D5.2 – ECS-Academy Training and Curriculum

Project number	101110124
Project name	European Chips Skills Academy
Project acronym	ECS-Academy
Call	ERASMUS-EDU-2022-PI-ALL-INNO
Topic	ERASMUS-EDU-2022-PI-ALL-INNO-BLUEPRINT
Type of action	ERASMUS-LS
Service	EACEA/A/02
WP	5
Due Date	28 February, 2026
Submission Date	
Lead Partner	P4 - BME
Author(s)	Dr. Oliver Krammer
Deliverable type	Report[1]
Dissemination level	Public

Version history

Version	Date	Authors	Partner
1.1	14.01.2026	Oliver Krammer	BME
1.2	20.01.2026	Oliver Krammer	BME
1.3	22.01.2026	Oliver Krammer	BME
1.4	26.01.2026	Oliver Krammer	BME
1.5	27.01.2026	Dominik Zupan	TU Graz
1.6	28.01.2026	Marek Spanyik	VSB-TUO
1.7	28.01.2026	Oliver Krammer	BME
1.8	29.01.2026	Oliver Krammer	BME
1.9	30.01.2026	D. Zupan, O. Krammer	TU Graz, BME
2.0	26.02.2026	Oliver Krammer	BME

Appointed internal reviewer

Reviewed version	Date	Reviewers	Partner
1.8	02.02.2026	Alessandra Messana Marianna Muin	IAL FVG

External reviewers

*Reviewed version is 1.9

- SYDELITY b.v.
- NXP
- RVO-Society
- Aalto University

Table of Contents

1. Introduction

The main objective of Work Package 5 is to provide specialised training content to the ECS-Academy to train the future workforce and re-train the current workforce in the electronics and microelectronics sectors of Europe. The WP5 started at the inception of the project, with the development of training materials (as a reactive response) on two specific areas identified in the proposal:

- Agile Management
- Digital Competences and Skills, including Remote Workforce Development

The ECSA partners developed **19 courses for the reactive response** in the first 10 months of the project. In the second part of the course development, the learning outcomes for the ECSA proactive response were defined first. The learning outcomes of the courses were defined through initial analyses, in accordance with the ADDIE model. The analyses included seeking ECSA-specific job profiles and the associated skill and knowledge items on the ESCO platform. The "ECSA Skills Strategy" (deliverable D3.2) was also studied in depth, critical areas were identified and then mapped to ESCO occupational profiles. The skill and knowledge items for these occupational profiles were also used to define the ECSA learning outcomes. Next, the courses were created on the ECSA learning platform (https://learn.chipsacademy.eu/), and then the course materials were developed and uploaded. The ECSA partners developed **41 courses** in this stage **for the proactive response**, yielding a curriculum for the **ECSA specialised training**, comprising **60 internal courses** altogether. These courses cover 6 key areas related to the microelectronics sector as follows:

- Project management, entrepreneurship (including agile management)
- Digital competences & remote self-development
- Gender & inclusivity
- Green & sustainability
- Intelligent digital systems (including sub-areas of artificial intelligence and cybersecurity, and digital systems)
- Microelectronics (including sub-areas of electrical engineering principles, microelectronics design-, manufacturing- and testing aspects)

External partners are also engaged to develop and offer courses via the ECSA learning platform. At the time of preparing this deliverable (end of February 2026), **28 courses are offered by external partners** covering various topics in areas of Gender & Inclusivity, Intelligent Digital Systems and Microelectronics. Even more courses developed by external partners are foreseen in the second part of the project. The ECSA internal and external courses are listed in Chapter 3 – Content of the ECSA specialised training program.

2. Development of the ECSA specialised training program

2.1 Developing the key elements of the ECSA courses

From the beginning, the development of the reactive response has followed the principle of supporting flexible learning pathways by adopting a modular approach. The development started by splitting the training topics/areas (identified in the proposal for reactive and proactive responses) into small learning volumes. The next step was to develop and determine their key elements, including clear learning outcomes, EQF level (European Qualifications Framework), and workload. The development of ECSA courses was divided into two phases. A set of the courses was completed by M10 (reactive response), while the others were completed by M29 (proactive response), together forming the complete ECSA training program.

Learning outcomes are the learning goals defined from the learner's perspective (what the learner knows, understands, and is able to do after completing the learning process). The learning outcomes for the ECSA courses were defined through initial analyses, in accordance with the **ADDIE model** (see D5.1 – ECS-Academy Pedagogic Model, Guidelines and Learning Outcomes[2]). The analyses included seeking ECSA-specific job profiles and the associated skill and knowledge items on the ESCO platform[3]. The "ECSA Skills Strategy" (deliverable D3.2[4]) was also studied in depth, critical areas were identified and then mapped to ESCO occupational profiles. The skill and knowledge items for these occupational profiles were also used to define the ECSA learning outcomes. The details for defining ECSA learning outcomes are provided in deliverable D5.1. Based on these analyses and the identified learning outcomes, the **main areas of ECSA specialised training** were refined and defined as:

- **Project management, entrepreneurship (including agile management)**
- **Digital competences & remote self-development**
- **Gender & inclusivity**
- **Green & sustainability**
- **Intelligent digital systems (including sub-areas of artificial intelligence and cybersecurity, and digital systems)**
- **Microelectronics (including sub-areas of electrical engineering principles, microelectronics design-, manufacturing- and testing aspects)**

The learning outcomes are then grouped into the main elements of the EQF and ESCO level descriptors: **Knowledge** (factual and/or theoretical) and **Skills/Competences** (cognitive/practical). Since most European countries have developed their NQF (National Qualifications Framework) level descriptors based on the EQF approach[5], using these descriptors enhances the portability of learning outcomes.

The portability of learning outcomes was further facilitated by using the ESCO Knowledge and Skills/Competences items for as many courses as possible. This also helps create the link between the courses and occupational profiles later, as the ESCO platform already provides crosslinking between learning outcomes and occupational profiles. Additionally, the **Maturity level system of the DRIVES project**[6,7] has been adopted to define the learning outcomes even more precisely (and to map them to Job Roles). The levelof maturity for a

---

[2] https://chipsacademy.eu/wp-content/uploads/2024/11/Deliverable-5.1_final.pdf

[3] https://esco.ec.europa.eu/en/classification/occupation_main

[4] https://chipsacademy.eu/wp-content/uploads/2025/05/ECSA-Skills-Strategy-2024-rev-20052025.pdf

[5] https://www.cedefop.europa.eu/files/6119_en.pdf

[6] https://www.project-drives.eu/Media/Publications/211/Publications_211_20211201_113520.pdf

[7] https://skills-framework.eu/home

given learning outcome can be one of the following:

- **Awareness:** understand the background knowledge, competence/skill, and its practical implications in the practical environment

- **Practitioner:** strong understanding of the knowledge, experience in the competence/skill; able to apply knowledge, the experience of the competence/skill, and share with others, including the use of the most appropriate tools and techniques for the solution

- **Expert:** an expert knowledge or competence/skill, with the ability to develop and apply procedures and activities as an individual and/or provide a qualified opinion to a team; recognised specialist and advisor in the generation of solutions and ideas, including methods, tools, techniques, guiding or leading others in best practice use of the specific knowledge and skill.

The appropriate maturity level of skills/competences is defined by analysing the verbs (originating from Bloom's Revised Taxonomy; Armstrong, P. (2010). Bloom's Taxonomy. Vanderbilt University Centre *for Teaching*) in the learning outcomes. These verbs are characteristic of the level of knowledge, as illustrated in Figure 1[8].
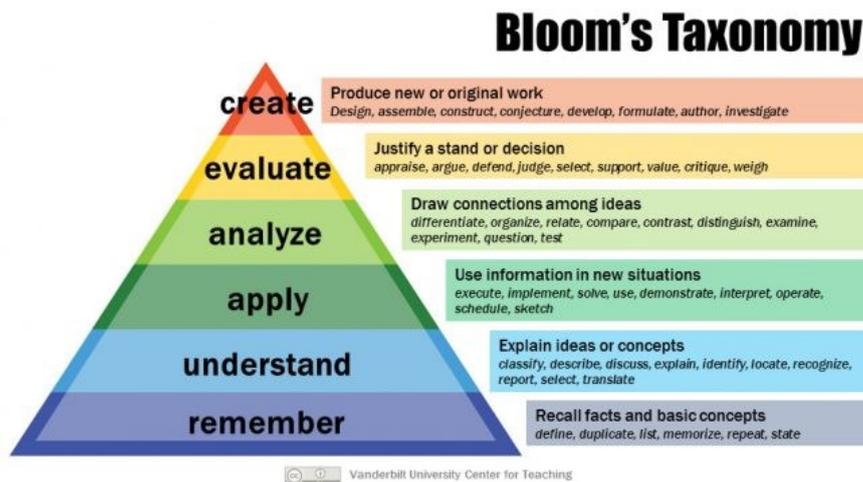
Fig. 1. Bloom's taxonomy (*Armstrong, P. (2010). Bloom's Taxonomy. Vanderbilt University Center for Teaching***)**

The workload for all courses is estimated by considering the overall time required for a learner to achieve the learning outcomes. This includes not just the estimated class/contact/screen time, but the time needed to read, process, and learn the course material in more detail (i.e. preparing for the examination). Workloads for some courses are also expressed in credits, as in the European Credit Transfer and Accumulation System[9] (ECTS) and the European Credit System for Vocational Education and Training[10] (ECVET). The ECS-Academy followed the ECTS Users' Guide, which defines that 1 credit corresponds to 25 to 30 hours of work. These approaches all support the potential to transform the developed ECSA courses into micro-credentials[11].

---

[8] https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy
[9] https://op.europa.eu/en/publication-detail/-/publication/da7467e6-8450-11e5-b8b7-01aa75ed71a1
[10] https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009H0708%2802%29
[11] https://www.etf.europa.eu/sites/default/files/2023-06/Micro-Credential%20Guidelines%20Final%20Delivery.pdf

2.2 Standardised tools for the course development

Standardised tools were created for the reactive response course development by adapting the description from the Skills Hub[12], including an Excel sheet to collect all course information, resulting in standardised descriptions. Elements describing the courses are the following:

Partner name and ID	*Partner name and ID*	e.g., P1-SEMI
Course ID	*P##.##*	##.## = Partner_ID.Course_ID, e.g. P01.01, where the first number is the partner ID and the second one is the course ID
Course version	*v.##*	example: v.01
Title	*Example Training*	name of the training
Abstract	*consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua..*	Ideally 500, maximum 1000 characters - short description of the training
Link	https://example.org	Link to the content on the ECSA learning platform
Contact details		
Name	*John Doe*	Name of the contact person
E-mail	*example@example.org*	E-mail address of the contact person
Additional information		
Learning hours	*##*	Course learning hours estimate the class/contact/screen time and the time required to read, process, and learn the course material in more detail. If a course (face-to-face) or a video has a specific length, a general rule is to multiply the duration by two to determine the learning hours.
Course level	*e.g., Intermediate*	Select from: ▪ Beginner ▪ Intermediate ▪ Advanced ▪ Expert
Prerequisites	*e.g., basic math knowledge, basic understanding of microtechnology, etc…*	Comment on possible prerequisites to the course
Target group	*e.g., high-school students, technicians	students with ongoing bachelor studies; engineers*	Plain text, multiple options
Image		Image for the training, PNG (optional)
ECTS points	*5*	Optional
ECVET points	*5*	Optional
EQF Levels	*1,2,3,4,5,6,7,8*	Can be a single value or range; e.g., 4,5 or 6,7,8
Content	*1. Lorem ipsum dolor sit* *1.1 ametconsectetur adipiscing elit* *1.2 sed do eiusmod tempor incididunt* *1... ut labore et dolore magna aliqua.* *2 Ut enim ad minim veniam* *2.1 quis nostrud exercitation ullamco laboris* *… nisi ut aliquip ex ea commodo consequat.*	(splitting chapters into subchapters is needed, especially for longer courses)
Assessment	*e.g., Moodle-like quiz test*	A brief description of how the students' understanding is assessed.

	Mandatory
	Optional

---

[12] https://skills-framework.eu/home

Learning outcomes

Fill in as many skills/competence or knowledge as needed considering the learning hours*				
Type	**Name**	**Description of the learning outcome**	**ESCO - https://esco.ec.europa.eu/en/classification/skill_main**	**Level of Maturity**
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*communication*	*Exchanging and conveying information, ideas, concepts, thoughts, and feelings through the use of a shared system of words, signs, and semiotic rules via a medium.*	*TRUE*	*If the learning outcome presents in ESCO, then e.g., http://data.europa.eu/esco/…...*	*Practitioner*

*suggestion for the number of learning outcomes based on the learning hours:

Learning hours	Suggested number of skills/competences	Suggested number of knowledge items
1–4	1–2	1–2
5–10	1–3	1–3
11–30	2–4	2–4
31–60	4–7	4–7
>60	approx. 10	approx. 10

Additionally, a PowerPoint template has been developed to have the ECSA training content in a standardised format. The template is accessible at:
https://docs.google.com/presentation/d/1H24dv5EKtiGbsWysClx7HwuKvGXugHam/edit?usp=sharing&ouid=110753458353402727679&rtpof=true&sd=true

3. Content of the ECSA specialised training program

The structure of the ECSA specialised training follows a modular approach: the training content is divided into sub-units (courses), each with learning outcomes that can be individually assessed, validated, and certified (if the course and the provider meet the recognition criteria; see chapter 5). In the following subchapters, an overview of the specialised training content classified in the areas mentioned above (**project management, entrepreneurship; digital competences & remote self-development; gender & inclusivity; green & sustainability; intelligent digital systems and microelectronics**) is provided. The ECSA project partners developed 60 courses altogether. Additionally, the project began inviting and engaging external partners. 28 courses are offered by external partners at the time of writing this deliverable (end of February 2026), and the number of external courses is expected to increase further in the second period of the project.

The ECSA courses can be combined to form learning pathways suited to individual needs, technical development, or occupational profiles, permitting continuous adaptation of the training content. Exemplary pathways for studying project management through ECSA courses are shown in Figure 2 below.
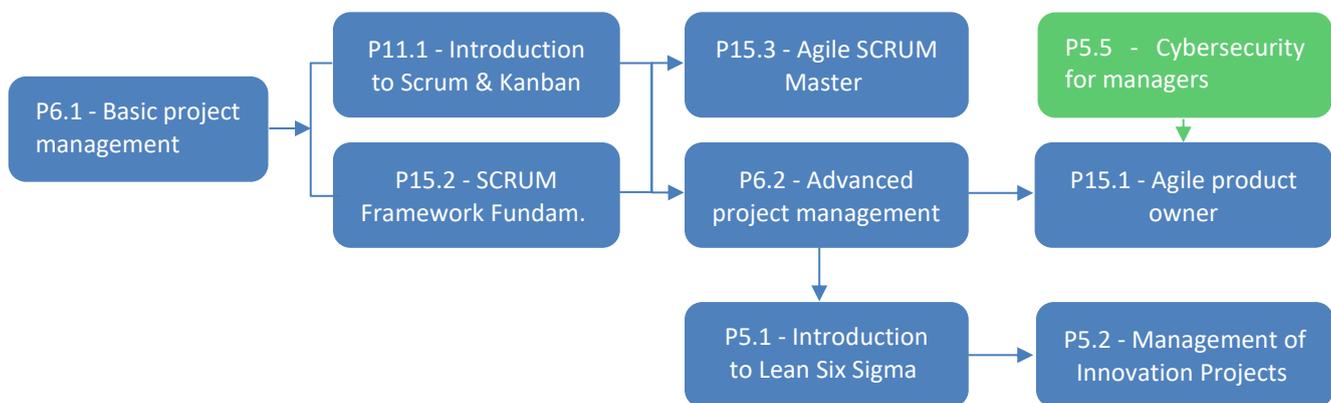
Fig. 2. Exemplary pathways for studying project management (the green course belongs to the category of *Intelligent digital systems*)

The training content is listed in the tables below. For every course, the following information is provided (the detailed course descriptions are collected in the Annex):

- Course ID (composed of the partner ID and course number)
- Course title
- The number of learning hours (LHs) needed to achieve the learning outcomes
- The European Qualification Framework (EQF) level the course is aiming for
- Link to the course on the ECSA learning platform

3.1 Project management, entrepreneurship

In the area of **Project management & entrepreneurship**, ECSA training provides **12** individual internal **courses** classified into **four groups**.

#	ID	Title	LH	EQF	Link
A1		**Basic project management**			
	P6.1	Basic project management	32	4	▶
A2		**Advanced project management**			

#	ID	Title	LH	EQF	Link
	P6.2	Advanced project management	24	5	▶
	P11.1	Introduction to Scrum & Kanban	3	4	▶
	P15.1	Agile product owner	4	5–8	▶
	P15.2	SCRUM Framework Fundamentals	4	5–6	▶
	P15.3	Agile SCRUM Master	4	5–8	▶
	P5.7	Introduction to Risk Analysis	6	4–5	▶
A3		**Specialised project management**			
	P5.1	Introduction to Lean Six Sigma	40	4–5	▶
	P5.2	Management of Innovation Projects	60	3–8	▶
A4		**Entrepreneurship**			
	P6.4	Canva at the service	30	4	▶
	P6.5	Entrepreneurship become a startupper	30	4	▶
	P6.6	Developing a simple Business Plan	30	4	▶

3.2 Digital competences & remote self-development

In the areas of **Digital competences and Remote workforce development**, ECSA training provides **6** individual internal **courses** classified into **two groups**.

#	ID	Title	LH	EQF	Link
B1		**Digital tools, platforms, and systems**			
	P4.1	Digital competences – Office tools	60	5–6	▶
	P5.3	Digital strategy and competences (EP – RESIST)	4	3–4	▶
	P5.4	Understanding digital transformation (EP – RESIST)	4	3–4	▶
B2		**Remote self-development**			
	P1.1	Education and Career Pathways (in microelectronics)	4	4–8	▶
	P3.1	Copyright Law, Licensing and OER	2	3–8	▶
	P6.3	Europass, ESCO and other platforms for remote workforce development	15	4	▶

3.3 Gender & inclusivity

ECSA provides one course in this area; however, it engaged 19 courses by involving the sister project ECDA (European Chips Diversity Alliance) – see chapter "3.7 External courses".

#	ID	Title	LH	EQF	Link
C1		**Gender & inclusivity**			
	P7.2	Effective equality for women and men in the workplace	2	3	▶

3.4 Green & sustainability

In the area of **Green & sustainability**, ECSA provides **7** internal **courses** classified into **two groups**.

#	ID	Title	LH	EQF	Link
D1		**Sustainability**			
	P7.1	Sustainable Financial Literacy	30	3	▶
	P6.7	Circular economy in the manufacturing sector	30	4	▶
	P6.8	Ensuring Health and Safety in Manufacturing	30	4	▶
D2		**Green technologies**			
	P4.2	Technology of biodegradable printed circuit boards	30	6–7	▶
	P4.3	Characterization of biodegradable printed circuit boards	30	6–7	▶
	P4.4	Design of biodegradable printed circuit boards	30	6–7	▶
	P4.5	Assembly of biodegradable printed circuit boards	30	6–7	▶

3.5 Intelligent digital systems

In the area of **Intelligent digital systems**, ECSA provides **4** internal **courses** classified into **two groups**.

#	ID	Title	LH	EQF	Link
E1		**Artificial intelligence & cybersecurity**			
	P5.5	Cybersecurity for Managers	36	6–7	▶
	P5.6	Cybersecurity for Engineers	36	6–7	▶
	P5.8	Introduction to ICT Cybersecurity	8	4–5	▶
E2		**Digital systems**			
	P5.9	Introduction to SW Development Process	10	4–5	▶

3.6 Microelectronics

In the area of **Microelectronics**, ECSA provides **30** internal **courses** classified into **four groups**.

