes achieved in second cycle university studies shall be the following:

15.1. Excellent achievement level:

15.1.1. Fundamental understanding of Mechanical Engineering and adjacent study fields as well as related practical abilities are comprehensive, not limited to information gained during studies;

15.1.2. Analysis and consideration of work results clearly reveal original analytical thinking, excellent knowledge of literature and mechanical engineering activities;

15.1.3. The graduate is able to plan and conduct research;

15.1.4. The graduate is able to rapidly apply knowledge and practical abilities even in intensively changing activities and setting, when changes are hard to predict and activities consist of constantly changing combinations of tasks;

15.1.5. Calculations, interpretations, analyses and explanations requiring deeper knowledge are performed rapidly, smoothly, accurately and with insight; theoretical models and research methods are applied for the solution; the problem and its solution are evaluated critically;

15.1.6. New mechanical engineering knowledge is acquired quickly and with certainty. The graduate has excellent general abilities and manages the agenda well;

15.1.7. Graduates of this level are recommended enrolling in doctoral studies;

15.1.8. Upon acquisition of professional experience, the graduate should become an excellent engineer-analyst able to demonstrate good expert competences. Career prospects cover research, creation of innovations, management of engineering activities in the study field of Mechanical Engineering and adjacent study fields as well as significant managerial responsibility. The graduate may quickly take the executive or engineering administration position of a very high level.

15.2. Typical achievement level:

15.2.1. Fundamental understanding of Mechanical Engineering and adjacent study fields as well as related practical abilities are good, yet limited to information gained during studies;

15.2.2. While analysing and considering the results of work, the graduate understands what knowledge and abilities may be adapted in new situations of activities in the study field of

Mechanical Engineering and adjacent study fields, is able to understand scientific literature, plan and conduct research;

15.2.3. The graduate is able to rapidly adapt knowledge and practical abilities to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

15.2.4. Calculations, interpretations, analyses and explanations requiring deeper knowledge are performed accurately; mastered theoretical models and research methods are applied to solutions;

15.2.5. The graduate is able to acquire new knowledge, has good general abilities and the ability to manage the agenda;

15.2.6. Graduates of this level may enrol in doctoral studies;

15.2.7. Upon acquisition of professional experience, the graduate should become a good engineer able to demonstrate good analytical competences. Career prospects cover research, creation of innovations, management of engineering activities in the study field of Mechanical Engineering and adjacent study fields as well as significant managerial responsibility. The graduate is prepared to take a high-level executive or engineering administration position.

15.3. Threshold achievement level:

15.3.1. Knowledge and fundamental understanding of mechanical engineering and the adjacent study fields as well as practical abilities are basic;

15.3.2. The graduate understands what general knowledge may be applied in new situations, yet lacks knowledge and confidence to use it;

15.3.3. The graduate is able to apply the methods for solution of problems in the study field of Mechanical Engineering which help to evaluate changes known in advance and the progress of engineering;

15.3.4. The graduate is able to perform calculations, interpretations and analysis of results requiring deeper knowledge, yet assistance and control are needed;

15.3.5. The graduate is minimally prepared for further doctoral studies;

15.3.6. Graduates of this level should be suitable for the position of a senior technical or general operator. Upon acquisition of respective professional experience, the graduate may become a good engineer of a specific area. Upon acquisition of professional mechanical engineering experience, the graduate may become a good engineer of this area.

Annex 4
to the Descriptor of the Group of Study Fields of
Engineering

DESCRIPTOR OF THE STUDY FIELD OF AEROSPACE ENGINEERING

CHAPTER I
GENERAL PROVISIONS

1. The Descriptor of the Study Field of Aerospace Engineering (hereinafter referred to as the "Descriptor") shall govern the special requirements applied to the study programmes of the study field of Aerospace Engineering.
2. The Descriptor shall apply to higher education college, first cycle and second cycle university study programmes of study field of Aerospace Engineering.
3. The Descriptor shall be applicable to the following branches of the study field of Aerospace Engineering: Aviation Engineering, Aviation Mechanics Engineering, Avionics and Electrical Engineering, Airport System engineering.

CHAPTER II
CONCEPT AND SCOPE OF THE STUDY FIELD

4. Aerospace engineering is a focussed activity aimed at design, efficient and safe use of equipment, other means and systems using natural resources and phenomena in order to meet people's needs for transport and travelling by air. The principles of the science of technologies and engineering are applied in planning, designing, using and operating aircrafts, technological equipment and infrastructure in order to develop or improve tools and systems for safe, efficient, fast, comfortable and environmentally friendly mobility of people and carriage of cargos. During the studies of Aerospace Engineering, persons shall acquire higher college or university education which along with practical experience shall form a sufficient basis for their professional activities as engineers. Aerospace Engineering encompasses aircrafts, machinery equipment and technologies which form a part of the infrastructure ensuring carriage by air.
5. As the study field of Aerospace Engineering contains some occupations which belong to the group of professions regulated by the European Aviation Safety Agency (EASA), the concept of and requirements for these programmes shall be established by the following international and national civil aviation legislation: Regulation (EC) No 216/2008 of the European Parliament and Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC, Commission Regulation (EU) No 805/2011 of 10 August 2011 laying down detailed rules for air traffic controllers' licences and certain certificates pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council and Order No 3-517 of 16 September 2003 of the Minister of Transport and Communications of the Republic of Lithuania on the approval of regulations for licensing civil aviation specialists of the Republic of Lithuania.

CHAPTER III
GENERAL AND SPECIAL LEARNING OUTCOMES

6. In designing new study programmes, the main learning outcomes of the study field of Aerospace Engineering provided in the present chapter should be specified thoroughly in the way

that enables the study programme to comply best with the special requirements of the study field of Aerospace Engineering or its branch.

7. Higher education college and first cycle university study programmes of the study field of Aerospace Engineering where engineers are trained shall build on the same knowledge of fundamental sciences required for engineering activities, provide the same key engineering abilities and aim at providing and improving the competences of the study field of Aerospace Engineering, yet higher education college studies shall be more targeted at the application of scientific knowledge and typical engineering solutions verified in practice, whereas the goals of university study programmes shall also include acquisition and application of latest knowledge, solving untypical tasks in untypical environment, and finding new engineering solutions.

8. After completing higher education college studies, the person shall:

8.1. Acquire the following knowledge and abilities:

8.1.1. Know general consistent patterns and laws of natural sciences and mathematics required for understanding the fundamentals of the study field of Aerospace Engineering corresponding to the study programme;

8.1.2. Know the key concepts of the study field of Aerospace Engineering corresponding to the study programme and understand their content;

8.1.3. Have main knowledge of Aerospace Engineering which is important in practical work;

8.1.4. Know the context of problems of adjacent study fields and their solutions.

8.2. Be able to perform engineering analysis:

8.2.1. Be able to apply their knowledge and understanding when solving the problems of the study field of Aerospace Engineering corresponding to the study programme, creatively apply familiar methods;

8.2.2. Be able to apply their knowledge and understanding in the analysis of engineering tasks and choose appropriate methods, experimental and industrial equipment to fulfil them;

8.2.3. Be able to apply analytical and modelling methods when fulfilling engineering tasks of the study field of Aerospace Engineering corresponding to the study programme.

8.3. Have knowledge and skills required for design works of the study field of Aerospace Engineering corresponding to the study programme:

8.3.1. Be able to apply engineering knowledge and understanding when formulating and performing design tasks in accordance with the defined requirements;

8.3.2. Understand design methodologies and be able to apply them.

8.4. Be able to conduct applied research:

8.4.1. Be able to find required professional information in databases and other sources of scientific and engineering information;

8.4.2. Be able to carry out experiments intended for fulfilment of engineering tasks, process their findings and present practical conclusions of the findings;

8.4.3. Have skills for operating equipment used in the study field of Aerospace Engineering corresponding to the study programme.

8.5. Have the following practical knowledge and skills required for fulfilling engineering tasks:

8.5.1. Be able to choose engineering solutions, tools and equipment required for the implementation of these solutions;

8.5.2. Be able to combine theoretical and applied knowledge when solving engineering problems;

8.5.3. Understand ethical, environmental and commercial circumstances of engineering activities;

8.5.4. Understand the principles of organisation of engineering activities, know the main occupational and fire safety requirements.

8.6. Have the following personal and social abilities:

8.6.1. Be able to fulfil engineering tasks individually and in a team;
8.6.2. Have good skills of communication with the engineering community and the general public;
8.6.3. Understand the impact of engineering solutions on society and environment, adhere to the standards of professional ethics and engineering activities, understand responsibility for the results of engineering activities;
8.6.4. Know well the key aspects of project implementation and management at the level of engineering activities;
8.6.5. Understand the importance of individual life long learning and prepare for it.
9. After completing first cycle university studies, the person shall:
9.1. Acquire the following knowledge and abilities:
9.1.1. Know and understand the fundamentals of natural sciences and mathematics required for understanding the fundamentals of the study field of Aerospace Engineering corresponding to the study programme;
9.1.2. Know and systematically understand the key theoretical and applied fundamentals and concepts of the study field of Aerospace Engineering corresponding to the study programme;
9.1.3. Have basic coherent knowledge of Aerospace Engineering corresponding to the study programme;
9.1.4. Know a broader multidisciplinary context of engineering, be able to adapt methods and processes of other scientific fields.
9.2. Be able to perform engineering analysis:
9.2.1. Be able to apply their knowledge and understanding when formulating and solving the problems of the study field of Aerospace Engineering corresponding to the study programme by choosing appropriate methods;
9.2.2. Be able to apply their knowledge and understanding when formulating and analysing engineering tasks and choose appropriate methods, experimental and industrial equipment to fulfil them;
9.2.3. Be able to choose and apply appropriate analytical and modelling methods of the study field of Aerospace Engineering corresponding to the study programme.
9.3. Have knowledge and skills required for design works of the study field of Aerospace Engineering corresponding to the study programme:
9.3.1. Be able to apply engineering knowledge and understanding of the study field of Aerospace Engineering corresponding to the study programme in developing and implementing projects in accordance with the defined requirements;
9.3.2. Understand design methodologies and be able to apply them.
9.4. Be able to conduct fundamental and applied research:
9.4.1. Be able to find required scientific and professional information in databases and other sources of scientific and engineering information;
9.4.2. Be able to plan and carry out required experiments, process and evaluate their data as well as present conclusions;
9.4.3. Have skills required for operating equipment used in the study field of Aerospace Engineering corresponding to the study programme.
9.5. Have abilities of practical work when fulfilling engineering tasks:
9.5.1. Be able to choose and apply appropriate methods, tools and equipment for implementation of engineering solutions, know structures of engineering equipment and principles of its functioning, have basic abilities to use it;
9.5.2. Be able to combine theoretical and applied knowledge when solving engineering problems;
9.5.3. Understand and evaluate ethical, environmental and commercial circumstances of engineering activities;

9.5.4. Understand the principles of organisation of engineering activities, the importance of occupational and fire safety as well as key requirements, the interaction between the links of engineering activities.
9.6. Have the following personal and social abilities:
9.6.1. Be able to efficiently work individually and in a team;
9.6.2. Have good skills of communication with the engineering community and the general public;
9.6.3. Have a holistic understanding of the impact of engineering solutions on society and environment, adhere to the standards of professional ethics and engineering activities, understand responsibility for engineering activities;
9.6.4. Know well the aspects of project management and business, understand the links between technological solutions and their economic outcomes;
9.6.5. Understand the importance of individual life long learning and prepare for it.
10. After completing second cycle studies, the person shall:
10.1. Acquire the following knowledge and abilities:
10.1.1. Know well and be able to creatively apply the fundamentals of natural sciences and mathematics, have thorough knowledge and understanding of the principles of the study field of Aerospace Engineering corresponding to the study programme and be able to apply them in fulfilling new engineering tasks;
10.1.2. Know and critically evaluate the latest achievements in the area of engineering.
10.2. Be able to perform engineering analysis:
10.2.1. Be able to solve problems that are not typical, strictly defined and exhaustively described;
10.2.2. Be able to envisage standard and non-standard engineering problems, formulate them clearly and solve them;
10.2.3. Be able to use their knowledge and understanding when fulfilling practical engineering tasks by adapting theoretical models and research methods, including mathematical analysis, computational modelling and experimental research methods;
10.2.4. Understand the importance of social, health, occupational and fire safety, environmental and commercial requirements;
10.2.5. Be able to apply innovative methods when solving specific problems and implementing their solutions.
10.3. Have knowledge and skills required for design works of the study field of Aerospace Engineering corresponding to the study programme:
10.3.1. Be able to apply their knowledge and understanding when solving non-standard problems, including the ones related to other scientific and engineering study fields;
10.3.2. Be able to innovatively develop new and original engineering ideas and methods;
10.3.3. Be able to make engineering decisions having encountered multi-faceted, technically undefined and clearly undescribed problems.
10.4. Be able to conduct fundamental and applied research:
10.4.1. Be able to recognise, find and evaluate the data required for engineering work by using databases and other information sources;
10.4.2. Be able to plan and conduct analytical, modelling and experimental research, critically evaluate its data and provide conclusions;
10.4.3. Be able to explore applicability of new methods and ways for solving engineering problems of the study field of Aerospace Engineering corresponding to the study programme.
10.5. Have the following skills of practical work to fulfil engineering tasks:
10.5.1. Be able to combine knowledge of different study fields into a whole and tackle multi-faceted engineering problems;

10.5.2. Understand thoroughly applied methods and methodologies, their limitations, be able to select engineering equipment and software;
10.5.3. Know well ethical, environmental and commercial requirements for engineering activities;
10.5.4. Know the principles of organisation of engineering activities, understand the interaction between its links, be able to evaluate engineering activities from occupational safety and environmental perspectives.
10.6. Have the following personal and social abilities:
10.6.1. Be able to efficiently work individually and in a team, be able to lead a team which may consist of representatives of different study fields and levels;
10.6.2. Have good skills of communication with the engineering community and the general public at the national and international level;
10.6.3. Have a holistic understanding of the impact of engineering solutions on society and environment, adhere to the standards of professional ethics and engineering activity, and understand responsibility for engineering activities;
10.6.4. Have very good knowledge of the aspects of project management and business, understand the links between technological solutions and their economic outcomes.

