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Alliance for Batteries Technology, Training and Skills 2019-2023

Report on Creation/Adaption of

Curricula/Training Course Content

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Deliverable 6.5



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| Author(s): | Damjan Ekert, Eoin Gubbins, João Alves | | |
| Responsible Project Partner: | ISCN, Realizeit | Contributing Project Partners: | VAMIA, VSB-TUO, Skellefteå, FEUP, UVaasa, Vestland CC, Univ. Maribor |

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This internal deliverable summarises the work done and the achievements of work of Task 6.5 - Creation/adaption of curricula/training course content.

The main objective of this task was to prepare training materials and offer them in an online learning environment either for self-learning or for teaching/training purposes onsite or in a blended learning environment. The courses are freely accessible and promoted by the ALBATTS project and the Automotive Skills Alliance. The courses are accessible at https://learn.skills-framework.eu/







Introduction

ALBATTS Education and Training Framework, as proposed in <u>Deliverable 6.2 - Preparatory</u> <u>development of the education and training framework and choice of tools</u>, identifies four central pillars that constitute the guiding principles for the battery sector:

- Pillar 1 Curricula for all levels
- Pillar 2 Innovative and flexible learning
- Pillar 3 Competent trainers and tutors
- Pillar 4 EU-wide recognition

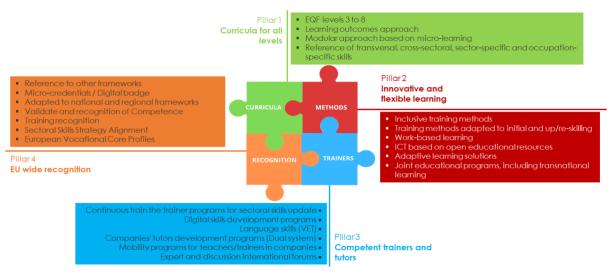


Figure 1 ALBATTS Education and Training Framework

Task 6.5 work was mainly focused on Pillar 2 by creating training material for the curricula proposed in

Task 6.4, taking into consideration the guiding principles identified in the framework, namely:

- Inclusive training methods
- Training methods adapted to initial and up/reskilling
- Work-based learning
- ICT based on open educational resources
- Adaptive learning solutions
- Joint educational programs, including transnational learning

The training materials developed configure a pack of micro-modules that can be used by training providers in different settings and are intended to respond to the short-term needs of both education and training providers and the industry for the training of trainers and initial and up/reskilling purposes, as tested during the piloting phase (see Deliverable 6.6).

To guarantee the sustainability of the developed training materials beyond the end of the project, ALBATTS partners decided to make the training units available in the Automotive Skills Alliance learning platform (<u>https://learn.skills-framework.eu/</u>), encouraging all users to test and take advantage of

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these resources. As of the moment of writing this report, more than 1173 users have registered for the courses directly on the platform, and more than 100 have attended trainer training sessions or blended learning settings.







List of Abbreviations and definitions

The abbreviations and definitions of terms used are a subset of the ones used in Deliverable 6.2, which contains a rich list. See <u>Deliverable 6.2 - Preparatory development of the education and training</u> <u>framework and choice of tools</u>., p11ff.





This section provides an overview of the methodological approach (Figure 2) used in the project to perform task 6.5 Creation/adaptation of curricula/training course content (OER). The main input for the task is the results of the curricula analysis from task 6.4 and the report from task 6.2 for the education and training framework.

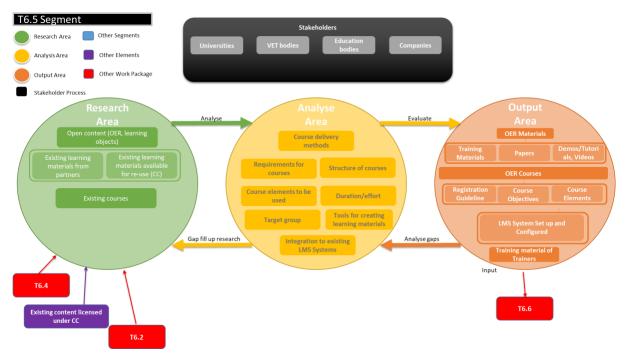


Figure 2 The Work process on curriculum analysis and proposed solutions

Taking into consideration the guidelines and principles from the ALBATTS framework, structure and formats (D6.2) and the available curricula (D6.4), task 6.5 will deliver training courses consisting of learning materials, videos, examples, relevant research papers and other open and available training materials. The courses are being developed based on the target group and the relevant EQF level. The existing reports from WP3, WP4 and WP5 were analysed and used as input for the Basic Battery course.

1.1 TRAINING MATERIALS FOR THE ADAPTIVE LEARNING APPROACH

Realizeit, founded in Dublin, Ireland, as CCKF Limited in 2007, is an online intelligent adaptive learning platform developed outside of the ALBATTS project. This commercial software, which is owned by CCKF, was made available to the ALBATTS project for the purpose of designing, building, and hosting courses and assessments for battery education, as well as providing a rich adaptive learning experience for students engaged in learning about batteries. Adaptive learning involves assessing the learner's knowledge continuously, allowing users to demonstrate and gain credit for their knowledge through testing without having to read through material they already understand. This allows Realizeit to meet learners where they are, rather than assuming that all students start courses with the same level of







knowledge. Depending on the learner's prior knowledge this can lead to substantial time savings, in contrast to traditional 'one size fits all' systems that force every learner to consume all of the content.

The Realizeit Learning Model



Figure 3 Depiction of Realizeit Learning Model

Realizeit can adapt to the individual and personalise their experience based on many different factors. These include learner characteristics and behaviours that the system infers as the learner engages with the content. The system continually gathers evidence and uses this in real time to adapt the content and questions that it presents to the learner (as illustrated in Figure 3)Figure 3 Depiction of Realizeit Learning Model. In this way, remediation of areas of weakness for each individual is carried out automatically by the system.

Courses in Realizeit start with an operation called Determine Knowledge – a generative assessment where students are tested on questions drawn from across a learning objective. If students do well, the system allows them to move ahead in their learning based on the knowledge they have demonstrated. This operation is repeated throughout the course at the beginning of each learning objective or unit, allowing learners to move quickly through areas they demonstrate knowledge in. This means that prior learning is respected, and learners don't need to spend time reviewing material that they already know. The system also continuously updates its calculation of the learner's knowledge, meaning that if the learner starts to struggle with learning content where they had previously demonstrated knowledge, they will be presented with material from earlier in the course to review; this should allow them to catch up where a gap has been identified.







Realizeit engaged with ALBATTS, helping to identify open-source content for the Basic Batteries course

and helping to convert and build these as adaptive courses starting with a curriculum for the courses that would be useful and beneficial to learners working to develop their competence in batteries. For Realizeit's engagement with ALBATTS, it was decided that Realizeit would provide a standard commercial instance of the Realizeit SaaS solution that would host the ALBATTS Basic Batteries course. This instance was integrated with the ALBATTS LMS, meaning that learners could launch from the ALBATTS LMS directly into Realizeit and that grades from Realizeit would be passed back to the LMS from Realizeit. Several research and technical analysts of the Realizeit "Content Team" adapted the course materials provided by ALBATTS for Basic Batteries to implement adaptive components of content within Realizeit. The course was subsequently made available to learners from ALBATTS partner ATEC.

1.2 TRAINING MATERIALS FOR THE LEARNING PLATFORM PROVIDED BY THE AUTOMOTIVE SKILLS ALLIANCE

The ASA Learning platform <u>https://learn.skills-framework.eu/</u> is based on the MOODLE Learning Environment offering and supporting different possibilities in offering courses. The training materials consist typically of a main module where the content is provided/presented (e.g. in the form of a PowerPoint presentation or as a Sharable Content Object Reference Model (SCORM) module) and additional supporting materials such as YouTube videos, reference to other publications or web pages, further reading suggestions or exercises in the form of multiple-choice text questions or quizzes. This was the courses can be used as:

- self-learning MOOC (Massive Open Online Courses) provides all relevant materials for the learner to self-study the content
- blended learning combining face-to-face learning with self-learning through the usage of the online environment
- face-to-face learning using the online environment only as a repository for the training materials

Access to all training materials is free, but the participant has to register only for the learning platform.