#	ID	Title	LH	EQF	Link
F1		**Electrical engineering principles**			
	P13.1	AENEAS Summer School	50	6	▶
	P1.3	Intro to semiconductors	4	4–8	▶
	P2.1	Intro to Modern Microelectronics	13	4	▶
	P3.2	Workshop on EMC fundamentals	12	6	▶
	P3.5	ElectRONiX - Amplifiers	28	5–6	▶
	P3.6	ElectRONiX - Digital	28	5–6	▶
	P3.7	ElectRONiX - Resonances	16	5–6	▶
	P3.8	ElectRONiX - Power	12	5–6	▶
	P7.3	Circuit Training with Analog Devices DC	25	4	▶
	P7.4	Circuit Training with Analog Devices - AC	25	5	▶
	P7.5	Training in Electronic Circuits with Analog Devices	50	5–6	▶
	P10.6	Introduction to power MOSFETs	2	6–7	▶
	P10.9	Magnetic Sensors	4	6–7	▶

	P10.10	Power Semiconductors Overview	2	5	▶
	P10.11	Basics of GaN power devices	3	6–7	▶
	P10.12	A/D and D/A Converters Fundamental Considerations and Definitions	2	5–6	▶
F2		**Microelectronics design**			
	P1.2	Engineering design process	4	4–8	▶
	P3.3	Circuit Design Challenge (for Learners)	50	5–8	▶
	P3.4	Circuit Design Challenge (for Teachers)	75	5–8	▶
	P10.4	Integrated Circuits design flow	5	6–7	▶
	P10.8	Probabilistic System Architecture	8	6–7	▶
	P10.13	Selected Topics on Chip Assembly for Chip Designers	10	6	▶
F3		**Microelectronics technology & manufacturing**			
	P4.6	Overview of SMD and THT components	15	6–7	▶
	P9.1	Introduction to MEMS Technology	8	5–6	▶
	P10.2	Introduction to Plasmaetching	5	5–7	▶
	P10.3	Semiconductor Carrier Systems	3	6–7	▶
	P10.5	Process Control Monitoring - measurement in wafer manufacturing	2	6	▶
	P10.7	Introduction to Lithography	8	6–7	▶
	P10.14	Ion Implantation for Semiconductor Industry	2	6	▶
F4		**Microelectronics testing**			
	P10.1	Introduction to Test Engineering for IC Development	4	5–6	▶

3.7 External courses

At the time of preparing this deliverable (January 2026), **28 courses** are offered by external partners via the ECSA learning platform, covering various topics and areas. The list of courses is presented in the table below.

#	ID	Title	LH	EQF	Link
EXT1		**Gender & inclusivity**			
	EP1.1	Designing Inclusive Learning Environments (in Microelectronics Education)	1	6–8	▶
	EP1.2	Diversity and Gender Competence in Electrical and Electronics Engineering	3	4–8	▶
	EP1.3	Diversity and Gender Competence in Electrical and Electronics Engineering	3	4–8	▶
	EP1.4	Module 1 Unit 2: Exploring Diversity Dimensions	2	4–8	▶
	EP1.5	Module 1 Unit 4: Exploring Diversity Dimensions	1	4–8	▶
	EP1.6	Module 1 Unit 5: Decision making and DEI: Understand how humans make decisions and how this relates to DEI	2	4–8	▶
	EP1.7	Module 2 Unit 1: Understanding unconscious bias and its workplace impact	2	4–8	▶
	EP1.8	Module 2 Unit 4: Empowerment and Resilience	1	4–8	▶
	EP1.9	Module 2 Unit 5: Behaving and communicating inclusively	1	4–8	▶
	EP1.10	Module 3 Unit 1: Diversity in the Employee Life Cycle	1	4–8	▶
	EP1.11	Module 3 Unit 3: Employer Branding Together	1	4–8	▶

EP1.12	Module 3 Unit 4: Democratize recruitment & building inclusive hiring processes	2	4–8	▶
EP1.13	Module 3 Unit 5: Fair & Equitable Performance Reviews	2	4–8	▶
EP1.14	Module 4 Unit 3: Creating psychological safety and belonging	2	4–8	▶
EP1.15	Module 4 Unit 4: How to manage diverse teams effectively	2	4–8	▶
EP1.16	Module 4 Unit 6: Leadership Development & Self-Awareness	2	4–8	▶
EP1.17	Module 5 - Learning Unit 7: Pathways to Innovation - Diverse Careers in Semiconductor R&D and Software	1	4–8	▶
EP1.18	Next-Gen chip makers: Discover your future role in the semiconductor revolution	1	4–8	▶
EP1.19	Bridging Education and Industry for Inclusive Talent Development	1	6–8	▶
EXT2	**Digital systems**			
EP2.1	Creative Computing-Introduction to Scratch Programming	2	3–6	▶
EP2.2	Programming with Blocks	3	3–6	▶
EXT3	**Electrical engineering principles**			
EP3.1	Basics of EMC	125	7	▶
EXT4	**Microelectronics technology & manufacturing**			
EP4.1	Soldering workshop - Create your first light machine!	1	3–6	▶
EXT5	**Microelectronics testing**			
EP4.1	SemiTest 1/4 - Introduction to Semiconductor Test	2	6–7	▶
EP4.2	SemiTest 2/4 - Overview of Semiconductors and ATE	6	6–7	▶
EP4.3	SemiTest 3/4 - Data Analysis and Demos	1	6–7	▶
EP4.4	SemiTest 4/4 - Introduction to Advantest		6–7	▶
EP4.5	Test & Repair of SoCs for Functional Safety Applications	2	6–7	▶

3.8 Corresponding milestone

The corresponding milestone **MS9** (Launch of ECS-Academy) belongs to WP3, but the ECSA specialised training developed in WP5 is also an integral part of this milestone. This milestone is to be achieved upon the launch of the first academic semester of ECSA, upon approval by Pact for Skills and the endorsement of the ECSA educational board and working group. An online event is scheduled for mid-March 2026 to present the features of the ECSA learning platform and the available courses, and to announce the official launch.

After the launch, ECSA curriculum is shared with universities (and other stakeholders) via various channels. Teachers will be invited to participate in the Test & Validation procedures of the ECSA courses (personal level channel). Universities were also invited to be a member of the Educational Working Group, who are engaged in the use and further development of ECSA curriculum. Moreover, ECSA has a specific dissemination and outreach strategy together with an established student ambassador programme specifically to reach more universities.

4. Trainers' guide

As a first step, users (learners and teaching staff) will need to opt in for creating an account for them on the project website (https://chipsacademy.eu/), or on the learning platform developed and hosted by P15-KNOLYX (https://learn.chipsacademy.eu/register). Then, they can access the training materials.

The main elements of the platform are accessible on the left side of the user interface (Fig. 3). The "Dashboard" contains all courses, assessments, and resources with recent activity. The "Knowledge Hub" tab contains all the courses to which the users are assigned/enrolled. Meanwhile, the "Marketplace" tab (accessible by students) contains additional useful materials (for example, job offers) that do not necessarily belong to a given course and can be accessed without specific restrictions.
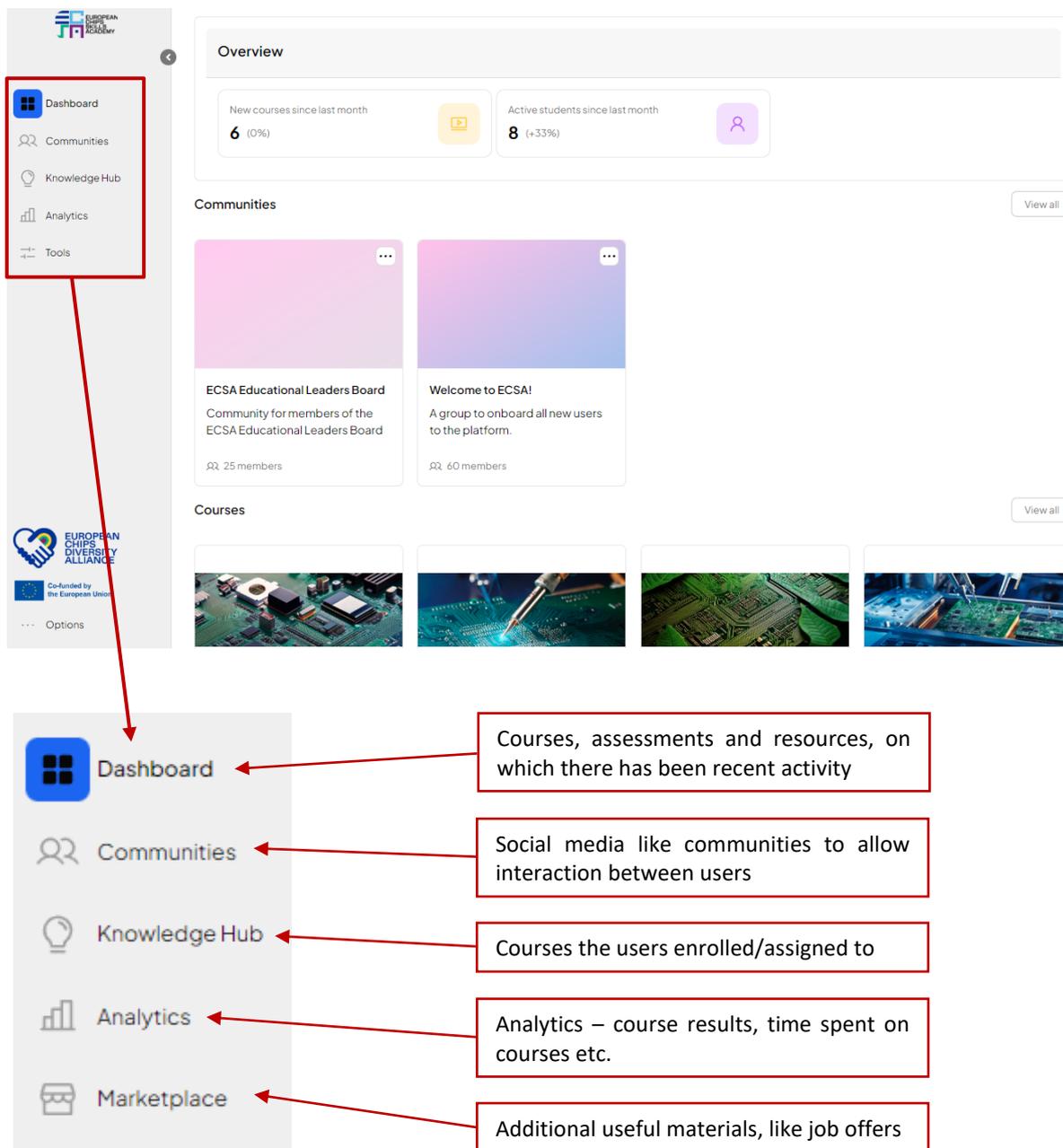

Fig. 3. User interface of the ECSA learning platform

When entering a course, essential information such as description (course abstract), learning hours, reading time, level, category, EQF level are immediately visible. Further information about the learning outcomes, curriculum, authors, instructors and partners (course provider organisation) is accessible on the respective tabs (Fig. 4).

Digital competences – Office tools ✓ Completed

10% — 👁 View ⋮

Learning hours: **60h** | Reading time: **2h 22min** | Level: **INTERMEDIATE** | Category: **ECSA – Digital competences & remote self-development**
ECTS credits: **0** | ECVETS points: **0** | EQF level: **5,6**

Description · Outcomes · Curriculum · Authors · Instructors · Partners · Reviews

Acquisition of the professional skills and knowledge (safe use of computers and the internet, word processing, spreadsheet and presentation skills, version control) required for general technical and eng... include: basics of computer literacy; basics of word processing (Microsoft Word, Google Docs); spreadsheet basics (Microsoft Excel, Google Sheets); presentation basics (Microsoft PowerPoint); online... Drive).   → **Course abstract**

Course details:

Description · Outcomes · Curriculum · Authors · Instructors · Partners · Reviews

- Outcomes → **Learning outcomes**
- Curriculum → **Chapters and learning materials**
- Instructors → **Course instructors (contact person)**
- Partners → **Course provider**
- Authors → **Crediting author of the course**

Learning outcomes details:

Name
use office systems ← **Name of the learning outcomes**

Description
Make appropriate and timely use of office s...
customer relationship management, vendo... ← **Description (gathered from ESCO platform if the LO is available on the ESCO platform)**

✔ Type: **Skill Competence** ← **Type of LO (skill/competence or knowledge)**

✔ Maturity Level: **Practitioner** ← **Maturity level (awareness, practitioner or expert)**

✔ ESCO Link ← **Link to the LO on the ESCO platform**

Name
use microsoft office

Description
Use the standard programs contained in Mi...
letters from a database of addresses. Creat...

Fig. 4. Course page showing the course information

All these data originate from the ECSA course descriptions (see the Annex).

After selecting a training material, it automatically opens in a frame of the platform (Fig. 5), allowing easy navigation between and within the materials. There are options to zoom in and out of the training content and to show it in full screen. This makes it possible to present a .pdf slide deck via the learning platform.
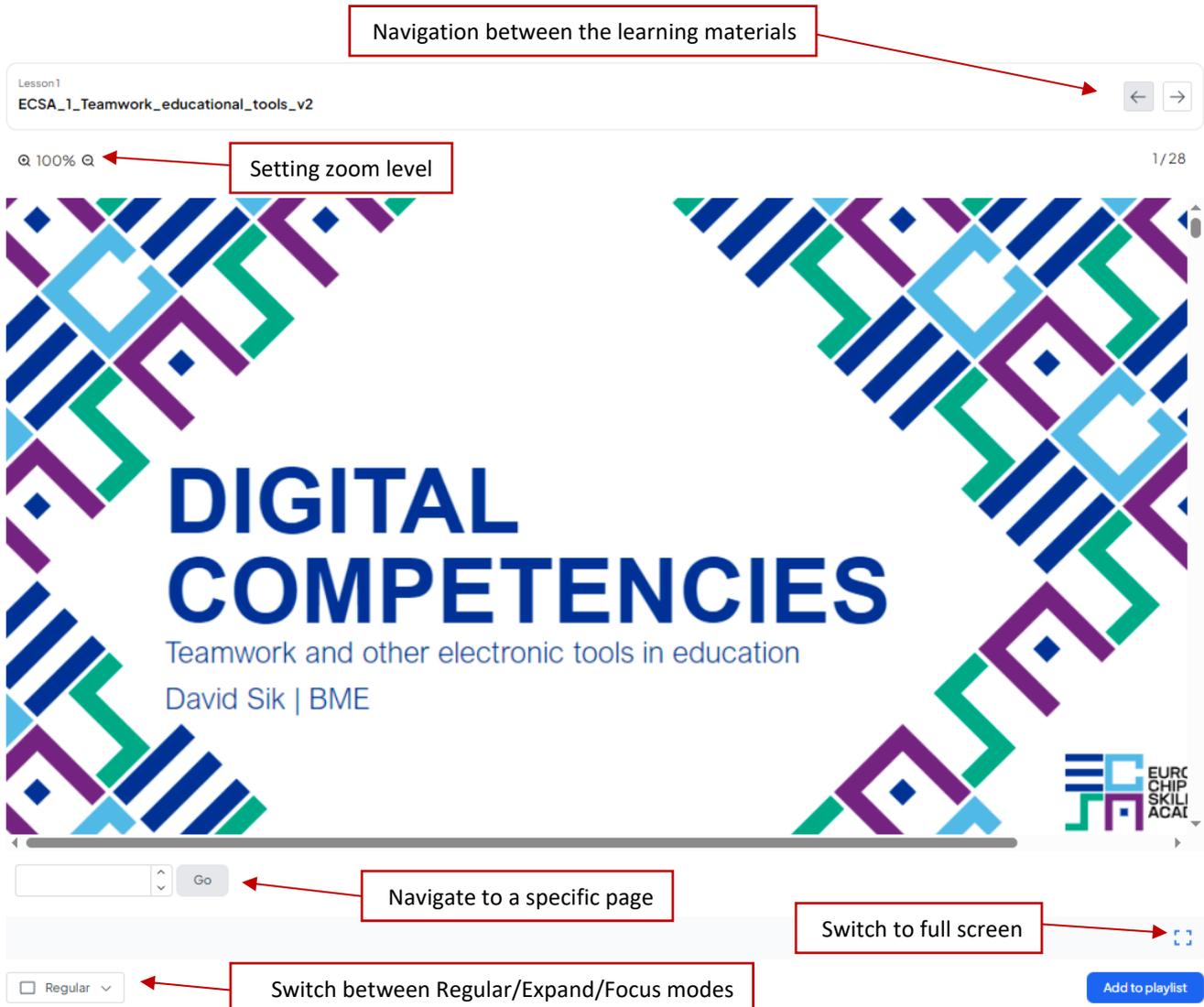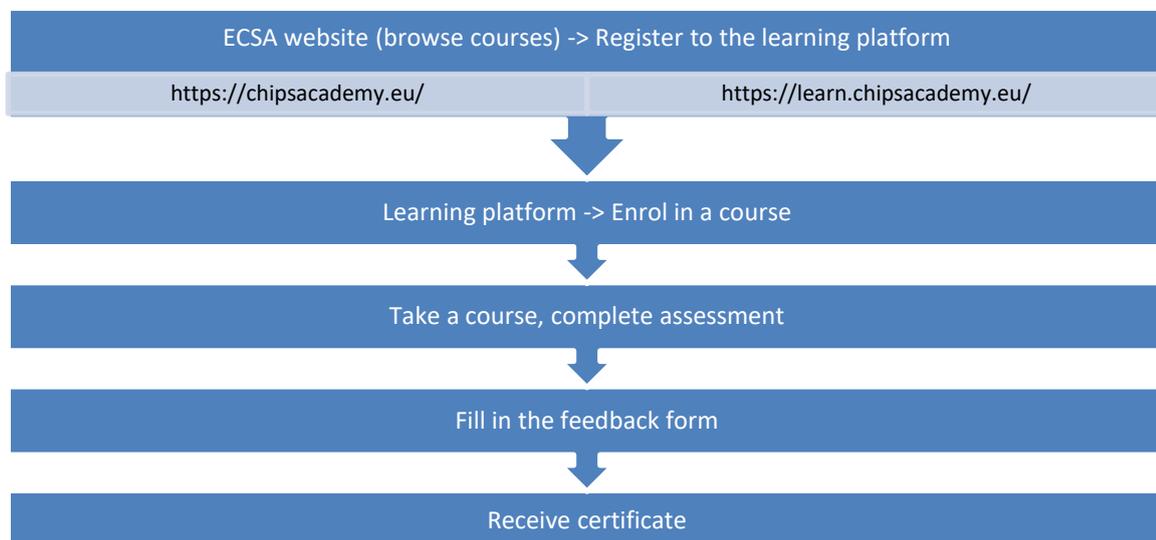

Fig. 5. Learning material frame

A detailed user's guide for the platform is available at: https://drive.google.com/file/d/1du2tN1eBIktTD0s9pek8_CHLQbS9Pcea/view?usp=sharing. Further details of the complete ECSA architecture and the learning platform are provided in the deliverable D4.1 – ECS-Academy digital architecture, website and Open Educational Resource (OER) Platform[13].

---

[13] https://chipsacademy.eu/wp-content/uploads/2024/07/D4.1-ECS-Academy-digital-architecture-website-and-Open-Educational-Resource-OER-Platform.pdf

5. Path to certification

Certificates for students are provided after completing the course sections, including the assessment and filling out the feedback form (to facilitate the test and validation procedures). The general course flow can be seen in Figure 6.

- First, learners can browse the ECSA website (https://chipsacademy.eu/) to get acquainted with the ECSA courses

- They can register themselves (or can be mass registered by P15-Knolyx per a teacher's request) to the learning platform (https://learn.chipsacademy.eu/) and enrol (or be enrolled) on a course

- Now, they can start the course, watch videos, check their learning progress and complete assessments

- Then, they have to evaluate the course to contribute to the testing and validation of the ECSA training content

- Finally, they receive a certificate (grey/silver badge) as detailed below.

ECSA website (browse courses) -> Register to the learning platform	
https://chipsacademy.eu/	https://learn.chipsacademy.eu/

Learning platform -> Enrol in a course

Take a course, complete assessment

Fill in the feedback form

Receive certificate

Fig. 6. Typical ECSA course flow

After filling out the feedback form, ECSA provides two types of certificates:

- A **certificate of attendance** (grey/silver badge) is given to learners who participate in activities (e.g., online courses, summer schools, etc.). If applicable, the assessment to obtain a certificate of attendance is generally written, unsupervised, asynchronous, and online, and mainly consists of closed questions (quiz-like). This assessment is organised by the organisation responsible for the given activity (for example, the course owner for online courses via the ECSA learning platform).

  o **Minimum requirements** – the course is completed by providing feedback via the standardised ECSA form.

  o To **issue a certificate of attendance** (grey/silver badge), the partners agreed that the assessment would be mostly unsupervised, asynchronous, online, written, and would mainly contain closed questions. This enables us to provide automatic assessments and to reach as many learners as possible by issuing certificates of attendance without requiring additional human resources. The grading would mostly be like pass or fail (issuing the badge or not).