CHAPTER IV
TEACHING, LEARNING, ASSESSMENT, REQUIREMENTS FOR THE IMPLEMENTATION OF STUDY PROGRAMMES AND DESRIPTOR OF LEVELS OF ACHIEVED LEARNING OUTCOMES

11. The requirements for teaching, learning, assessment and implementation of study programmes shall comply with the requirements provided in the Descriptor of the Group of Study Fields of Engineering.
12. The following achievement levels of learning outcomes attained by graduates of the study field of Aerospace Engineering shall be distinguished: threshold (minimum requirements), typical (standard, average requirements) and excellent (higher than average requirements).
13. The levels of learning outcomes achieved in higher education college studies shall be the following:
13.1. Excellent achievement level:
13.1.1. Aerospace engineering knowledge and related practical abilities are comprehensive and not limited to information gained during studies;
13.1.2. Analysis and consideration of work results clearly reveal original thinking and excellent knowledge of aerospace engineering activities;
13.1.3. Knowledge and practical abilities are rapidly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;
13.1.4. Ordinary calculations, explanations, interpretations and analyses are performed rapidly, smoothly and accurately; analytical and modelling methods are applied;
13.1.5. New knowledge of aerospace engineering is acquired quickly and with certainty; graduates have excellent general abilities and the ability to manage the agenda well;
13.1.6. Graduates of this level may enrol in Master's studies;
13.1.7. Upon acquisition of professional experience, the graduate should become an excellent engineer-practitioner. Career prospects are related to engineering activities in the study field of Aerospace Engineering and managerial responsibility. Graduates are able to quickly take a high-level executive position.
13.2. Typical achievement level:
13.2.1. Aerospace engineering knowledge and related practical abilities are good, yet limited to the material provided in the study programme;

13.2.2. While analysing and considering the results of work, the graduate understands what knowledge and abilities may be adapted in new situations of activities in the study field of Aerospace Engineering;
13.2.3. The graduate is able to apply the methods for solution of problems in the study field of Aerospace Engineering which help to evaluate changes known in advance and the progress of aerospace engineering;
13.2.4. Ordinary actions related to preparation and operation of aerospace engineering equipment and processes are performed accurately;
13.2.5. The graduate is able to acquire new knowledge easily, has good general abilities and the ability to manage the agenda. At the start of the career, assistance may be needed;
13.2.6. Graduates of this level may enrol in Master's studies;
13.2.7. Upon acquisition of professional experience, the graduate should become a good engineer-practitioner. Career prospects are related to engineering activities in the study field of Aerospace Engineering and managerial responsibility. The graduate is able to take a senior executive position.
13.3. Threshold achievement level:
13.3.1. Aerospace engineering knowledge and practical abilities are basic;
13.3.2. The graduate understands which general knowledge may be applied in new situations;
13.3.3. The student is prepared to perform ordinary activities in the study field of Aerospace Engineering, yet assistance and control are needed;
13.3.4. The graduate is able to perform simple calculations, explain ordinary results, however, assistance and control are required;
13.3.5. The graduate is minimally prepared for further studies;
13.3.6. The graduate of this level should be suitable for the position of technical or general operator/assistant. Upon acquisition of professional aerospace engineering experience, the graduate should become a good practitioner of a specific area which requires knowledge and understanding of materials and typical or conventional technologies, yet regular application of fundamental knowledge is not required.
14. The levels of learning outcomes achieved in first cycle university studies shall be the following:
14.1. Excellent achievement level:
14.1.1. Aerospace engineering knowledge and systematic understanding as well as related practical abilities are comprehensive, not limited to information gained during the studies in the programme;
14.1.2. Analysis and consideration of work results clearly reveal original systematic thinking and excellent knowledge of literature as well as practical aerospace engineering activities;
14.1.3. Knowledge and practical abilities are rapidly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;
14.1.4. Ordinary calculations, interpretations, analyses and explanations are performed rapidly, smoothly and accurately. Graduates are able to select and use adequate analytical and modelling methods; the problem and its solutions are evaluated critically;
14.1.5. New aerospace engineering knowledge is acquired quickly and with certainty; graduates have excellent general abilities and the ability to manage the agenda well;
14.1.6. Graduates of this level are recommended enrolling in Master's studies;
14.1.7. Upon acquisition of professional experience, the graduate should become an excellent engineer-innovator. Career prospects cover research, creation of innovations, management of engineering activities in the study field of Aerospace Engineering and significant managerial responsibility. The graduate can take a high-level executive or engineering administration positions.
14.2. Typical achievement level:

14.2.1. Aerospace engineering knowledge and its systematic understanding as well as related practical abilities are good, yet limited to information gained during studies;
14.2.2. While analysing and considering work results, the graduate understands what knowledge and abilities may be adapted in new situations of activities in the study field of Aerospace Engineering. Graduates are able to use scientific literature when a task of aerospace engineering activities is assigned to them;
14.2.3. The graduate is able to rapidly apply the methods for solution of problems in the study field of Aerospace Engineering which help to evaluate changes known in advance and the progress of engineering;
14.2.4. Ordinary calculations, interpretations, analyses and explanations are performed accurately. Graduates are able to use mastered analytical and modelling methods;
14.2.5. New knowledge is acquired easily; graduates have good general abilities and the ability to manage the agenda well. At the start of the career, assistance may be needed;
14.2.6. Graduates of this level may enrol in Master's studies;
14.2.7. Upon acquisition of professional experience, the graduate should become a good engineer. Career prospects cover research, creation of innovations and management of engineering activities in the study field of Aerospace Engineering; significant managerial responsibility and promotion to a senior executive position may be expected.
14.3. Threshold achievement level:
14.3.1. Aerospace engineering knowledge and understanding as well as practical abilities are basic;
14.3.2. The graduate understands what general knowledge may be applied in new situations;
14.3.3. The graduate is able to apply the methods for solution of problems in the study field of Aerospace Engineering, yet assistance and control are needed;
14.3.4. The graduate is able to perform ordinary calculations, interpretations, analyses and explanations of results, yet assistance and control are needed;
14.3.5. The graduate is minimally prepared for Master's studies;
14.3.6. The graduate of this level should be suitable for the position of a technical or general operator/assistant. Upon acquisition of professional aerospace engineering experience, the graduate should become a good engineer in a specific area which does not require regular application of fundamental knowledge and systematic understanding.
15. The levels of learning outcomes achieved in second cycle university studies shall be the following:
15.1. Excellent achievement level:
15.1.1. Fundamental understanding of Aerospace Engineering and adjacent study fields as well as related practical abilities are comprehensive, not limited to information gained during studies;
15.1.2. Analysis and consideration of work results clearly reveal original analytical thinking, excellent knowledge of literature and aerospace engineering activities;
15.1.3. The graduate is able to plan and conduct research;
15.1.4. The graduate is able to rapidly apply knowledge and practical abilities even in intensively changing activities and setting, when changes are hard to predict and activities consist of constantly changing combinations of tasks;
15.1.5. Calculations, interpretations, analyses and explanations requiring deeper knowledge are performed rapidly, smoothly, accurately and with insight; theoretical models and research methods are applied for the solution; the problem and its solution are evaluated critically;
15.1.6. New aerospace engineering knowledge is acquired quickly and with certainty. The graduate has excellent general abilities and manages the agenda well;
15.1.7. Graduates of this level are recommended enrolling in doctoral studies;
15.1.8. Upon acquisition of professional experience, the graduate should become an excellent engineer-analyst able to demonstrate good expert competences. Career prospects cover research,

creation of innovations, management of engineering activities in the study field of Aerospace Engineering and adjacent study fields as well as significant managerial responsibility. The graduate may quickly take the executive or engineering administration position of a very high level.

15.2. Typical achievement level:

15.2.1. Fundamental understanding of Aerospace Engineering and adjacent study fields as well as related practical abilities are good, yet limited to information provided in the study programme;

15.2.2. While analysing and considering the results of work, the graduate understands what knowledge and abilities may be adapted in new situations of activities in the study field of Aerospace Engineering and adjacent study fields, is able to understand scientific literature, plan and conduct research;

15.2.3. The graduate is able to rapidly adapt knowledge and practical abilities to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

15.2.4. Calculations, interpretations, analyses and explanations requiring deeper knowledge are performed accurately; mastered theoretical models and research methods are applied to solutions;

15.2.5. The graduate is able to acquire new knowledge, has good general abilities and the ability to manage the agenda;

15.2.6. Graduates of this level may enrol in doctoral studies;

15.2.7. Upon acquisition of professional experience, the graduate should become a good engineer able to demonstrate good analytical competences. Career prospects cover research, creation of innovations, management of engineering activities in the study field of Aerospace Engineering and adjacent study fields as well as significant managerial responsibility. The graduate is prepared to take a high-level executive or engineering administration position.

15.3. Threshold achievement level:

15.3.1. Knowledge and fundamental understanding of aerospace engineering and the adjacent study fields as well as practical abilities are basic;

15.3.2. The graduate understands what general knowledge may be applied in new situations, yet lacks knowledge and confidence to use it;

15.3.3. The graduate is able to apply the methods for solution of problems in the study field of Aerospace Engineering which help to evaluate changes known in advance and the progress of engineering;

15.3.4. The graduate is able to perform calculations, interpretations and analysis of results requiring deeper knowledge, yet assistance and control are needed;

15.3.5. The graduate is minimally prepared for further doctoral studies;

15.3.6. Graduates of this level will be suitable for the position of a senior technical or general operator. Upon acquisition of professional experience in aerospace engineering, the graduate may become a good engineer of a specific area.

Annex 5 to
the Descriptor of the Group
of Study Fields of Engineering

DESCRIPTOR OF THE STUDY FIELD OF MARINE ENGINEERING

CHAPTER I
GENERAL PROVISIONS

1. The Descriptor of the Study Field of Marine Engineering (hereinafter referred to as the "Descriptor") shall govern the special requirements applied to the study programmes of the study field of Marine Engineering.

2. The Descriptor shall apply to college and first and second cycle university study programmes of the study field of Marine Engineering.

3. The study field of Marine Engineering falls within the study area of Technology. The study field consists of the following branches: ship building, ship design, seaport engineering, fleet engineering, high seas engineering and vessel power plan engineering.

CHAPTER II
CONCEPT AND SCOPE OF THE STUDY FIELD

4. Marine Engineering is a targeted activity aimed at creating tools, instruments and systems to use natural resources and natural phenomena in a safe, effective, economic and sustainable manner so that human needs could be met. Studies in the study field of Marine Engineering shall provide a person with higher education which, combined with practical experience, forms a sufficient basis of engineer's professional activity. Marine Engineering integrates knowledge of a number of study fields of technology necessary for designing, building, operation and maintenance of waterborne vehicles and their propulsion and on-board systems.

5. Additional requirements for conventional (state regulated) study programmes of the study field of Marine Engineering are set out in international legislation ratified or recognised by the Government of the Republic of Lithuania otherwise.

CHAPTER III
GENERAL AND SPECIAL LEARNING OUTCOMES

6. College and first cycle university study programmes of the study field of Marine Engineering shall be based on the same knowledge of fundamental science necessary for engineering activities, provide the same main engineering abilities and aim at providing and improving competences in the same area. College studies shall be targeted at the application of scientific knowledge and typical engineering solutions verified in practice, whereas the objectives of university study programmes should also cover perception and application of up-to-date knowledge, solving non-typical tasks in non-typical settings, and finding new engineering solutions.

7. Upon completion of college studies, persons shall:

7.1. Acquire the following knowledge and abilities:

7.1.1. Knowledge of the general consistent patterns and laws of natural sciences and mathematics, which is required for understanding of the fundamentals of the study field of Marine Engineering;

7.1.2. Knowledge of the key concepts of the study field of Marine Engineering and understanding of their content;

7.1.3. Basic knowledge of Marine Engineering relevant to the major study programme and significant to practical work;

7.1.4. Knowledge of the context of the problems of adjacent fields of study and their solutions.

7.2. Be able to perform engineering analysis:

7.2.1. Ability to apply their knowledge and understanding when solving the problems of the study field of Marine Engineering by creatively using familiar methods;

7.2.2. Ability to apply their knowledge and understanding when analysing engineering tasks and choosing appropriate methods, experimental and industrial equipment to solve them;

7.2.3. Ability to apply analytical and modelling methods when solving engineering tasks of the study field of Marine Engineering.

7.3. Have knowledge and skills necessary to perform design works of the study field of Marine Engineering:

7.3.1. Ability to apply engineering knowledge and understanding when formulating and performing design tasks according to the defined requirements;

7.3.2. Understanding of design methodologies and ability to apply them;

7.4. Be able to conduct applied research:

7.4.1. Ability to find necessary professional information in databases and other scientific and engineering information sources;

7.4.2. Ability to carry out experiments when solving engineering tasks, process their findings and present practical conclusions of these findings;

7.4.3. Skills of operating equipment used in the study field of Marine Engineering.

7.5. Have practical knowledge and skills when solving engineering tasks:

7.5.1. Ability to choose engineering solutions as well as tools and equipment necessary to implement these solutions;

7.5.2. Ability to combine theoretical and applied knowledge when solving engineering problems;

7.5.3. Understanding of the ethical, environmental and commercial circumstances of engineering activities;

7.5.4. Understanding of engineering activity organisation principles, knowledge of the main requirements for occupational and fire safety.

7.6. Have the following personal and social abilities:

7.6.1. Ability to solve engineering tasks individually and in a team;

7.6.2. Ability to communicate with engineering community and the general public;

7.6.3. Understanding of the impact of engineering solutions on the society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for the outcomes of engineering activities;

7.6.4. Knowledge of the key aspects of project implementation and management on the level of engineering activities;

7.6.5. Perception of the importance of individual lifelong learning and preparation for it.

8. Upon completion of first cycle university studies, persons shall:

8.1. Acquire the following knowledge and abilities:

8.1.1. Knowledge and understanding of the basics of natural sciences and mathematics required for understanding of the fundamentals of the study field of Marine Engineering;

8.1.2. Knowledge and systematic understanding of the key theoretical and applied basics and concepts of the study field of Marine Engineering;

8.1.3. Basic coherent knowledge of the study field of Marine Engineering relevant to the major study programme;

8.1.4. Knowledge of a wider multidisciplinary engineering context, ability to apply methods and processes of other fields of science.

8.2. Be able to perform engineering analysis:

8.2.1. Ability to apply their knowledge and understanding when formulating and solving the problems of the study field of Marine Engineering by choosing appropriate methods;

8.2.2. Ability to apply their knowledge and understanding when formulating and analysing engineering tasks and choosing appropriate methods, experimental and industrial equipment to solve them;

8.2.3. Ability to choose and apply appropriate analytical and modelling methods of the study field of Engineering relevant to the study programme.