2 Learning Management Platform

2.1 AUTOMOTIVE SKILLS ALLIANCE (ASA) LEARNING PLATFORM

2.1.1 Access to the platform

The ALBATTS courses are located at the Automotive Skills Alliance (ASA) learning platform: <u>https://learn.skills-framework.eu/</u>. In order to access the course materials and attend the courses, the participant has to register for the course.

Once the participant is registered to the ASA Learning Platform, he/she can enrol in any of the ALBATTS courses.

2.1.2 Roles in the ASA platform

2.1.2.1 Student

A user with the Student role in the ASA Learning Platform can participate in course activities and view resources but cannot alter them or see the class gradebook.

When a student first joins, they see all available courses. Once they have enrolled or been enrolled into at least one course, they may only see their own courses in the "My Courses" section of the navigation block or via their dashboard.

2.1.2.2 Teachers

Teachers can do almost anything within a course, including adding or changing the activities and grading students. By default, teachers can also assign a Non-editing teacher role and a Student role to other users.

In order to assign a user to the role of a teacher in a course, the following steps have to be performed:

1. The user needs to register to the ASA Learning Platform

2. The user has to contact the administrator of the ASA Learning Platform in order to be assigned the role of a teacher.

2.1.2.3 Course Manager

In order to administer a course, the participant needs to have the role of a Teacher. With this role, typically, the person can:

- Update training materials
- Add reference materials such as articles, YouTube videos, and links to web pages.
- Administer the discussion forum, e.g. remove posts, add new topics
- Evaluate the feedback form and export data
- See the results of the self-assessment quiz
- See the registered participants

2.1.2.4 Site Administrator

Is to be contacted in case of issues with the course or in order to assign a teacher for a course.





2.1.3 Moodle Learning Environment

The ASA Learning Platform is based on the Moodle Learning Management System. Extensive documentation about Moodle and how to manage it is available at:

https://docs.moodle.org/39/en/Main_page

and on the Moodle YouTube Channel:

https://www.youtube.com/@moodle

Next to the content which needs to be updated, e.g. training materials, an Edit possibility appears:

| 🕀 🖆 UI.EI Introduction to Battery Concepts in Automotive Architectures - SLIDES ENGLISH 🖋 | | Edit 🚽 🔀 |
|---|-----------------|----------|
| 💠 🗕 UI.EI Introduction to Battery Concepts in Automotive Architectures - STUDENT NOTES 🖋 | | Edit 👻 💟 |
| | 🔅 Edit settings | |
| where the participant can edit the settings, hide, | Move right | 8 |
| duplicate or delete the content: | Ide | |
| | C Duplicate | ource |
| With the edit settings option, the participant has the | O Assign roles | |
| possibility to change/update the training materials (in our | 🗍 Delete | ~ |
| case, a PDF slide set). | | |

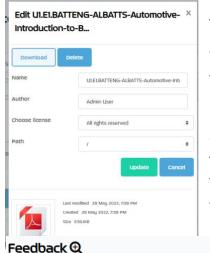
| ▼ General | | |
|--------------|--|--------------------------------------|
| Name | ULEI Introduction to Battery Concepts in Automotive Architectures - SUDES ENGUSH | D. |
| Description | | |
| | Display description on course page 💿 | |
| Select files | | Maximum size for new lies: Unlimited |
| | Name | ₀ Last modified |
| | U1.E1.BATTENG-ALBATTS-Automotive-Introduction-to-Battery_v1.pdf | 28/05/22, 19:38 638:1KB PDF document |

By clicking on the file, additional options appear, such as renaming the file, changing the author, or deleting the file.









Templates

Analysis

Show responses

To update or add a new file, click on the upload icon or drag and drop the file. You can remove the old file or set the new file as the main file.

Evaluation of the course

As a teacher, you can evaluate the course feedback by clicking on the feedback link and then selecting either Analysis or Show Responses. With the Analysis option, the feedback can be exported easily to Excel.

•

Overview Edit questions

We value your feedback!

Help us improve your learning experience by taking a few moments to complete our feedback form. Your input is vital in shaping future training modules and ensuring we meet your needs effectively. Thank you!

Overview

Submitted answers: 7 Questions: 10







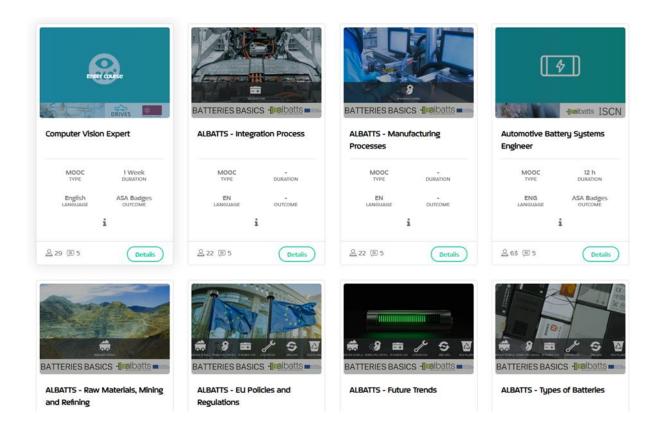
3 Courses in the ASA Learning Platform

The ASA Learning platform <u>https://learn.skills-framework.eu/</u> contains several courses offered by the ASA. The battery-relevant courses are grouped into the Battery category.

In order to enrol in the courses, the participant has to register on the platform and manually enrol in the dedicated course. In the case of the Introduction course, each module of the course is configured as a separate course.

In order to administer a course, the participant needs to have the role of a Teacher or Manager. With this role, typically, the person can:

- Update training materials
- Add reference materials such as articles, YouTube videos, and links to web pages.
- Administer the discussion forum, e.g. remove posts, add new topics
- Evaluate the feedback form and export data
- See the results of the self-assessment quiz
- See the registered participants









In the table below, it is possible to see the target groups, recommended prior knowledge and teaching methods recommended for each of the training courses developed by the ALBATTS project:

| Course | Target Group | Recommended prior knowledge | Teaching Method |
|---|---|--|---|
| Batteries basics | Everyone wants to develop basic knowledge about the battery sector. No minimum EQF level is required. All job roles on the battery value chain are targeted. | Intermediate English level (reading, writing and listening comprehension) Basic digital skills. | The course is designed for online learning. However, the course can also be delivered in a face-to-face environment or blended learning, led by a teacher. |
| English basic battery vocabulary | Everyone who wants to develop basic battery vocabulary. No minimum EQF level is required. All job roles on the battery value chain are targeted. Specific units for Electricians, Automation, etc | Basic English level (reading, writing and listening comprehension) Basic digital skills. | The course is designed for personal online learning. |
| Soft skills for the battery sector | Teachers and trainers who want to help their students develop soft skills for the battery sector. The EQF level recommended is 6 or higher. Lower EQF levels may apply according to national requirements for being a teacher and/or trainer. | Intermediate English level (reading, writing and listening comprehension) Basic digital skills. | The course is designed for personal online learning. However, the course can also be delivered in a face-to- face environment or blended learning, led by a teacher. |
| Batteries Safety | Everyone who works within the battery and/or works with batteries and their materials and components. No minimum EQF level is required. All job roles on the battery value chain are targeted. | Basic knowledge about batteries and the battery sector Intermediate English level (reading, writing and listening comprehension) Basic digital skills. | The course is designed for personal online learning. However, the course can also be delivered in a face-to- face environment or blended learning, led by a teacher. |
| Training machine operators for Northvolt Gigafactory | Adults who want to work as machine operators in a battery plant (Gigafactory). The EQF level recommended is 4. Battery production operators' job roles on the battery value chain are targeted. | Basic knowledge about batteries and the battery sector Intermediate English level (reading, writing and listening comprehension) Basic digital skills. | More so-called "blended learning" may be appropriate, as many learning tasks need equipment to practice skills, physically present instructors, etc. |