- A **full certificate** (gold badge) leading to officially recognised micro-credentials at a later stage of the project. The full certificate is awarded to learners who pass an examination after participating in an activity. In this supervised examination, the students shall demonstrate that they have understood the course content and have acquired the respective learning outcomes. The examination and issuance of the full certificate are not carried out directly by ECSA but rather in a decentralised manner, in cooperation with the project's internal and external partners (HEIs, VETs) and certifying institutions. Student admissions and examinations are carried out in accordance with the internal rules of the specific partner or institution. The certificates are issued by these institutions and are considered verified micro-credentials.

  o **Minimum requirements** – the course is completed by feedback provision and assessment by the tutor according to the internal ECSA/Knolyx quality rules (certified by the tutor that the golden badge should be awarded).

  o To **issue a full certificate** (gold badge), the partners agreed that the assessment would be conducted by the organisers of the respective activity in a full examination. The partners may charge students a fee for the examination. This examination will be mostly supervised and synchronous to ensure that learners are properly identified and that they understand the content and can verify that they have acquired the knowledge, skills and competences. The grading would be based on the internal rules of the partners (e.g. from 1 to 5).

Please find more information on micro-credentials and certification in deliverable "ECSA Educational and Pedagogical Aspects" (project identifier: D3.5).

The badge system was originally adopted from the DRIVES project[14], which is currently extensively used by the Automotive Skills Alliance (ASA) and further maintained by the Technical University of Ostrava. Digital badges generally validate the accomplishment, knowledge, skill, or competence earned in learning environments, typically online. Badges show the name of the earner and evidence of work that led to the badge. Additionally, it contains details such as badge name, criteria, URL, issue date, and issuer. Individual badges are awarded for each acquired skill/competence or knowledge on a certain level (based on the learning outcomes in the course description).

Layers of the badge information:

- Layer 1: Maturity Level: (1) Awareness; (2) Practitioner or (3) Expert

- Layer 2: Type of the learning outcome: (1) Skill/Competence or (2) Knowledge

- Layer 3: Type of Completion: (1) Attendance (not a proof of learning -> grey badge); (2) Exam (leading to a gold badge and later to micro-credentials)

- Layer 4: Recognition – must be fulfilled in order to get the gold badge (ECTS points awarded or ISO17024 of the provider)

The appearance of badges (designed in the DRIVES project) is illustrated in Figure 7.

---

[14] https://www.project-drives.eu/Media/Publications/211/Publications_211_20211201_113520.pdf

a)

b)
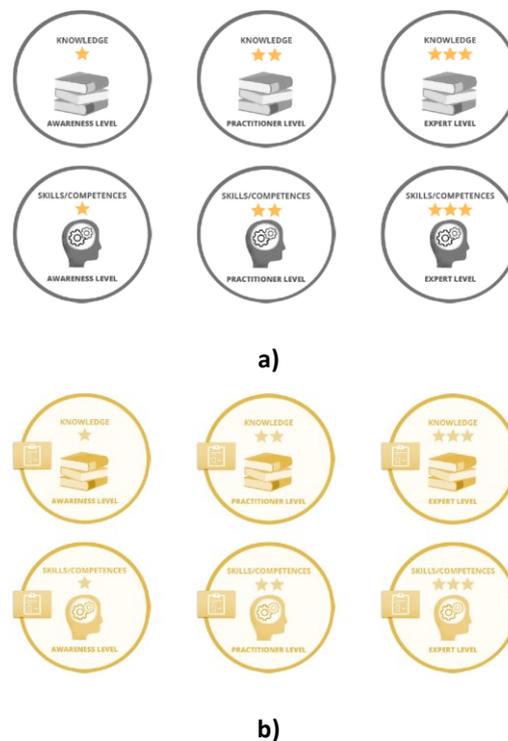
Fig. 7. The appearance of digital badges from the DRIVES project: a) grey badges; b) gold badges

For issuing gold badges, a course (and the course provider) should meet the following recognition criteria[15]:

Conformity Assessment ISO:17024[16]:

- 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
- Information is shown in the provider's detailed information

ECTS credits: ECTS users' guide[17]:

- If course completion is connected to the ECTS credits, trainees will obtain gold badges

ECVET credits: Necessary conditions for ECVET implementation[18]:

- If course completion is connected to the ECVET credits, trainees will obtain gold badges

EQAVET implementation[19]:

- This is specified during the provider registration and has no effect on the badges; information is only shown in the provider's detailed information

Certificates (badges) are stored in the Skills Hub (provided via e-mail to the user after course completion) and can be used to suggest further learning activities for each learner. Credentials are shown in the ECSA Learning Platform via API on the user profile – seen in the picture below (Fig. 8). Badges can be publicly displayed and shared by the learner.
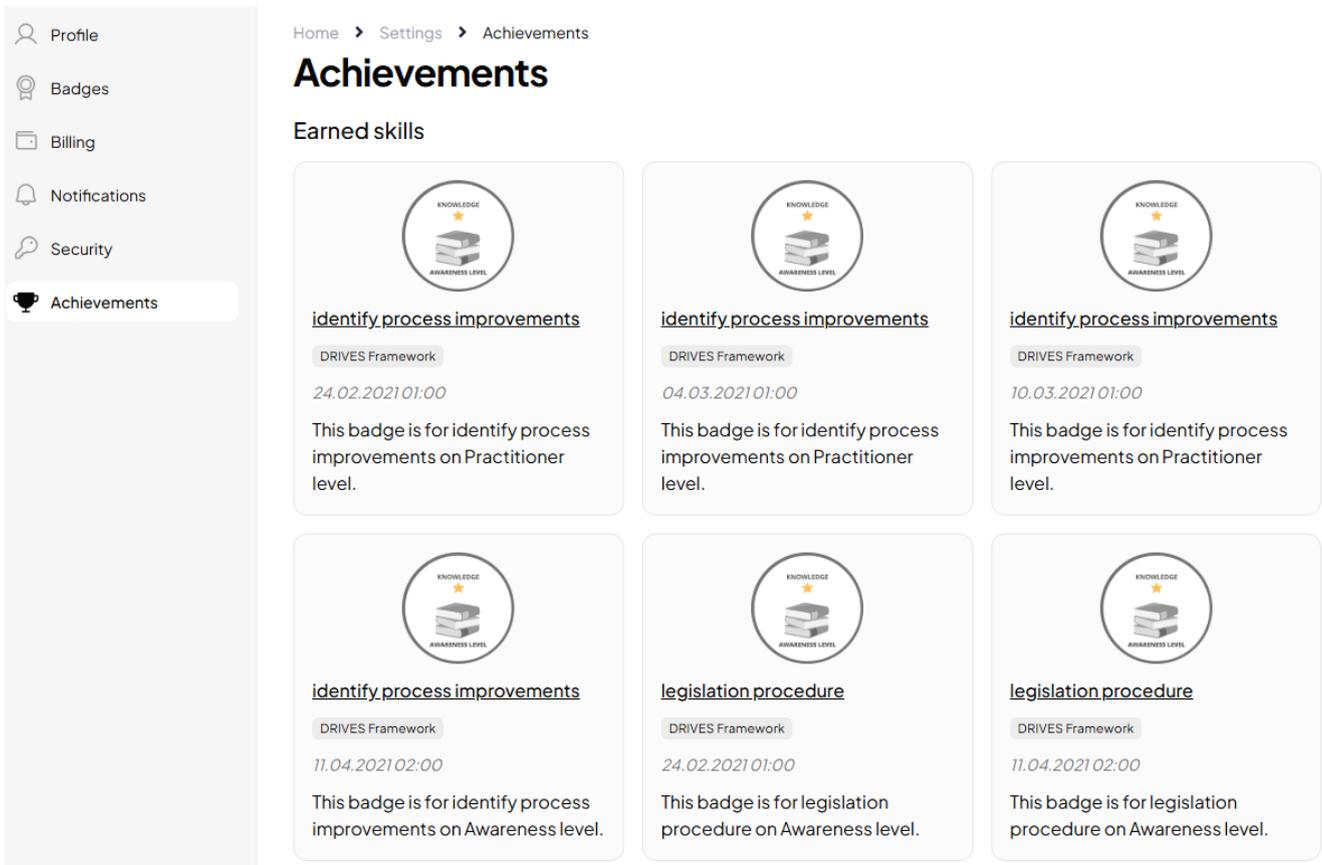
---

[15] https://skills-framework.eu/wiki?id=4
[16] https://en.wikipedia.org/wiki/ISO/IEC_17024
[17] https://op.europa.eu/en/publication-detail/-/publication/da7467e6-8450-11e5-b8b7-01aa75ed71a1/language-en
[18] https://www.cedefop.europa.eu/files/4113_en.pdf
[19] https://ec.europa.eu/social/main.jsp?catId=1536&langId=en

Fig. 8. Template of the paper-copy-like diploma (the template is subject to change based on ongoing development)

In addition to the digital badges, ECSA partners agreed that users might want to receive paper-copy-like diplomas in .pdf format. These certificates (primarily for attendance) are issued directly on the ECSA learning platform, using the template shown in Fig. 9.

Fig. 9. Template of the paper-copy-like diploma (the template is subject to change based on ongoing development)

6. Annex – course descriptions

P1.1 – Education and Career Pathways

Partner name and ID	P1-SEMI
Course ID	*P01.01*
Title	*Education and Career Pathways*
Abstract	*It is important to identify relevant skills used in high tech and understand where you can learn about them. In this module, we will explore the skills needed in the high-tech industry and the education pathways you can take to acquire those skills. Career exploration and planning are KEY components to launching a satisfying career in high tech. We will learn about the career pathways that you can choose from in the high-tech industry.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2936
Contact details	
Name	*Victoria Cummings*
Email	vcummings@semi.org
Additional information	
Learning hours	*4*
Course level	*Beginner*
Prerequisites	*elementary background in science and knowledge of operating computers*
Target group	*Highschool students and above who want to learn about the education and career pathways that exist in the high-tech industry*
ECTS points	–
ECVET points	–
EQF Levels	*4,5,6,7,8*

Content	*1. Course Overview*
	2. Objectives
	3. Education and Career Pathways in the High-Tech Industry
	    3.1. Preparing for High-Tech Jobs
	    3.2. High-Tech Jobs
	    3.3. Education and Pay
	    3.4. Goal Settings—Considerations
	    3.5. Personality Types
	    3.6. Educational Foundation
	    3.7. Considering about College
	    3.8. Funding Your Education

Assessment	*No assessment*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
skill/competence	listen actively	Give attention to what other people say, patiently understand points being made, asking questions as appropriate, and not interrupting at inappropriate times; able to listen carefully the needs of customers, clients, passengers, service users or others, and provide solutions accordingly.	TRUE	http://data.europa.eu/esco/skill/a17286c5-238d-4f0b-bc24-29e9121345de	Awareness
skill/competence	demonstrate willingness to learn	Show a positive attitude towards new and challenging demands that can only be met via lifelong learning.	TRUE	http://data.europa.eu/esco/skill/9bf266a6-188b-4d17-a22f-2f266d76832b	Awareness
skill/competence	adapt to change	Alter one's attitude or behaviour to accommodate modifications in the workplace.	TRUE	http://data.europa.eu/esco/skill/49de9958-2aa4-4eef-a89d-fe5d5bcd28c4	Awareness
skill/competence	demonstrate curiosity	Show a lively interest in novelty, an openness to experience, find subjects and topics fascinating, actively explore and discover new areas.	TRUE	http://data.europa.eu/esco/skill/429062f1-a958-43ea-83dd-4e1af078c156	Awareness
skill/competence	exercise self-reflection	Effectively, regularly and systematically reflect on own actions, performance, and attitudes, and make necessary adjustments, seeking professional development opportunities to plug knowledge and practice gaps in identified areas.	TRUE	http://data.europa.eu/esco/skill/409a0245-0e6c-4aac-ba16-0920ecb76a8d	Awareness
knowledge	theories of personality	Theoretical conceptions of personality, such as psychodynamic theory, humanistic theory or behaviorism.	TRUE	http://data.europa.eu/esco/skill/07d1dd29-4954-48f0-b807-6df53a7bceb2	Awareness
knowledge	personal development	The techniques and methods used to improve awareness and identity and develop talents and potential in human beings.	TRUE	http://data.europa.eu/esco/skill/519e801b-3cc4-44d4-bcf1-32fdb9a77e51	Awareness

P1.2 – Engineering design process

Partner name and ID	*P1-SEMI*
Course ID	*P01.02*
Course version	*v.01*
Title	*Engineering design process*
Abstract	*In this module, we will explore the meaning of the engineering design process. We will delve into the series of steps included in the engineering design process.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3076
Contact details	
Name	*Irene Da Pont*
Email	idapont@semi.org
Additional information	
Learning hours	*4*
Course level	*Beginner*
Prerequisites	*basic understanding of mathematics and physics*
Target group	*Highschool students, diploma students, bachelor students, master students, doctorate students, and professionals with elementary background in science and knowledge of operating computers.*
ECTS points	*-*
ECVET points	*-*
EQF Levels	*4,5,6,7,8*

Content	*1. Course Overview*
	2. Objectives
	3. Section 1: Steps of the Engineering Design Process
	    3.1. Engineering Design Process
	    3.2. Steps in the Engineering Design Process
	    3.3. Define the Problem or Need
	    3.4. Research and Gather Relevant Information
	    3.5. Specify Design Requirements
	    3.6. Knowledge Check
	    3.7. Create Multiple Solutions
	    3.8. Analyse Potential Solutions
	    3.9. Create Design Plan and Methodology
	    3.10. Develop and Prototype Solution
	    3.11. Knowledge Check
	    3.12. Test the Prototype
	    3.13. Communicate the Results
	4. Summary
	5. Knowledge Checks

Assessment	*No assessment*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*engineering principles*	*The engineering elements like functionality, replicability, and costs in relation to the design and how they are applied in the completion of engineering projects.*	*TRUE*	http://data.europa.eu/esco/skill/8712b176-c063-462f-9d0f-2e3c54d9a2eb	*Awareness*
skill/competence	*design microelectronics*	*Design and develop microelectronic systems, products, and components according to specifications, such as microchips.*	*TRUE*	http://data.europa.eu/esco/skill/8712b176-c063-462f-9d0f-2e3c54d9a2eb	*Awareness*

P1.3 – Intro to semiconductors

Partner name and ID	*P1-SEMI*
Course ID	*P01.03*
Course version	*v.01*
Title	*Intro to semiconductors*
Abstract	*In this course, we are going to learn about what the semiconductors are, how they work, and the science behind them. We will look at what conductors, insulators, and semiconductors are. We will then dive into understanding semiconductors in detail. We will talk about doping and how doping results into N- and P-type semiconductors.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2983
Contact details	
Name	*Irene Da Pont*
Email	idapont@semi.org
Additional information	
Learning hours	*4*
Course level	*Beginner*
Prerequisites	*basic understanding of mathematics and physics*
Target group	*Highschool students*
ECTS points	*-*
ECVET points	*-*
EQF Levels	*4,5,6,7,8*

Content	*1. Course Overview*
	2. Objectives
	3. Science behind Semiconductors
	   3.1. Conductors
	   3.2. Atomic Structure of Conductors
	   3.3. Atomic Structure of Insulators
	4. Semiconductors
	   4.1. More about Semiconductors
	   4.2. Semiconductor Valence Orbit
	   4.3. Semiconductors—Crystal Lattice Structure
	5. Doping
	   5.1. Semiconductor as a Conductor
	   5.2. Can We Dope Differently?
	   5.3. Types of Semiconductors
	   5.4. Current Flow in N-Type Semiconductor
	   5.5. Current Flow in P-Type Semiconductor

Assessment	*No assessment*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*electronics*	*The functioning of electronic circuit boards, processors, chips, and computer hardware and software, including programming and applications.*	*TRUE*	http://data.europa.eu/esco/skill/95c35c3a-035f-47c2-90cf-7e934d20fc08	*Awareness*
knowledge	*semiconductors*	*Semiconductors are essential components of electronic circuits and contain properties of both insulators, such as glass, and conductors, such as copper. Most semiconductors are crystals made of silicon or germanium. By introducing other elements in the crystal through doping, the crystals turn into semiconductors. Depending on the amount of electrons created by the doping process, the crystals turn into N-type semiconductors, or P-type semiconductors.*	*TRUE*	http://data.europa.eu/esco/skill/e5e17773-3a63-40c5-99e4-10e036cf7b99	*Awareness*

P2.1 – Intro to Modern Microelectronics

Partner name and ID	*P2 - TU Dresden*
Course ID	*P02.01*
Title	*Intro to Modern Microelectronics*
Abstract	*This course introduces non-engineering students to the fascinating world of microelectronics. Explore how tiny chips power smartphones, laptops, and smart devices. Learn the basics of how electronic components like transistors and circuits work, how they're made, and how they continue to shape the modern world. Includes hands-on demonstrations and real-life examples, with no prior technical background required.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3271
Contact details	
Name	*Mohamad Moner Al Chawa*
Email	mohamad_moner.al_chawa@tu-dresden.de
Additional information	
Learning hours	*13*
Prerequisites	*basic high school physics and math recommended*
Target group	*learners, teachers*
ECTS points	
ECVET points	
EQF Levels	*4*
Content	*1. Basics of Microelectronics* * 1.1. Key components (transistors, diodes, resistors)* * 1.2. What microchips do and why they matter* *2. How Circuits Work* * 2.1. Simple circuits and signal flow* * 2.2. Analog vs. digital behavior* *3. From Sand to Chip* * 3.1. Introduction to semiconductors and chip fabrication* *4. Everyday Applications* * 4.1 Microelectronics in phones, cars, and smart devices*
Assessment	*Online assessment, using single/multiple choice, calculation questions etc.*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*electronic components*	*Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.*	*TRUE*	*http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b*	*Practitioner*
skill/competence	*design electronic systems*	*Draft sketches and design electronic systems, products, and components using Computer Aided Design (CAD) software and equipment. Make a simulation so that an assessment can be made of the viability of the product and so the physical parameters can be examined before the actual building of the product.*	*TRUE*	*http://data.europa.eu/esco/skill/feb717ff-fba6-4a91-aa10-ee11cf2da6b4*	*Practitioner*
knowledge	*analog electronics theory*	*The theory based on analogue circuits in which volumes (voltage or current) continuously vary over time.*	*TRUE*	*http://data.europa.eu/esco/skill/ee1417ac-4e9a-4102-b89a-528ab4ffba13*	*Awareness*
knowledge	*electronics principles*	*The study of electric energy, more specifically electron, control and its prominent principles regarding integrated circuits and electrical systems.*	*TRUE*	*http://data.europa.eu/esco/skill/557d1221-0235-4a48-ada5-8fca73443627*	*Awareness*
knowledge	*electronics*	*The functioning of electronic circuit boards, processors, chips, and computer hardware and software, including programming and applications.*	*TRUE*	*http://data.europa.eu/esco/skill/95c35c3a-035f-47c2-90cf-7e934d20fc08*	*Awareness*

P3.1 – Copyright Law, Licensing and Open Educational Resources

Partner name and ID	*P3 - TU Graz*
Course ID	*P03.01*
Title	*Copyright Law, Licensing and Open Educational Resources*
Abstract	*This course deals with copyright law, licensing, and open educational resources. Topics include traditional comprehensive overview on copyright within the European Union, how materials can be (openly) licensed and practical aspects of licensing agreements, open licenses and digital rights. The content is designed for educators, teachers and individuals explaining, what to to be aware of when creating learning materials and how to create open educational ressources (OERs).*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2895
Contact details	
Name	*Dominik Zupan*
Email	*dominik.zupan@tugraz.at*
Additional information	
Learning hours	*2*
Course level	*Beginner*
Prerequisites	*no prerequisites, basic understanding of legal concepts and familiarity with digital content creation beneficial*
Target group	*teachers, students*
ECTS points	
ECVET points	
EQF Levels	*3,4,5,6,7,8*