8.3. Have knowledge and skills necessary to perform design works of the study field of Marine Engineering:

8.3.1. Ability to apply engineering knowledge and understanding of the study field of Marine Engineering when developing and implementing projects which comply with the defined requirements;

8.3.2. Understanding of design methodologies and ability to apply them.

8.4. Be able to conduct fundamental and applied research:

8.4.1. Ability to find necessary scientific and professional information in databases and other information sources;

8.4.2. Ability to plan and carry out necessary marine engineering experiments, process and evaluate their data and present conclusions;

8.4.3. Skills of operating equipment used in the study field of engineering relevant to the study programme.

8.5. Have the abilities of practical work when solving engineering tasks:

8.5.1. Ability to choose and apply appropriate methods, tools and equipment for the implementation of engineering solutions, knowledge of the structures, principles of operation and functions of this engineering equipment, as well as basic abilities to use it;

8.5.2. Ability to combine theoretical and applied knowledge when solving marine engineering problems;

8.5.3. Understanding and evaluation of the ethical, environmental and commercial circumstances of engineering activities;

8.5.4. Understanding of the principles of organisation of engineering activities, the importance of occupational and fire safety as well as the key requirements and engineering activity chain interaction.

8.6. Have the following personal and social abilities:

8.6.1. Ability to efficiently work individually and in a team;

8.6.2. Ability to communicate with engineering community and the general public;

8.6.3. Holistic understanding of the impact of engineering solutions on the society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for engineering activities;

8.6.4. Knowledge of the aspects of project management and business, understanding of the connections between technological solutions and their economic outcomes;

8.6.5. Perception of the importance of individual lifelong learning and preparation for it.

9. Upon completion of second cycle and integrated university studies, persons shall:

9.1. Acquire the following knowledge and abilities:

9.1.1. Good knowledge and ability to creatively apply the basics of natural sciences and mathematics, thorough knowledge and understanding of the principles of the study field of Marine Engineering and ability to apply them when solving new engineering tasks;

9.1.2. Knowledge and critical evaluation of the latest achievements in marine engineering.

9.2. Be able to perform engineering analysis:

9.2.1. Ability to solve non-typical, non-strictly defined and non-exhaustively described problems;

9.2.2. Ability to envisage standard and non-standard engineering problems, clearly formulate and solve them;

9.2.3. Ability to use their knowledge and understanding when solving practical marine engineering tasks by applying theoretical models and research methods, including mathematical analysis, computational modelling and experimental research methods;

9.2.4. Understanding of the importance of social, health, occupational and fire safety, environmental and commercial requirements;

9.2.5. Ability to apply innovative methods when solving specific problems and implementing their solutions.

9.3. Have knowledge and skills necessary to perform design works of the study field of Marine Engineering:

9.3.1. Ability to apply their knowledge and understanding when solving non-standard problems, including those related to other fields of science and engineering studies;

9.3.2. Ability to innovatively develop new and original engineering ideas and methods;

9.3.3. Ability to make engineering decisions, having encountered multiple, technically undefined and not clearly described problems;

9.4. Be able to conduct fundamental and applied research:

9.4.1. Ability to recognise, find and evaluate data necessary for engineering work using databases and other information sources;

9.4.2. Ability to plan and conduct analytical, modelling and experimental research in marine engineering, critically evaluate its data and present conclusions;

9.4.3. Ability to explore applicability of new methods and ways of solving engineering problems of the study field of Marine Engineering.

9.5. Have the abilities of practical work when solving engineering tasks:

9.5.1. Ability to combine the knowledge of different study fields and solve multiple engineering problems;

9.5.2. Thorough understanding of applied methods and methodologies as well as their limitations, ability to select engineering equipment and software;

9.5.3. Knowledge of ethical, environmental and commercial requirements of engineering equipment;

9.5.4. Knowledge of engineering activity organisation principles, understanding of its chain interaction, ability to evaluate engineering activities in terms of occupational safety and environment protection.

9.6. Have the following personal and social abilities:

9.6.1. Ability to efficiently work individually and in a team, be leader of a team which may consist of representatives of various study fields and levels;

9.6.2. Ability to communicate with engineering community and the general public on both national and international level;

9.6.3. Holistic understanding of the impact of engineering solutions on the society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for engineering activities;

9.6.4. Very good knowledge of the aspects of project management and business, understanding of the connections between technological solutions and their economic outcomes.

CHAPTER IV
TEACHING, LEARNING, ASSESSMENT, REQUIREMENTS FOR THE IMPLEMENTATION OF STUDY PROGRAMMES AND DESCRIPTOR OF LEVELS OF ACHIEVED LEARNING OUTCOMES

10. The requirements for teaching, learning, assessment and implementation of study programmes comply with the requirements presented in the Descriptor of the Group of Study Fields of Engineering.

11. The following study achievement levels of graduates of the study field of General Engineering shall be distinguished: threshold (minimum requirements), typical (standard, average requirements) and excellent (higher than average requirements). The achievement level is the level to be achieved by all students who acquire a higher education qualification.

12. The levels of the learning outcomes of college studies are the following:

12.1. Excellent achievement level:

12.1.1. Marine engineering knowledge and related practical abilities are comprehensive and are not limited to information gained during studies;

12.1.2. Analysis and consideration of work results clearly reveals original thinking and excellent knowledge of marine engineering activities;

12.1.3. Knowledge and practical abilities are quickly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

12.1.4. Common calculations, explanations, interpretations and analyses are performed quickly, smoothly and accurately; analytical and modelling methods are applied;

12.1.5. New knowledge of marine engineering is acquired quickly and with certainty. Excellent general abilities, good agenda management;

12.1.6. Graduates of this level may enrol in Master's studies;

12.1.7. Upon acquisition of professional experience, graduates should be excellent engineers-practitioners. Career prospects are related to engineering activities of the study field of Marine Engineering and managerial responsibility.

12.2. Typical achievement level:

12.2.1. Marine engineering knowledge and related practical abilities are good, yet limited to what is provided by the programme;

12.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Marine Engineering;

12.2.3. Ability to apply methods of solving problems of the study field of Marine Engineering, which help to evaluate changes known in advance and the progress of general engineering;

12.2.4. Common actions of preparation and operation of engineering equipment and processes are performed accurately;

12.2.5. Ability to quickly acquire new knowledge, good general abilities and ability to manage the agenda. External assistance needed at the beginning of career;

12.2.6. Graduates of this level may enrol in Master's studies;

12.2.7. Upon acquisition of professional experience, graduates should be good engineers-practitioners. Career prospects are related to engineering activities of the study field of Marine Engineering and managerial responsibility.

12.3. Threshold achievement level:

12.3.1. Basic marine engineering knowledge and practical abilities;

12.3.2. Graduates understand which general knowledge could be applied in new situations, yet they do not have abilities and confidence how to use it;

12.3.3. Students are ready to perform common activities of the study field of Marine Engineering, yet they need assistance and control;

12.3.4. Ability to perform simple calculations, explain typical results, yet assistance and control is needed;

12.3.5. Minimum preparation for further studies;

12.3.6. Graduates of this level should be suitable for the position of a technical or general operator (assistant). Upon acquisition of relevant professional experience, graduates should become good practitioners of the specific field which requires knowledge and understanding of materials, typical and common technologies, yet does not require regular application of fundamental knowledge.

13. The levels of the learning outcomes of first cycle university studies are the following:

13.1. Excellent achievement level:

13.1.1. Marine engineering knowledge and systematic understanding as well as related practical abilities are comprehensive and are not limited to information gained during studies;

13.1.2. Analysis and consideration of work results clearly reveals original systematic thinking and excellent knowledge of theoretical material and practical marine engineering activities;

13.1.3. Knowledge and practical abilities are quickly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

13.1.4. Typical calculations, interpretations, analyses and explanations are performed quickly, smoothly and accurately; ability to select and apply adequate analytical and modelling methods; the problem and its solutions are evaluated critically;

13.1.5. New marine engineering knowledge is acquired quickly and confidently; excellent general abilities and good management of the agenda;

13.1.6. Graduates of this level are recommended to enrol in Master's studies;

13.1.7. Upon acquisition of professional experience, graduates should be excellent engineers-innovators. Career prospects cover research, creation of innovations, administration of engineering activities of the relevant study field as well as significant managerial responsibility.

13.2. Typical achievement level:

13.2.1. Marine engineering knowledge and systematic understanding as well as related practical abilities are good yet limited to information gained during studies;

13.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Marine Engineering. Graduates are able to use scientific literature to perform an engineering activity task;

13.2.3. Ability to quickly apply methods of solving problems of the study field of Marine Engineering, which help to evaluate changes known in advance and the progress of engineering;

13.2.4. Typical calculations, interpretations, analyses and explanations are performed accurately; ability to apply mastered analytical and modelling methods;

13.2.5. Ability to quickly acquire new knowledge, good general abilities and good ability to manage the agenda. External assistance needed at the beginning of career;

13.2.6. Graduates of this level may enrol in Master's studies;

13.2.7. Upon acquisition of professional experience, graduates should be good engineers. Career prospects cover research, creation of innovations, administration of engineering activities of the relevant study field.

13.3. Threshold achievement level:

13.3.1. Basic knowledge and understanding of the study field of Marine Engineering, practical abilities;

13.3.2. Graduates understand which general knowledge could be applied in new situations, yet they lack abilities and confidence how to use it;

13.3.3. Ability to apply methods of solving problems of the study field of Marine Engineering, yet assistance and control is needed;

13.3.4. Ability to perform typical calculations, interpretations, result analyses and explanations, yet assistance and control is needed;

13.3.5. Graduates are prepared for Master's studies to a minimum extent;

13.3.6. Graduates of this level should be suitable for the position of a technical or general operator (assistant). Upon acquisition of the relevant professional experience, graduates should

become good engineers of the specific field which does not require regular application of fundamental knowledge and systematic understanding.

14. The levels of the learning outcomes of second cycle and integrated university studies are the following:

14.1. Excellent achievement level:

14.1.1. Fundamental understanding of the study field of Marine Engineering and adjacent study fields and related practical abilities are comprehensive and are not limited to information gained during studies;

14.1.2. Analysis and consideration of work results clearly reveals original analytical thinking, excellent knowledge of literature and marine engineering activities;

14.1.3. Graduates are able to plan and conduct research;

14.1.4. Ability to quickly apply knowledge and practical abilities also in intensively changing activities and setting, when changes are hard to predict and activities consist of constantly changing task combinations;

14.1.5. Calculations, interpretations, analyses and explanations that require deeper knowledge are performed quickly, smoothly, accurately and with insight; theoretical models and research methods are applied, and the problem and its solution are evaluated critically;

14.1.6. New marine engineering knowledge is acquired quickly and confidently; excellent general abilities and good management of the agenda;

14.1.7. Graduates of this level are recommended to enrol in doctoral studies;

14.1.8. Upon acquisition of professional experience, graduates should be excellent engineers-analysts able to demonstrate good expert competences. Career prospects cover research, creation of innovations, administration of engineering activities of the relevant study field and adjacent study fields as well as significant managerial responsibility.

14.2. Typical achievement level:

14.2.1. Fundamental understanding of the relevant study field and adjacent study fields as well as related practical abilities are good, yet limited to what is provided by the programme;

14.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Marine Engineering and adjacent study fields and are able to understand scientific literature, plan and conduct scientific research;

14.2.3. Knowledge and practical abilities are adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

14.2.4. Calculations, interpretations, analyses and explanations that require deeper knowledge are performed accurately; mastered theoretical models and research methods are applied for problem solving;

14.2.5. Ability to acquire new knowledge; good general abilities and ability to manage the agenda;

14.2.6. Graduates of this level may enrol in doctoral studies;

14.2.7. Upon acquisition of professional experience, graduates should be good engineers able to demonstrate good analyst competences. Career prospects cover scientific research, creation of innovations, administration of engineering activities of the study field of Marine Engineering and adjacent study fields as well as significant managerial responsibility.

14.3. Threshold achievement level:

14.3.1. Basic fundamental understanding of the study field of Marine Engineering and adjacent study fields as well as practical abilities;

14.3.2. Understanding which general knowledge could be applied in new situations, yet lack of knowledge and confidence how to use this knowledge;

14.3.3. Ability to apply methods of solving problems of the study field of Marine Engineering, which help to evaluate changes known in advance and the progress of engineering;

14.3.4. Ability to perform calculations, interpretations and result analyses that require more thorough knowledge, yet assistance and control is needed;

14.3.5. Minimum preparation for further doctoral studies;

14.3.6. Graduates of this level should be suitable for the position of a senior technical or general operator. Upon acquisition of professional experience in marine engineering, graduates should become good engineers of the specific field.

Annex 6 to
the Descriptor of the Group of Study Fields
of Engineering

DESCRIPTOR OF THE STUDY FIELD OF ELECTRONIC AND ELECTRICAL ENGINEERING

CHAPTER I
GENERAL PROVISIONS, CONCEPT AND SCOPE OF THE STUDY FIELD

1. The Descriptor of the Study Field of Electronic and Electrical Engineering (hereinafter referred to as the "Descriptor") shall govern the special requirements applied to the study programmes of the study field of Electronic and Electrical Engineering.

2. The Descriptor shall apply to college and first and second cycle university study programmes of the study field of Electronic and Electrical Engineering.

3. The Descriptor shall apply to the following branches of the study field of Electronic and Electrical Engineering: electronic engineering, electrical engineering, electricity, telecommunications engineering, system engineering, control systems, robotics and cybernetics, optoelectronic engineering and computer engineering.

4. Electronic and electrical engineering is a targeted activity aimed at creating and effectively and safely operating electronic and electrical tools and systems that use natural resources and natural phenomena for safe, effective, confortable, economic and sustainable human activities. Studies in the study field of Electronic and Electrical Engineering shall provide a person with higher education which, combined with practical experience, forms a sufficient basis of engineer's professional activity. Electronic and electrical engineering covers electronic, electrical and power tools and systems, telecommunications, control systems, robotics, optoelectronic and computer engineering.

CHAPTER II
GENERAL AND SPECIAL LEARNING OUTCOMES

5. When developing new study programmes, the main learning outcomes of study programmes of the study field of Electronic and Electrical Engineering, provided in this chapter, should be specified in such a way that the study programme best meets the specific requirements for the study field or branch of Electronic and Electrical Engineering.

6. College and first cycle university study programmes of the study field of Electronic and Electrical Engineering, which aim at preparing engineers, are based on the same knowledge of fundamental science necessary for engineering activities, provide the same main engineering abilities, aim at providing and improving general engineering competences, yet college studies are more targeted at the application of scientific knowledge and typical engineering solutions verified in practice, whereas the objectives of university study programmes also cover the perception and application of up-to-date knowledge, solving non-typical tasks in non-typical settings, and finding new engineering solutions.