Table 1 Overview of ALBATTS' courses







| Course | Target Group | Recommended prior knowledge | Teaching Method |
|--|--|--|---|
| Automotive Battery Systems Engineer Course | Students or workers in the automotive sector in a Research and Development department. Minimum bachelor level, master level preferred. Minimum five years of experience in the design of complex systems. EQF level 7 and 8, university degree required. HV Battery Requirements Engineer – E-Mobility, Battery Module Development Engineer and Battery Management System Engineer are examples of targeted job roles. | The participant should: Know the development process for an automotive mechatronic product. Be familiar with terms like system architecture, system testing, and validation. | The course is designed for online teaching as it provides narrated slides. As the materials are also available in the form of a PowerPoint presentation, the course can also be taught in a face-to-face environment or blended learning. |
| Stationary applications course | VET students. EQF levels recommended are 4 and 5. Planning, building, maintaining, servicing, and selling, among others, of battery-supported systems job roles are targeted. | Basic knowledge about batteries and the battery sector Intermediate English level (reading, writing and listening comprehension) Basic digital skills Basic knowledge of electrical documentation | More so-called "blended learning" may be appropriate, as many learning tasks need equipment to practice skills, physically present instructors, etc. |
| Cell Preparation and Evaluation on a Lab-Scale | VET students. EQF levels recommended are 4 and 5. Battery quality related job roles on the battery value chain are targeted. | Basic knowledge about batteries and the battery sector Intermediate English level (reading, writing and listening comprehension) Basic digital skills Basic knowledge of lab working procedures | The course is designed for personal online learning. However, the course can also be delivered in a face-to- face environment or blended learning, led by a teacher, to include learning tasks in a lab. |

Table 2 Links to courses available online

| Course | Link |
|------------------|---|
| Batteries basics | The course is structured into different training units/modules, and each module is represented as its own course: |
| | Introduction to the battery sector https://learn.skills-framework.eu/course/view.php?id=56 |
| | Battery fundamentals <u>https://learn.skills-framework.eu/course/view.php?id=71</u> |
| | Types of batteries |





| Course | Link |
|------------------------------------|---|
| | https://learn.skills-framework.eu/course/view.php?id=72 |
| | Future trends https://learn.skills-framework.eu/course/view.php?id=73 |
| | EU policies and regulations https://learn.skills-framework.eu/course/view.php?id=74 |
| | Integration Process https://learn.skills-framework.eu/course/view.php?id=92 |
| | Manufacturing processes <u>https://learn.skills-framework.eu/course/view.php?id=76</u> |
| | Raw materials, mining and refining https://learn.skills-framework.eu/course/view.php?id=75 |
| | Batteries operation/applications https://learn.skills-framework.eu/course/view.php?id=93 |
| | Batteries second life and recycling https://learn.skills-framework.eu/course/view.php?id=94 |
| | The course is structured into different training units/modules, and each module is represented as its own course: |
| | Battery English 1 - Terms and concepts https://learn.skills-framework.eu/course/view.php?id=96 |
| | Battery English 2 - Safety of batteries https://learn.skills-framework.eu/course/view.php?id=97 |
| | Battery English 3 – Quality https://learn.skills-framework.eu/course/view.php?id=98 |
| English basic battery vocabulary | Battery English 4 - Tools and equipment for electricians https://learn.skills-framework.eu/course/view.php?id=99 |
| | Battery English 5 - Tools and equipment for process operators <u>https://learn.skills-framework.eu/course/view.php?id=100</u> |
| | Battery English 6 - Tools and equipment for automation and robotics <u>https://learn.skills-framework.eu/course/view.php?id=102</u> |
| | Battery English 7 - Tools and equipment for maintenance <u>https://learn.skills-framework.eu/course/view.php?id=101</u> |
| | Battery English 8 - Tools and equipment for logistics <u>https://learn.skills-framework.eu/course/view.php?id=103</u> |
| Soft skills for the battery sector | Soft skills course https://learn.skills-framework.eu/course/view.php?id=87 |







| Course | Link |
|--|---|
| | The course is structured into different training units/modules, and each module is represented as its own course: |
| | Introduction to safety in batteries https://learn.skills-framework.eu/course/view.php?id=95 |
| Batteries Safety | Battery Fires https://learn.skills-framework.eu/enrol/index.php?id=107 |
| | Electrical Safety https://learn.skills-framework.eu/enrol/index.php?id=106 |
| Automotive Battery Systems Engineer Course | Automotive battery systems engineer https://learn.skills-framework.eu/course/view.php?id=57 |
| Stationary applications course | Batteries stationary applications https://learn.skills-framework.eu/course/view.php?id=91 |
| Cell Preparation and Evaluation on a Lab-Scale | Cell Preparation and Evaluation on a Lab-Scale https://learn.skills-framework.eu/enrol/index.php?id=89 |

3.1 BATTERIES BASICS COURSE

The batteries basics course gives an overview of battery technology and its value chain and can be used as an introduction course to anyone working or studying in the field.

It comprehends 10 different training units that can be delivered individually or combined to create different introductory approaches according to the different training paths.

Target Group

This course and all its training units address everyone who wants to develop basic knowledge about the battery sector, targeting all job roles on the battery value chain. No minimum EQF level is required.

Recommended prior knowledge

Participants should have intermediate English level (reading, writing and listening comprehension) and basic digital skills.

Teaching Method

The course is designed for personal online learning. However, the course can also be delivered in a face-to-face environment or as blended learning led by a teacher.

Course Structure and Training Materials





The Batteries Basic Course incorporates the different training units:

- Introduction to the Battery Sector
- Battery Fundamentals
- Types of Batteries
- Future Trends
- EU Policies and Regulations
- Raw Materials, Mining and Refining
- Manufacturing Processes
- Integration Process
- Operation/Applications
- Recycling & Second life

Each training unit has its own Moodle Topics organised per learning outcome where all relevant training materials are stored.

| Platform ENGLISH (EN) ~ | | | |
|---|--|--|--|
| | | | |
| Course Outline | Course Content | Course start date: 14/04/22 Category: Battery Sector | |
| ALBATTS.BASIC.01 | | Your progress () | |
| Welcome | Welcome | | |
| Learning Outcomes | | | |
| 01 - History of Batteries 02 - Battery Value Chain | Welcome | | |
| 02 - Battery Value Chain 03 - Battery Market and its Players | | | |
| 04 - Application of Batteries | | | |
| 05 - Battery Industry Impact | | | |
| Feedback | - | albatts | |
| | | INGLLO | |
| | Alli | ance for Batteries Technology, Training and Skills | |
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| | Referencements | | |
| ③ Options | Learning Outcomes | • | |

Figure 4: Example for the Training Unit on Introduction to the Battery Sector

For each learning outcome, a SCORM file was developed, and the participant could interactively go through each of them.







~

01 - History of Batteries

01 - History of Batteries

To finalize this module, the learner will have to:

- · Identify the key moments in battery history
- Order by date the chronology of events

📕 History of Batteries

Figure 5: Example for the Learning element on the History of Batteries

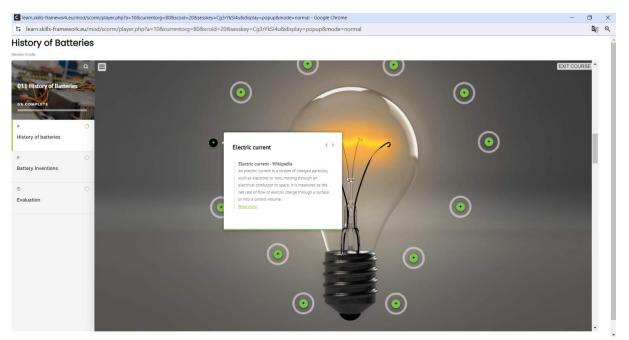


Figure 6: Example of the training materials

In addition, and where relevant, reference materials such as videos, articles or other freely available activities are added directly to the SCORM files.