Content	*1. Copyright Law*
	    1.1. What is Copyright Law?
	    1.2. Works in the Sense of the Copyright Law
	    1.3. Limitations
	    1.4. Creator Principle
	    1.5. Usage and Citations
	2. Licensing
	    2.1. Open Licenses
	3. Open Educational Ressources
	    3.1. Search Engines

Assessment	*n.a.*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*copyright legislation*	*Exchanging and conveying information, ideas, concepts, thoughts, and feelings through the use of a shared system of words, signs, and semiotic rules via a medium.*	*TRUE*	http://data.europa.eu/esco/skill/e2103a1d-4a84-47a9-b4f7-774787573449	*Practitioner*
knowledge	*copyright and licenses related to digital content*	*Understand how copyright and licences apply to data, information and digital content.*	*TRUE*	http://data.europa.eu/esco/skill/a91732ce-988e-4105-9570-f425c6ffdc82	*Practitioner*
skill/competence	*develop educational resources*	*Create and develop educational resources for visitors, school groups, families and special interest groups.*	*TRUE*	http://data.europa.eu/esco/skill/3a5b7435-c262-4a9d-893d-ee6c19bd9d92	*Practitioner*

P3.2 – Workshop on EMC Fundamentals

Partner name and ID	*P3 - TU Graz*
Course ID	*P03.02*
Course version	*v.01*
Title	*Workshop on EMC Fundamentals*
Abstract	*This course provides an introductory, hands-on approach to understanding Electromagnetic Compatibility (EMC), with a focus on coupling mechanisms, passive component characterization, decoupling capacitors and mitigating conducted emissions. Through a series of workshops, participants will engage with advanced instruments such as Vector Network Analyzers (VNA) and oscilloscopes to conduct practical experiments. Participants will explore capacitive, inductive, galvanic, and radiated coupling on printed circuit boards (PCBs), analyze the performance of decoupling capacitors, and learn how to apply EMI mitigation techniques. The course blends theoretical insights with real-world applications, preparing learners to manage and minimize electromagnetic interference in microelectronics.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3080
Contact details	
Name	*Jan Eberl*
Email	jan.eberl@tugraz.at
Additional information	
Learning hours	*12*
Course level	*Intermediate*
Prerequisites	*Basic understanding of electronics and circuit design. Familiarity with electrical measurement tools is beneficial but not mandatory.*
Target group	*teachers, students*
ECTS points	
ECVET points	
EQF Levels	*6*

Content	1 Workshop I: Coupling Mechanisms
	  1.1 Preparation: Online learning through videos, simulations, and a self-assessment quiz to understand capacitive, inductive, galvanic, and radiated coupling.
	  1.2 Lab Session: Hands-on experiments measuring and mitigating different coupling types on PCBs using VNAs and oscilloscopes.
	2 Workshop II: Characterizing Passive Components
	  2.1 Preparation: Interactive videos, self-assessment, and additional reading materials on using VNAs for impedance measurements and calibration techniques.
	  2.2 Lab Session: Practical VNA exercises, comparing measurements to SPICE models, and performing voltage-dependent characterizations.
	3 Workshop III: Decoupling Capacitors and 150-Ohm Method
	  3.1 Preparation: Videos, self-assessment, and further reading to explore the use of decoupling capacitors in reducing emissions and the 150-Ohm method.
	  3.2 Lab Session: Measuring emissions with EMI receivers, analyzing emission plots, and selecting optimal decoupling capacitors.
	4 Workshop IV: Conducted Emissions
	  4.1 Preparation: Videos, simulations, and a self-assessment covering LISN setups, noise differentiation, and filter design.
	  4.2 Lab Session: Conducted emission measurements on a GaN half-bridge circuit, understanding noise modes, and designing filters.
	Each workshop includes a 1.5-hour lab session on one day, where participants apply their knowledge under the guidance of a tutor.

Assessment	*Self-assessment quizzes after each video module* *Practical lab assignments evaluated by tutors during the on-site lab sessions*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	_
knowledge	*Coupling Mechanisms in Electromagnetic Interference*	*Understand the four primary coupling mechanisms—capacitive, inductive, galvanic, and radiated—in PCB designs. Learn how these mechanisms affect system performance and how to identify and mitigate them.*	*PARTIAL*	http://data.europa.eu/esco/skill/3edd4853-a8d2-4791-a5f0-af3a92f18245	*Practitioner*
skill/competence	*Mitigating Electromagnetic Interference*	*Develop practical skills to implement countermeasures for different types of unintentional coupling on both circuitry and layout levels, using best practices for PCB design and shielding techniques.*	*PARTIAL*	http://data.europa.eu/esco/skill/ce6242a1-a2d9-43e6-a481-ae89b9ec0460	*Practitioner*
skill/competence	*Quantifying Interference using Oscilloscopes*	*Use oscilloscopes to quantify interference by performing FFT (Fast Fourier Transform) and THD (Total Harmonic Distortion) measurements on electronic circuits.*	*TRUE*	http://data.europa.eu/esco/skill/a9b68e58-766a-403d-b5fe-955b57bdad1b	*Practitioner*
skill/competence	*Using a vector network analyzer (VNA)*	*Learn to set up and calibrate a VNA for 1-port and 2-port measurements and use it to evaluate the impedance of passive components, comparing measurements to datasheets and SPICE models.*	*TRUE*	http://data.europa.eu/esco/skill/a9b68e58-766a-403d-b5fe-955b57bdad1b	*Practitioner*
knowledge	*Bias Tees and Voltage-Dependent Characterization*	*Understand the use of bias tees for performing voltage-dependent component measurements and how these setups affect the characterization of passive components in practical application*	*FALSE*	_	*Practitioner*
knowledge	*Decoupling Capacitors in Circuit Design*	*Explain the function of decoupling capacitors in reducing electromagnetic emissions and stabilizing the power supply, using the 150-Ohm method to measure and evaluate their performance.*	*FALSE*	_	*Practitioner*

skill/competence	Interpreting Emission Plots	Learn to interpret emission plots and extract relevant information to determine which decoupling capacitor should be used to reduce emissions in a particular frequency range.	FALSE	_	Practitioner
knowledge	Common Mode and Differential Mode Noise	Explain the differences between common mode and differential mode noise in conducted emissions, and their relevance in filter design and EMI testing.	PARTIAL	http://data.europa.eu/esco/skill/c500f5d0-42d4-4341-904e-cd4ef2ff3181	Practitioner
skill/competence	Designing Filters for Conducted Emissions	Design effective filters to reduce conducted emissions, taking into account the Line Impedance Stabilization Network (LISN) and other factors affecting measurement setups in accordance with CISPR25 standards.	PARTIAL	http://data.europa.eu/esco/skill/52739347-5eaa-4c9e-8cde-af7d2ba83320	Practitioner
knowledge	electronic equipment standards	The national and international quality and safety standards and regulations with regards to the use and manufacture of electronic equipment and its components, such as semiconductors and printed circuit boards.	TRUE	http://data.europa.eu/esco/skill/19ec88aa-c0b1-4515-ba10-56b6cf27369e	Practitioner
skill/competence	design microelectronics	Design and develop microelectronic systems, products, and components according to specifications, such as microchips.	TRUE	http://data.europa.eu/esco/skill/8712b176-c063-462f-9d0f-2e3c54d9a2eb	Awareness
skill/competence	design electronic systems	Draft sketches and design electronic systems, products, and components using Computer Aided Design (CAD) software and equipment. Make a simulation so that an assessment can be made of the viability of the product and so the physical parameters can be examined before the actual building of the product.	TRUE	http://data.europa.eu/esco/skill/feb717ff-fba6-4a91-aa10-ee11cf2da6b4	Awareness
skill/competence	measure electrical characteristics	Measure voltage, current, resistance or other electrical characteristics by using electrical measuring equipment such as multimeters, voltmeters, and ammeters.	TRUE	http://data.europa.eu/esco/skill/270de514-3206-4cf9-b122-0f148ab06fa1	Practitioner

P3.3 – Circuit Design Challenge (for Learners)

Partner name and ID	*P3 - TU Graz*
Course ID	*P3.3*
Title	*Circuit Design Challenge (for Learners)*
Abstract	*The circuit design challenge enables learners to compete with each other individually or in groups. A test system provides circuit design tasks created by teachers. Learners must then try to solve these tasks as good as possible. The better the learners perform, the better their score and the higher they appear in the high score list. This course gives an introduction to the challenge based learning system for learners by explaining how the system works and how to participate using an example.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3010
Contact details	
Name	*Dominik Zupan*
Email	*dominik.zupan@tugraz.at*
Additional information	
Learning hours	*50*
Prerequisites	*basics of electronics, electronics circuit design, circuit simulation*
Target group	*learners*
ECTS points	
ECVET points	
EQF Levels	*5,6,7,8*
Content	*1. Introduction to the Circuit Design Challenge System* *1.1. What is the Circuit Design Challenge?* *1.2. How does the Circuit Design Challenge work?* *1.3. Features* *2. Example (Track and Hold circuit)* *2.1 Explaining the problem* *2.2 Prerequisites* *2.3 Testbench* *2.4 Test cases* *3. Tutorial: How to participate in design challenges*
Assessment	*The learners circuit solutions are assessed by the circuit design challenge system, based on the test cases defined by the teachers. Each solution is scored and shown in a highscore leaderboard.*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
skill/competence	*design circuits using CAD*	*Draught sketches and design electronic circuitry; utilise Computer Aided Design (CAD) software and equipment.*	*TRUE*	*http://data.europa.eu/esco/skill/9ba355be-f119-42b6-a7d6-52f6ce2e4a3f*	*Practitioner*
skill/competence	*design integrated circuits*	*Design and draft integrated circuits (IC) or semiconductors, such as microchips, used in electronic products. Integrate all necessary components, such as diodes, transistors, and resistors. Pay attention to the design of input signals, output signals, and power availability.*	*TRUE*	*http://data.europa.eu/esco/skill/6d12ac9b-5ec0-49b9-bd70-5a19352585cb*	*Practitioner*
knowledge	*integrated circuits*	*Electronic components, made up from a set of electronic circuits which are placed on semiconductor material, such as silicon. Integrated circuits (IC) can hold billions of electronic components on a microscale and are one of basic components of electronic devices.*	*TRUE*	*http://data.europa.eu/esco/skill/2b9f4584-da2e-44e2-a2fb-4dd4fc64c1a2*	*Practitioner*
knowledge	*integrated circuit types*	*Types of integrated circuits (IC), such as analog integrated circuits, digital integrated circuits, and mixed-signal integrated circuits.*	*TRUE*	*http://data.europa.eu/esco/skill/61c81161-b732-4c47-aba5-9e554d9a853f*	*Practitioner*
skill/competence	*run simulations*	*Run simulations and audits to assess operability of newly implemented setups; detect errors for improvement.*	*TRUE*	*http://data.europa.eu/esco/skill/a432ffcd-b58d-4417-836c-ea3282b626ca*	*Practitioner*
knowledge	*computer simulation*	*A programme run on a computer that represents dynamic responses of a system to explore a mathematical model behaviour, using a model of a real system, composed of mathematical equations.*	*TRUE*	*http://data.europa.eu/esco/skill/0823ccef-813f-4f22-afef-ac0d68615e8f*	*Practitioner*
skill/competence	*design electronic systems*	*Draft sketches and design electronic systems, products, and components using Computer Aided Design (CAD) software and equipment. Make a simulation so that an assessment can be made of the viability of the product and so the physical parameters can be examined before the actual building of the product.*	*TRUE*	*http://data.europa.eu/esco/skill/feb717ff-fba6-4a91-aa10-ee11cf2da6b4*	*Practitioner*

P3.4 – Circuit Design Challenge (for Teachers)

Partner name and ID	*P3 - TU Graz*
Course ID	*P3.4*
Title	*Circuit Design Challenge (for Teachers)*
Abstract	*The circuit design challenge enables learners to compete with each other individually or in groups. A test system provides circuit design tasks created by teachers. Learners must then try to solve these tasks as good as possible. The better the learners perform, the better their score and the higher they appear in the high score list. This course gives an introduction to the challenge based learning system for teachers. It explains how the systems works, how an example of such a challenge could look like, how to create new challenges and how learners can upload their solutions*
Link	https://example.org
Contact details	
Name	*Dominik Zupan*
Email	*dominik.zupan@tugraz.at*
Additional information	
Learning hours	*75*
Prerequisites	*basics of electronics, electronics circuit design, circuit simulation*
Target group	*teachers*
ECTS points	
ECVET points	
EQF Levels	*5,6,7,8*
Content	*1. Introduction to the Circuit Design Challenge System* *1.1. What is the Circuit Design Challenge?* *1.2. How does the Circuit Design Challenge work?* *1.3. Features* *2. Example (Track and Hold circuit)* *2.1 Explaining the problem* *2.2 Prerequisites* *2.3 Testbench* *2.4 Test cases* *3. Tutorial: How to participate in design challenges* *4. Tutorial: How to create design challenges*
Assessment	*The learners circuit solutions are assessed by the circuit design challenge system, based on the test cases defined by the teachers. Each solution is scored and shown in a highscore leaderboard.*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
skill/competence	*design circuits using CAD*	*Draught sketches and design electronic circuitry; utilise Computer Aided Design (CAD) software and equipment.*	*TRUE*	*http://data.europa.eu/esco/skill/9ba355be-f119-42b6-a7d6-52f6ce2e4a3f*	*Practitioner*
skill/competence	*design integrated circuits*	*Design and draft integrated circuits (IC) or semiconductors, such as microchips, used in electronic products. Integrate all necessary components, such as diodes, transistors, and resistors. Pay attention to the design of input signals, output signals, and power availability.*	*TRUE*	*http://data.europa.eu/esco/skill/6d12ac9b-5ec0-49b9-bd70-5a19352585cb*	*Practitioner*
knowledge	*integrated circuits*	*Electronic components, made up from a set of electronic circuits which are placed on semiconductor material, such as silicon. Integrated circuits (IC) can hold billions of electronic components on a microscale and are one of basic components of electronic devices.*	*TRUE*	*http://data.europa.eu/esco/skill/2b9f4584-da2e-44e2-a2fb-4dd4fc64c1a2*	*Practitioner*
knowledge	*integrated circuit types*	*Types of integrated circuits (IC), such as analog integrated circuits, digital integrated circuits, and mixed-signal integrated circuits.*	*TRUE*	*http://data.europa.eu/esco/skill/61c81161-b732-4c47-aba5-9e554d9a853f*	*Practitioner*
skill/competence	*run simulations*	*Run simulations and audits to assess operability of newly implemented setups; detect errors for improvement.*	*TRUE*	*http://data.europa.eu/esco/skill/a432ffcd-b58d-4417-836c-ea3282b626ca*	*Practitioner*
knowledge	*computer simulation*	*A programme run on a computer that represents dynamic responses of a system to explore a mathematical model behaviour, using a model of a real system, composed of mathematical equations.*	*TRUE*	*http://data.europa.eu/esco/skill/0823ccef-813f-4f22-afef-ac0d68615e8f*	*Practitioner*
skill/competence	*design electronic systems*	*Draft sketches and design electronic systems, products, and components using Computer Aided Design (CAD) software and equipment. Make a simulation so that an assessment can be made of the viability of the product and so the physical parameters can be examined before the actual building of the product.*	*TRUE*	*http://data.europa.eu/esco/skill/feb717ff-fba6-4a91-aa10-ee11cf2da6b4*	*Practitioner*
knowledge	*learning technologies*	*The technologies and channels, including digital, to enhance learning.*	*TRUE*	*http://data.europa.eu/esco/skill/7fc4c18a-68f3-425a-aadf-f83633be47a1*	*Awareness*
skill/competence	*create training materials*	*Develop and compile training items and resources according to didactical methods and training needs and using specific types of media.*	*TRUE*	*http://data.europa.eu/esco/skill/4c5d616e-f6d8-4fb4-8ce6-89a4b048b916*	*Practitioner*
knowledge	*e-learning*	*The strategies and didactical methods of learning in which the main elements include the use of ICT technologies.*	*TRUE*	*http://data.europa.eu/esco/skill/5f5e9350-1d13-4391-b9e1-07f6b2047fc5*	*Awareness*

P3.5 – ElectrONiX - Amplifiers

Partner name and ID	*P3 - TU Graz*
Course ID	*P3.5*
Title	*ElectrONiX - Amplifiers*
Abstract	*Electronics is the science of controlling electrical current. Probably the most important control elements available to us in microelectronics are transistors and diodes. They serve as controllable valves with which complex amplifier circuits can be built.* *But how do such amplifiers work? How can they be calculated and dimensioned and what properties do such circuits have?* *We provide answers to these questions in this course.*
Link	*https://learn.chipsacademy.eu/knowledge-hub/courses/3075*
Contact details	
Name	*Dominik Zupan*
Email	*dominik.zupan@tugraz.at*
Additional information	
Learning hours	*28*
Prerequisites	*Ohm's law, Kirchhoff's circuit rules, Alternating and direct current, Basics of electrical components (resistor, coil, capacitor, voltage and current sources).*
Target group	*learners, teachers*
ECTS points	
ECVET points	
EQF Levels	*5,6*
Content	*1 Fundamental components* *1.1 Diodes* *1.2 Bipolar transistors* *1.3 MOSFETs* *2 Current sources* *3 Transistor amplifiers* *4 Differential amplifiers* *5 Operational amplifiers*
Assessment	*Online assessment, using single/multiple choice, calculation questions etc.*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*electronic components*	*Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.*	*TRUE*	*http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b*	*Practitioner*
skill/competence	*design electronic systems*	*Draft sketches and design electronic systems, products, and components using Computer Aided Design (CAD) software and equipment. Make a simulation so that an assessment can be made of the viability of the product and so the physical parameters can be examined before the actual building of the product.*	*TRUE*	*http://data.europa.eu/esco/skill/feb717ff-fba6-4a91-aa10-ee11cf2da6b4*	*Practitioner*
knowledge	*analog electronics theory*	*The theory based on analogue circuits in which volumes (voltage or current) continuously vary over time.*	*TRUE*	*http://data.europa.eu/esco/skill/ee1417ac-4e9a-4102-b89a-528ab4ffba13*	*Awareness*
knowledge	*electronics principles*	*The study of electric energy, more specifically electron, control and its prominent principles regarding integrated circuits and electrical systems.*	*TRUE*	*http://data.europa.eu/esco/skill/557d1221-0235-4a48-ada5-8fca73443627*	*Awareness*
knowledge	*electronics*	*The functioning of electronic circuit boards, processors, chips, and computer hardware and software, including programming and applications.*	*TRUE*	*http://data.europa.eu/esco/skill/95c35c3a-035f-47c2-90cf-7e934d20fc08*	*Awareness*

P3.6 – ElectrONiX - Digital

Partner name and ID	P3 - TU Graz
Course ID	P3.6
Title	ElectrONiX - Digital
Abstract	Electronics is the science of controlling electrical current. Probably the most important control elements available to us in digital electronics are transistors. With them, digital calculations can be realised and memory structures can be built. This leads the way to complex computer processors and chips and their ways of communicating with each other and with us humans. But how do such digital components work? How can we build more complex digital functions and digital storage elements? What properties do such circuits have? How can chips communicate with each other? And how can computers actually "communicate" with us and our environment? We provide answers to these questions in this course.
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3077
Contact details	
Name	Dominik Zupan
Email	dominik.zupan@tugraz.at
Additional information	
Learning hours	28
Prerequisites	Ohm's law, Kirchhoff's circuit rules, Alternating and direct current, Basics of electrical components (resistor, coil, capacitor, voltage and current sources), Basics of electronics (Diodes, bipolar transistors, MOSFETs, transistor amplifiers, operational amplifiers)
Target group	learners, teachers
ECTS points	
ECVET points	
EQF Levels	5,6
Content	1 CMOS Circuits 2 Multivibrators 2.1 Bistable Multivibrators 2.2 Monostable Multivibrators 2.3 Astable Multivibrators 3 Analog-to-Digital Converters 4 Digital-to-Analog Converters 5 Hardware Interfaces
Assessment	Online assessment, using single/multiple choice, calculation questions etc.