7. Upon completion of college studies, persons shall:

7.1. Acquire the following knowledge and abilities:

7.1.1. Knowledge of the general consistent patterns and laws of natural sciences and mathematics, which is required for understanding of the fundamentals of the study field of Electronic and Electrical Engineering;

7.1.2. Knowledge of the key concepts of the study field of Electronic and Electrical Engineering relevant to the study programme and understanding of their content;

7.1.3. Basic knowledge of electronic and electrical engineering relevant to the study programme and significant to practice;

7.1.4. Knowledge of the context of the problems of adjacent fields of study and their solutions.

7.2. Be able to perform engineering analysis:

7.2.1. Ability to apply their knowledge and understanding when solving the problems of the study field of Electronic and Electrical Engineering relevant to the study programme and ability to creatively apply familiar methods;

7.2.2. Ability to apply their knowledge and understanding when analysing engineering tasks and choosing appropriate methods, experimental and industrial equipment to solve them;

7.2.3. Ability to apply analytical and modelling methods when solving engineering tasks of the study field of Electronic and Electrical Engineering relevant to the study programme.

7.3. Have knowledge and skills necessary to perform design works of the study field of Electronic and Electrical Engineering relevant to the study programme:

7.3.1. Ability to apply engineering knowledge and understanding when formulating and performing design tasks according to the defined requirements;

7.3.2. Understanding of design methodologies and ability to apply them.

7.4. Be able to conduct applied research:

7.4.1. Ability to find necessary professional information in databases and other scientific and engineering information sources;

7.4.2. Ability to carry out experiments when solving engineering tasks, process their findings and present practical conclusions of these findings;

7.4.3. Skills of operating equipment used in the study field of Electronic and Electrical Engineering relevant to the study programme.

7.5. Have practical knowledge and skills when solving engineering tasks:

7.5.1. Ability to choose engineering solutions as well as tools and equipment necessary to implement these solutions;

7.5.2. Ability to combine theoretical and applied knowledge when solving engineering problems;

7.5.3. Understanding of the ethical, environmental and commercial circumstances of engineering activities;

7.5.4. Understanding of engineering activity organisation principles, knowledge of the main requirements for occupational and fire safety.

7.6. Have the following personal and social abilities:

7.6.1. Ability to solve engineering tasks individually and in a team;

7.6.2. Ability to communicate with engineering community and the general public;

7.6.3. Understanding of the impact of engineering solutions on the society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for the outcomes of engineering activities;

7.6.4. Knowledge of the key aspects of project implementation and management on the level of engineering activities;

7.6.5. Perception of the importance of individual lifelong learning and preparation for it.

8. Upon completion of first cycle university studies, persons shall:

8.1. Acquire the following knowledge and abilities:

8.1.1. Knowledge and understanding of the basics of natural sciences and mathematics required for understanding of the fundamentals of the study field of Electronic and Electrical Engineering;

8.1.2. Knowledge and systematic understanding of the key theoretical and applied basics and concepts of the study field of Electronic and Electrical Engineering;

8.1.3. Basic coherent knowledge of the study field of Electronic and Electrical Engineering relevant to the major study programme;

8.1.4. Knowledge of a wider multidisciplinary engineering context, ability to apply methods and processes of other fields of science.

8.2. Be able to perform engineering analysis:

8.2.1. Ability to apply their knowledge and understanding when formulating and solving the problems of the study field of Electronic and Electrical Engineering by choosing appropriate methods;

8.2.2. Ability to apply their knowledge and understanding when formulating and analysing engineering tasks and choosing appropriate methods, experimental and industrial equipment to solve them;

8.2.3. Ability to choose and apply appropriate analytical and modelling methods of the study field of Electronic and Electrical Engineering relevant to the study programme.

8.3. Have knowledge and skills necessary to perform design works of the study field of Electronic and Electronic Engineering relevant to the study programme:

8.3.1. Ability to apply engineering knowledge and understanding of the study field of Electronic and Electrical Engineering when developing and implementing projects which comply with the defined requirements;

8.3.2. Understanding of design methodologies and ability to apply them.

8.4. Be able to conduct fundamental and applied research:

8.4.1. Ability to find necessary scientific and professional information in databases and other information sources;

8.4.2. Ability to plan and carry out necessary experiments, process and evaluate their data and present conclusions;

8.4.3. Skills of operating equipment used in the study field of Electronic and Electrical Engineering relevant to the study programme.

8.5. Have the abilities of practical work when solving engineering tasks:

8.5.1. Ability to choose and apply appropriate methods, tools and equipment for the implementation of engineering solutions, knowledge of the structures, principles of operation and functions of this engineering equipment, as well as basic abilities to use it;

8.5.2. Ability to combine theoretical and applied knowledge when solving engineering problems;

8.5.3. Understanding and evaluation of the ethical, environmental and commercial circumstances of engineering activities;

8.5.4. Understanding of the principles of organisation of engineering activities, the importance of occupational and fire safety as well as the key requirements and engineering activity chain interaction.

8.6. Have the following personal and social abilities:

8.6.1. Ability to efficiently work individually and in a team;

8.6.2. Ability to communicate with engineering community and the general public;

8.6.3. Holistic understanding of the impact of engineering solutions on the society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for engineering activities;

8.6.4. Knowledge of the aspects of project management and business, understanding of the connections between technological solutions and their economic outcomes;

8.6.5. Perception of the importance of individual lifelong learning and preparation for it.

9. Upon completion of second cycle university studies, persons shall:

9.1. Acquire the following knowledge and abilities:

9.1.1. Good knowledge and ability to creatively apply the basics of natural sciences and mathematics, thorough knowledge and understanding of the principles of the study field of Electronic and Electrical Engineering relevant to the study programme and ability to apply them when solving new engineering tasks;

9.1.2. Knowledge and critical evaluation of the latest achievements in engineering.

9.2. Be able to perform engineering analysis:

9.2.1. Ability to solve non-typical, non-strictly defined and non-exhaustively described problems;

9.2.2. Ability to envisage standard and non-standard engineering problems, clearly formulate and solve them;

9.2.3. Ability to use their knowledge and understanding when solving practical engineering tasks by applying theoretical models and research methods, including mathematical analysis, computational modelling and experimental research methods;

9.2.4. Understanding of the importance of social, health, occupational and fire safety, environmental and commercial requirements;

9.2.5. Ability to apply innovative methods when solving specific problems and implementing their solutions.

9.3. Have knowledge and skills necessary to perform design works of the study field of Electronic and Electrical Engineering relevant to the study programme:

9.3.1. Ability to apply their knowledge and understanding when solving non-standard problems, including those related to other fields of science and engineering studies;

9.3.2. Ability to innovatively develop new and original engineering ideas and methods;

9.3.3. Ability to make engineering decisions, having encountered multiple, technically undefined and not clearly described problems.

9.4. Be able to conduct fundamental and applied research:

9.4.1. Ability to recognise, find and evaluate data necessary for engineering work using databases and other information sources;

9.4.2. Ability to plan and conduct analytical, modelling and experimental research, critically evaluate its data and present conclusions;

9.4.3. Ability to explore applicability of new methods and ways of solving engineering problems of the study field of Electronic and Electrical Engineering relevant to the study programme.

9.5. Have the abilities of practical work when solving engineering tasks:

9.5.1. Ability to combine the knowledge of different study fields and solve multiple engineering problems;

9.5.2. Thorough understanding of applied methods and methodologies as well as their limitations, ability to select engineering equipment and software;

9.5.3. Knowledge of ethical, environmental and commercial requirements of engineering equipment;

9.5.4. Knowledge of engineering activity organisation principles, understanding of its chain interaction, ability to evaluate engineering activities in terms of occupational safety and environment protection.

9.6. Have the following personal and social abilities:

9.6.1. Ability to efficiently work individually and in a team, be leader of a team which may consist of representatives of various study fields and levels;

9.6.2. Ability to communicate with engineering community and the general public on both national and international level;

9.6.3. Holistic understanding of the impact of engineering solutions on the society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for engineering activities;

9.6.4. Very good knowledge of the aspects of project management and business, understanding of the connections between technological solutions and their economic outcomes.

CHAPTER III
TEACHING, LEARNING, ASSESSMENT, REQUIREMENTS FOR THE IMPLEMENTATION OF STUDY PROGRAMMES AND DESCRIPTOR OF LEVELS OF ACHIEVED LEARNING OUTCOMES

10. The requirements for teaching, learning, assessment and implementation of study programmes comply with the requirements presented in the Descriptor of the Group of Study Fields of Engineering.

11. The achieved level of learning outcomes is the description of student's knowledge and practical abilities, related to academic and/or professional career opportunities.

12. The following study achievement levels of graduates of the study field of Electronic and Electrical Engineering shall be distinguished: threshold (minimum requirements), typical (standard, average requirements) and excellent (higher than average requirements). The threshold achievement level is the level to be achieved by all students who acquire a higher education qualification.

13. The levels of the learning outcomes of college studies are the following:

13.1. Excellent achievement level:

13.1.1. Knowledge of electronic and electrical engineering and related practical abilities are comprehensive and are not limited to information gained during studies;

13.1.2. Analysis and consideration of work results clearly reveals original thinking and excellent knowledge of electronic and electrical engineering activities;

13.1.3. Knowledge and practical abilities are quickly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

13.1.4. Common calculations, explanations, interpretations and analyses are performed quickly, smoothly and accurately; analytical and modelling methods are applied;

13.1.5. New knowledge of electronic and electrical engineering is acquired quickly and with certainty. Excellent general abilities, good agenda management;

13.1.6. Graduates of this level may enrol in Master's studies;

13.1.7. Upon acquisition of professional experience, graduates should be excellent engineers-practitioners. Career prospects are related to engineering activities of the study field of Electronic and Electrical Engineering and managerial responsibility. They may quickly occupy the position of a high-level operator.

13.2. Typical achievement level:

13.2.1. Knowledge of electronic and electrical engineering and related practical abilities are good, yet limited to what is provided by the programme;

13.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Electronic and Electrical Engineering;

13.2.3. Ability to apply methods of solving problems of the study field of Electronic and Electrical Engineering, which help to evaluate changes known in advance and the progress of general engineering;

13.2.4. Common actions of preparation and operation of electronic and electrical engineering equipment and processes are performed accurately;

13.2.5. Ability to quickly acquire new knowledge, good general abilities and ability to manage the agenda. External assistance needed at the beginning of career;

13.2.6. Graduates of this level may enrol in Master's studies;

13.2.7. Upon acquisition of professional experience, graduates should be good engineers-practitioners. Career prospects are related to engineering activities of the study field of Electronic

and Electrical Engineering and managerial responsibility. They may occupy the position of a higher-level operator.

13.3. Threshold achievement level:

13.3.1. Basic knowledge of electronic and electrical engineering and practical abilities;

13.3.2. Graduates understand which general knowledge could be applied in new situations, yet they do not have abilities and confidence how to use it;

13.3.3. Students are ready to perform common activities of the study field of Electronic and Electrical Engineering, yet they need assistance and control;

13.3.4. Ability to perform simple calculations, explain typical results, yet assistance and control is needed;

13.3.5. Minimum preparation for further studies;

13.3.6. Graduates of this level should be suitable for the position of a technical or general operator (assistant). Upon acquisition of professional experience in electronic and electrical engineering, graduates should become good practitioners of the specific field which requires knowledge and understanding of materials, typical and common technologies, yet does not require regular application of fundamental knowledge.

14. The levels of the learning outcomes of first cycle university studies are the following:

14.1. Excellent achievement level:

14.1.1. Knowledge and systematic understanding of electronic and electrical engineering as well as related practical abilities are comprehensive and are not limited to information gained during studies;

14.1.2. Analysis and consideration of work results clearly reveals original systematic thinking and excellent knowledge of theoretical material and practical electronic and electrical engineering activities;

14.1.3. Knowledge and practical abilities are quickly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

14.1.4. Typical calculations, interpretations, analyses and explanations are performed quickly, smoothly and accurately; ability to select and apply adequate analytical and modelling methods; the problem and its solutions are evaluated critically;

14.1.5. New knowledge of electronic and electrical engineering is acquired quickly and confidently; excellent general abilities and good management of the agenda;

14.1.6. Graduates of this level are recommended to enrol in Master’s studies;

14.1.7. Upon acquisition of professional experience, graduates should be excellent engineers-innovators. Career prospects cover research, creation of innovations, administration of engineering activities of the study field of Electronic and Electrical Engineering as well as significant managerial responsibility. Graduates may quickly occupy the position of a high-level operator or engineering administrator.

14.2. Typical achievement level:

14.2.1. Knowledge and systematic understanding of electronic and electrical engineering as well as related practical abilities are good yet limited to information gained during studies;

14.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Electronic and Electrical Engineering. Graduates are able to use scientific literature to perform an engineering activity task of the study field of Electronic and Electrical Engineering;

14.2.3. Ability to quickly apply methods of solving problems of the study field of Eletcronic and Electrical Engineering, which help to evaluate changes known in advance and the progress of engineering;

14.2.4. Typical calculations, interpretations, analyses and explanations are performed accurately; ability to apply mastered analytical and modelling methods;

14.2.5. Ability to quickly acquire new knowledge, good general abilities and good ability to manage the agenda. External assistance needed at the beginning of career;

14.2.6. Graduates of this level may enrol in Master's studies;

14.2.7. Upon acquisition of professional experience, graduates should be good engineers. Career prospects cover research, creation of innovations, administration of engineering activities of the study field of Electronic and Electrical Engineering; significant managerial responsibility and career development to the position of a higher-level operator may be expected.

14.3. Threshold achievement level:

14.3.1. Basic knowledge and understanding of electronic and electrical engineering, practical abilities;

14.3.2. Graduates understand which general knowledge could be applied in new situations, yet they lack abilities and confidence how to use it;

14.3.3. Ability to apply methods of solving problems of the study field of Electronic and Electrical Engineering, yet assistance and control is needed;

14.3.4. Ability to perform typical calculations, interpretations, result analyses and explanations, yet assistance and control is needed;

14.3.5. Graduates are prepared for Master's studies to a minimum extent;

14.3.6. Graduates of this level should be suitable for the position of a technical or general operator (assistant). Upon acquisition of professional experience of the study field of Electronic and Electrical Engineering, graduates should become good engineers of the specific field which does not require regular application of fundamental knowledge and systematic understanding.

15. The levels of the learning outcomes of second cycle university studies are the following:

15.1. Excellent achievement level:

15.1.1. Fundamental understanding of the study field of Electronic and Electrical Engineering and adjacent study fields and related practical abilities are comprehensive and are not limited to information gained during studies;

15.1.2. Analysis and consideration of work results clearly reveals original analytical thinking, excellent knowledge of literature and appropriate electronic and electrical engineering activities;

15.1.3. Graduates are able to plan and conduct scientific research;

15.1.4. Ability to quickly apply knowledge and practical abilities also in intensively changing activities and setting, when changes are hard to predict and activities consist of constantly changing task combinations;

15.1.5. Calculations, interpretations, analyses and explanations that require deeper knowledge are performed quickly, smoothly, accurately and with insight; theoretical models and research methods are applied, and the problem and its solution are evaluated critically;

15.1.6. New knowledge of electronic and electrical engineering is acquired quickly and confidently; excellent general abilities and good management of the agenda;

15.1.7. Graduates of this level are recommended to enrol in doctoral studies;

15.1.8. Upon acquisition of professional experience, graduates should be excellent engineers-analysts able to demonstrate good expert competences. Career prospects cover scientific research, creation of innovations, administration of engineering activities of the study field of Electronic and Electrical Engineering and adjacent study fields as well as significant managerial responsibility. Graduates may quickly occupy the position of a top level operator or engineering administrator.