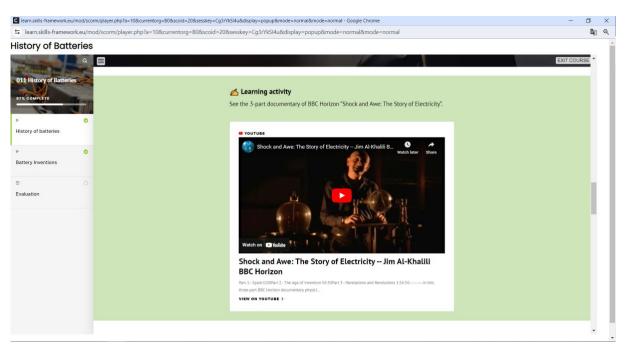


Figure 7: Additional materials

Each SCORM file also includes a final evaluation quiz to help the participant recap the information and check his knowledge.

| ** • • • <th></th> | |
|--|--|
| 011 History of Batteries Question 07. COMPLETE 01/03 * O To which scientists is attributed the invention of the Lithium-ion battery? | |
| History of batteries | |
| André-Marie Ampère Michael Faraday and William Conke | |
| Battery Inventions | |
| Thomas Edison and Nicola Tesla | |
| | |
| Evaluation Subject Control Con | |
| John B. Goodenough, Rachid Yazami and Akira Yoshino | |
| Karret | |

Figure 8: Example of the quiz

3.2 ENGLISH BASIC BATTERY VOCABULARY

The online English course is designed specifically for individuals working within or with the battery sector and related fields, catering to professionals seeking to enhance their industry-

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specific language skills and technical communication. No previous knowledge of the batteries or sectors' value chain is required, nor is a specific EQF level required. The course is divided into modules where the first three modules are common to all: basic battery, safety, and quality vocabularies are introduced in these modules. After these are completed, the student chooses a module of their choice. The modules that may be chosen are related to different areas and professions within the battery sector: Battery English 4 – Tools and equipment for electricians

Battery English 5 – Tools and equipment for process operators

Battery English 6 – Tools and equipment for automation and robotics

Battery English 7 – Tools and equipment for maintenance

Battery English 8 – Tools and equipment for logistics

The English course is designed for personal online learning courses but may also be used as learning material in a face-to-face environment or blended learning led by the teacher.

Target group

Everyone who is interested in the battery industry and in enhancing their industry-specific language skills and technical communication. For those working in the battery industry or those who intend to move into the battery industry, the course will provide a good basis for the necessary language skills.

Recommended prior knowledge

Basic English level in reading, writing, and listening comprehension is required, and basic digital skills for the course completion are required.

Teaching method

This course is crafted to cater to a variety of learning preferences, offering a comprehensive, self-paced online learning experience. It is designed to function seamlessly as a standalone resource for individual learners, as well as integrate smoothly into synchronous teaching settings and blended learning curriculums. It is tailored especially for self-paced learning, where learners can progress through modules and receive immediate feedback on their tasks. This method is good for those needing flexibility in timing and paced learning, allowing students to apply learning techniques best suited for them.

The course may also be used as an effective workbook for teachers leading live, synchronous classes. This adaptability makes it an excellent resource for teachers looking to enrich their





classroom interactions with prepared, structured content. For environments that blend selfpaced and instructor-led learning, this course offers a seamless integration of both approaches. Instructors can assign modules as homework to be reviewed asynchronously and then use class time for interactive discussions, group projects, or deeper exploration of complex topics. This hybrid approach enhances learning by combining independent study with collaborative educational experiences.

Course structure and training materials

The course is constructed in a modular fashion, where the first three modules form the basics of battery vocabulary:

- Battery English 1 Terms and concepts
- Battery English 2 Safety of batteries
- Battery English 3 Quality

After these modules, the student choose the module of the field they want to study further:

- Battery English 4 Tools and equipment for electricians
- Battery English 5 Tools and equipment for process operators
- Battery English 6 Tools and equipment for automation and robotics
- Battery English 7 Tools and equipment for maintenance
- Battery English 8 Tools and equipment for logistics

Each module has its own Moodle Topics, which store all relevant training materials.

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| | Learn the words | ~ |
| Course Outline B Bart ENGUSH01 Welcomet | Learn the words | |
| Learn the words | Forms and concepts related to batteries-vocabulary | 8 |
| Give feedback and you are done! | 55 Different types of batteries | Ø |
| | Different types and shapes of Lithium-Ion batteries | |
| | 5 Components of Lithium-Ion batteries | Ø |
| | The Battery Value Chain | |
| | Exercises | Ψ |
| | Exercises | |
| | Read the story and fill in missing word | |
| | Give feedback and you are done! | × |
| Options | Give feedback and you are done! | 1 |

Figure 9: Example for the Module on Terms and Concepts

Co-funded by the Erasmus+ Programme of the European Union





Each module is constructed so that first, the new vocabulary is introduced in a way that a word, related explanation, picture, and an example of the word's pronunciation are given simultaneously. Students are allowed to use as much time and practice sessions as needed to achieve the learning outcomes.

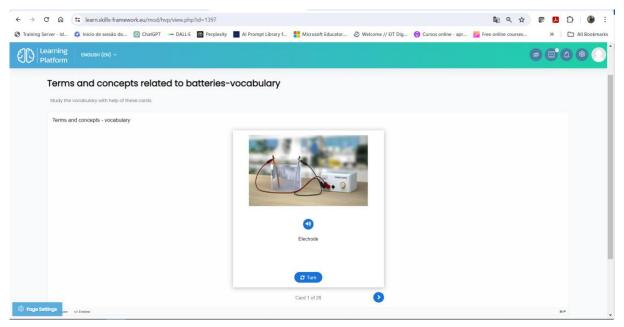


Figure 10: Example of the training materials

After this, the student may test his/her learning with tests where feedback is given simultaneously.

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| Battery English 1 - Tern | ns and Concepts | Home / Courses / BatterySe / BatteryEn / Exercises / Read the s / Preview |
| Quiz navigation | | |
| 12345 | | |
| Finish attempt | | |
| | | |
| Start a new preview | | |
| start a new preview | | |
| QUESTION] | In the bustling city of Innovatown, there w | vas a renowned school where students embarked on a project to learn about batteries, focusing on one type at |
| | In the bustling city of Innovatown, there w a time. Their first lesson was on the | as a renowned school where students embarked on a project to learn about batteries, focusing on one type at a , a popular choice for its high energy density and long life. |
| QUESTION] Not yet onswered Market out of 100 Tr Rog question | | |
| QUESTION] Not yet answered Marked out of 1.00 | a time. Their first lesson was on the | , a popular choice for its high energy density and long life. |
| QUESTION] Not yet onswered Market out of 100 Tr Rog question | a time. Their first lesson was on the Next, they explored the | , a popular choice for its high energy density and long life. , learning about its less toxic materials and suitability for a wide range of temperatures. The |
| QUESTION] Not yet onswered Market out of 100 Tr Rog question | a time. Their first lesson was on the Next, they explored the journey continued with the | , a popular choice for its high energy density and long life. , learning about its less toxic materials and suitability for a wide range of temperatures. The |
| QUESTION] Not yet onswered Market out of 100 Tr Rog question | a time. Their first lesson was on the Next, they explored the journey continued with the storage. | , a popular choice for its high energy density and long life. , learning about its less toxic materials and suitability for a wide range of temperatures. The , where they discovered its reliability and cost-effectiveness for large-scale energy |

Figure 11: Example of the quiz





3.3 SOFT SKILLS FOR THE BATTERY SECTOR

The soft skills for the battery sector course comprehend a wide range of learning material for teachers and trainers to capacitate them to help develop soft skills in young people and employees.

It gathers content for teachers and trainers to develop their knowledge around soft skills for the battery sector, as well as tools and exercises that they can use in class to develop their students' soft skills.

Target Group

This course addresses all teachers and trainers who want to help their students develop soft skills for the battery sector.