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	electronic components	Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.	TRUE	http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b	Practitioner
skill/competence	design electronic systems	Draft sketches and design electronic systems, products, and components using Computer Aided Design (CAD) software and equipment. Make a simulation so that an assessment can be made of the viability of the product and so the physical parameters can be examined before the actual building of the product.	TRUE	http://data.europa.eu/esco/skill/feb717ff-fba6-4a91-aa10-ee11cf2da6b4	Practitioner
knowledge	analog electronics theory	The theory based on analogue circuits in which volumes (voltage or current) continuously vary over time.	TRUE	http://data.europa.eu/esco/skill/ee1417ac-4e9a-4102-b89a-528ab4ffba13	Awareness
knowledge	electronics principles	The study of electric energy, more specifically electron, control and its prominent principles regarding integrated circuits and electrical systems.	TRUE	http://data.europa.eu/esco/skill/557d1221-0235-4a48-ada5-8fca73443627	Awareness
knowledge	electronics	The functioning of electronic circuit boards, processors, chips, and computer hardware and software, including programming and applications.	TRUE	http://data.europa.eu/esco/skill/95c35c3a-035f-47c2-90cf-7e934d20fc08	Awareness
knowledge	types of electronics	The different categories of electronics, such as consumer electronics, medical devices, microelectronics, computers, information and communication equipment, and measuring equipment.	TRUE	http://data.europa.eu/esco/skill/52838a25-11f5-4cb1-b4ab-c5c7d59041e8	Awareness
knowledge	digital systems	Systems to store, process and spread information in digital form. They are hardware, software and networks, as well as the ways in which these can be employed.	TRUE	http://data.europa.eu/esco/skill/397da142-ab35-48fe-b154-7c38f447adfb	Awareness

44

P3.7 – ElectrONiX - Resonance

Partner name and ID	*P3 - TU Graz*
Course ID	*P3.7*
Title	*ElectrONiX - Resonance*
Abstract	*This course, as its name suggests, is about resonances - where do they cause problems, where do they solve them and how can they be measured at all? These questions and more are dealt with and clarified in the topics Laboratory Basics, Resonance Circuits, Active Filters and Passive Filters.*
Link	*https://learn.chipsacademy.eu/knowledge-hub/courses/3078*
Contact details	
Name	*Dominik Zupan*
Email	*dominik.zupan@tugraz.at*
Additional information	
Learning hours	*16*
Prerequisites	*Ohm's law, Kirchhoff's circuit rules, Alternating and direct current, Basics of electrical components (resistor, coil, capacitor, voltage and current sources), Basics of electronics (Diodes, bipolar transistors, MOSFETs, transistor amplifiers, operational amplifiers, ElectrONiX - Amplifiers)*
Target group	*learners, teachers*
ECTS points	
ECVET points	
EQF Levels	*5,6*
Content	*1 Lab Basics* *1.1 Multimeter* *1.2 Function Generator* *1.3 Power Supply* *1.4 Oscilloscope* *2 Passive Filters* *3 Active Filters* *4 Resonance Circuits*
Assessment	*Online assessment, using single/multiple choice, calculation questions etc.*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	*electronic components*	*Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.*	*TRUE*	*http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b*	*Practitioner*
skill/competence	*design electronic systems*	*Draft sketches and design electronic systems, products, and components using Computer Aided Design (CAD) software and equipment. Make a simulation so that an assessment can be made of the viability of the product and so the physical parameters can be examined before the actual building of the product.*	*TRUE*	*http://data.europa.eu/esco/skill/feb717ff-fba6-4a91-aa10-ee11cf2da6b4*	*Practitioner*
knowledge	*electronics principles*	*The study of electric energy, more specifically electron, control and its prominent principles regarding integrated circuits and electrical systems.*	*TRUE*	*http://data.europa.eu/esco/skill/557d1221-0235-4a48-ada5-8fca73443627*	*Awareness*
knowledge	*electronics*	*The functioning of electronic circuit boards, processors, chips, and computer hardware and software, including programming and applications.*	*TRUE*	*http://data.europa.eu/esco/skill/95c35c3a-035f-47c2-90cf-7e934d20fc08*	*Awareness*
skill/competence	*test microelectronics*	*Test microelectronics using appropriate equipment. Gather and analyse data. Monitor and evaluate system performance and take action if needed.*	*TRUE*	*http://data.europa.eu/esco/skill/7957b5f9-1f33-4ff8-84e9-e258b17882c2*	*Practitioner*
skill/competence	*measure electrical characteristics*	*Measure voltage, current, resistance or other electrical characteristics by using electrical measuring equipment such as multimeters, voltmeters, and ammeters.*	*TRUE*	*http://data.europa.eu/esco/skill/270de514-3206-4cf9-b122-0f148ab06fa1*	*Practitioner*
knowledge	*hardware testing methods*	*Those processes in which hardware components or systems are tested, such as the system test (ST), the ongoing reliability test (ORT), and the in-circuit test (ICT).*	*TRUE*	*http://data.europa.eu/esco/skill/53456d90-8c0d-4bd2-9f1b-312619b6e2a6*	*Awareness*

P3.8 – ElectrONiX - Power

Partner name and ID	*P3 - TU Graz*
Course ID	*P3.8*
Title	*ElectrONiX - Power*
Abstract	*Electronics is the science of controlling electrical current. Probably the most important control elements available to us in digital electronics are transistors. With them, digital calculations can be realized, as well as memory structures can be built.* *However, every electronic system needs a power supply. This can be done, for example, with linear regulators or switched mode power supplies. They bring their individual advantages and disadvantages with them. An eye must also be kept on the so-called electromagnetic compatibility.*
Link	*https://learn.chipsacademy.eu/knowledge-hub/courses/3079*
Contact details	
Name	*Dominik Zupan*
Email	*dominik.zupan@tugraz.at*
Additional information	
Learning hours	*12*
Prerequisites	*Ohm's law, Kirchhoff's circuit rules, Alternating and direct current, Basics of electrical components (resistor, coil, capacitor, voltage and current sources), Basics of electronics (Diodes, bipolar transistors, MOSFETs, transistor amplifiers, operational amplifiers, ElectrONiX - Amplifiers), Passive filters and resonant circuits (See ElectrOnix - Resonance)*
Target group	*learners, teachers*
ECTS points	
ECVET points	
EQF Levels	*5,6*
Content	*1 Linear Voltage Regulators* *2 Switched Mode Power Supplies* *3 Fundamentals of EMC*
Assessment	*Online assessment, using single/multiple choice, calculation questions etc.*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	*electronic components*	*Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.*	*TRUE*	*http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b*	*Practitioner*
skill/competence	*design electronic systems*	*Draft sketches and design electronic systems, products, and components using Computer Aided Design (CAD) software and equipment. Make a simulation so that an assessment can be made of the viability of the product and so the physical parameters can be examined before the actual building of the product.*	*TRUE*	*http://data.europa.eu/esco/skill/feb717ff-fba6-4a91-aa10-ee11cf2da6b4*	*Practitioner*
knowledge	*electronics principles*	*The study of electric energy, more specifically electron, control and its prominent principles regarding integrated circuits and electrical systems.*	*TRUE*	*http://data.europa.eu/esco/skill/557d1221-0235-4a48-ada5-8fca73443627*	*Awareness*
knowledge	*electronics*	*The functioning of electronic circuit boards, processors, chips, and computer hardware and software, including programming and applications.*	*TRUE*	*http://data.europa.eu/esco/skill/95c35c3a-035f-47c2-90cf-7e934d20fc08*	*Awareness*
knowledge	*power electronics*	*The functioning, design, and usage of electronics that control and convert electric power. Power conversion systems are usually categorised as AC-DC or rectifiers, DC-AC or inverters, DC-DC converters, and AC-AC converters.*	*TRUE*	*http://data.europa.eu/esco/skill/86ff9a65-66eb-4c8f-93d8-22e0a467fc08*	*Practitioner*
skill/competence	*design power electronics*	*Design and develop power electronics systems, products, and components according to specifications. Select suitable ancillary devices for the intended application.*	*TRUE*	*http://data.europa.eu/esco/skill/1177a1e9-213a-477b-b57c-364368c68b95*	*Awareness*

P4.1 – Digital competences - Office tools

Partner name and ID	*P4-BME*
Course ID	*P04.01*
Title	*Digital competences - Office tools*
Abstract	*Acquisition of the professional skills and knowledge (safe use of computers and the internet, word processing, spreadsheet and presentation skills, version control) required for general technical and engineering work. Covered topics include: basics of computer literacy; basics of word processing (Microsoft Word, Google Docs); spreadsheet basics (Microsoft Excel, Google Sheets); presentation basics (Microsoft PowerPoint); online collaboration (Office 365, Google Drive).*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2931
Contact details	
Name	*Dr. Oliver Krammer*
Email	krammer.oliver@vik.bme.hu
Additional information	
Learning hours	*60*
Course level	*Intermediate*
Prerequisites	*basic computer skills, basic math skills*
Target group	*high-school students, technicians, bachelor students in their first years of studies*
ECTS points	*-*
ECVET points	*-*
EQF Levels	*5,6*
Content	*1. Introduction, teamwork and other electronic tools in education (Microsoft Teams and Moodle)* *2. Word processing* *2.1. Document types, software tools, Word, word processing basics* *2.2. Styles, typography basics, character encoding, references, images, formats* *3. Spreadsheets* *3.1. Excel basic concepts, formatting, basic operations* *3.2. Charts, absolute and relative references, formulas, simple functions, complex formulas* *4. Presentation skills (PowerPoint, slides, animations, presentation techniques)* *5. Operating system architecture* *5.1 Common tasks in Windows environment* *5.2 Common tasks in Linux environment*
Assessment	*Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
skill/competence	*use office systems*	*Make appropriate and timely use of office systems used in business facilities depending on the aim, whether for the collection of messages, client information storage, or agenda scheduling. It includes administration of systems such as customer relationship management, vendor management, storage, and voicemail systems.*	*TRUE*	http://data.europa.eu/esco/skill/71dde84c-0058-4c52-a556-523369333db8	*Practitioner*
skill/competence	*use microsoft office*	*Use the standard programs contained in Microsoft Office. Create a document and do basic formatting, insert page breaks, create headers or footers, and insert graphics, create automatically generated tables of contents and merge form letters from a database of addresses. Create auto-calculating spreadsheets, create images, and sort and filter data tables.*	*TRUE*	http://data.europa.eu/esco/skill/f683ae1d-cb7c-4aa1-b9fe-205e1bd23535	*Practitioner*
skill/competence	*use word processing software*	*Use computer software applications for composition, editing, formatting, and printing of any sort of written material.*	*TRUE*	http://data.europa.eu/esco/skill/81633a44-f1db-4a01-a940-804c6905e330	*Practitioner*
skill/competence	*use spreadsheets software*	*Use software tools to create and edit tabular data to carry out mathematical calculations, organise data and information, create diagrams based on data and to retrieve them.*	*TRUE*	http://data.europa.eu/esco/skill/1973c966-f236-40c9-b2d4-5d71a89019be	*Practitioner*
skill/competence	*use presentation software*	*Use software tools to create digital presentations which combine various elements, such as graphs, images, text and other multimedia.*	*TRUE*	http://data.europa.eu/esco/skill/234aeb8d-56c3-4531-9193-1c5e6a8d16cb	*Practitioner*
skill/competence	*collaborate through digital technologies*	*Use digital tools and technologies for collaborative processes, and for co-construction and co-creation of resources and knowledge.*	*TRUE*	http://data.europa.eu/esco/skill/2b34a99f-9813-4c91-9509-b6b9b8c3132e	*Practitioner*
knowledge	*operating systems*	*The features, restrictions, architectures and other characteristics of operating systems such Linux, Windows, MacOS, etc.*	*TRUE*	http://data.europa.eu/esco/skill/f9a6f35b-01a7-40c9-8b61-b6ee46f97272	*Practitioner*
knowledge	*office software*	*The characteristics and functioning of software programs for office tasks such as word processing, spreadsheets, presentation, email and database.*	*TRUE*	http://data.europa.eu/esco/skill/cf310cff-0d28-4dbc-9dbb-cc500a3196c2	*Practitioner*
knowledge	*documentation types*	*The characteristics of internal and external documentation types aligned with the product life cycle and their specific content types.*	*TRUE*	http://data.europa.eu/esco/skill/327d15c8-29ff-4ad4-a4fe-6536d777a45f	*Practitioner*

P4.2 – Technology of biodegradable printed circuit boards

Partner name and ID	*P4-BME*
Course ID	*P04.02*
Course version	*v.01*
Title	*Technology of biodegradable printed circuit boards*
Abstract	*This course comprehensively introduces the materials and technologies used to produce printed circuit boards (PCBs). Students will learn about classic rigid PCB materials such as FR2, FR4, CEM, and Rogers, as well as flexible substrates like PE (Polyester), PEN (Polyethylene Naphthalate), and PI (Polyimide). The course also introduces biodegradable PCB materials, highlighting their potential in sustainable electronics. Core manufacturing processes for single-sided PCBs, including subtractive, additive, and semi-additive patterning techniques, and an overview of double-sided and multilayer board technologies are covered. Attention is given to the specialities of flexible and biodegradable PCBs, focusing on strategies to enhance mechanical properties and ensure functional stability across diverse applications.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3046
Contact details	
Name	*Oliver Krammer*
Email	krammer.oliver@vik.bme.hu
Additional information	
Learning hours	*30*
Course level	*Intermediate*
Prerequisites	*basic understanding of electronics*
Target group	*students with ongoing bachelor studies; engineers*
ECTS points	*1*
ECVET points	*1*
EQF Levels	*6,7*
Content	*1. Materials for printed circuit boards* 　*1.1. Classic rigid printed circuit boards: FR2, FR4, CEM, Rogers* 　*1.2. Materials for flexible circuit boards: PE, PEN, PI* 　*1.3. Materials for biodegradable printed circuit boards* *2. Special considerations for flexible and biodegradable printed circuit boards* 　*2.1. Improving mechanical properties* 　*2.2. Improving functional stability* *3. Technology of printed circuit boards* 　*3.1. Basics of processes* 　*3.2. Subtractive, additive, semi-additive patterning technologies* 　*3.3. Double-sided and multilayer printed circuit boards*
Assessment	*Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	sustainable technologies	Technologies with the aim of reducing environmental and ecological risks, achieving at the same time, a positive economic, social, and environmental impact. They are innovative technologies designed to prevent, reduce and recover from the negative impact of humanity in the planet.	TRUE	http://data.europa.eu/esco/skill/103f7814-d262-4df6-a1b6-759bc51f76cb	Awareness
knowledge	types of plastic	Types of plastic materials and their chemical composition, physical properties, possible issues and usage cases.	TRUE	http://data.europa.eu/esco/skill/9c66b182-96ec-43b3-8821-2aeb7df66f12	Awareness
knowledge	regulations on substances	The national and international regulations on the classification, labelling and packaging of substances and mixtures, e.g. regulation (EC) No 1272/2008.	TRUE	http://data.europa.eu/esco/skill/d1ec6846-dd8a-4810-8115-474cdf271540	Awareness
knowledge	through-hole technology	Through-hole technology or THT is a method of mounting electronic components onto the printed circuit board through inserting leads on the components into holes in the circuit board and soldering the components to the board. THT components attached in this way are usually larger than SMT components, such as capacitors or coils.	TRUE	http://data.europa.eu/esco/skill/81d2eb6a-0db6-4fde-8f99-c9cb3718fcb8	Practitioner
knowledge	surface-mount technology	Surface-mount technology or SMT is a method where the electronic components are placed on the surface of the printed circuit board. SMT components attached in this way are usually sensitive, small components such as resistors, transistors, diodes, and integrated circuits.	TRUE	http://data.europa.eu/esco/skill/88033500-d3a7-4a94-ba88-0f1680b9d017	Practitioner
knowledge	printed circuit boards	Printed circuit boards (PCB) are essential components to almost all electronic devices. They consist of thin wafers or substrates on which electronic components, such as microchips, are placed. The electronic components are electrically connected through conductive tracks and pads.	TRUE	http://data.europa.eu/esco/skill/6a2bc03b-e30d-429b-9549-5784cb92ae2f	Practitioner

P4.3 – Characterization of biodegradable printed circuit boards

Partner name and ID	*P4-BME*
Course ID	*P04.03*
Course version	*v.01*
Title	*Characterization of biodegradable printed circuit boards*
Abstract	*This course covers the mechanical, thermo-mechanical, and electrical behaviour of printed circuit board (PCB) substrates, focusing on traditional and biodegradable materials. Topics include the description of thermal expansion coefficient, thermal conductivity, glass transition temperature, and mechanical strength characteristics such as tensile, compressive, and flexural properties. The following section covers the electrical properties, like conductivity, dielectric properties, relative permittivity, and high-frequency performance, emphasizing the impact of design features like copper pours and surface characteristics. The course concludes with the basics of testing methods used to characterize PCB substrates, including mechanical (elongation and bending tests), thermo-mechanical (DSC, DMA, TMA), and dielectric (network and impedance analysis) measurements.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3053
	Contact details
Name	*Oliver Krammer*
Email	krammer.oliver@vik.bme.hu
	Additional information
Learning hours	*30*
Course level	*Advanced*
Prerequisites	*basic understanding of electronics and mechanics*
Target group	*students with ongoing bachelor studies; engineers*
ECTS points	*1*
ECVET points	*1*
EQF Levels	*6,7*
Content	*1. Mechanical and thermo-mechanical behaviour of printed circuit board substrates* *1.1. Coefficient of thermal expansion, thermal conductivity* *1.2. Glass transition temperature* *1.3. Tensile, compressive and flexural properties, copper adhesion* *1.4. Comparison of traditional and biodegradable circuit substrates* *2. Electrical behaviour of printed circuit board substrates* *2.1. Volume resistivity, surface resistivity, dielectric strength* *2.2. Current carrying capacity* *2.3. Effect of design on high-frequency operation* *3. Testing methods for characterizing printed circuit boards* *3.1. Measuring mechanical properties (bending test, copper peel strength)* *3.2. Measuring thermo-mechanical properties (DSC, DMA, TMA)* *3.3. Measuring dielectric properties*
Assessment	*Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*quality standards*	*The national and international requirements, specifications and guidelines to ensure that products, services and processes are of good quality and fit for purpose.*	*TRUE*	http://data.europa.eu/esco/skill/8d4271ca-c9fd-40b3-875f-15f78332a49e	*Awareness*
knowledge	*printed circuit boards testing methods*	*Printed circuit board (PCB) testing methods consist of those processes in which PCB components or systems are tested, such as the in-circuit test (ICT), joint test action group (JTAG) test, and automated optical inspection (AOI).*	*TRUE*	http://data.europa.eu/esco/skill/3e75d405-c3d1-4a66-9963-05a9397d68fb	*Practitioner*
skill/competence	*test materials*	*Test the composition, characteristics, and use of materials in order to create new products and applications. Test them under normal and extraordinary conditions.*	*TRUE*	http://data.europa.eu/esco/skill/0415142d-6921-4f8d-832b-6271382b8193	*Practitioner*
skill/competence	*test printed circuit boards*	*Test the printed circuit board with special testing adapters to ensure optimal efficiency, functionality, and that everything works according to design. Adapt the testing devices to the type of circuit board.*	*TRUE*	http://data.europa.eu/esco/skill/d1f435d2-e574-482c-8187-4a6c2214c683	*Practitioner*

P4.4 – Design aspects of biodegradable printed circuit boards

Partner name and ID	P4-BME
Course ID	P04.04
Course version	v.01
Title	Design aspects of biodegradable printed circuit boards
Abstract	This course comprehensively introduces computer-aided design (CAD) for printed circuit boards (PCBs). It covers the fundamentals of PCB CAD design, including design flow and essential design terminology. It incorporates advanced design techniques, including SPICE-based circuit simulation, thermal simulation, and 3D modelling with import/export workflows. Special design constraints related to biodegradable substrates are analyzed, with emphasis on mechanical stability and yield optimization. The course includes a hands-on demonstration task guiding students through schematic editing, stack-up definition, layout routing, and basic electrical integrity analyses. Students will gain practical skills and a deeper understanding of both conventional and sustainable PCB design practices.
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3054

Contact details	
Name	Attila Géczy
Email	geczy.attila@vik.bme.hu

Additional information	
Learning hours	30
Course level	Intermediate
Prerequisites	basic understanding of electronics
Target group	students with ongoing bachelor studies; engineers
ECTS points	1
ECVET points	1
EQF Levels	6,7