15.2. Typical achievement level:

15.2.1. Fundamental understanding of the study field of Electronic and Electrical Engineering and adjacent study fields as well as related practical abilities are good, yet limited to what is provided by the programme;

15.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Electronic

and Electrical Engineering and adjacent study fields and are able to understand scientific literature, plan and conduct scientific research;

15.2.3. Knowledge and practical abilities are adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

15.2.4. Calculations, interpretations, analyses and explanations that require deeper knowledge are performed accurately; mastered theoretical models and research methods are applied for problem solving;

15.2.5. Ability to acquire new knowledge; good general abilities and ability to manage the agenda;

15.2.6. Graduates of this level may enrol in doctoral studies;

15.2.7. Upon acquisition of professional experience, graduates should be good engineers able to demonstrate good analyst competences. Career prospects cover scientific research, creation of innovations, administration of engineering activities of the study field of Electronic and Electrical Engineering and adjacent study fields as well as significant managerial responsibility. Graduates are ready to occupy the position of a high-level operator or engineering administrator.

15.3. Threshold achievement level:

15.3.1. Basic understanding of the study field of Electronic and Electrical Engineering and adjacent study fields as well as practical abilities;

15.3.2. Understanding which general knowledge could be applied in new situations, yet lack of knowledge and confidence how to use this knowledge;

15.3.3. Ability to apply methods of solving problems of the study field of Electronic and Electrical Engineering, which help to evaluate changes known in advance and the progress of engineering;

15.3.4. Ability to perform calculations, interpretations and result analyses that require more thorough knowledge, yet assistance and control is needed;

15.3.5. Minimum preparation for further doctoral studies;

15.3.6. Graduates of this level will be suitable for the position of a senior technical or general operator. Upon acquisition of professional experience in electronic and electrical engineering, graduates should become good engineers of the specific area.

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Annex 7 to
the Descriptor of the Group of Study Fields
of Engineering

DESCRIPTOR OF THE STUDY FIELD OF PRODUCTION ENGINEERING

CHAPTER I
GENERAL PROVISIONS, CONCEPT AND SCOPE OF THE STUDY FIELD

1. The Descriptor of the Study Field of Production Engineering (hereinafter referred to as the "Descriptor") shall govern the special requirements applied to the study programmes of the study field of Production Engineering.

2. The Descriptor shall apply to college and first and second cycle university study programmes of the study field of Production Engineering.

3. The Descriptor shall apply to the following branches of the study field of Production Engineering: production system engineering, quality assurance engineering, mechatronics, press engineering, materials engineering, welding engineering, industrial engineering, innovative engineering.

4. Production means the entirety of operational methods and measures developed through physical and intellectual human efforts, where raw material is transformed into material, and the material, in its turn, into a product. Production engineering is scientific and practical engineer's activity targeted at controlling full technical operation of equipment and creating new production methods and measures by using known and developing new or substantially improving materials already developed, technology, facilities, processes, products and services, also at arranging their implementation, planning and organising production processes. Studies of the study field of Production Engineering shall provide a person with higher education which, combined with practical experience, forms a sufficient basis of engineer's professional activity.

CHAPTER II
GENERAL AND SPECIAL LEARNING OUTCOMES

5. College and first cycle university study programmes of the study field of Production Engineering, which aim at preparing engineers, are based on the same knowledge of fundamental science necessary for engineering activities, provide the same main engineering abilities, aim at providing and improving production engineering competences, yet college studies are more targeted at the application of scientific knowledge and typical engineering solutions verified in practice, whereas the objectives of university study programmes also cover perception and application of up-to-date knowledge, solving non-typical tasks in non-typical settings, and finding new engineering solutions.

6. Upon completion of college studies, persons shall:

6.1. Acquire the following knowledge and abilities:

6.1.1. Knowledge of the general consistent patterns and laws of natural sciences and mathematics, which is required for understanding of the fundamentals of the study field of Production Engineering;

6.1.2. Knowledge of the key concepts of the study field of Production Engineering and understanding of their content;

6.1.3. Basic knowledge of production engineering significant to practice;

6.1.4. Knowledge of the context of the problems of adjacent fields of study and their solutions.

6.2. Be able to perform engineering analysis:

6.2.1. Ability to apply their knowledge and understanding when solving the problems of the study field of Production Engineering and ability to creatively apply familiar methods;

6.2.2. Ability to apply their knowledge and understanding when analysing engineering tasks and choosing appropriate methods, experimental and industrial equipment to solve them;

6.2.3. Ability to apply analytical and modelling methods when solving engineering tasks of the study field of Production Engineering.

6.3. Have knowledge and skills necessary to perform design works of the study field of Production Engineering:

6.3.1. Ability to apply engineering knowledge and understanding when formulating and performing design tasks according to the defined requirements;

6.3.2. Understanding of design methodologies and ability to apply them.

6.4. Be able to conduct applied research:

6.4.1. Ability to find necessary professional information in databases and other scientific and engineering information sources;

6.4.2. Ability to carry out experiments when solving engineering tasks, process their findings and present practical conclusions of these findings;

6.4.3. Skills of operating equipment used in the study field of Production Engineering.

6.5. Have practical knowledge and skills when solving production engineering tasks:

6.5.1. Ability to choose engineering solutions as well as tools and equipment necessary to implement these solutions;

6.5.2. Ability to combine theoretical and applied knowledge when solving production engineering problems;

6.5.3. Understanding of the ethical, environmental and commercial circumstances of production engineering activities;

6.5.4. Understanding of production engineering activity organisation principles, knowledge of the main requirements for occupational and fire safety.

6.6. Have the following personal and social abilities:

6.6.1. Ability to solve engineering tasks individually and in a team;

6.6.2. Ability to communicate with engineering community and the general public;

6.6.3. Understanding of the impact of production engineering solutions on the society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for the outcomes of engineering activities;

6.6.4. Knowledge of the key aspects of project implementation and management on the level of production engineering activities;

6.6.5. Perception of the importance of individual lifelong learning and preparation for it.

7. Upon completion of first cycle university studies, persons shall:

7.1. Acquire the following knowledge and abilities:

7.1.1. Knowledge and understanding of the basics of natural sciences and mathematics required for understanding of the fundamentals of the study field of Production Engineering;

7.1.2. Knowledge and systematic understanding of the key theoretical and applied basics and concepts of the study field of Production Engineering;

7.1.3. Basic coherent knowledge of the study field of Production Engineering;

7.1.4. Knowledge of a wider multidisciplinary engineering context, ability to apply methods and processes of other fields of science.

7.2. Be able to perform engineering analysis:

7.2.1. Ability to apply their knowledge and understanding when formulating and solving the problems of the study field of Production Engineering, choosing appropriate methods;

7.2.2. Ability to apply their knowledge and understanding when formulating and analysing engineering tasks and choosing appropriate methods, experimental and industrial equipment to solve them;

7.2.3. Ability to choose and apply appropriate analytical and modelling methods.

7.3. Have knowledge and skills necessary to perform design works of the study field of Production Engineering:

7.3.1. Ability to apply engineering knowledge and understanding of the study field of Production Engineering when developing and implementing projects which comply with the defined requirements;

7.3.2. Understanding of design methodologies and ability to apply them.

7.4. Be able to conduct fundamental and applied research:

7.4.1. Ability to find necessary scientific and professional information in databases and other information sources;

7.4.2. Ability to plan and carry out necessary experiments, process and evaluate their data and present conclusions;

7.4.3. Skills of operating equipment used in production engineering.

7.5. Have the abilities of practical work when solving production engineering tasks:

7.5.1. Ability to choose and apply appropriate methods, tools and equipment for the implementation of specific production engineering solutions, knowledge of the structures, principles of operation and functions of this engineering equipment, as well as basic abilities to use it;

7.5.2. Ability to combine theoretical and applied knowledge when solving production and general engineering problems;

7.5.3. Understanding and evaluation of the ethical, environmental and commercial circumstances of production engineering activities;

7.5.4. Understanding of the principles of organisation of production activities, the importance of occupational and fire safety as well as the key requirements and production chain coherence and interaction.

7.6. Have the following personal and social abilities:

7.6.1. Ability to efficiently work individually and in a team;

7.6.2. Ability to communicate with engineering community and the general public;

7.6.3. Holistic understanding of the impact of engineering solutions on the society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for engineering activities;

7.6.4. Knowledge of the aspects of project management and business, understanding of the connections between technological solutions and their economic outcomes;

7.6.5. Perception of the importance of individual lifelong learning and preparation for it.

8. Upon completion of second cycle university studies, persons shall:

8.1. Acquire the following knowledge and abilities:

8.1.1. Good knowledge and ability to creatively apply the basics of natural sciences and mathematics, thorough knowledge and understanding of the principles of the study field of Production Engineering and ability to apply them when solving new engineering tasks;

8.1.2. Knowledge and critical evaluation of the latest achievements in production engineering.

8.2. Be able to perform engineering analysis:

8.2.1. Ability to solve non-typical, non-strictly defined and non-exhaustively described problems;

8.2.2. Ability to envisage standard and non-standard production engineering problems, clearly formulate and solve them;

8.2.3. Ability to use their knowledge and understanding when solving practical engineering tasks by applying theoretical models and research methods, including mathematical analysis, computational modelling and experimental research methods;

8.2.4. Understanding of the importance of social, health, occupational and fire safety, environmental and commercial requirements;

8.2.5. Ability to apply innovative methods when solving typical and specific problems and implementing their solutions.

8.3. Have knowledge and skills necessary to perform design works of the study field of Production Engineering:

8.3.1. Ability to apply their knowledge and understanding when solving non-standard problems, including those related to other fields of science and engineering studies;

8.3.2. Ability to innovatively develop new and original engineering ideas and methods;

8.3.3. Ability to make engineering decisions, having encountered multiple, technically undefined and not clearly described problems.

8.4. Be able to conduct fundamental and applied research:

8.4.1. Ability to recognise, find and evaluate data necessary for engineering work using databases and other information sources;

8.4.2. Ability to plan and conduct analytical, modelling and experimental research, critically evaluate its data and present conclusions;

8.4.3. Ability to explore applicability of new and emerging methods and ways of solving engineering problems of the study field of Production Engineering.

8.5. Have the abilities of practical work when solving engineering tasks:

8.5.1. Ability to combine the knowledge of different study fields and solve multiple engineering problems;

8.5.2. Thorough understanding of applied methods and methodologies as well as their limitations, ability to select engineering equipment and software;

8.5.3. Knowledge of ethical, environmental and commercial requirements of engineering equipment;

8.5.4. Knowledge of production activity organisation principles, understanding of its chain coherence and interaction, ability to evaluate engineering activities in terms of occupational safety and environment protection.

8.6. Have the following personal and social abilities:

8.6.1. Ability to efficiently work individually and in a team, be leader of a team which may consist of representatives of various study fields and levels;

8.6.2. Ability to communicate with engineering community and the general public on both national and international level;

8.6.3. Holistic understanding of the impact of engineering solutions on the society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for engineering activities;

8.6.4. Very good knowledge of the aspects of project management and business, understanding of the connections between technological solutions and their economic outcomes.

CHAPTER III
TEACHING, LEARNING, ASSESSMENT, REQUIREMENTS FOR THE IMPLEMENTATION OF STUDY PROGRAMMES AND DESCRIPTOR OF LEVELS OF ACHIEVED LEARNING OUTCOMES

9. The requirements for teaching, learning, assessment and implementation of study programmes comply with the requirements presented in the Descriptor of the Group of Study Fields of Engineering.

10. The achieved level of learning outcomes is the description of student’s knowledge and practical abilities, related to academic and/or professional career opportunities.

11. The following study achievement levels of graduates of the study field of Production Engineering shall be distinguished: threshold (minimum requirements), typical (standard, average

requirements) and excellent (higher than average requirements). The threshold achievement level is the level to be achieved by all students who acquire a higher education qualification.

12. The levels of the learning outcomes of college studies are the following:

12.1. Excellent achievement level:

12.1.1. Knowledge of production engineering and related practical abilities are comprehensive and are not limited to information gained during studies;

12.1.2. Analysis and consideration of work results clearly reveals original thinking and excellent knowledge of production engineering activities;

12.1.3. Knowledge and practical abilities are quickly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

12.1.4. Common calculations, explanations, interpretations and analyses are performed quickly, smoothly and accurately; analytical and modelling methods are applied;

12.1.5. New knowledge of production engineering is acquired quickly and with certainty. Excellent general abilities, good agenda management;

12.1.6. Graduates of this level may enrol in Master's studies;

12.1.7. Upon acquisition of professional experience, graduates should be excellent engineers-practitioners. Career prospects are related to engineering activities of the study field of Production Engineering and managerial responsibility. They may quickly occupy the position of a high-level operator.

12.2. Typical achievement level:

12.2.1. Knowledge of production engineering and related practical abilities are good, yet limited to what is provided by the programme;

12.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Production Engineering;

12.2.3. Ability to apply methods of solving problems of the study field of Production Engineering, which help to evaluate changes known in advance and the progress of engineering;

12.2.4. Common actions of preparation and operation of engineering equipment and processes are performed accurately;

12.2.5. Ability to quickly acquire new knowledge, good general abilities and ability to manage the agenda. External assistance needed at the beginning of career;

12.2.6. Graduates of this level may enrol in Master's studies;

12.2.7. Upon acquisition of professional experience, graduates should be good engineers-practitioners. Career prospects are related to engineering activities of the study field of Production Engineering and managerial responsibility. They may occupy the position of a higher-level operator.

12.3. Threshold achievement level:

12.3.1. Basic knowledge of production engineering and practical abilities;

12.3.2. Graduates understand which general knowledge could be applied in new situations, yet they do not have abilities and confidence how to use it;

12.3.3. Students are ready to perform common activities of the study field of Production Engineering, yet they need assistance and control;

12.3.4. Ability to perform simple calculations, explain typical results, yet assistance and control is needed;

12.3.5. Minimum preparation for further studies;

12.3.6. Graduates of this level should be suitable for the position of a technical or general operator (assistant). Upon acquisition of professional experience in production engineering, graduates should become good practitioners of the specific field which requires knowledge and understanding of materials, typical and common technologies, yet does not require regular application of fundamental knowledge.

