**Training Fiche**

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| **Title** | Theoretical training in the drone industry based on STEM subjects in vet education | |
| **Keywords** | STEM, connecting STEM subjects with drone operation, drone construction, drone operation | |
| **Provided by** | Kuldiga Technology and tourism technical school, Latvia | |
| **Language** | Englisch | |
| **Name of the professional profile** | STEM subjects in a drone environment | |
| **Profile of the qualification and training goals** | Learn and apply the specifics and characteristics of drones. Understand the construction of drones. Identify the problem and fix it. | |
| **Duration and scope** |  | |
| **Admission requirements** |  | |
| **Training structure and modules** | STEM subjects STEM subjects in the field of drones Course topics for drone operation STEM categories in drone training | |
| **Objectives and goals** | To understand how related STEM subjects are in the construction, operation, and application of drones. Be able to apply the knowledge gained in the training program in the operation of drones. | |
| **Learning outcomes** | Diagnose problems and find solutions in drone operations. | |
| **Learning field** | Theoretical knowledge in the operation, construction and application of drones. |  |
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| **Content index** | **Unit 1:** Introduction to the meaning of STEM STEM fields of study, directions  **Section 1.1:** What is STEM  **Section 1.2:** What are STEM subjects  **Section 1.3:** How STEM influences modern learning  **Unit 2:** Bridging STEM disciplines in drone operations In which STEM areas can we use drones?  **Section 2.1:** STEM learning directions in drone operation  **Unit 3:** Teaching subjects in drone training Subjects  **Section 3.1:** Drones in science subjects  **Section 3.2:** In technological subjects  **Section 3.3:** Engineering subjects  **Section 3.4:** In mathematical subjects | |

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| **Content development** | **Unit 1:** Introduction to the meaning of STEM  STEM fields of study, directions  **Section 1.1:** What is STEM? Science and technology subjects (called STEM - from the English language Science, Technology, Engineering and Mathematics) explain the environment in which we find ourselves. Physics, chemistry, mathematics and biology describe the laws and processes of the surrounding nature, while informatics and computer science give us an idea of how things work technologies. Education is important for every person, family, society and country as a whole. It is the way to the quality of a person's individual life, the creation of a knowledge society and the economic growth and prosperity of the country. Investments in education and lifelong learning are an essential prerequisite for the development of the national economy and the promotion of the country's competitiveness, as well as for achieving a higher level of well-being. STEM is an educational program that focuses heavily on science, technology, engineering, and mathematics.  **Section 1.2:** What are STEM subjects?  STEM subjects will include mathematics, science, biology, geography, physics, chemistry, design and technology, computer science, engineering, programming, robotics and digital design.  **Section 1.3:** How does STEM affect modern learning? Realizing that one of the key components of future education is the development of 21st century skills, which have yet to be precisely defined and assessed, technology and science skills play an important role, so they are closely related to future employment and quality of life. In recent years, however, the field of STEM education has experienced various criticisms. It is rather difficult to achieve a comprehensive integration of the different fields of STEM, partly because the nature of the disciplines is quite different, with fields such as science and technology more represented than mathematics and engineering (Haesen and Van de Put, 2018). Therefore, more and more often, the STEM acronym is supplemented with the letter "A" - Art (art), which makes the lessons a creative learning environment and learners purposefully experiment and participate in experimental learning, constantly solve problems, collaborate and learn through the creative process (The Institute for Arts Integration and STEAM, 2020).  **Unit 2:** Bridging STEM disciplines in drone operations In which STEM areas can we use drones?  **Section 2.1:** STEM learning directions in drone operation As much as drones are today's devices, their relationship to STEM subjects is directly related. Drones use all 4 areas of STEM learning.  **Unit 3:** Teaching subjects in drone training Subjects  **Section 3.1:** Drones in science subjects  Lifting power The dynamics of rowing  Lifting capacity - dead weight  **Section 3.2**: In technological subjects  Introduction to mechatronics  Control systems and feedback mechanisms  Actuators and sensors  Electronic control systems and programming  Types of aircraft lighting systems  Electrical and optical principles of aircraft lighting  Installation and maintenance of aircraft lighting systems  **Section 3.3:** In engineering subjects  Basic Electrical and Electronics Theory  Introduction to electrical and electronic systems in aircraft  Electrical and electronic theory and principles  Electrical safety and regulations  Electrical and electronic circuits and components  Introduction to avionics systems  Navigation and communication systems  Flight control systems  Instrumentation and display systems  Electrical power generation systems  Aircraft electrical power distribution systems  Electrical load management and control  Battery systems and charging  Basic principles of computer science  Programming languages and algorithms  Data structures and databases  Computer architecture and components  Operating systems and software applications used in avionics  Aircraft data networks and communication protocols  Principles of communication systems  Types of communication systems  Avionics system integration  Testing and certification of avionics systems  **Section 3.4:** In mathematical subjects  Battery capacity - consumption  Rotor area - lifting capacity |
| **Glossary** | **STEM:**  Science, Technology, Engineering and Mathematics including biology, geography, physics, chemistry, design and technology, computer science, engineering, programming, robotics and digital design. One of the key components of future education is the development of 21st century skills, assessed, technology and science skills play an important role, so they are closely related to future employment and quality of life.  Source: https://ppdb.mk.gov.lv/wp-content/uploads/2021/06/STEM\_petijums\_gala\_zinojums\_PETIJUMS\_ANOTACIJA.pdf  **STEM basad learning in drones:**  Undoubtedly, interest in drones as a consumer product is growing. Thus, the demand for education and training around them is increasing. The STEM Drone Orientation is one example of a program that paves the way for STEM education for students.  Source: tryengineering.org  **Drone teaching subjects:**  When Leonardo da Vinci in the second half of the 15th century drew a sketch very similar to a modern unmanned aerial vehicle among other inventions, he probably did not think that four hundred years would pass until such devices would gradually acquire real outlines and applications. First of all, as has often happened elsewhere in the history of mankind, this innovation was pushed forward by wars and military needs, but in the XXI century, the development of technology has given unmanned aerial vehicles a victory march in the civilian world as well.  Source:epale.ec.europa.eu  Drone robotics is the most advanced of robotics where you can learn soldering skills and microelectronics knowledge. As technologies develop, this knowledge and skills remain very relevant. Do you know a single electronic device without solder? And drones are a special electrotechnical device that must be soldered in such a way that no accidents affect its ability to continue operating. While learning to pilot drones, students develop spatial sense, the ability to concentrate, and strategic thinking.  Source: e-klase.lv |
| **Self-evaluation (multiple choice queries and answers)** | 1. STEM is:  **a) Science, Technology, Engineering and Mathematics**  b) Social terms in English managment  c) System termal esmission monitoring  2. Drone is:  a) Unidentified Flying Object  **b) An unmanned aircraft**  c) Drop down menu  3. Drone learning subjects:  **a) Electronic, programming and piloting**  b) Swimming, jumping and aviation  c) Splicing, screwing and melting |
| **Reference material** | Author: SIA “Dynamic University”  Title: A study of the educational offer coverage and learner engagement in the STEM field.  Publisher:Ministry of Education and Science  Date of Publication: 2021. june  URL: <https://ppdb.mk.gov.lv/wp-content/uploads/2021/06/STEM_petijums_gala_zinojums_PETIJUMS_ANOTACIJA.pdf>  Author: Techtarget  Title: drone  Publisher:Techtarget  Date of Publication: Not specified  URL:https://www.techtarget.com/iotagenda/definition/drone  Author: epale.ec.europa.eu/  Title: Drones now and in the future.  Publisher:epale.ec.europa.eu/  Date of Publication: 8 march 2022  URL:https://epale.ec.europa.eu/lv/blog/droni-tagad-un-nakotne-kas-jazina-pilotiem  Author: tryengineering  Title: STEM Drone Orientation  Publisher:tryengineering  Date of Publication: Not specified  URL:https://tryengineering.org/lv/news/program-spotlight-stem-drone-orientation/ |
| **Resources (videos, reference link)** | Amtech training  Amtech training module STEM based drone learning.pptx |