Content	1. CAD design of printed circuit boards
	  1.1. Basics of PCB CAD design
	  1.2. CAD Design flow
	  1.3. Additional terms of PCB design
	  1.4. Layer stackup ad design rule in general
	2. Additional techniques in PCB design
	  2.1. SPICE simulation
	  2.2. Thermal simulation
	  2.3. 3D modeling and import/export processes
	3. Special design considerations for biodegradable substrates
	  3.1. Design for mechanical stability
	  3.2. Design for yield
	4. Demonstration task for PCB design
	  4.1. Schematic and layout edition
	  4.2. Electrical analyses

Assessment	Moodle like quiz test

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
skill/competence	*interpret circuit diagrams*	*Read and comprehend circuit diagrams showing the connections between the devices, such as power and signal connections.*	*TRUE*	http://data.europa.eu/esco/skill/02c71cde-f513-43da-8952-0974763c7568	*Practitioner*
skill/competence	*design circuits using CAD*	*Draught sketches and design electronic circuitry; utilise Computer Aided Design (CAD) software and equipment.*	*TRUE*	http://data.europa.eu/esco/skill/9ba355be-f119-42b6-a7d6-52f6ce2e4a3f	*Practitioner*
skill/competence	*design circuit boards*	*Draught circuit boards used in electronic product such as cell phones and computers, make sure to include integrated circuits and microchips in the design.*	*TRUE*	http://data.europa.eu/esco/skill/77bf865e-6360-424f-9d77-ce03918c7dcf	*Practitioner*
skill/competence	*use sustainable materials and components*	*Identify, select environmentally friendly materials and components. Decide on the substitution of certain materials by the one that are environmentally friendly, maintaining the same level of functionality and other characteristics of the product.*	*TRUE*	http://data.europa.eu/esco/skill/73576419-31c2-4e45-8e30-ab1afec3db4e	*Awareness*
skill/competence	*model microelectronics*	*Model and simulate microelectronic systems, products, and components using technical design software. Assess the viability of the product and examine the physical parameters to ensure a successful production process.*	*TRUE*	http://data.europa.eu/esco/skill/ce6242a1-a2d9-43e6-a481-ae89b9ec0460	*Awareness*
knowledge	*surface-mount technology*	*Surface-mount technology or SMT is a method where the electronic components are placed on the surface of the printed circuit board. SMT components attached in this way are usually sensitive, small components such as resistors, transistors, diodes, and integrated circuits.*	*TRUE*	http://data.europa.eu/esco/skill/88033500-d3a7-4a94-ba88-0f1680b9d017	*Practitioner*
knowledge	*integrated circuit types*	*Types of integrated circuits (IC), such as analog integrated circuits, digital integrated circuits, and mixed-signal integrated circuits.*	*TRUE*	http://data.europa.eu/esco/skill/61c81161-b732-4c47-aba5-9e554d9a853f	*Practitioner*
knowledge	*through-hole technology*	*Through-hole technology or THT is a method of mounting electronic components onto the printed circuit board through inserting leads on the components into holes in the circuit board and soldering the components to the board. THT components attached in this way are usually larger than SMT components, such as capacitors or coils.*	*TRUE*	http://data.europa.eu/esco/skill/81d2eb6a-0db6-4fde-8f99-c9cb3718fcb8	*Practitioner*

P4.5 – Assembly and soldering of biodegradable printed circuit boards

Partner name and ID	*P4-BME*
Course ID	*P04.05*
Course version	*v.01*
Title	*Assembly and soldering of biodegradable printed circuit boards*
Abstract	*This course introduces students to the fundamentals of biodegradable printed circuit board assembly (PCBA). It begins with a brief overview of electronic components, PCB types, substrate materials, and both through-hole and surface-mount technologies. The core focus is on the assembly of biodegradable PCBs using reflow soldering with low-temperature solder (LTS) alloys. The course provides a detailed examination of various LTS alloys, their technological characteristics, and the specific requirements of reflow soldering for biodegradable substrates. Additionally, it addresses the quality and reliability of LTS solder joints and evaluates the overall performance of biodegradable electronic assemblies.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3055
Contact details	
Name	*Balázs Illés*
Email	illes.balazs@vik.bme.hu
Additional information	
Learning hours	*30*
Course level	*Advanced*
Prerequisites	*basic understanding of electronics and mechanics*
Target group	*students with ongoing bachelor studies; engineers*
ECTS points	*1*
ECVET points	*1*
EQF Levels	*6,7*
Content	*1. Basics of PCB assembly technologies* * 1.1 Classification of electronic components, substrates, subassemblies, materials for electronics; through-hole and surface-mounted components.* * 1.2 Single-sided and double-sided printed wiring boards, multilayer printed wiring* * 1.3 Basics of surface mounting technology (SMT)* * 1.4 Basics of through-hole technology (THT)* * 1.5 Reflow soldering technology, selective soldering technologies* * 1.6 Conductive adhesive technology* *2. Assembling on biodegradable PCBs* * 2.1 Types and technological properties of biodegradable PCBs.* * 2.2 Low-temperature soldering (LTS) technology, types and properties of LTS solder alloys* * 2.3 LTS reflow soldering on biodegradable substrates* * 2.4 Quality and reliability of LTS solder joints* * 2.5 Using conductive adhesives on biodegradable substrates* * 2.6 Quality and reliability of biodegradable assemblies*
Assessment	*Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
skill/competence	*define manufacturing quality criteria*	*Define and describe the criteria by which data quality is measured for manufacturing purposes, such as international standards and manufacturing regulations.*	*TRUE*	http://data.europa.eu/esco/skill/46e1b714-94f4-462d-88e6-31f442708812	*Awareness*
skill/competence	*solder electronics*	*Operate and use soldering tools and soldering iron, which supply high temperatures to melt the solder and to join electronic components.*	*TRUE*	http://data.europa.eu/esco/skill/26ed52cf-30ca-451e-9699-a6c04a30649f	*Awareness*
skill/competence	*solder components onto electronic board*	*Solder electronic components onto bare electronic boards to create loaded electronic boards using hand soldering tools or soldering machinery.*	*TRUE*	http://data.europa.eu/esco/skill/190b7060-79fa-4450-9a3d-c4ce63b0fa4d	*Awareness*
skill/competence	*apply advanced manufacturing*	*Improve production rates, efficiencies, yields, costs, and changeovers of products and processes using relevant advanced, innovative, and cutting edge technology.*	*TRUE*	http://data.europa.eu/esco/skill/4f0e579d-ca7b-427c-ace6-9e2de3eb19c7	*Awareness*
skill/competence	*apply soldering techniques*	*Apply and work with a variety of techniques in the process of soldering, such as soft soldering, silver soldering, induction soldering, resistance soldering, pipe soldering, mechanical and aluminium soldering.*	*TRUE*	http://data.europa.eu/esco/skill/136596a4-00b5-4ed3-bb6e-717198c1ccbe	*Awareness*
skill/competence	*assemble printed circuit boards*	*Attach electronic components to the printed circuit board through applying soldering techniques. Electronic components are placed in holes in through-hole assembly (THT), or are placed on the surface of PCB in surface-mount assembly (SMT).*	*TRUE*	http://data.europa.eu/esco/skill/4ce4dd33-7429-4e65-a055-6e46a34cb19b	*Awareness*
skill/competence	*use sustainable materials and components*	*Identify, select environmentally friendly materials and components. Decide on the substitution of certain materials by the one that are environmentally friendly, maintaining the same level of functionality and other characteristics of the product.*	*TRUE*	http://data.europa.eu/esco/skill/73576419-31c2-4e45-8e30-ab1afec3db4e	*Awareness*
knowledge	*manufacturing processes*	*The steps required through which a material is transformed into a product, its development and full-scale manufacturing.*	*TRUE*	http://data.europa.eu/esco/skill/3786b61f-f22e-48d1-af8d-ad4c354534db	*Awareness*
knowledge	*electronic components*	*Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.*	*TRUE*	http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b	*Awareness*
knowledge	*surface-mount technology*	*Surface-mount technology or SMT is a method where the electronic components are placed on the surface of the printed circuit board. SMT components attached in this way are usually sensitive, small components such as resistors, transistors, diodes, and integrated circuits.*	*TRUE*	http://data.europa.eu/esco/skill/88033500-d3a7-4a94-ba88-0f1680b9d017	*Awareness*

P4.6 – Overview of SMD and THT components

Partner name and ID	*P4-BME*
Course ID	*P04.06*
Course version	*v.01*
Title	*Overview of SMD and THT components*
Abstract	*This course overviews electronic component technologies, beginning with the structure, classification, and properties of through-hole components. It then covers surface-mounted components, detailing their structure and types. Characteristics of through-hole, surface-mounted and mixed assemblies are also covered. The final section focuses on chip-level and chip-scale technologies, covering first-level interconnection technologies such as wire bonding, tape-automated bonding and flip-chip. The course concludes with wafer-level packaging concepts, including fan-in and fan-out packaging.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3056
Contact details	
Name	*Oliver Krammer*
Email	krammer.oliver@vik.bme.hu
Additional information	
Learning hours	*15*
Course level	*Intermediate*
Prerequisites	*basic understanding of electronics*
Target group	*students with ongoing bachelor studies; engineers*
ECTS points	*0*
ECVET points	*0*
EQF Levels	*6,7*
Content	*1. Through-hole components* * 1.1. Structure and classification of through-hole components* * 1.2. Properties of assemblies using through-hole components* *2. Surface-mounted components* * 2.1. Structure and classification of surface-mounted components* * 2.2. Properties of assemblies using surface-mounted components* *3. Chip-level and chip-scale technologies* * 3.1. First-level interconnection technologies; wire-bonding, tape-automated bonding, flip-chip* * 3.2. Fan-in and fan-out wafer-level packaging*
Assessment	*Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*electronic components*	*Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.*	*TRUE*	http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b	*Practitioner*
knowledge	*surface-mount technology*	*Surface-mount technology or SMT is a method where the electronic components are placed on the surface of the printed circuit board. SMT components attached in this way are usually sensitive, small components such as resistors, transistors, diodes, and integrated circuits.*	*TRUE*	http://data.europa.eu/esco/skill/88033500-d3a7-4a94-ba88-0f1680b9d017	*Practitioner*
knowledge	*integrated circuit types*	*Types of integrated circuits (IC), such as analog integrated circuits, digital integrated circuits, and mixed-signal integrated circuits.*	*TRUE*	http://data.europa.eu/esco/skill/61c81161-b732-4c47-aba5-9e554d9a853f	*Practitioner*
knowledge	*through-hole technology*	*Through-hole technology or THT is a method of mounting electronic components onto the printed circuit board through inserting leads on the components into holes in the circuit board and soldering the components to the board. THT components attached in this way are usually larger than SMT components, such as capacitors or coils.*	*TRUE*	http://data.europa.eu/esco/skill/81d2eb6a-0db6-4fde-8f99-c9cb3718fcb8	*Practitioner*

P5.1 – Introduction to Lean six Sigma

Partner name and ID	*P5-VSB-TUO*
Course ID	*P05.01*
Title	*Introduction to Lean six Sigma*
Abstract	*This training offers a brief introduction to continuous improvement and how improvement methods like Lean and Six Sigma are supporting companies in the automotive industry to improve their processes and guarantee quality. After following this introduction training you can subscribe for full Lean Six Sigma training at the level of Yellow, Green or Black Belt offered through the DRIVES Project network.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2944
Contact details	
Name	*Marek Spányik*
Email	marek.spanyik@vsb.cz
Additional information	
Learning hours	*40*
Course level	*Intermediate*
Prerequisites	*There are no Prerequisites.*
Target group	*general workers, public, etc.*
ECTS points	
ECVET points	
EQF Levels	*4,5*
Content	*1. Continuous Improvement history* *2. Continuous Improvement values and principles* *3. Continuous Improvement Maturity Model* *4. Continuous Improvement roles and responsibilities*
Assessment	*Self assessment quiz* *Possible exam option with external certification provider*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity [3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*continuous improvement philosophies*	*Underlying ideas of quality management systems. Implementation process of lean manufacturing, Kanban, Kaizen, Total Quality Management (TQM) and other continuous improvement systems.*	TRUE	http://data.europa.eu/esco/skill/0550431f-9c8b-4204-9c45-59bc5feacf06	*Awareness*
knowledge	Continuous Improvement Maturity Model	*Knowledge on levels of CIMM framework.*	FALSE	https://skills-framework.eu/sck-detail?id=cmVtVUlhQ3l1S3FndEY5ZjlscXd4dz09	*Awareness*
knowledge	Continuous Improvement Roles and Responsibilities	*Knowledge on different roles present in continuous improvement.*	FALSE	https://skills-framework.eu/sck-detail?id=bFc2d01SdzBaYUd1YVcySUFQRmN3dz09	*Awareness*

P5.2 – Management of Innovation Projects

Partner name and ID	*P5-VSB-TUO*
Course ID	*P05.02*
Title	*Management of Innovation Projects*
Abstract	*The course entitled Innovation Project Management (InnoPro) places emphasis on the linking methods of project management with technical-economic-managerial aspects of innovation projects. The course is training-based (including exchange of good practices and workshops) and developed along with e-learning support (on-line documentation and e-learning sessions). The InnoPro course focuses on practical aspects of project management and innovation issues which companies and institutions in the R&D sector often face. The main objective of the course is to develop relevant and high-quality competence related to the preparation and management of innovation projects with the use of innovative teaching methods, tools and innovative up to date content.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2946
Contact details	
Name	*Michal Pivko*
Email	michal.pivko@vsb.cz
Additional information	
Learning hours	*60*
Course level	*Intermediate*
Prerequisites	*There are no Prerequisites.*
Target group	*general workers, public, project managers etc.*
ECTS points	
ECVET points	
EQF Levels	*3,4,5,6,7,8*
Content	*1. Introduction* *2. AIDIC model* * 2.1. Concept, basis and structure* * 2.2. Theoretical basis* *3. Stage 1: Assessment* * 3.1. Assessment of problems, needs, opportunities to start a project* * 3.2. Formalisation, innovation opportunities, innovation prospective* *4. Stage 2: Initiation* * 4.1. Identification and definition* * 4.2. Purpose, goals and questions, scope, deliverables* * 4.3. Stakeholders, fundraising* *5. Stage 3: Design* * 5.1. Workflow, time and budget estimation* * 5.2. Milestones, scheduling, budgeting* * 5.3. Risk assessment* * 5.4. Communication, monitoring and controlling* *6. Stage 4: Implementation* * 6.1. Briefing, kick-off meeting* * 6.2. Managing team and consortium* * 6.3. Monitoring quality of work* * 6.4. Validity and up-to-date innovations* * 6.5. Addressing risks* *7. Stage 5: Closure* * 7.1. Formal project closure* * 7.2. Project documentation closure*
Assessment	*Self assessment per module*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*Project Cycle Management*	*Students are getting acquainted with the essence and structure of the AIDIC model concept and raise understanding of project cycle management.*	TRUE	http://data.europa.eu/esco/skill/237db40b-4600-47c0-837f-4a2c4f3014ab	*Awareness*
knowledge	*Innovation Management Systems*	*Students will become familiar with the structure of the InnoPro course and with the essence of the concepts of innovation and Innovation Management Systems.*	PARTIAL	http://data.europa.eu/esco/skill/2fb8480e-de3c-462b-b169-e8bbb344da68	*Awareness*
knowledge	*Project Identification*	*Students will become familiar with the importance of properly assessing business opportunities that can be achieved through the initiation of projects and identifying those that provide the best "strategic fit" for their organisation. Selecting the right projects is equally important to project management and the organisation, as properly implementing projects.*	FALSE	_	*Awareness*
knowledge	*Project Initiation*	*Students are getting acquainted and raise understanding on the topic of Project Initiation.*	FALSE		*Awareness*
knowledge	*Project Design*	*Students will be acquainted with how to plan a project in brief and learn about the general workflow of project steps in developing a project design.*	FALSE		*Awareness*
knowledge	*Project Implementation*	*Students will learn how to manage the project step by step at the stage of its implementation. The aim is to introduce to them the individual topics that they may encounter during the execution of the project.*	FALSE		*Awareness*
knowledge	*Project Closure*	*Students will become familiar with the importance of closing a project and the steps that must be followed in order to properly implement the Closure stage of the InnoPro model.*	FALSE		*Awareness*

P5.3 – Digital Strategy and Competencies

Partner name and ID	*P5-VSB-TUO*
Course ID	*P05.03*
Title	*Digital Strategy and Competencies*
Abstract	*In a world where digital technologies continually reshape the rules of the game, digital transformation becomes crucial for the survival and growth of businesses. The "Digital Strategy and Competencies" training module is designed to provide participants with a comprehensive overview of how digital strategy can reform company structures, processes, and culture.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2947
Contact details	
Name	*Adam Priechodsky*
Email	a.priechodsky@autoklastr.cz
Additional information	
Learning hours	*4*
Course level	*Intermediate*
Prerequisites	*There are no Prerequisites.*
Target group	*intended for managers, leaders, and professionals*
ECTS points	
ECVET points	
EQF Levels	*3,4*
Content	*1. Fundamentals of Digital Transformation* *2. Innovation and Technology in Businesses* *3. Leadership and Team Dynamics* *4. Implementation and Competencies*
Assessment	*Self Test per module*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*Fundamentals of Digital Transformation*	*Understanding basic concepts and principles of digital transformation, exploring how modern technologies enhance performance, reach, and efficiency, learning about market transformation, process optimization, customer experience enhancement, and recognizing the need for innovation in products/services and changes in corporate culture.*	*PARTIAL*	http://data.europa.eu/esco/skill/237db40b-4600-47c0-837f-4a2c4f3014ab	*Awareness*
knowledge	*Innovation and Technology in Businesses*	*Exploring specific examples of cutting-edge technologies and their business impact, understanding trends like artificial intelligence, cloud technologies, and big data applications, and learning how technologies assist in creating innovative products/services and adapting to markets.*	*PARTIAL*	http://data.europa.eu/esco/skill/2fb8480e-de3c-462b-b169-e8bbb344da68	*Awareness*
knowledge	*Digital Transformation Leadership and Team Dynamics*	*Understanding key aspects of leadership during digital transformation, learning about the role of the Chief Digital Officer (CDO) and building change-driven teams, recognizing the importance of preparing key groups within the company and effective communication.*	*PARTIAL*	http://data.europa.eu/esco/skill/3740b2a0-c94e-4116-bf18-f9fdd5b59f56	*Awareness*
knowledge	*Digital Strategy Implementation and Competencies*	*Learning practical aspects of implementing digital strategies, understanding methods of mapping and digitalizing processes, agile principles, and competency development in the digital era.*	*FALSE*		*Awareness*

P5.4 – Understanding Digital Transformation

Partner name and ID	*P5-VSB-TUO*
Course ID	*P05.04*
Title	*Understanding Digital Transformation*
Abstract	*The course "Understanding Digital Transformation. Guidelines for SMEs in the Mobility, Transport and Automotive ecosystem (MTA)" aims to provide a clear vision of the benefits of digital transformation for companies, specifically for SMEs. It is about offering guidelines and recommendations that help SMEs in the MTA ecosystem to start a transformation process by incorporating new digital technologies that improve their processes, products or business models.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2948
Contact details	
Name	*Adam Priechodsky*
Email	a.priechodsky@autoklastr.cz
Additional information	
Learning hours	*4*
Course level	*Intermediate*
Prerequisites	*There are no Prerequisites.*
Target group	*specifically for SMEs*
ECTS points	
ECVET points	
EQF Levels	*3,4*
Content	*1. Introduction – What do we mean by Digital Transformation?* *2. Digital transformation trends driving the future of the industry* *3. How to start a Digital Transformation process?* *4. Next step – The Industry 5.0 revolution*
Assessment	*Self Test per module*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*Fundamentals of Digital Transformation*	*Understanding basic concepts and principles of digital transformation, exploring how modern technologies enhance performance, reach, and efficiency, learning about market transformation, process optimization, customer experience enhancement, and recognizing the need for innovation in products/services and changes in corporate culture.*	*PARTIAL*	http://data.europa.eu/esco/skill/237db40b-4600-47c0-837f-4a2c4f3014ab	*Awareness*
knowledge	*Digital Transformation Trends*	*Defining the main trends in digital transformation, reviewing technologies shaping the mobility, transport, and automotive ecosystem, and analyzing technologies expected to influence the future of the industry.*	*FALSE*	_	*Awareness*
knowledge	*Digital Transformation Process*	*Establishing the main steps for SMEs to initiate a digital transformation process, encouraging companies within the mobility, transport, and automotive ecosystem to embark on digital transformation, and providing guidance to help companies commence the digital transformation journey.*	*PARTIAL*	http://data.europa.eu/esco/skill/237db40b-4600-47c0-837f-4a2c4f3014ab	*Awareness*
knowledge	*Industry 5.0*	*Introducing the concept of Industry 5.0 and its significance for the future of mobility, transport, and automotive companies, explaining the emergence, implications, and benefits of Industry 5.0 for companies, and providing insights into the principles and potential impact of Industry 5.0 on businesses.*	*FALSE*		*Awareness*