The EQF level recommended is 6 or higher. However, lower EQF levels may apply, according to national requirements for being a teacher and/or trainer.

Recommended prior knowledge

Participants should have intermediate English level (reading, writing and listening comprehension) and basic digital skills.

Teaching Method

The course is designed for self-directed online learning. However, the course can also be delivered in a face-to-face environment or blended learning, led by a teacher.

Course Structure and Training Materials

The Soft Skills for the Battery Sector Course includes technical content and additional resources that teachers and trainers may use in their classes, according to the objectives and scope of the training. The course has its own Moodle Topics organised where all relevant training materials are stored.





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| Platform | | Q | |
| | Course Content | Course start date: 9/10/23 Category: Soft Skills | |
| Course Outline | General | v | |
| i albatts.softSkills General | announcements | | |
| The European battery industry and soft skills Industry and Soft Skills | The European battery industry and soft skills | v | |
| Why are soft skills important to highlight? | The European battery industry and soft skills | | |
| Why soft skills have become more important | The European battery industry and soft skills. | Ø | |
| Central Soft skills Suggestions on how you can help young people/employees develop their | Industry and Soft Skills | ~ | |
| soft skills | Industry and Soft Skills | | |
| Various classroom exercises for soft skills - Learning cards | Page Industry and Soft skills | Ø | |
| Soft Skills Assesment Youtube films | Why are soft skills important to highlight? | Ŷ | |
| Work Book - Soft Skills for work Al Buddy | Why are soft skills important to highlight? | | |
| | Why soft skills are important to highlight | Ø | |
| © Options | Why soft skills have become more important | * | |

Figure 12: Structure of the Soft Skills for the Battery Sector Course in Moodle

The participant can go through each of the topics directly in Moodle.

| ← → C ⋒ 🖙 learn.skills-framework.eu/moo | d/page/view.php?id=1352 | | | \$ 1 Q ☆ | e 🖪 🖸 💮 : |
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| ENGUSH (EN) ~ | | | | (| 86000 |
| Communication | | | | | |
| | ire develops with the help of communication. Vygotsky's vie communication that we create understanding with others. | | munication we can, among o | other things, convey but also | receive different |
| | comes more efficient, more organized and more attuned to communicate complex ideas and convey important messe | | | | nunication skills |
| In the dynamic world of the battery industry, when binds together various components in the comple | e technological advances and industry 4.0 are reshaping t ar manufacturing process. | the landscope, communication emerges as a crucial so | ft skill. It's not just about tran | isferring information; it is the | glue itself that |
| | in Ros | | | | |
| | ins in teams, collaboration is the cornerstone of success. Th ms not only fosters innovation, but also creates a work cultu | | g and creating a flow of idea | is and solutions between diffe | rent teams. |
| | thods are implemented, communication becomes the key as listening and adapting the communication style to the | | iding change among the wo | orkforce is critical to avoiding | resistance and |

In addition, reference materials such as videos, classroom exercises, workbooks, and an Artificial Intelligence buddy test have been added to further facilitate the development of soft skills in class.





Figure 13: Example of the training materials



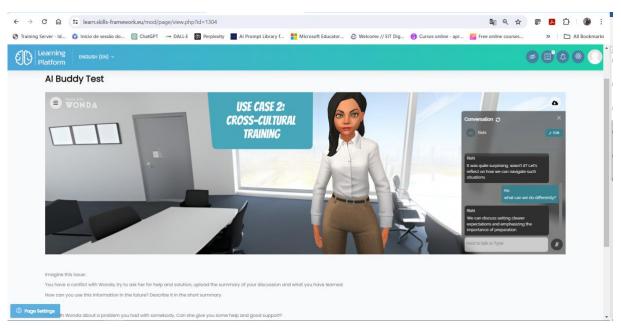


Figure 14: Additional materials

3.4 BATTERIES SAFETY COURSE

The course is aimed at anyone working in the battery sector and related fields. It is constructed in a way that basic knowledge of batteries and their value chain is assumed as background knowledge, but no minimum EQF level is required. The course content includes an overall view of different stages of the battery value chain while also diving a bit deeper into marine and EV applications. It is designed for personal online learning courses but may also be used as learning material in a face-to-face environment or blended learning led by the teacher.

Target group

All those interested in the battery industry and battery safety. For those working in the battery industry or those who intend to move into the battery industry, the course will provide a good basis for the necessary safety knowledge.

Recommended prior knowledge

Participants should have basic knowledge about batteries and the battery sector, along with intermediate English level (reading, writing and listening comprehension) and basic digital skills.





Teaching method

This course is crafted to cater to a variety of learning preferences, offering a comprehensive, self-paced online learning experience. It is designed to function seamlessly as a standalone resource for individual learners, as well as integrate smoothly into synchronous teaching settings and blended learning curriculums. It is tailored especially for self-paced learning, where learners can progress through modules and receive immediate feedback on their tasks. This method is good for those needing flexibility in timing and paced learning, allowing students to apply learning techniques best suited for them.

The course may also be used as an effective workbook for teachers leading live, synchronous classes. This adaptability makes it an excellent resource for teachers looking to enrich their classroom interactions with prepared, structured content. For environments that blend self-paced and instructor-led learning, this course offers a seamless integration of both approaches. Instructors can assign modules as homework to be reviewed asynchronously and then use class time for interactive discussions, group projects, or deeper exploration of complex topics. This hybrid approach enhances learning by combining independent study with collaborative educational experiences.

Course structure and training materials

The Batteries Safety Course incorporates the different training units:

- Introduction to Safety in Batteries
- Electrical Safety
- Battery Chemicals
- Battery Fires

Each training unit has its own Moodle Topics organised per learning outcome where all relevant training materials are stored.





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Figure 15: Example for the Training Unit on Introduction to Safety in Batteries

For each learning outcome, a SCORM file was developed, and the participant could interactively go through each of them.

| 01 - Risks and Dangers associated with the batteries | ~ |
|--|--------------|
| 01 - Risks and Dangers associated with the batteries | |
| To finalize this module, the learner will have to: Identify possible dangers of usage of batteries Identify the risks associated to battery usage | |
| AL04-01.1 Risks and dangers associated with batteries | \mathbb{S} |

Figure 16: Example for the Learning element on Risks and Dangers associated with batteries







| learn.skills-framework.eu/mod/scorm/player.php?a= | =63¤torg=B0&scoid=126&sesskey=Cg3rYkSI4u&disp | lay=popup&mode=normal | | | ଦ୍ରୁ ପ୍ | |
|--|--|--|---|--|---------|--|
| AL04-01.1 Risks and dangers ass | ociated with batteries | | | | Â | |
| AL04-011 Ricks and dangers associated with batteries tops complete Dot complete | • • | Safety concepts When studying safety in electrification and electric batteries, it is important to be familiar with the following concepts: | | | | |
| ASSOCIATED WITH THE BATTERES V P Introduction to safety in batteries Vhy safety is needed with lithium batteries | Indicates the difference in electrical potential between two points. The higher the voltage, the greater the risk of electric shock and other | Amperage | Resistance | | | |
| Important concepts to know in safety | Capacity | Charging time is measured in hours and indicates the time it takes for a battery to fully charge. A short charging time can be beneficial, but it can | Battery acid is a corrosive chemical found in some types of batteries, including lead-acid batteries. It is important to handle battery acid with care to avoid damage. | | | |

Figure 17: Example of the training materials

In addition, and where relevant, reference materials such as videos, articles or other freely available activities are added directly to the SCORM files.

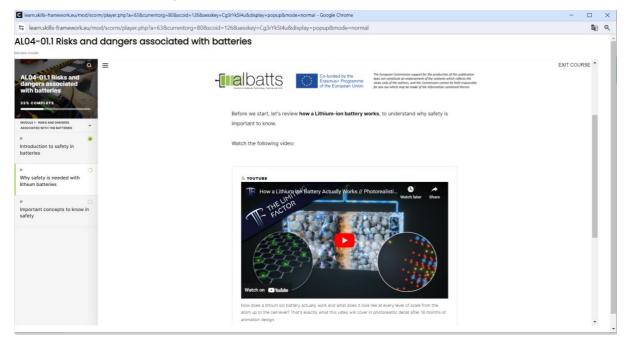


Figure 18: Additional materials

Each SCORM file also includes a final evaluation quiz to help the participant recap the information and check his knowledge.