13. The levels of the learning outcomes of first cycle university studies are the following:

13.1. Excellent achievement level:

13.1.1. Knowledge of production engineering and systematic understanding as well as related practical abilities are comprehensive and are not limited to information gained during studies;

13.1.2. Analysis and consideration of work results clearly reveals original systematic thinking and excellent knowledge of theoretical material and practical production engineering activities;

13.1.3. Knowledge and practical abilities are quickly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

13.1.4. Typical calculations, interpretations, analyses and explanations are performed quickly, smoothly and accurately; ability to select and apply adequate analytical and modelling methods; the problem and its solutions are evaluated critically;

13.1.5. New knowledge is acquired quickly and confidently; excellent general abilities and good management of the agenda;

13.1.6. Graduates of this level are recommended to enrol in Master's studies;

13.1.7. Upon acquisition of professional experience, graduates should be excellent engineers-innovators. Career prospects cover research, creation of innovations, administration of production engineering activities as well as significant managerial responsibility. Graduates may quickly occupy the position of a high-level operator or engineering administrator.

13.2. Typical achievement level:

13.2.1. Knowledge of production engineering and systematic understanding as well as related practical abilities are good yet limited to information gained during studies;

13.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Production Engineering. Graduates are able to use scientific literature to perform an engineering activity task;

13.2.3. Ability to quickly apply methods of solving problems of the study field of Production Engineering, which help to evaluate changes known in advance and the progress of engineering;

13.2.4. Typical calculations, interpretations, analyses and explanations are performed accurately; ability to apply mastered analytical and modelling methods;

13.2.5. Ability to quickly acquire new knowledge, good general abilities and good ability to manage the agenda. External assistance needed at the beginning of career;

13.2.6. Graduates of this level may enrol in Master's studies;

13.2.7. Upon acquisition of professional experience, graduates should be good engineers. Career prospects cover research, creation of innovations, administration of engineering activities of the study field of Production Engineering; significant managerial responsibility and career development to the position of a higher-level operator may be expected.

13.3. Threshold achievement level:

13.3.1. Basic knowledge and understanding of production engineering, practical abilities;

13.3.2. Graduates understand which general knowledge could be applied in new situations, yet they lack abilities and confidence how to use it;

13.3.3. Ability to apply methods of solving problems of the study field of Production Engineering, yet assistance and control is needed;

13.3.4. Ability to perform typical calculations, interpretations, result analyses and explanations, yet assistance and control is needed;

13.3.5. Graduates are prepared for Master's studies to a minimum extent;

13.3.6. Graduates of this level should be suitable for the position of a technical or general operator (assistant). Upon acquisition of professional experience, graduates should become good engineers of the specific field which does not require regular application of fundamental knowledge and systematic understanding.

14. The levels of the learning outcomes of second cycle university studies are the following:

14.1. Excellent achievement level:

14.1.1. Fundamental understanding of the study field of Production Engineering and adjacent study fields and related practical abilities are comprehensive and are not limited to information gained during studies;

14.1.2. Analysis and consideration of work results clearly reveals original analytical thinking, excellent knowledge of literature and appropriate production engineering activities;

14.1.3. Graduates are able to plan and conduct scientific research;

14.1.4. Ability to quickly apply knowledge and practical abilities also in intensively changing activities and setting, when changes are hard to predict and activities consist of constantly changing task combinations;

14.1.5. Calculations, interpretations, analyses and explanations that require deeper knowledge are performed quickly, smoothly, accurately and with insight; theoretical models and research methods are applied, and the problem and its solution are evaluated critically;

14.1.6. New knowledge is acquired quickly and confidently; excellent general abilities and good management of the agenda;

14.1.7. Graduates of this level are recommended to enrol in doctoral studies;

14.1.8. Upon acquisition of professional experience, graduates should be excellent engineers-analysts able to demonstrate good expert competences. Career prospects cover scientific research, creation of innovations, administration of engineering activities of the study field of Production Engineering and adjacent study fields as well as significant managerial responsibility. Graduates may quickly occupy the position of a top level operator or engineering administrator.

14.2. Typical achievement level:

14.2.1. Fundamental understanding of the study field of Production Engineering and adjacent study fields as well as related practical abilities are good, yet limited to what is provided by the programme;

14.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Production Engineering and adjacent study fields and are able to understand scientific literature, plan and conduct scientific research;

14.2.3. Knowledge and practical abilities are adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

14.2.4. Calculations, interpretations, analyses and explanations that require deeper knowledge are performed accurately; mastered theoretical models and research methods are applied for problem solving;

14.2.5. Ability to acquire new knowledge; good general abilities and ability to manage the agenda;

14.2.6. Graduates of this level may enrol in doctoral studies;

14.2.7. Upon acquisition of professional experience, graduates should be good engineers able to demonstrate good analyst competences. Career prospects cover scientific research, creation of innovations, administration of engineering activities of the study field of Production Engineering and adjacent study fields as well as significant managerial responsibility. Graduates are ready to occupy the position of a high-level operator or engineering administrator.

14.3. Threshold achievement level:

14.3.1. Basic understanding of the study field of Production Engineering and adjacent study fields as well as practical abilities;

14.3.2. Understanding which general knowledge could be applied in new situations, yet lack of knowledge and confidence how to use this knowledge;

14.3.3. Ability to apply methods of solving problems of the study field of Production Engineering, which help to evaluate changes known in advance and the progress of engineering;

14.3.4. Ability to perform calculations, interpretations and result analyses that require more thorough knowledge, yet assistance and control is needed;

14.3.5. Minimum preparation for further doctoral studies;

14.3.6. Graduates of this level will be suitable for the position of a senior technical or general operator. Upon acquisition of professional experience in general engineering, graduates should become good engineers of the specific field.

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Annex 8 to
the Descriptor of the Group of Study Fields
of Engineering

DESCRIPTOR OF THE STUDY FIELD OF CHEMICAL AND PROCESS ENGINEERING

CHAPTER I
GENERAL PROVISIONS, CONCEPT AND SCOPE OF THE STUDY FIELD

1. The Descriptor of the Study Field of Chemical and Process Engineering (hereinafter referred to as the "Descriptor") shall govern the special requirements applied to the study programmes of the study field of Chemical and Process Engineering.

2. The Descriptor shall apply to the following branches of the study field of Chemical and Process Engineering: chemical engineering, process engineering, gas engineering, oil engineering.

3. Chemical and process engineering is a targeted activity aimed at creating tools, instruments and systems intended for the production, processing and adjustment of chemical substances to meet human needs. Studies of this study field shall provide a person with higher education which, combined with practical experience, forms a sufficient basis of engineer's professional activity.

CHAPTER II
GENERAL AND SPECIAL LEARNING OUTCOMES

4. When developing new study programmes, the main learning outcomes of study programmes of the study field of Chemical and Process Engineering, provided in this chapter, should be specified in such a way that the study programme best meets the specific requirements for the study field or branch of Chemical and Process Engineering.

5. College and first cycle university study programmes of the study field of Chemical and Process Engineering, which aim at preparing engineers, are based on the same knowledge of fundamental science necessary for engineering activities, provide the same main engineering abilities, aim at providing and improving competences of the same field, yet college studies are more targeted at the application of scientific knowledge and typical engineering solutions verified in practice, whereas the objectives of university study programmes also cover perception and application of latest knowledge, solving non-typical tasks in non-typical settings, and finding new engineering solutions.

6. Upon completion of college studies, persons shall:

6.1. Acquire the following knowledge and abilities:

6.1.1. Knowledge of the general consistent patterns and laws of chemistry, other natural sciences and mathematics, which is required for understanding of the fundamentals of the study field of Chemical and Process Engineering;

6.1.2. Knowledge of the key concepts of the study field of Chemical and Process Engineering and understanding of their content;

6.1.3. Basic knowledge of chemical and process engineering relevant to practice;

6.1.4. Knowledge of the context of the problems of adjacent fields of study and their solutions.

6.2. Be able to perform engineering analysis:

6.2.1. Ability to apply their knowledge and understanding when solving the problems of the study field of Chemical and Process Engineering and ability to creatively apply familiar methods;

6.2.2. Ability to apply their knowledge and understanding when analysing engineering tasks and choosing appropriate methods, experimental and industrial equipment to solve them;

6.2.3. Ability to apply analytical and modelling methods when solving engineering tasks of the study field of Chemical and Process Engineering.

6.3. Have knowledge and skills necessary to perform design works of the study field of Chemical and Process Engineering:

6.3.1. Ability to apply engineering knowledge and understanding when formulating and performing design tasks according to the defined requirements;

6.3.2. Understanding of design methodologies and ability to apply them.

6.4. Be able to conduct applied research:

6.4.1. Ability to find necessary professional information in databases and other scientific and engineering information sources;

6.4.2. Ability to carry out experiments when solving engineering tasks, process their findings and present practical conclusions of these findings;

6.4.3. Skills of working with equipment used in the study field of Chemical and Process Engineering.

6.5. Have practical knowledge and skills when solving engineering tasks:

6.5.1. Ability to choose engineering solutions as well as tools and equipment necessary to implement these solutions;

6.5.2. Ability to combine theoretical and applied knowledge when solving engineering problems;

6.5.3. Understanding of the ethical, environmental and commercial circumstances of engineering activities;

6.5.4. Understanding of engineering activity organisation principles, knowledge of the main requirements for occupational and fire safety.

6.6. Have the following personal and social abilities:

6.6.1. Ability to solve engineering tasks individually and in a team;

6.6.2. Ability to communicate with engineering community and the general public;

6.6.3. Understanding of the impact of engineering solutions on the society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for the outcomes of engineering activities;

6.6.4. Knowledge of the key aspects of project implementation and management on the level of engineering activities;

6.6.5. Perception of the importance of individual lifelong learning and preparation for it.

7. Upon completion of first cycle university studies, persons shall:

7.1. Acquire the following knowledge and abilities:

7.1.1. Knowledge and understanding of the basics of chemistry, other natural sciences and mathematics required for understanding of the fundamentals of the study field of Chemical and Process Engineering;

7.1.2. Knowledge and systematic understanding of the key theoretical and applied basics and concepts of the study field of Chemical and Process Engineering;

7.1.3. Basic coherent knowledge of the study field of Chemical and Process Engineering;

7.1.4. Knowledge of a wider multidisciplinary engineering context, ability to apply methods and processes of other fields of science.

7.2. Be able to perform engineering analysis:

7.2.1. Ability to apply their knowledge and understanding when formulating and solving the problems of the study field of Chemical and Process Engineering, choosing appropriate methods;

7.2.2. Ability to apply their knowledge and understanding when formulating and analysing engineering tasks and choosing appropriate methods, experimental and industrial equipment to solve them;

7.2.3. Ability to choose and apply appropriate analytical and modelling methods of the study field of Chemical and Process Engineering.

7.3. Have knowledge and skills necessary to perform design works of the study field of Chemical and Process Engineering:

7.3.1. Ability to apply engineering knowledge and understanding of the study field of Chemical and Process Engineering when developing and implementing projects which comply with the defined requirements;

7.3.2. Understanding of design methodologies and ability to apply them.

7.4. Be able to conduct fundamental and applied research:

7.4.1. Ability to find necessary scientific and professional information in databases and other information sources;

7.4.2. Ability to plan and carry out necessary experiments, process and evaluate their data and present conclusions;

7.4.3. Skills of operating equipment used in the study field of Chemical and Process Engineering.

7.5. Have the abilities of practical work when solving engineering tasks:

7.5.1. Ability to choose and apply appropriate methods, tools and equipment for the implementation of engineering solutions, knowledge of the structures, principles of operation and functions of this engineering equipment, as well as basic abilities to use it;

7.5.2. Ability to combine theoretical and applied knowledge when solving engineering problems;

7.5.3. Understanding and evaluation of the ethical, environmental and commercial circumstances of engineering activities;

7.5.4. Understanding of the principles of organisation of engineering activities, the importance of occupational and fire safety as well as the key requirements and engineering activity chain interaction.

7.6. Have the following personal and social abilities:

7.6.1. Ability to efficiently work individually and in a team;

7.6.2. Ability to communicate with engineering community and the general public;

7.6.3. Holistic understanding of the impact of engineering solutions on the society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for engineering activities;

7.6.4. Knowledge of the aspects of project management and business, understanding of the connections between technological solutions and their economic outcomes;

7.6.5. Perception of the importance of individual lifelong learning and preparation for it.

8. Upon completion of second cycle university studies, persons shall:

8.1. Acquire the following knowledge and abilities:

8.1.1. Good knowledge and ability to creatively apply the basics of chemistry, other natural sciences and mathematics, thorough knowledge and understanding of the principles of the study field of Chemical and Process Engineering and ability to apply them when solving new engineering tasks;

8.1.2. Knowledge and critical evaluation of the latest achievements in engineering.

8.2. Be able to perform engineering analysis:

8.2.1. Ability to solve non-typical, non-strictly defined and non-exhaustively described problems;

8.2.2. Ability to envisage standard and non-standard engineering problems, clearly formulate and solve them;

8.2.3. Ability to use their knowledge and understanding when solving practical engineering tasks by applying theoretical models and research methods, including mathematical analysis, computational modelling and experimental research methods;

8.2.4. Understanding of the importance of social, health, occupational and fire safety, environmental and commercial requirements;

8.2.5. Ability to apply innovative methods when solving specific problems and implementing their solutions.

8.3. Have knowledge and skills necessary to perform design works of the study field of Chemical and Process Engineering:

8.3.1. Ability to apply their knowledge and understanding when solving non-standard problems, including those related to other fields of science and engineering studies;

8.3.2. Ability to innovatively develop new and original engineering ideas and methods;

8.3.3. Ability to make engineering decisions, having encountered multiple, technically undefined and not clearly described problems.

8.4. Be able to conduct fundamental and applied research:

8.4.1. Ability to recognise, find and evaluate data necessary for engineering work using databases and other information sources;

8.4.2. Ability to plan and conduct analytical, modelling and experimental research, critically evaluate its data and present conclusions;

8.4.3. Ability to explore applicability of new methods and ways of solving engineering problems of the study field of Chemical and Process Engineering.

8.5. Have the abilities of practical work when solving engineering tasks:

8.5.1. Ability to combine the knowledge of different study fields and solve multiple engineering problems;

8.5.2. Thorough understanding of applied methods and methodologies as well as their limitations, ability to select engineering equipment and software;

8.5.3. Knowledge of ethical, environmental and commercial requirements of engineering equipment;

8.5.4. Knowledge of engineering activity organisation principles, understanding of its chain interaction, ability to evaluate engineering activities in terms of occupational safety and environment protection.