P5.5 – Cybersecurity for Managers

Partner name and ID	*VSB-TUO*
Course ID	*P05.05*
Title	*Cybersecurity for Managers*
Abstract	*Design of modern vehicles requires to consider security related norms (SAE J3061, ISO 21434) and the implementation of security related design patterns. This includes e.g. consideration of security risks early on and at key development stages. Managers should have knowledge on legal situation, cases showing a high business impact, issues, and the most important standards and their main meaning. They should have a clear view on cybersecurity related organisational structures and be able to plan implement cybersecurity related projects. This course aims to address the above topics.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2949
Contact details	
Name	*Marek Spányik*
Email	marek.spanyik@vsb.cz
Additional information	
Learning hours	*36*
Course level	*Advanced*
Prerequisites	
Target group	*students with ongoing bacherlor studies; technical managers*
ECTS points	
ECVET points	
EQF Levels	*6,7*
Content	*1. System threat analysis* *2. Legal aspects and privacy* *3. Organisational structures* *4. Cybersecurity planning and monitoring* * 4.1. Planning* * 4.2. Life cycle assessment* * 4.3. Cybersecurity Processes and Audits* * 4.4. Incident Response Management* *5. Supply chain security*
Assessment	*Self assessment quiz* *Feedback form* *optional exam at third party provider*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	System Threat Analysis	A system threat analysis is a process used to determine which components of the system need to be protected and the types of security risks (threats) they should be protected from.	FALSE	System Threat Analysis	Expert
knowledge	Legal Aspects and Privacy	Knowledge on legal situation, cases showing a high business impact, issues of complex mechatronic products and safety and the most important norms ad their main meaning, required for homologation of cars in case of functional safety.	FALSE	Legal Aspects and Privacy	Practitioner
knowledge	Organisational Structure	Knowledge on cybersecurity related roles, cybersecurity related organisational structures, cybersecurity planning.	FALSE	Organisational Structure	Practitioner
knowledge	Cybersecurity Planning	Knowledge on establishment of project plan, selection of proper methods and considerations not only in development, also production or maintenance - entire lifecycle.	FALSE	Cybersecurity Planning	Practitioner
skill/competence	Life Cycle Assessment	Skills needed to assess threats throughout the entire life cycle, not just during development.	FALSE	Life Cycle Assessment	Practitioner
knowledge	Cybersecurity Processes and Audits	Requirements to collect evidences to prepare for a cybersecurity process audit.	FALSE	Cybersecurity Processes and Audits	Practitioner
knowledge	Incident Response Management	Methods and approaches to handle incidents in the field.	FALSE	Incident Response Management	Practitioner
skill/competence	Supply Chain Security	Supply chain security includes the entire supply chain and necessary controls to keep up a secure environment.	FALSE	Supply Chain Security	Practitioner

P5.6 – Cybersecurity for Engineers

Partner name and ID	*VSB-TUO*
Course ID	*P05.06*
Title	*Cybersecurity for Engineers*
Abstract	*Design of modern vehicles requires to consider security related norms (SAE J3061, ISO 21434) and the implementation of security related design patterns. This includes e.g. consideration of security risks early on and at key development stages (mostly those with design decisions). This course covers cybersecurity related SW deisgn principles, critical code inspections and reviews; secure sessions key generation; cybersecurity design patterns on system levels, attack tree and vulnerability analyses; cybersecure data analysis and function analysis.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2950
Contact details	
Name	*Marek Spányik*
Email	marek.spanyik@vsb.cz
Additional information	
Learning hours	*36*
Course level	*Advanced*
Prerequisites	
Target group	*students with ongoing bacherlor studies; engineers*
ECTS points	
ECVET points	
EQF Levels	*6,7*

Content	*1. Identification and addressing of potential threats and attack targets*
	2. Appropriate methods of attack surface reduction
	  2.1. Layered cybersecurity defenses (defense-in-depth)
	  2.2. Identification of trust boundaries
	3. Inclusion of security design reviews in development process
	  3.1. Emphasizing secure connections
	  3.2. Limiting of network interactions
	4. Testing of integrity and security
	  4.1. SW-level vulnerability testing
	  4.2. Validation of security systems at vehicle level

Assessment	*Self assessment quiz* *Feedback form* *optional exam at third party provider*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	_
knowledge	System Threat Analysis	*A system threat analysis is a process used to determine which components of the system need to be protected and the types of security risks (threats) they should be protected from.*	*FALSE*	System Threat Analysis	Expert
skill/competence	Software Threat Modelling	*Threat modeling is a process by which potential threats, such as structural vulnerabilities or the absence of appropriate safeguards, can be identified, enumerated, and mitigations can be prioritized.*	*FALSE*	Software Threat Modelling	Expert
skill/competence	Software Detailed Design and Cybersecurity	*Cybersecurity methods, such as: cybersecurity related detailed SW deisgn principles, critical code inspections and reviews. Qualification of development tools and SW development environments - secure sessions key generation by random generator, encryption of signals, secure key store, etc.*	*FALSE*	Software Detailed Design and Cybersecurity	Expert
skill/competence	System Design and Vulnerability Analysis	*Apply cybersecurity design patterns on system levels, perform an atack tree analysis and vulnerability analysis. Integrate proper defence mechanisms, cybersecurity views into the system architectural design. Write cybersecurity requirements.*	*FALSE*	System Design and Vulnerability Analysis	Expert
skill/competence	Software Design and Vulnerability Analysis	*Ability to perform software related cybersecurity methods, such as: cybersecure data analysis and function analysis; write cybersecurity software requirements. Integrate cybersecurity views into the software architectural design and apply list of state-of-the-art software related cybersecurity design patterns.*	*FALSE*	Software Design and Vulnerability Analysis	Practitioner
skill/competence	Cybersecure hardware and firmware design	*Integrate HSM on ECU, interfaces and configuration of secure com stack as well as listing of main diagnostic security services to be provided.*	*FALSE*	Cybersecure hardware and firmware design	Expert
skill/competence	Cybersecurity verification at SW level	*Aspects of what is required in SW testing to cover the cybersecure relevant SW requirements.*	*FALSE*	Cybersecurity verification at SW level	Awareness
knowledge	Cybersecurity verification at HW level	*Aspects of what is required in HW testing to cover the cybersecure relevant HW requirements.*	*FALSE*	Cybersecurity verification at HW level	Awareness
knowledge	Cybersecurity verification at system level	Aspects of what is required in SW testing to cover the cybersecure relevant SW requirements.	*FALSE*	Cybersecurity verification at system level	Awareness

P5.7 – Introduction to Risk Analysis

Partner name and ID	*P5-VSB-TUO*
Course ID	*P05.07*
Course version	*v.01*
Title	*Introduction to Risk Analysis*
Abstract	*This introductory course provides a foundational understanding of risk analysis in the context of cyber security. It covers the identification of critical ICT assets, introduces the MITRE ATT&CK framework, and explores methods for identifying and analyzing system vulnerabilities. Participants will gain insight into the types of security threats and learn techniques for recognizing ICT security risks and weaknesses, aligned with ESCO learning outcomes. The training is ideal for individuals seeking to build or strengthen their cybersecurity awareness.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3268
Contact details	
Name	*Svatopluk Stolfa*
Email	svatopluk.stolfa@vsb.cz
Additional information	
Learning hours	*6*
Course level	*Beginner*
Prerequisites	*Basic familiarity with IT systems is recommended but not required.*
Target group	*Students and professionals interested in cyber security, IT administrators, risk managers, and anyone responsible for protecting digital systems.*
ECTS points	
ECVET points	
EQF Levels	*4,5*
Content	*1. Introduction to Risk in Cybersecurity* *　　1.1. Understanding Cybersecurity Risk* *　　1.2. Risk Analysis Principles* *2. Cybersecurity Assets* *　　2.1. What Are Cyber Assets?* *　　2.2. Asset Identification and Categorization* *3. Threats and Vulnerabilities* *　　3.1. Common Cyber Threats* *　　3.2. ICT System Weaknesses* *4. MITRE ATT&CK Framework* *　　4.1. Overview of the Framework* *　　4.2. Use Cases in Risk Analysis* *5. Risk Assessment Techniques* *　　5.1. Risk Scoring and Prioritization* *　　5.2. Aligning Risks to Organizational Needs*
Assessment	*Learners will complete a short quiz to demonstrate understanding of risk analysis principles, key cyber assets, and application of the MITRE ATT&CK framework. A final case scenario is included to evaluate practical understanding of identifying and analyzing ICT security risks.*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
skill	*identify ICT security risks*	*Apply methods and techniques to identify potential security threats, security breaches and risk factors using ICT tools for surveying ICT systems, analysing risks, vulnerabilities and threats and evaluating contingency plans.*	*TRUE*	http://data.europa.eu/esco/skill/fe1c2b32-7fe9-4668-affa-07ff658a68cf	*Awareness*
skill	*identify ICT system weaknesses*	*Analyse the system and network architecture, hardware and software components and data in order to identify weaknesses and vulnerability to intrusions or attacks. Execute diagnostic operations on cyber infrastructure including research, identification, interpretation and categorization of vulnerabilities, associated attacks and malicious code (e.g. malware forensics and malicious network activity). Compare indicators or observables with requirements and review logs to identify evidence of past intrusions.*	*TRUE*	http://data.europa.eu/esco/skill/dad7e408-162f-46a4-8567-db560e19e2fc	*Awareness*

P5.8 – Introduction to ICT Cybersecurity

Partner name and ID	*P5-VSB-TUO*
Course ID	*P05.08*
Course version	*v.01*
Title	*Introduction to ICT Cybersecurity*
Abstract	*This foundational course offers a broad overview of cybersecurity concepts and practices in the ICT domain. It introduces participants to cyber risks, common attack types, and widely recognized standards and frameworks such as OWASP and NIST. The course also explores the development of information security strategies, principles of safety engineering, and counter-measures against cyberattacks. Learners will gain an understanding of ICT security standards and be equipped with the basic tools and frameworks needed to build a strategic approach to cybersecurity in development and organizational settings.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3243
Contact details	
Name	*Svatopluk Stolfa*
Email	svatopluk.stolfa@vsb.cz
Additional information	
Learning hours	*8*
Course level	*Beginner*
Prerequisites	*No formal prerequisites. General knowledge of ICT or software development is beneficial.*
Target group	*Students in ICT fields, junior developers, IT support staff, digital project managers, and professionals seeking an overview of cybersecurity principles.*
ECTS points	
ECVET points	
EQF Levels	*4,5*

Content	*1. Introduction to Cybersecurity*
	   1.1. Definition and Scope
	   1.2. Current Cybersecurity Landscape
	2. Cyber Risks and Attack Types
	   2.1. Common Cyber Threats
	   2.2. Attack Vectors and Examples
	3. Cybersecurity Frameworks and Standards
	   3.1. OWASP Top 10
	   3.2. NIST Cybersecurity Framework
	   3.3. ISO/IEC Standards Overview
	4. Developing Information Security Strategy
	   4.1. Principles and Objectives
	   4.2. Implementation in Development Environments
	5. Engineering and Counter-Measures
	   5.1. Security-by-Design Principles
	   5.2. Response Strategies and Best Practices

Assessment	*Participants will complete a structured multiple-choice quiz and short-answer scenario analysis to demonstrate understanding of key cybersecurity principles, frameworks, and strategic planning approaches.*

Type[1)]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3)]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	*cybersecurity*	*The methods and best practices that protect ICT systems, networks, computers, devices, services, processes and people against unauthorised access, modification and/or denial of service of assets.*	*TRUE*	http://data.europa.eu/esco/skill/8088750d-8388-4170-a76f-48354c469c44	*Awareness*
knowledge	*ICT security standards*	*Best practices and guidelines established for securing information and communication technology (ICT) systems and data. Standards as is the case of ISO 27000 series, provide a framework for implementing effective security controls, including access control, risk assessment and incident management, as well as to provide compliance of anorganisation.*	*TRUE*	http://data.europa.eu/esco/skill/3ff589b7-68df-4ea5-ae41-b395bdb2378f	*Awareness*
knowledge	*information security strategy*	*The plan defined by a company which sets the information security objectives and measures to mitigate risks, define control objectives, establish metrics and benchmarks while complying with legal, internal and contractual requirements.*	*TRUE*	http://data.europa.eu/esco/skill/11eebd42-44ab-401d-8a2c-bdb9fc9beb50	*Awareness*
knowledge	*safety engineering*	*The study of the risks associated with engineered designs and systems, accident prevention as well as the safety benefits of reducing deaths and injuries. The discipline focuses on analysing and mitigating potential hazards in engineering processes.*	*TRUE*	http://data.europa.eu/esco/skill/47d491a9-f7c0-4b13-a10f-983d3aa0113e	*Awareness*
knowledge	*cyber attack counter-measures*	*Methods, technologies and techniques used to defend (detect, monitor and recover) against cyber attacks. These cyber attacks include several attack vectors such as malware, denial of service (DoS) attacks and phishing. Intrusion prevention systems (IPS), firewall, antivirus, intrusion detection systems (IDS), cybersecurity training, backup, Information Security Management System (ISM), multi-factor authentication and employ awareness, are some examples of the methods used.*	*TRUE*	http://data.europa.eu/esco/skill/5898d99a-62a4-4e10-a2e3-0d815ce44248	*Awareness*

P5.9 – Introduction to Software Development Process

Partner name and ID	*P5-VSB-TUO*
Course ID	*P05.09*
Course version	*v.01*
Title	*Introduction to Software Development Process*
Abstract	*This course introduces the foundational principles and steps of the software development process. It covers the basics of digital information systems and leads learners through key development stages including planning, analysis, design, implementation, and testing. Learners will explore common methodologies such as waterfall and agile, and gain hands-on experience with prototyping software solutions. The course supports learners in understanding structured development practices and building competence to work within or alongside development teams.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3244
Contact details	
Name	*Svatopluk Stolfa*
Email	svatopluk.stolfa@vsb.cz
Additional information	
Learning hours	*10*
Course level	*Beginner*
Prerequisites	*No prior coding experience required. Basic digital literacy is sufficient.*
Target group	*Students and professionals new to software engineering, junior IT professionals, project coordinators, and non-technical stakeholders working in tech environments.*
ECTS points	
ECVET points	
EQF Levels	*4,5*

Content	*1. Understanding Software Development*
	    1.1. Role of Software in Digital Systems
	    1.2. Overview of Software Development Life Cycle (SDLC)
	2. Methodologies and Models
	    2.1. Waterfall, Agile, and Hybrid Models
	    2.2. Choosing the Right Approach
	3. Key Phases of Development
	    3.1. Requirements Gathering and Analysis
	    3.2. Design and Architecture Basics
	    3.3. Implementation and Testing
	4. Prototyping and Demonstration
	    4.1. What is a Software Prototype?
	    4.2. Tools and Techniques for Rapid Prototyping
	    4.3. From Idea to Interactive Model

Assessment	*Learners will complete a short quiz and submit a simple software prototype or design concept using predefined tools. Emphasis will be on practical understanding of development stages and clarity of the proposed solution.*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	*digital information systems*	*Systems to store, process and spread information in digital form. They are hardware, software and networks, as well as the ways in which these can be employed.*	*TRUE*	http://data.europa.eu/esco/skill/397da142-ab35-48fe-b154-7c38f447adfb	*Awareness*
skill/competence	*develop software prototype*	*Create a first incomplete or preliminary version of a piece of software application to simulate some specific aspects of the final product.*	*TRUE*	http://data.europa.eu/esco/skill/797a4416-0b8d-44f3-8fcd-eb10bd0be6b4	*Awareness*

P6.1 – Basic Project Management

Partner name and ID	*P6-IAL-FVG*
Course ID	*P06.01*
Title	*Basic Project Management*
Abstract	*Acquire the knowledge and advanced skills to follow a complete development cycle with the application of Agile methodologies and manage the economic and management aspects of a project.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2938
	Contact details
Name	*Marianna Muin*
Email	marianna.muin@ial.fvg.it
	Additional information
Learning hours	*32*
Course level	*Intermediate*
Prerequisites	*Students with a good knowledge of computer science and English language*
Target group	*high-school students, technicians*
ECTS points	*–*
ECVET points	*–*
EQF Levels	*4*
Content	*1. Basic concepts of project planning* * 1.1. Considering elements such as limited resources, project risks, deadlines* * 1.2. Objective and subjective difficulties in dealing with estimates* * 1.3. Know tools for collaborative estimation (e.g., planning poker), in order to reduce the possibility of significant errors* *2. Version management* * 2.1. Importance and functioning of version management tools (e.g. git)* * 2.2. Automated approaches to validation (ATDD / BDD)* *3. Criticality of deployment operations, from a technical point of view, but also in relation to social dynamics with colleagues and the customer*
Assessment	*Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
skill/competence	*carry out project activities*	*Carry out project activities based on the project work plan and schedule. Assist in the development and execution of project plans.*	*TRUE*	http://data.europa.eu/esco/skill/1fcce318-3212-487a-ac07-4941bc85060d	*Practitioner*
skill/competence	*document project progress*	*Record the project planning and development, the work steps, the required resources and the final results in order to present and keep track of the realised and ongoing projects.*	*TRUE*	http://data.europa.eu/esco/skill/4d38b095-6730-4157-9807-8049dd7b43b8	*Practitioner*
skill/competence	*manage project metrics*	*Gather, report, analyse and create key metrics for a project to help measure its success.*	*TRUE*	http://data.europa.eu/esco/skill/c5a135be-218d-48e6-a422-5225a576dcd8	*Practitioner*
skill/competence	*introduce new employees*	*Give new employees a tour in the company, introduce them to the colleagues, explain them the corporate culture, routines and working methods and get them settled in their working place.*	*TRUE*	http://data.europa.eu/esco/skill/9d9ba780-4aa2-43d2-888c-95a41a713fb9	*Practitioner*
skill/competence	*maintain a central project repository*	*Store project files and documents in a central repository accessible to the project manager and to all the project teams. Use available online tools and dedicated software.*	*TRUE*	http://data.europa.eu/esco/skill/770d4956-b5e0-4d44-bf42-3a766b232c5d	*Practitioner*
skill/competence	*collaborate through digital technologies*	*Use digital tools and technologies for collaborative processes, and for co-construction and co-creation of resources and knowledge.*	*TRUE*	http://data.europa.eu/esco/skill/2b34a99f-9813-4c91-9509-b6b9b8c3132e	*Practitioner*
knowledge	*project management principles*	*Different elements and phases of project management.*	*TRUE*	http://data.europa.eu/esco/skill/237db40b-4600-47c0-837f-4a2c4f3014ab	*Practitioner*
knowledge	*project management*	*Understand project management and the activities which comprise this area. Know the variables implied in project management such as time, resources, requirements, deadlines, and responding to unexpected events.*	*TRUE*	http://data.europa.eu/esco/skill/7111b95d-0ce3-441a-9d92-4c75d05c4388	*Awareness*

knowledge	project configuration management	*The process for the effective management of the key project artefacts and deliverables, ensuring that the correct versions are delivered to the project requestor and allowing project managers to identify the latest state of project artefacts and be able to gather all sources, documents, and other information for the project, prevent unauthorised changes, guarantee artefacts traceability and return to previous versions. It comprises the identification of project configuration items (CIs), their attributes and status codes, the establishment of baselines, the definition of roles and responsibilities for authorised changes to CIs, and the maintenance and control of a project repository.*	*TRUE*	http://data.europa.eu/esco/skill/ccb2e5f2-4279-48fd-9d85-a1db42ff1e13	*Awareness*
knowledge	*internal risk management policy*	*The internal risk management policies that identify, assess and prioritise risks in an IT environment. The methods used to minimise, monitor and control the possibility and the impact of disastrous events that affect the reaching of business goals.*	*TRUE*	http://data.europa.eu/esco/skill/0daaf096-1639-461c-bf1a-bbeea77e6b67	*Awareness*
knowledge	*corporate social responsibility*	*The handling or managing of business processes in a responsible and ethical manner considering the economic responsibility towards shareholders as equally important as the responsibility towards environmental and social stakeholders.*	*TRUE*	http://data.europa.eu/esco/skill/66db424f-2abe-420d-8e5b-186607266b61	*Practitioner*
knowledge	*corporate social responsibility*	*The handling or managing of business processes in a responsible and ethical manner considering the economic responsibility towards shareholders as equally important as the responsibility towards environmental and social stakeholders.*	*TRUE*	http://data.europa.eu/esco/skill/66db424f-2abe-420d-8e5b-186607266b61	*Practitioner*