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| Review mode | | | ^ |
| ALO4-01.2 Risks during distribution and Riccage | Ourstein O2/10 What is a primary safety concern during the raw material extraction process for batteries? Chemical reactions Chemical reactions Electrical conductivity Magnetic interference Magnetic interference | EXIT COURSE * | |
| ⊫ 🔗 Safety during Second Life | NEXT | | |
| and Recycling of batteries 💌 | | * | |
| | | | . 1 |

Figure 19: Example of the quiz

3.5 BATTERIES STATIONARY APPLICATIONS

This course will broadly cover a range of subjects, including battery storage developments, applications, safety, and business opportunities. This course will provide students with an in-depth understanding of energy storage solutions by gaining insight into how to design, obtain and maintain battery energy storage systems, i.e., from sourcing and utilising to recycling.

Target Group

This course addresses EQF levels 4 and 5 VET students, targeting planning, building, maintaining, servicing, and selling, among others, of battery-supported systems job roles.

Recommended prior knowledge

Participants should have basic knowledge about batteries and the battery sector, along with intermediate English level (reading, writing and listening comprehension) and basic digital skills.

Teaching Method

More so-called "blended learning" may be appropriate, as many learning tasks need equipment to practice skills, physically present instructors, etc.

Course Structure and Training Materials

The Batteries Stationary Applications Course is organised according to its different learning outcomes and has its own Moodle Topics organised where all relevant training materials are stored.





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| Platform ENOUSH (EN) ~ | | | | | | Q 🚺 | 0 | () |
| Course Outline | Course Content | | | Course start date: 2/12/23 | Category: Battery Sector | | | _ |
| ALBATTS.Stationary General | General | | | | v | | | |
| Learning Outcomes | General | | | | | | | |
| 01 - Battery Energy Storage (BES) 02 - Technology associated with BES | announcements | | | | | | | |
| 03 - Service and maintenance of BES 04 - BES solutions/applications | | | | | | | | |
| 05 - Future developments of BES | | | | | Y | | | |
| 06 - Safety risks associated with BES Feedback | | | lha | $++ \bigcirc$ | | | | |
| | • | | | IIS | | | | |
| | | Alliance for | r Batteries Technology | Training and Skills | | | | |
| | | | | | | | | |
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| | | The European Commission support for the production of this only of the authors, and the Commission cannot be held reag | s publication does not constitute an and/osament of the conside for any use which may be made of the informa | r contents which reflects the views tion contained therein | | | | |
| | | | | | | | | |
| © Options | Learning Outcomes | | | | × | | | • |

Figure 20: Structure of the Batteries Stationary Applications Course in Moodle

For each learning outcome, a set of theoretical content complemented with exercises is available.

| 01 - Battery Energy Storage (BES) | ~ |
|---|---|
| 01 - Battery Energy Storage (BES) | |
| To complete this module you should study the given material and do given exercises. | |
| | |
| Introduction | |
| Read this first chapter before the exercises. | |
| Practice: Introduction | 8 |
| Overview | 8 |
| Practice: BES | V |

Figure 21: Example of the Learning element on Battery Energy Storage (BES)







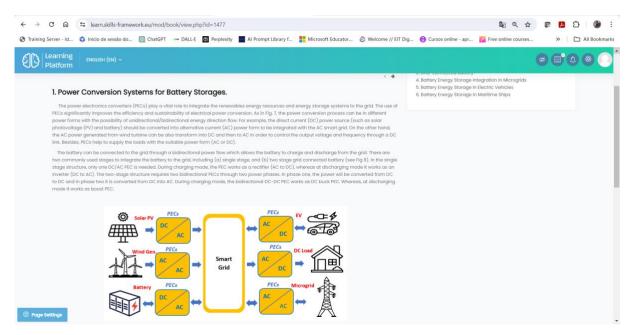


Figure 22: Example of the training materials

The practical exercises in the form of quizzes help the participant recap the information and check his

knowledge.

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| ALBATTS - Batteries Stationar | 9 Applications | Home / Courses / Bot | tery Se. / ALBATTS / 04 - BES sol. / | Practice: L_ / P | review | | |
| QUESTION 6 Not yet answered Marked out of 1.00 10 Flog question 10 Edit question | What has been identified as a significant driver in the definition of a the decline in the use of smartphones. a. The decline in the use of smartphones. b. The price of solar panels. c. The decrease in wind power production. d. The mass production of electric cars. | velopment and cost reduction of batte | ry energy storage systems? | | | | |
| Previous page | | | | Net | xt page | | |

Figure 23: Example of the quiz

3.6 AUTOMOTIVE BATTERY SYSTEMS ENGINEER COURSE

The Automotive Battery System Engineer Course is targeted at system and software engineers from the automotive sector, coping with the development of whole battery systems as well as dedicated battery management systems. The course highlights the importance of functional safety and cybersecurity aspects in the development of battery management systems, as well as the testing and homologation procedures for battery packs and systems.





The course addresses new job role descriptions in the automotive industry. The skill level in car makers is defined as "minimum bachelor level, master level preferred, minimum 5 years' experience in the design of complex systems". Also, car makers search for PhDs from technical universities that are involved in battery design and development.

EQF level 7 and 8, university degree required.

Example job roles in one of the representative car makers:

- HV Battery Requirements Engineer E-Mobility
- Battery Module Development Engineer
- Battery Management System Engineer

Recommended prior knowledge

The course is targeted at students or workers in the automotive sector in a Research and Development department. The participant should know the development process for an automotive mechatronic product and be familiar with terms like system architecture, system testing, and validation.

Teaching Method

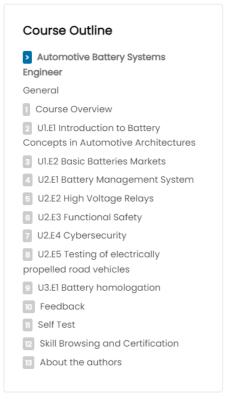
The course is designed for online teaching as it provides narrated slides. As the materials are also available in the form of a PowerPoint presentation, the course can also be taught in a face-to-face environment or as blended learning.

Course Structure and Training Materials

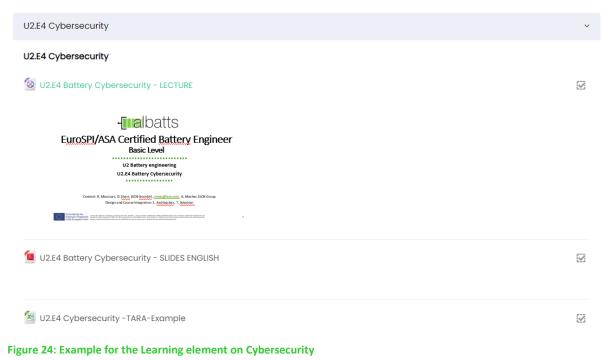
The Automotive Battery Systems Engineer Course has the following structure:







Each learning element has its own Moodle Topic, which stores all relevant training materials. For each learning element, a set of PowerPoint slides have been prepared and converted/narrated to mp4 videos. The participant can either go through the slides or listen to the explanations of each slide done in the narrated videos.