8.6. Have the following personal and social abilities:

8.6.1. Ability to efficiently work individually and in a team, be leader of a team which may consist of representatives of various study fields and levels;

8.6.2. Ability to communicate with engineering community and the general public on both national and international level;

8.6.3. Holistic understanding of the impact of engineering solutions on the society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for engineering activities;

8.6.4. Very good knowledge of the aspects of project management and business, understanding of the connections between technological solutions and their economic outcomes.

CHAPTER III
TEACHING, LEARNING, ASSESSMENT, REQUIREMENTS FOR THE IMPLEMENTATION OF STUDY PROGRAMMES AND DESCRIPTOR OF LEVELS OF ACHIEVED LEARNING OUTCOMES

9. The requirements for teaching, learning, assessment and implementation of study programmes comply with the requirements presented in the Descriptor of the Group of Study Fields of Engineering.

10. The achieved level of learning outcomes is the description of student's knowledge and practical abilities, related to academic and/or professional career opportunities.

11. The following study achievement levels of graduates of the study field of Chemical and Process Engineering shall be distinguished: threshold (minimum requirements), typical (standard, average requirements) and excellent (higher than average requirements). The threshold

achievement level is the level to be achieved by all students who acquire a higher education qualification.

12. The levels of the learning outcomes of college studies are the following:

12.1. Excellent achievement level:

12.1.1. Knowledge of chemical and process engineering and related practical abilities are comprehensive and are not limited to information gained during studies;

12.1.2. Analysis and consideration of work results clearly reveals original thinking and excellent knowledge of chemical and process engineering activities;

12.1.3. Knowledge and practical abilities are quickly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

12.1.4. Common calculations, explanations, interpretations and analyses are performed quickly, smoothly and accurately; analytical and modelling methods are applied;

12.1.5. New knowledge of engineering is acquired quickly and with certainty. Excellent general abilities, good agenda management;

12.1.6. Graduates of this level may enrol in Master's studies;

12.1.7. Upon acquisition of professional experience, graduates should be excellent engineers-practitioners. Career prospects are related to engineering activities of the study field of Chemical and Process Engineering and managerial responsibility. They may quickly occupy the position of a high-level operator.

12.2. Typical achievement level:

12.2.1. Knowledge of chemical and process engineering and related practical abilities are good, yet limited to what is provided by the programme;

12.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Chemical and Process Engineering;

12.2.3. Ability to apply methods of solving problems of the study field of Chemical and Process Engineering, which help to evaluate changes known in advance and the progress of engineering;

12.2.4. Common actions of preparation and operation of chemical and process engineering equipment and processes are performed accurately;

12.2.5. Ability to quickly acquire new knowledge, good general abilities and ability to manage the agenda. External assistance needed at the beginning of career;

12.2.6. Graduates of this level may enrol in Master's studies;

12.2.7. Upon acquisition of professional experience, graduates should be good engineers-practitioners. Career prospects are related to engineering activities of the study field of Chemical and Process Engineering and managerial responsibility. They may occupy the position of a higher-level operator.

12.3. Threshold achievement level:

12.3.1. Basic knowledge of chemical and process engineering and practical abilities;

12.3.2. Graduates understand which general knowledge could be applied in new situations, yet they do not have abilities and confidence how to use it;

12.3.3. Students are ready to perform common activities of the study field of Chemical and Process Engineering, yet they need assistance and control;

12.3.4. Ability to perform simple calculations, explain typical results, yet assistance and control is needed;

12.3.5. Minimum preparation for further studies;

12.3.6. Graduates of this level should be suitable for the position of a technical or general operator (assistant). Upon acquisition of professional experience in chemical and process engineering, graduates should become good practitioners of the specific field which requires

knowledge and understanding of materials, typical and common technologies, yet does not require regular application of fundamental knowledge.

13. The levels of the learning outcomes of first cycle university studies are the following:

13.1. Excellent achievement level:

13.1.1. Knowledge and systematic understanding of chemical and process engineering as well as related practical abilities are comprehensive and are not limited to information gained during studies;

13.1.2. Analysis and consideration of work results clearly reveals original systematic thinking and excellent knowledge of theoretical material and practical chemical and process engineering activities;

13.1.3. Knowledge and practical abilities are quickly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

13.1.4. Typical calculations, interpretations, analyses and explanations are performed quickly, smoothly and accurately; ability to select and apply adequate analytical and modelling methods; the problem and its solutions are evaluated critically;

13.1.5. New knowledge of chemical and process engineering is acquired quickly and confidently; excellent general abilities and good management of the agenda;

13.1.6. Graduates of this level are recommended to enrol in Master's studies;

13.1.7. Upon acquisition of professional experience, graduates should be excellent engineers-innovators. Career prospects cover research, creation of innovations, administration of engineering activities of the study field of Chemical and Process Engineering as well as significant managerial responsibility. Graduates may quickly occupy the position of a high-level operator or engineering administrator.

13.2. Typical achievement level:

13.2.1. Knowledge and systematic understanding of chemical and process engineering as well as related practical abilities are good yet limited to information gained during studies;

13.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Chemical and Process Engineering. Graduates are able to use scientific literature to perform an engineering activity task;

13.2.3. Ability to quickly apply methods of solving problems of the study field of Chemical and Process Engineering, which help to evaluate changes known in advance and the progress of engineering;

13.2.4. Typical calculations, interpretations, analyses and explanations are performed accurately; ability to apply mastered analytical and modelling methods;

13.2.5. Ability to quickly acquire new knowledge, good general abilities and good ability to manage the agenda. External assistance needed at the beginning of career;

13.2.6. Graduates of this level may enrol in Master's studies;

13.2.7. Upon acquisition of professional experience, graduates should be good engineers. Career prospects cover research, creation of innovations, administration of engineering activities of the study field of Chemical and Process Engineering; significant managerial responsibility and career development to the position of a higher-level operator may be expected.

13.3. Threshold achievement level:

13.3.1. Basic knowledge and understanding of the study field of Chemical and Process Engineering, practical abilities;

13.3.2. Graduates understand which general knowledge could be applied in new situations, yet they lack abilities and confidence how to use it;

13.3.3. Ability to apply methods of solving problems of the study field of Chemical and Process Engineering, yet assistance and control is needed;

13.3.4. Ability to perform typical calculations, interpretations, result analyses and explanations, yet assistance and control is needed;

13.3.5. Graduates are prepared for Master's studies to a minimum extent;

13.3.6. Graduates of this level should be suitable for the position of a technical or general operator (assistant). Upon acquisition of professional experience in chemical and process engineering, graduates should become good engineers of the specific field which does not require regular application of fundamental knowledge and systematic understanding.

14. The levels of the learning outcomes of second cycle university studies are the following:

14.1. Excellent achievement level:

14.1.1. Fundamental understanding of the study field of Chemical and Process Engineering and adjacent study fields and related practical abilities are comprehensive and are not limited to information gained during studies;

14.1.2. Analysis and consideration of work results clearly reveals original analytical thinking, excellent knowledge of literature and appropriate chemical and process engineering activities;

14.1.3. Graduates are able to plan and conduct scientific research;

14.1.4. Ability to quickly apply knowledge and practical abilities also in intensively changing activities and setting, when changes are hard to predict and activities consist of constantly changing task combinations;

14.1.5. Calculations, interpretations, analyses and explanations that require deeper knowledge are performed quickly, smoothly, accurately and with insight; theoretical models and research methods are applied, and the problem and its solution are evaluated critically;

14.1.6. New knowledge of chemical and process engineering is acquired quickly and confidently; excellent general abilities and good management of the agenda;

14.1.7. Graduates of this level are recommended to enrol in doctoral studies;

14.1.8. Upon acquisition of professional experience, graduates should be excellent engineers-analysts able to demonstrate good expert competences. Career prospects cover scientific research, creation of innovations, administration of engineering activities of the study field of Chemical and Process Engineering and adjacent study fields as well as significant managerial responsibility. Graduates may quickly occupy the position of a top level operator or engineering administrator.

14.2. Typical achievement level:

14.2.1. Fundamental understanding of the study field of Chemical and Process Engineering and adjacent study fields as well as related practical abilities are good, yet limited to what is provided by the programme;

14.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Chemical and Process Engineering and adjacent study fields and are able to understand scientific literature, plan and conduct scientific research;

14.2.3. Knowledge and practical abilities are adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

14.2.4. Calculations, interpretations, analyses and explanations that require deeper knowledge are performed accurately; mastered theoretical models and research methods are applied for problem solving;

14.2.5. Ability to acquire new knowledge; good general abilities and ability to manage the agenda;

14.2.6. Graduates of this level may enrol in doctoral studies;

14.2.7. Upon acquisition of professional experience, graduates should be good engineers able to demonstrate good analyst competences. Career prospects cover scientific research, creation of innovations, administration of engineering activities of the study field of Chemical and Process

Engineering and adjacent study fields as well as significant managerial responsibility. Graduates are ready to occupy the position of a high-level operator or engineering administrator.

14.3. Threshold achievement level:

14.3.1. Basic understanding of the study field of Chemical and Process Engineering and adjacent study fields as well as practical abilities;

14.3.2. Understanding which general knowledge could be applied in new situations, yet lack of knowledge and confidence how to use this knowledge;

14.3.3. Ability to apply methods of solving problems of the study field of Chemical and Process Engineering, which help to evaluate changes known in advance and the progress of engineering;

14.3.4. Ability to perform calculations, interpretations and result analyses that require more thorough knowledge, yet assistance and control is needed;

14.3.5. Minimum preparation for further doctoral studies;

14.3.6. Graduates of this level will be suitable for the position of a senior technical or general operator. Upon acquisition of professional experience in chemical and process engineering, graduates should become good engineers of this field.

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Annex 9 to
the Descriptor of the Group of Study Fields
of Engineering

DESCRIPTOR OF THE STUDY FIELD OF LAND TRANSPORT ENGINEERING

CHAPTER I
GENERAL PROVISIONS, CONCEPT AND SCOPE OF THE STUDY FIELD

1. The Descriptor of the Study Field of Land Transport Engineering (hereinafter referred to as the "Descriptor") shall govern the special requirements applied to the study programmes of the study field of Land Transport Engineering.

2. The Descriptor shall apply to college and first and second cycle university study programmes of the study field of Land Transport Engineering.

3. The study field of Land Transport Engineering falls within the area of technological sciences. The study field encompasses the following branches: motor vehicle transport engineering, rail transport engineering, transport technological system engineering and road safety engineering.

4. Land transport engineering is a targeted activity aimed at creating and effectively and safely employing tools, instruments and systems using natural resources and natural phenomena so that human needs for communication and land transport could be met. It applies the principles of the technological and engineering science when planning, designing, operating and controlling means of land transport, technological facilities and infrastructure in order to create or improve tools and systems for safe, effective, fast, comfortable, cost-effective and ecological human mobility and carriage of goods. Studies of the study field of Land Transport Engineering shall provide a person with higher education which, combined with practical experience, forms a sufficient basis of engineer's professional activity. Land transport engineering covers road transport, rail transport, machinery and equipment for building and maintenance of the transport infrastructure and pipeline transport.

CHAPTER II
GENERAL AND SPECIAL LEARNING OUTCOMES

5. College and first cycle university study programmes of the study field of Land Transport Engineering, which aim at preparing engineers, are based on the same knowledge of fundamental science necessary for engineering activities, provide the same main engineering abilities, aim at providing and improving competences of the same field, yet college studies are more targeted at the application of scientific knowledge and typical engineering solutions verified in practice, whereas the objectives of university study programmes also cover perception and application of latest knowledge, solving non-typical tasks in non-typical settings, and finding new engineering solutions.

6. Upon completion of college studies, persons shall:

6.1. Acquire the following knowledge and abilities:

6.1.1. Knowledge of the general physical and chemical processes and phenomena of natural sciences, on the basis of which processes in a natural and technological environment are explained, also consistent patterns and laws of mathematics, which are required for understanding of the fundamentals of the study field of Land Transport Engineering;

6.1.2. Knowledge of the key concepts of the study field of Land Transport Engineering and understanding of their content;

6.1.3. Basic knowledge of land transport engineering about the structure, principles of functioning and operation, structural and operational materials of machinery that are significant to practical work;

6.1.4. Knowledge of the context of the problems of adjacent fields of study and their solutions.

6.2. Be able to perform engineering analysis:

6.2.1. Ability to apply their knowledge and understanding when solving the problems of the study field of Land Transport Engineering and ability to creatively apply familiar methods;

6.2.2. Ability to apply their knowledge and understanding when analysing engineering tasks and choosing appropriate methods, experimental, laboratory and industrial equipment to solve them;

6.2.3. Ability to apply analytical and modelling methods when solving qualitative and quantitative engineering tasks of the study field of Land Transport Engineering.

6.3. Have knowledge and skills necessary to perform design works of the study field of Land Transport Engineering:

6.3.1. Ability to apply engineering knowledge and understanding when implementing, organising and controlling technological processes of internal combustion engines, mechanical, hydraulic and pneumatic systems and machinery according to the defined requirements;

6.3.2. Understanding of design methodologies and ability to apply them when designing of technological processes.

6.4. Be able to conduct applied research:

6.4.1. Ability to find necessary professional information by using information technology, databases, software and other scientific and engineering information sources;

6.4.2. Ability to carry out experiments, practical and laboratory work when solving land transport engineering tasks, process their findings and present practical conclusions of these findings;

6.4.3. Skills of operating technological equipment used in the study field of Land Transport Engineering.

6.5. Have practical knowledge and skills when solving engineering tasks:

6.5.1. Ability to choose engineering solutions as well as tools and technological equipment necessary to design, organise, implement and control the technological process designed for diagnostics and control of motor vehicle engines, control and regulation equipment of management systems;

6.5.2. Ability to combine theoretical and applied knowledge when solving engineering problems of safe operation of vehicles;

6.5.3. Understanding of the ethical, environmental, economic and commercial circumstances of engineering activities;

6.5.4. Understanding of engineering activity organisation principles, knowledge of the main requirements for occupational and fire safety.

6.6. Have the following personal and social abilities:

6.6.1. Ability to solve engineering tasks individually and in a multi-task team;

6.6.2. Ability to communicate with engineering community and the general public in standard Lithuanian and at least one foreign language;

6.6.3. Understanding of the impact of engineering solutions on the society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for the outcomes of engineering activities;

6.6.4. Knowledge of the key aspects of project implementation and management on the level of engineering activities, which are revealed through organisational skills, ability to plan and implement productive and effective operational methods;

6.6.5. Perception of the importance of individual professional improvement and lifelong learning and preparation for it.

7. Upon completion of first cycle university studies, persons shall:

7.1. Acquire the following knowledge and abilities:

7.1.1. Knowledge and understanding of the basics of natural sciences, mathematics and mechanics required for understanding of the fundamentals of the study field of Land Transport Engineering;

7.1.2. Knowledge and systematic understanding of the key theoretical and applied basics and concepts of the study field of Land Transport Engineering;

7.1.3. Basic coherent knowledge of the study field of Land Transport Engineering;

7.1.4. Knowledge of a wider multidisciplinary engineering context, ability to apply methods and processes of other fields of science.