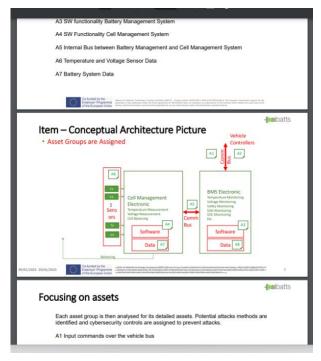


Figure 25: Example of the training materials

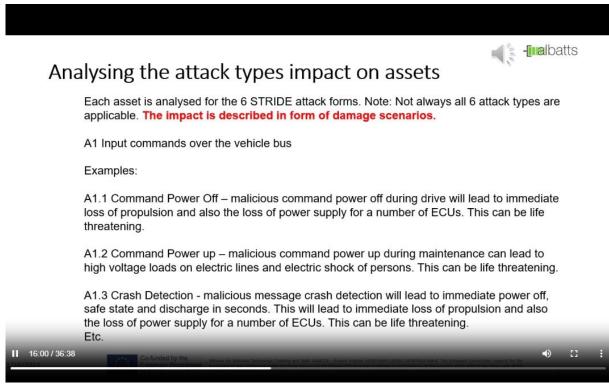


Figure 26: Example of a narrated video for the learning element of Cybersecurity

In addition, where relevant reference materials are added:

- Templates for performing a task (e.g. TARA or HARA)
- Articles and publication
- YouTube videos





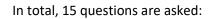


| 🖲 Standards for the performance and durability assessment of electric vehicle batteries | \odot |
|---|---------|
| Comparing different vibration tests proposed for li-ion batteries with vibration measurement in an electric vehicle | |
| 🙇 A Review of Lithium-Ion Battery Failure Hazards: Test Standards, Accident Analysis, and Safety Suggestions | |
| Risk management over the life cycle of lithium-ion batteries in electric vehicles | Ø |
| Visit https://batterystandards.info/ for an overview on battery standards BatteryStandards.lwfo | V |

Figure 27: Additional materials

The course also includes a self-test to help the participant recap the information and check his knowledge.

| Self Test | ~ |
|---|---|
| Self Test | |
| V Self Assessment Quiz | 8 |
| Please answer the questions in order to self-assess yourself. | |



| QUESTION Not yet answered Marked out of 1.00 re Flag question Edit question | The number of lines of softwarein the battery electronics includes - Select one: a. some hundred lines b. some thousand lines of software c. More than one hundred thousand lines of software d. This is only an electro-checmical process, no software needed |
|--|---|
| QUESTION 2 Not yet answered Marked out of 1.00 r Flag question © Edit question | Do the statistics show an increase of BEV and HEV share Select one: O a. Yes O b. No |

Figure 28: Example of the self-test





3.7 CELL PREPARATION AND EVALUATION ON A LAB-SCALE

The Cell Preparation and Evaluation on a Lab-Scale course provides a comprehensive understanding of various aspects related to electrode materials and battery technology by exploring fundamental and applied methodologies, including battery production, characterization, manufacturing, and testing on a laboratory scale.

Target Group

This course addresses EQF levels 4 and 5 VET students, targeting battery quality related job roles on the battery value chain.

Recommended prior knowledge

Participants should have basic knowledge about batteries and the battery sector, along with intermediate English level (reading, writing and listening comprehension) and basic digital skills. Additionally, participants should also have basic knowledge of lab working procedures.

Teaching Method

The course is designed for personal online learning. However, the course can also be delivered in a face-to-face environment or blended learning, led by a teacher, to include learning tasks in a lab.

Course Structure and Training Materials

The Cell Preparation and Evaluation on a Lab-Scale Course is organised according to its different learning outcomes and has its own Moodle Topics organised where all relevant training materials are stored.

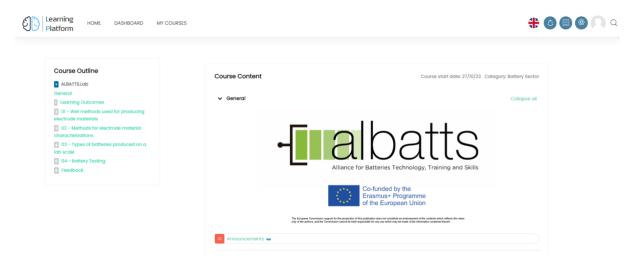


Figure 29: Example for the Training Unit on Introduction to the Battery Sector

For each learning outcome, a SCORM file was developed, and the participant could interactively go through each of them.

Co-funded by the Erasmus+ Programme of the European Union





✓ 01 - Wet methods used for producing electrode materials

To finalize this module, the learner will have to:

Understand various wet synthesis techniques, such as sol-gel, hydrothermal, precipitation, and co-precipitation, to produce an electrode material with specific parameters.

Perform the production of electrode materials on a lab scale according to specific wet methods.



Figure 30: Example for the Learning element on the Wet methods used for producing electrode materials

| ALOB-011Wet methods used for producing electrode materials 13% COMPLET MODELT - VETHETHORS USE FOR MERCONNE LET FORCE METERS | EXT COURSE* Sol-gel Method |
|--|--|
| Introduction to cell preparation at laboratory scale Sol-gel Method | Co-funded by the Ensures Programme of the European Union Co of United Dy the Ensures Programme of the European Union Co of the European Union Co of the European Union |
| Co-precipitation method Self-propagating High- | The Sol-Gel method is a widely used technique for the synthesis of electrode materials, mainly cathodes. |
| temperature Synthesis | Precursor + Solvent |

Figure 31: Example of the training materials

In addition, and where relevant, reference materials such as videos, articles or other freely available activities are added directly to the SCORM files.







| ALO8-01.2 Method for electrode mater characterizations os complete | ial | Check the following video which explains the basics of the XRD method: |
|---|-----|---|
| • | 0 | Introduction to X-ray Diffraction (XRD) Watch later Share |
| X-ray diffraction | | |
| P. | 0 | Introduction to X-ray Diffraction (XRD) |
| Neutron Diffraction | | Nichole Wonderling |
| 5 | | MCL BARRENCION LA |
| Scanning electron microscopy | | Permistance La Consta Fincance La Permistance Constance La Consta Fincance La Consta Constance La Consta |
| | | Watch on Statistics |
| Atomic Force Microscop | | |
| | | Introduction to X-ray Diffraction (XRD) |
| Thermal stability (therma analysis: TGA/DTA/DSC) | | |
| P Deserves Freedo | | CONTINUE |
| Brunauer-Emmett- Teller method | | CONTINUE |
| ж. | | |
| Electrical Conductivity | | |

Figure 32: Additional materials

Each SCORM file also includes a final evaluation quiz to help the participant recap the information and check his knowledge.

| LO8-01.2 Methods or electrode materia haracterizations | •/ | Question |
|--|----|--|
| COMPLETE | | 02/04 |
| | • | What information does the XRD technique provide in the characterization of electrode materials for batteries? |
| tion | | ③ The hydrogen content of the material |
| tion | 1 | ③ Thickness of the electrode material layers |
| | • | (Thermal analysis of the sample |
| licroscopy | · | The crystal structure and phases of the material |
| ermal SC) | · | \bigcirc |
| t- | • | Correct |
| uctivity | • | NEXT |

Figure 33: Example of the quiz







Do not show again

Got it

D6.5

4 Basic Batteries Course in Realizeit Online Adaptive Learning Platform

As is the case with the courses offered on the ASA platform, <u>https://learn.skills-framework.eu/</u> hosts the Basic Batteries course offered through Realizeit. The Target Group, Recommended prior knowledge, Teaching Method, and Course Structure and Training Materials are the same as those detailed in section 3.1. The primary difference learners experience is that those learning the Basic Batteries course in Realizeit experience the benefits of the Adaptive Learning system.

If users select this course on the <u>https://learn.skills-framework.eu/</u> website, they will be launched into the Realizeit platform. They are enrolled in the Basic Batteries – ALBATTS course in Realizeit and are presented with guidance for using the Realizeit Adaptive Learning platform most effectively (see Figure 34).

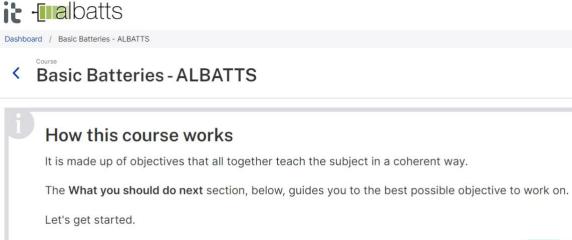


Figure 34 Realizeit platform with guidance on platform use

As the user progresses, the Realizeit Adaptive Learning platform provides metrics on their progress and guidance on what they should do next, as illustrated in Figure 35.