7.2. Be able to perform engineering analysis:

7.2.1. Ability to apply their knowledge and understanding when formulating and solving the problems of selection, enhancement and adjustment of vehicles for specific needs, improvement of their reliability and safety and other problems of the study field of Land Transport Engineering by choosing appropriate methods;

7.2.2. Ability to apply their knowledge and understanding when formulating and analysing engineering tasks and choosing appropriate methods, experimental and industrial equipment to solve them;

7.2.3. Ability to choose and apply appropriate analytical and modelling methods of the study field of Land Transport Engineering.

7.3. Have knowledge and skills necessary to perform design works of the study field of Land Transport Engineering:

7.3.1. Ability to apply engineering knowledge and understanding of the study field of Land Transport Engineering about the structural and theoretical principles of internal combustion engines, mechanical, electrical, hydraulic and pneumatic operation and control systems of vehicles, their structure, functioning, relevance, designing principles and dynamics when developing and implementing projects which comply with the defined requirements;

7.3.2. Understanding of design methodologies and ability to apply them.

7.4. Be able to conduct fundamental and applied research:

7.4.1. Ability to find necessary scientific and professional information in databases and other scientific and engineering information sources;

7.4.2. Ability to plan and carry out necessary experiments, process and evaluate their data and present conclusions;

7.4.3. Skills of operating equipment measuring parameters of mechanical motions, forces, vibrations, liquid and gas flow used in the study field of Land Transport Engineering.

7.5. Have the abilities of practical work when solving engineering tasks:

7.5.1. Ability to choose and apply appropriate methods, tools and equipment for the improvement vehicle and technological equipment, their adjustment for specific functions or operational conditions, enhancement of safety and implementation of other engineering solutions, knowledge of the structures of vehicles and engineering equipment, the principles of their operation and functions, as well as basic abilities to use it;

7.5.2. Ability to combine theoretical and applied knowledge when solving engineering problems;

7.5.3. Understanding and evaluation of the ethical, environmental and commercial circumstances of engineering activities;

7.5.4. Understanding of the principles of organisation of engineering activities, the importance of occupational and fire safety as well as the key requirements and engineering activity chain interaction.

7.6. Have the following personal and social abilities:

7.6.1. Ability to efficiently work individually and in a team;

7.6.2. Ability to communicate with engineering community and the general public;

7.6.3. Holistic understanding of the impact of engineering solutions on society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for engineering activities;

7.6.4. Knowledge of the aspects of project management and business, understanding of the connections between technological solutions and their economic outcomes;

7.6.5. Perception of the importance of individual lifelong learning and preparation for it.

8. Upon completion of second cycle university studies, persons shall:

8.1. Acquire the following knowledge and abilities:

8.1.1. Good knowledge and ability to creatively apply the basics of natural sciences, mathematics and mechanics, thorough knowledge and understanding of the principles of machinery, equipment and systems in the study field of Land Transport Engineering and ability to apply them when solving new engineering tasks;

8.1.2. Knowledge and critical evaluation of the latest achievements in land transport engineering.

8.2. Be able to perform engineering analysis:

8.2.1. Ability to solve non-typical, non-strictly defined and non-exhaustively described problems concerning the improvement, exploration and designing of vehicles and technological equipment and systems;

8.2.2. Ability to envisage standard and non-standard engineering problems, clearly formulate and solve them;

8.2.3. Ability to use their knowledge and understanding when solving practical engineering tasks by applying theoretical models and research methods, including mathematical analysis, computational modelling and experimental research methods;

8.2.4. Understanding of the importance of social, health, occupational and fire safety, environmental and commercial requirements;

8.2.5. Ability to apply innovative methods when solving specific problems and implementing their solutions.

8.3. Have knowledge and skills necessary to perform design works of the study field of Land Transport Engineering:

8.3.1. Ability to apply their knowledge and understanding of development, operation, designing and investigation of vehicles and technological systems when solving non-standard problems, including those related to other fields of science and engineering studies;

8.3.2. Ability to innovatively apply and develop new and original engineering ideas and methods;

8.3.3. Ability to make engineering decisions, having encountered multiple, technically undefined and not clearly described problems.

8.4. Be able to conduct fundamental and applied research:

8.4.1. Ability to recognise, find and evaluate data necessary for engineering work using databases and other scientific and engineering information sources;

8.4.2. Ability to plan and conduct analytical, modelling and experimental research of vehicles, transport systems and technological processes, critically evaluate its data and present qualified conclusions;

8.4.3. Ability to understand and assess the applicability of new methods and ways of solving engineering problems of the study field of Land Transport Engineering.

8.5. Have the abilities of practical work when solving engineering tasks:

8.5.1. Ability to combine the knowledge of different study fields and solve multiple engineering problems;

8.5.2. Thorough understanding of applied methods and methodologies as well as their limitations, ability to select engineering equipment and software;

8.5.3. Knowledge of ethical, environmental and commercial requirements of engineering equipment;

8.5.4. Knowledge of engineering activity organisation principles, understanding of its chain interaction, ability to evaluate engineering activities in terms of occupational safety and environment protection.

8.6. Have the following personal and social abilities:

8.6.1. Ability to efficiently work individually and in a team, be leader of a team which may consist of representatives of various study fields and levels;

8.6.2. Ability to communicate with engineering community and the general public on both national and international level;

8.6.3. Holistic understanding of the impact of engineering solutions on the society and environment, adherence to professional ethics and engineering activity standards, perception of responsibility for engineering activities;

8.6.4. Very good knowledge of the aspects of project management and business, understanding of the connections between technological solutions and their economic outcomes.

CHAPTER III
TEACHING, LEARNING, ASSESSMENT, REQUIREMENTS FOR THE IMPLEMENTATION OF STUDY PROGRAMMES AND DESCRIPTOR OF LEVELS OF ACHIEVED LEARNING OUTCOMES

9. The requirements for teaching, learning, assessment and implementation of study programmes comply with the requirements presented in the Descriptor of the Group of Study Fields of Engineering.

10. The following study achievement levels of graduates of the study field of engineering shall be distinguished: threshold (minimum requirements), typical (standard, average requirements) and excellent (higher than average requirements). The threshold achievement level is the level to be achieved by all students who acquire a higher education qualification.

11. The levels of the learning outcomes of college studies are the following:

11.1. Excellent achievement level:

11.1.1. Knowledge of land transport engineering and related practical abilities are comprehensive and are not limited to information gained during studies;

11.1.2. Analysis and consideration of work results clearly reveals original thinking and excellent knowledge of appropriate engineering activities;

11.1.3. Knowledge and practical abilities are quickly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

11.1.4. Common calculations, explanations, interpretations and analyses are performed quickly, smoothly and accurately; analytical and modelling methods are applied;

11.1.5. New knowledge of general engineering is acquired quickly and with certainty, excellent general abilities, good agenda management;

11.1.6. Graduates of this level may enrol in Master’s studies;

11.1.7. Upon acquisition of professional experience, graduates should be excellent engineers-practitioners. Career prospects are related to engineering activities of the study field of Land Transport Engineering and managerial responsibility.

11.2. Typical achievement level:

11.2.1. Knowledge of land transport engineering and related practical abilities are good, yet limited to what is provided by the programme;

11.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Land Transport Engineering;

11.2.3. Ability to apply methods of solving problems of the study field of Land Transport Engineering, which help to evaluate changes known in advance and the progress of engineering;

11.2.4. Common actions of preparation and operation of engineering equipment and processes are performed accurately;

11.2.5. Ability to quickly acquire new knowledge, good general abilities and ability to manage the agenda. External assistance needed at the beginning of career;

11.2.6. Graduates of this level may enrol in Master's studies;

11.2.7. Upon acquisition of professional experience, graduates should be good engineers-practitioners. Career prospects are related to engineering activities of the study field of Land Transport Engineering and managerial responsibility.

11.3. Threshold achievement level:

11.3.1. Basic knowledge of land transport engineering and practical abilities;

11.3.2. Graduates understand which general knowledge could be applied in new situations, yet they do not have abilities and confidence how to use it;

11.3.3. Students are ready to perform common activities of the study field of Land Transport Engineering, yet they need assistance and control;

11.3.4. Ability to perform simple calculations, explain typical results, yet assistance and control is needed;

11.3.5. Minimum preparation for further studies;

11.3.6. Graduates of this level should be suitable for the position of a technical or general operator (assistant). Upon acquisition of appropriate professional experience, graduates should become good practitioners of the specific field which requires knowledge and understanding of materials and typical or common technologies.

12. The levels of the learning outcomes of first cycle university studies are the following:

12.1. Excellent achievement level:

12.1.1. Knowledge and systematic understanding of land transport engineering as well as related practical abilities are comprehensive and are not limited to information gained during studies;

12.1.2. Analysis and consideration of work results clearly reveals original systematic thinking and excellent knowledge of theoretical material and practical activities in the study field of Land Transport Engineering;

12.1.3. Knowledge and practical abilities are quickly adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

12.1.4. Typical calculations, interpretations, analyses and explanations are performed quickly, smoothly and accurately; ability to select and apply adequate analytical and modelling methods; the problem and its solutions are evaluated critically;

12.1.5. New knowledge of engineering is acquired quickly and confidently; excellent general abilities and good management of the agenda;

12.1.6. Graduates of this level are recommended to enrol in Master's studies;

12.1.7. Upon acquisition of professional experience, graduates should be excellent engineers-innovators. Career prospects cover research, creation of innovations, administration of engineering activities of the study field of Land Transport Engineering as well as significant managerial responsibility.

12.2. Typical achievement level:

12.2.1. Knowledge and systematic understanding of land transport engineering as well as related practical abilities are good yet limited to information gained during studies;

12.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Land Transport Engineering. Graduates are able to use scientific literature to perform an engineering activity task;

12.2.3. Ability to quickly apply methods of solving problems of the study field of Land Transport Engineering, which help to evaluate changes known in advance and the progress of engineering;

12.2.4. Typical calculations, interpretations, analyses and explanations are performed accurately; ability to apply mastered analytical and modelling methods;

12.2.5. Ability to quickly acquire new knowledge, good general abilities and good ability to manage the agenda. External assistance needed at the beginning of career;

12.2.6. Graduates of this level may enrol in Master's studies;

12.2.7. Upon acquisition of professional experience, graduates should be good engineers. Career prospects cover research, creation of innovations, administration of engineering activities of the study field of Land Transport Engineering.

12.3. Threshold achievement level:

12.3.1. Basic knowledge and understanding of land transport engineering, practical abilities;

12.3.2. Graduates understand which general knowledge could be applied in new situations, yet they lack abilities and confidence how to use it;

12.3.3. Ability to apply methods of solving problems of the study field of Land Transport Engineering, yet assistance and control is needed;

12.3.4. Ability to perform typical calculations, interpretations, result analyses and explanations, yet assistance and control is needed;

12.3.5. Graduates are prepared for Master's studies to a minimum extent;

12.3.6. Graduates of this level should be suitable for the position of a technical or general operator (assistant). Upon acquisition of appropriate professional experience, graduates should become good engineers of the specific field which does not require regular application of fundamental knowledge and systematic understanding.

13. The levels of the learning outcomes of second cycle university studies are the following:

13.1. Excellent achievement level:

13.1.1. Fundamental understanding of the chosen study field and adjacent study fields and related practical abilities are comprehensive and are not limited to information gained during studies;

13.1.2. Analysis and consideration of work results clearly reveals original analytical thinking, excellent knowledge of literature and appropriate engineering activities;

13.1.3. Graduates are able to plan and conduct scientific research;

13.1.4. Ability to quickly apply knowledge and practical abilities also in intensively changing activities and setting, when changes are hard to predict and activities consist of constantly changing task combinations;

13.1.5. Calculations, interpretations, analyses and explanations that require deeper knowledge are performed quickly, smoothly, accurately and with insight; theoretical models and research methods are applied, and the problem and its solution are evaluated critically;

13.1.6. New knowledge of engineering is acquired quickly and confidently; excellent general abilities and good management of the agenda;

13.1.7. Graduates of this level are recommended to enrol in doctoral studies;

13.1.8. Upon acquisition of professional experience, graduates should be excellent engineers-analysts able to demonstrate good expert competences. Career prospects cover scientific research, creation of innovations, administration of engineering activities of the study field of Land Transport Engineering and adjacent study fields as well as significant managerial responsibility.

13.2. Typical achievement level:

13.2.1. Fundamental understanding of the study field of Land Transport Engineering and adjacent study fields as well as related practical abilities are good, yet limited to what is provided by the programme;

13.2.2. While analysing and considering work results, graduates understand what knowledge and abilities may be applied in new engineering activity situations of the study field of Land Transport Engineering and adjacent study fields and are able to understand scientific literature, plan and conduct scientific research;

13.2.3. Knowledge and practical abilities are adapted to constant and usually unpredictable changes arising due to the progress of knowledge and technologies;

13.2.4. Calculations, interpretations, analyses and explanations that require deeper knowledge are performed accurately; mastered theoretical models and research methods are applied for problem solving;

13.2.5. Ability to acquire new knowledge; good general abilities and ability to manage the agenda;

13.2.6. Graduates of this level may enrol in doctoral studies;

13.2.7. Upon acquisition of professional experience, graduates should be good engineers able to demonstrate good analyst competences. Career prospects cover scientific research, creation of innovations, administration of engineering activities of the study field of Land Transport Engineering and adjacent study fields as well as significant managerial responsibility.

13.3. Threshold achievement level:

13.3.1. Basic understanding of the study field of Land Transport Engineering and adjacent study fields as well as practical abilities;

13.3.2. Understanding which general knowledge could be applied in new situations, yet lack of knowledge and confidence how to use this knowledge;

13.3.3. Ability to apply methods of solving problems of the study field of Land Transport Engineering, which help to evaluate changes known in advance and the progress of engineering;

13.3.4. Ability to perform calculations, interpretations and result analyses that require more thorough knowledge, yet assistance and control is needed;

13.3.5. Minimum preparation for further doctoral studies;

13.3.6. Graduates of this level will be suitable for the position of a senior technical or general operator. Upon acquisition of appropriate professional experience, graduates should become good engineers in the field of land transport engineering.

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