Dashboard / Basic Batteries - ALBATTS

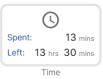
< Basic Batteries - ALBATTS

What you have done so far

- 5/32 Knowledge covered
- You have completed 5 out of 32 activities (16%) across 8 objectives in this Course. Ju Details # Full learning map



Your Mastery level for the 5 activities that you have completed in this Course is 99% — Master. Ju Details



What you should do next

Start



Module 2-Battery Fundamentals

Electrochemistry is the branch of physics and chemistry that studies the relationships between chemical reactions and electric current. The reactions studied in electrochemistry are the reduction-oxidation reactions (REDOX), in which electrons are transferred. in addition to the simultaneous occurrence of oxidation and reduction of certain chemical species that participate in the process.

Figure 35 Realizeit platform with metrics and guidance for the next steps

This advice will develop and change as the system continuously changes its calculation of the user's ability and knowledge. This process is illustrated in Figure 36.

The Realizeit Learning Model



Figure 36 Illustration of Realizeit Learning Model, including Determine Knowledge, learning paths, ability metrics and profiling

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When the user selects a learning objective in Realizeit, they are presented with a suggested first step of completing Determine Knowledge (as in Figure 37). This operation draws questions from across the objective and tests learners on their knowledge. It is the recommended first step for every learning objective and allows learners to demonstrate their prior knowledge on a given objective before engaging in the learning content. This allows Realizeit to respect users' prior knowledge – if the system judges from Determine Knowledge that the user already has sufficient understanding of a lesson, the user won't need to complete the lesson and can progress to new material.

it - albatts

| Dashboard / Basic Batteries - ALBATTS / Module 2 - Battery Fundamentals | |
|--|--|
| < Module 2 - Battery Fundamentals | Q Search |
| Start learning with your personalized recommendation in the What your or explore the contents of this objective in your Learning map. | Do not show again |
| What you should do first | Learning map |
| Determine knowledge | Your Learning map for this Objective contains 5 activities. |
| Determine knowledge saves you time by allowing you to move past activities that you already know. This is the best place to start. It's a set of targeted questions to help | $\bigcirc \longrightarrow \bullet \longrightarrow \bullet \longrightarrow \bullet \longrightarrow \bullet$ |
| determine what you already know. This allows you to skip past familiar activities in your learning map. | |
| | |

Figure 37 Realizeit platform with details on Determine Knowledge

After completing Determine Knowledge, the student can work on lessons, which can be accessed through the Learning Map (as in Figure 38). This feature provides a visual and theoretical display of the links between different learning concepts. The map provides further information to the system on the learner's understanding of the material – for instance, if a user demonstrates problems answering questions on one lesson, they may be having issues with a prerequisite concept, and Realizeit will deliver material from an earlier lesson to address that deficit.







< Module 8 - Integration Process

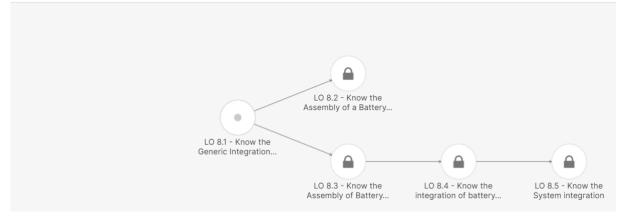


Figure 38 Realizeit Learning Map

Content is presented in the Realizeit Adaptive Learning platform (as in Figure 39). Content is presented in a variety of formats, including text, image, and video. Questions of various interactive forms have been defined, and the user's learning and knowledge are constantly measured as they work.

| Dashboard / Basic Batte | eries - AL | BATTS / Module 8 - Integration Process / Learning map / Learn: LO 8.1 - Know the Generic Integration Process |
|-------------------------|------------|---|
| Learn: LO 8 | 8.1-1 | Know the Generic Integration Process |
| Lesson path | + | 55 |
| 1. Integration process | ۲ | Integration process What is integration? It is the process where according to the architecture the elements of |
| 2. Knowledge Quiz | | the architecture are integrated. The interfaces must be tested in the integration process. A battery contains battery cells , the battery cells are integrated to battery modules , the battery modules are connected by electronics and sensors (temperate and voltage measurement), and the sensors are connected to a Battery Management System . The battery management system includes software which controls temperature , state of charge , state of health , and cell balancing . The BMS has a connection to a digital bus exchanging data with the connected system level . A layered view of the battery system is seem in figure 1. |
| | | Interface Battery to Vehicle Bus |
| | | Battery Management Electronic with SW |
| | | Next Exit |







5 Course Completion and Digital Badges Generation

5.1 DIGITAL BADGES

The system issues the Digital Badges through the Skills Hub (<u>https://skills-framework.eu/</u>) used by the Automotive Skills Alliance (ASA). Digital badges are micro-credentials that serve as a recognition of achieved competence or learning.

Digital Badges are a type of micro-certificate which may be shared online to prove competence (learning outcome) on a certain level, and it is issued by the Automotive Skills Alliance as a large-scale partnership in the automotive-mobility ecosystem under the Pact for Skills. An example of this micro-credential may be found here: <u>Assertion - Skills Hub (skills-framework.eu)</u>. The overall guide to the ASA micro-credentials is available here: <u>Wiki - Skills Hub (skills-framework.eu)</u>.

Badges may be decomposed into 4 layers:

- Layer 1: Maturity Level (1) Awareness; (2) Practitioner and (3) Expert Level Badges
- Layer 2: Concept Type (1) Skill/Competence or (2) Knowledge
- **Layer 3:** Type of Completion (1) Attendance; (2) Exam;
- Layer 4: Recognition
 - (1) Recognised certificate/training from a recognised entity (by DRIVES project) is provided for the completed training course; (Gold Color) – based on the recognition criteria
 - (2) Unrecognised certificate/training is provided from an unrecognised entity or not provided at all; (Grey Color) – or DRIVES colour

Recognition criteria are the following:

- Conformity Assessment ISO:17024
 - To be specified for certain certificates provided for the training certification is aligned with ISO:17024
 - Will result in Gold Badges issued upon training completion
 - \circ $\;$ Emblem is shown in the provider's detailed information $\;$
- ECTS credits:





- If course completion is connected to the ECTS credits, trainees will obtain Gold Badges
- EQAVET implementation:
 - This is specified during the provider registration and has no effect on the badges
 - Emblem is only shown in the provider's detailed information





Figure 41: Golden Badges

5.2 ISSUING THE DIGITAL BADGES

After all learning activities are completed, the Digital Badges are issued – the student studies all the relevant materials and learning resources, which concerns answering the feedback survey as well.





A student will receive an email informing about the course completion and about the fact that the badges were issued in the platform - <u>Home - Skills Hub (skills-framework.eu)</u>. The student will also be given the credentials to log in to the system to access the badges.







6 Conclusions and further developments

ALBATTS has successfully developed comprehensive training materials that are immediately accessible through the Automotive Skills Alliance learning platform as MOOCs, or can be used for blended learning, and face-to-face sessions. These materials, freely available on the learning platform, provide valuable resources for education and training providers, industry professionals and enthusiasts, ensuring wide accessibility and flexibility in learning. More information on how to utilize ALBATTS training material is available in the Handbook for training in the Battery Industry – Why? What? Where? How? (deliverable D6.7).

Moreover, the issuance of digital badges to participants not only recognizes their efforts but also enhances their professional credentials.

Moving forward, to keep pace with the rapid advancements in battery technology, it is advisable to continuously update and expand the training content for the sector. Additionally, efforts will be directed towards enhancing the Adaptive Learning solution to provide more personalized learning experiences. Collaborations with industry experts and educational institutions will be sought to refine the curriculum and incorporate emerging trends, ensuring that the training remains relevant and cutting-edge.