P6.2 – Advanced Project Management

Partner name and ID	*P6-IAL-FVG*
Course ID	*P06.02*
Title	*Advanced Project Management*
Abstract	*Acquire the knowledge and advanced skills to develop a cloud-based business application using the Design Thinking methodology.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2939
Contact details	
Name	*Marianna Muin*
Email	marianna.muin@ial.fvg.it
Additional information	
Learning hours	*24*
Course level	*Intermediate*
Prerequisites	*Students with a good knowledge of computer science and English language*
Target group	*high-school students, technicians, bachelor students in their first years of studies*
ECTS points	*–*
ECVET points	*–*
EQF Levels	*5*
Content	*1. Logic and purpose of Design Thinking* * 1.1. Phases, tools and working methods* * 1.2. Fundamentals of continuous integration and continuous deployment* *2. Introduction to issue tracking systems* * 2.1. Management of maintenance and extension interventions* * 2.2. Characteristics of the monitoring systems of a system and an application*
Assessment	*Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
skill/competence	*manage project metrics*	*Gather, report, analyse and create key metrics for a project to help measure its success.*	*TRUE*	http://data.europa.eu/esco/skill/c5a135be-218d-48e6-a422-5225a576dcd8	*Practitioner*
skill/competence	*perform project management*	*Manage and plan various resources, such as human resources, budget, deadline, results, and quality necessary for a specific project, and monitor the project's progress in order to achieve a specific goal within a set time and budget.*	*TRUE*	http://data.europa.eu/esco/skill/cd5efa8c-e44d-4cbc-91c6-796018dbed68	*Practitioner*
skill/competence	*apply systemic design thinking*	*Apply the process of combining systems thinking methodologies with human-centred design in order to solve complex societal challenges in an innovative and sustainable way. This is most often applied in social innovation practices that focus less on designing stand-alone products and services to designing complex service systems, organizations or policies that bring value to the society as a whole.*	*TRUE*	http://data.europa.eu/esco/skill/4d30ad07-9e39-4899-81dd-02b280f162f9	*Practitioner*
skill/competence	*keep up with digital transformation of industrial processes*	*Keep up to date with digital innovations applicable to industrial processes. Integrate these transformations in the company's processes aiming for competitive and profitable business models.*	*TRUE*	http://data.europa.eu/esco/skill/0458f6a0-cb54-4ff5-a543-b2c5354e17c0	*Practitioner*
skill/competence	*automate cloud tasks*	*Automate manual or repeatable processes to minimize management overhead. Evaluate cloud automation alternatives for network deployments and tool-based alternatives for network operations and management.*	*TRUE*	http://data.europa.eu/esco/skill/ce8ae6ca-61d8-4174-b457-641de96cbff4	*Awareness*
skill/competence	*design cloud architecture*	*Design a multi-tier cloud architecture solution, which tolerates faults and is fit for the workload and other business needs. Identify elastic and scalable computing solutions, select high-performing and scalable storage solutions, and choose high-performing database solutions. Identify cost-effective storage, computing, and database services in the cloud.*	*TRUE*	http://data.europa.eu/esco/skill/11430d93-c835-48ed-8e70-285fa69c9ae6	*Awareness*
knowledge	*project management*	*Understand project management and the activities which comprise this area. Know the variables implied in project management such as time, resources, requirements, deadlines, and responding to unexpected events.*	*TRUE*	http://data.europa.eu/esco/skill/7111b95d-0ce3-441a-9d92-4c75d05c4388	*Practitioner*

knowledge		design thinking	The process used to identify creative solutions to problem solving, by putting the user at its core. The five stages approach-empathise, define, ideate, prototype and test-are meant to challenge assumptions and iterate solutions that are better suited to the needs of the user.	*TRUE*	http://data.europa.eu/esco/skill/df64a7cc-2e96-4304-95d3-56fe0ac2dd39	*Practitioner*
knowledge		cyber security	The methods that protect ICT systems, networks, computers, devices, services, digital information and people against illegal or unauthorised use.	*TRUE*	http://data.europa.eu/esco/skill/8088750d-8388-4170-a76f-48354c469c44	*Awareness*
knowledge		results-based management	The management strategy typically used by international governmental bodies (such as United Nations) and civil society organisations to monitor and measure the performance and achievement of results of a project or policy. It focuses on results defined as outputs, outcomes and impact which help organisations to achieve strategic goals.	*TRUE*	http://data.europa.eu/esco/skill/c513cf4e-83bb-4edc-9ac8-2a7df04a9451	*Awareness*
knowledge		project configuration management	The process for the effective management of the key project artefacts and deliverables, ensuring that the correct versions are delivered to the project requestor and allowing project managers to identify the latest state of project artefacts and be able to gather all sources, documents, and other information for the project, prevent unauthorised changes, guarantee artefacts traceability and return to previous versions. It comprises the identification of project configuration items (CIs), their attributes and status codes, the establishment of baselines, the definition of roles and responsibilities for authorised changes to CIs, and the maintenance and control of a project repository.	*TRUE*	http://data.europa.eu/esco/skill/ccb2e5f2-4279-48fd-9d85-a1db42ff1e13	*Practitioner*
knowledge		internal risk management policy	The internal risk management policies that identify, assess and prioritise risks in an IT environment. The methods used to minimise, monitor and control the possibility and the impact of disastrous events that affect the reaching of business goals.	*TRUE*	http://data.europa.eu/esco/skill/0daaf096-1639-461c-bf1a-bbeea77e6b67	*Practitioner*
knowledge		quality assurance methodologies	Quality assurance principles, standard requirements, and the set of processes and activities used for measuring, controlling and ensuring the quality of products and processes.	*TRUE*	http://data.europa.eu/esco/skill/c7cc6dc5-d56b-4323-8e5c-47c4022f615f	*Awareness*

P6.3 – ESCO, Europass and Eures Platforms for remote workforce development

Partner name and ID	*P6-IAL-FVG*
Course ID	*P06.03*
Title	*ESCO, Europass and Eures Platforms for remote workforce development*
Abstract	*Acquire the knowledge and skills to make the best use of Europass, ESCO and other platforms to enhance and promote the professional profile and plan training and career development.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2937
Contact details	
Name	*Marianna Muin*
Email	marianna.muin@ial.fvg.it
Additional information	
Learning hours	*15*
Course level	*Intermediate*
Prerequisites	*Students with a good knowledge of English language*
Target group	*high-school students, technicians and bachelor students*
ECTS points	*–*
ECVET points	*–*
EQF Levels	*4*
Content	*1. Europass Platform* * 1.1. Operating Logics* * 1.2. Practical application and spendability* *2. ESCO Platform* * 2.1. Operating Logics* * 2.2. Practical application and spendability* *3. Eures Platform* * 3.1. Operating Logics* * 3.2. Practical application and spendability* *4. Logics of functional integrated use of the three platforms*
Assessment	*Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	_
skill/competence	*interpret their knowledge and skills*	*interpret one's own knowledge and skills in the light of the training course attended, the professional expertise acquired and the use of the application logics of the main European professional codification and standardisation portals (Europass, ESCO and Eures)*	*FALSE*	-	*Practitioner*
skill/competence	*Enhance competences and past work expertise*	*Enhance one's own competences and past work expertise using the tools made available by the main European professional codification and standardisation portals (Europass, ESCO and Eures)*	*FALSE*	-	*Practitioner*
skill/competence	*Plan one's own training pathway*	*plan one's own training pathway at national and foreign level using the tools made available by the main European professional codification and standardisation portals (Europass, ESCO and Eures);C10*	*FALSE*	-	*Awareness*
skill/competence	*Plan career progression*	*plan one's career progression by taking advantage of the tools made available by the main European professional codification and standardisation portals (Europass, ESCO and Eures);*	*FALSE*	-	*Awareness*
skill/competence	*Use EU specific Platforms*	*use in a specific and/or integrated way the Use in a specific and/or integrated way the main European professional codification and standardisation portals (Europass, ESCO and Eures);*	*FALSE*	-	*Awareness*
knowledge	*EU Portals and Tools (Europass, ESCO and Eures);*	*understand the operating logics and tools of the main main European professional coding and standardisation portals (Europass, ESCO and Eures);*	*FALSE*	-	*Practitioner*

P6.4 – Canva at the service of developing a person's entrepreneurial spirit

Partner name and ID	P6-IAL-FVG
Course ID	*P06.04*
Course version	*v.01*
Title	*Canva at the service of developing a person's entrepreneurial spirit*
Abstract	*Develop Your Entrepreneurial Mindset: Design your entrepreneurial growth using the Canvas tool. Shape your professional strategy in line with your values and interests by identifying your strengths and weaknesses.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3025
Contact details	
Name	*Marianna Muin*
Email	marianna.muin@ial.fvg.it
Additional information	
Learning hours	*30*
Course level	*Beginner*
Prerequisites	*Students with a good knowledge of computer science and English language*
Target group	*high-school students, technicians*
ECTS points	
ECVET points	
EQF Levels	*4*

Content	*1. Define your customer segments*
	2. Estimate the value provided
	3. Identify the Channels for promoting yourself
	4. Establish strong customer relationships
	5. Define the Revenue Stream
	6. Identification
	    6.1. Identify the Key Activities
	    6.2. Identify your Key Resources
	    6.3. Identify the Key Partnerships
	7. Estimate the Costs

Assessment	*Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*entrepreneurship*	*The development, organisation and management of an own business venture.*	*TRUE*	http://data.europa.eu/esco/skill/658605f2-1c95-49f0-bd98-0af7b15ad0b0	*Awareness*
skill/competence	*show entrepreneurial spirit*	*Develop, organise and manage an own business venture, identifying and pursuing opportunities and mobilising resources, keeping in mind a profitability perspective. Demonstrate a proactive attitude and determination to achieve success in business*	*TRUE*	http://data.europa.eu/esco/skill/bdcf429c-5ccf-4c3d-bb61-4c987573a35e	*Awareness*
skill/competence	*develop professional network*	*Reach out to and meet up with people in a professional context. Find common ground and use your contacts for mutual benefit. Keep track of the people in your personal professional network and stay up to date on their activities.*	*TRUE*	http://data.europa.eu/esco/skill/bf5d77ad-e18c-48d8-83f0-bc79c011c74a	*Awareness*
skill/competence	*assess financial viability*	*Revise and analyse financial information and requirements of projects such as their budget appraisal, expected turnover, and risk assessment for determining the benefits and costs of the project. Assess if the agreement or project will redeem its investment, and whether the potential profit is worth the financial risk.*	*TRUE*	http://data.europa.eu/esco/skill/e95058a6-e139-42e7-a470-72038a606649	*Awareness*
knowledge	*digital marketing techniques*	*The marketing techniques used on the web to reach and engage with stakeholders, customers and clients.*	*TRUE*	http://data.europa.eu/esco/skill/43dfbe7f-9e10-4871-b171-e5076737b4cf	*Awareness*
knowledge	*social media marketing techniques*	*The marketing methods and strategies used to increase attention and website traffic through social media channels.*	*TRUE*	http://data.europa.eu/esco/skill/509909a2-4a8f-4ead-8ad0-968df63b77cc	*Awareness*

P6.5 – Entrepreneurship become a startupper

Partner name and ID	P6-IAL-FVG
Course ID	*P06.05*
Course version	*v.01*
Title	*Entrepreneurship become a startupper*
Abstract	*This startup operations course will examine the real-world operational challenges and execution risks associated with getting a new venture started. The course will provide you with a set of steps, frameworks, and tools that can be used to understand the important considerations for building a startup operation from scratch.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3027
Contact details	
Name	*Marianna Muin*
Email	marianna.muin@ial.fvg.it
Additional information	
Learning hours	*30*
Course level	*Beginner*
Prerequisites	*Students with a good knowledge of computer science and English language*
Target group	*high-school students, technicians*
ECTS points	
ECVET points	
EQF Levels	*4*
Content	*1. Idea & Problem Validation* *2. Building a Winning Team* *3. Market & Competitor Analysis* *4. Prototyping & MVP (Minimum Viable Product)* *5. User Acquisition* *6. Go-to-Market Strategy* *7. Fundraising & Investor Pitch* *8. Scalability & Growth* *9. Common mistakes to avoid*
Assessment	*Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*entrepreneurship*	*The development, organisation and management of an own business venture.*	*TRUE*	http://data.europa.eu/esco/skill/658605f2-1c95-49f0-bd98-0af7b15ad0b0	*Awareness*
skill/competence	*show entrepreneurial spirit*	*Develop, organise and manage an own business venture, identifying and pursuing opportunities and mobilising resources, keeping in mind a profitability perspective. Demonstrate a proactive attitude and determination to achieve success in business*	*TRUE*	http://data.europa.eu/esco/skill/bdcf429c-5ccf-4c3d-bb61-4c987573a35e	*Awareness*
skill/competence	*apply for research funding*	*Identify key relevant funding sources and prepare research grant application in order to obtain funds and grants. Write research proposals.*	*TRUE*	http://data.europa.eu/esco/skill/5f0082ab-2131-49b5-94d6-a1821daf57d6	*Awareness*
knowledge	*crowdfunding*	*The process of collecting money via internet to fund a project or a business, using digital strategies to collect small amounts of money from a large group of contributors.*	*TRUE*	http://data.europa.eu/esco/skill/1fc03dc8-0ee0-4876-83ec-86e0bfcb3876	*Awareness*
skill/competence	*assess financial viability*	*Revise and analyse financial information and requirements of projects such as their budget appraisal, expected turnover, and risk assessment for determining the benefits and costs of the project. Assess if the agreement or project will redeem its investment, and whether the potential profit is worth the financial risk.*	*TRUE*	http://data.europa.eu/esco/skill/e95058a6-e139-42e7-a470-72038a606649	*Awareness*
knowledge	*product life-cycle*	*The management of the life-cycle of a product from the development stages to the market entry and market removal.*	*TRUE*	http://data.europa.eu/esco/skill/21e0cad8-4eef-42be-b18b-0f8e37f0dbd0	*Awareness*

P6.6 – Developing a simple Business Plan

Partner name and ID	P6-IAL-FVG
Course ID	*P06.06*
Course version	*v.01*
Title	*Developing a simple Business Plan*
Abstract	*Acquire the essential knowledge and skills to create a simple business plan, in particular by defining clear objectives, understanding the target market and managing basic finances and transforming ideas into a comprehensive yet simple business plan.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3028
Contact details	
Name	*Marianna Muin*
Email	marianna.muin@ial.fvg.it
Additional information	
Learning hours	*30*
Course level	*Beginner*
Prerequisites	*Students with a good knowledge of computer science and English language*
Target group	*high-school students, technicians*
ECTS points	
ECVET points	
EQF Levels	*4*

Content	1. What is a Business Plan?
	  1.1. Why it's important and what it includes.
	2. Setting Clear Goals
	  2.1. Defining your business idea and goals.
	3. Market Research Basics
	  3.1. Identifying customers and competitors.
	4. Financial Planning
	  4.1. Estimating costs and planning income.
	5. Writing the Plan
	  5.1. Creating a simple executive summary and describing your product.
	6. Next Steps
	  6.1. Setting a timeline and taking action.

Assessment	*Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
skill/competence	*set sales goals*	*Set sales goals and objectives to be reached by a sales team within a period of time such as the target amount of sales made and new customers found.*	*TRUE*	http://data.europa.eu/esco/skill/89f5fa96-ae45-4906-902c-d50ca51009c6	*Awareness*
skill/competence	*research your target community*	*Match your skills with your research on the needs of the target community.*	*TRUE*	http://data.europa.eu/esco/skill/cbdce1f8-affe-4013-a519-283fa8ec1f6e	*Awareness*
knowledge	*think critically*	*Make and defend judgements based on internal evidence and external criteria. Critically evaluate the credibility and reliability of information before using or passing it on to others. Develop independent and critical thinking*	*TRUE*	http://data.europa.eu/esco/skill/7dd94ad3-13d6-43fe-8b94-51fcbf67ced9	*Awareness*
skill/competence	*develop business plans*	*Plan, write and collaborate in the implement business plans. Include and foresee in the business plan the market strategy, the competitive analysis of the company, the design and the development of the plan, the operations and the management aspects and the financial forecast of the business plan.*	*TRUE*	http://data.europa.eu/esco/skill/ead58f22-0af5-467c-ac1e-b750e4e1ac6a	*Awareness*
skill/competence	*assess financial viability*	*Revise and analyse financial information and requirements of projects such as their budget appraisal, expected turnover, and risk assessment for determining the benefits and costs of the project. Assess if the agreement or project will redeem its investment, and whether the potential profit is worth the financial risk.*	*TRUE*	http://data.europa.eu/esco/skill/e95058a6-e139-42e7-a470-72038a606649	*Awareness*

P6.7 – Circular economy in the manufacturing sector

Partner name and ID	P6-IAL-FVG
Course ID	*P06.07*
Course version	*v.01*
Title	*Circular economy in the manufacturing sector*
Abstract	*Develop a basic understanding of the key concepts of the circular economy as applied to the microelectronics industry with knowledge of key sustainable practices, resource efficiency, waste reduction and design principles for longevity and recyclability in microelectronics manufacturing and aspiration of practical examples of circular economy applications and their impact on the industry*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3029
Contact details	
Name	*Marianna Muin*
Email	marianna.muin@ial.fvg.it
Additional information	
Learning hours	*30*
Course level	*Beginner*
Prerequisites	*Students with a good knowledge of computer science and English language*
Target group	*high-school students, technicians*
ECTS points	
ECVET points	
EQF Levels	*4*

Content	1. Introduction to Circular Economy
	   1.1. Key principles and concepts
	   1.2. Benefits for sustainability
	2. Circular Economy in Microelectronics
	   2.1. Application of circular principles in microelectronics
	   2.2. Design for longevity and recyclability
	3. Resource Efficiency and Waste Reduction
	   3.1. Optimizing material use in microelectronics
	   3.2. Reducing electronic waste
	4. Sustainable Manufacturing Practices
	   4.1. Eco-friendly production processes
	   4.2. Closed-loop systems in microelectronics
	5. Case Studies and Practical Examples
	   5.1. Real-world applications of circular economy in microelectronics
	   5.2. Industry best practices
	6. Future Trends and Challenges
	   6.1. Innovations and future opportunities
	   6.2. Overcoming industry-specific challenges

Assessment	*Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	*circular economy*	*The circular economy aims to keep materials and products in use for as long as possible, extracting the maximum value from them while in use and recycling them at the end of their life cycle. It improves resource efficiency and helps to reduce the demand for virgin materials.*	*TRUE*	http://data.europa.eu/esco/skill/1619f337-77d4-401c-a090-277a7b7253fb	*Awareness*
knowledge	*product life-cycle*	*The management of the life-cycle of a product from the development stages to the market entry and market removal.*	*TRUE*	http://data.europa.eu/esco/skill/21e0cad8-4eef-42be-b18b-0f8e37f0dbd0	*Awareness*
skill/competence	*identify new recycling opportunities*	*Investigate ideas and spot opportunities to improve the collection, process and recycling of waste materials.*	*TRUE*	http://data.europa.eu/esco/skill/89f5fa96-ae45-4906-902c-d50ca51009c6	*Awareness*
skill/competence	*use sustainable materials and components*	*Identify, select environmentally friendly materials and components. Decide on the substitution of certain materials by the one that are environmentally friendly, maintaining the same level of functionality and other characteristics of the product.*	*TRUE*	http://data.europa.eu/esco/skill/73576419-31c2-4e45-8e30-ab1afec3db4e	*Awareness*
knowledge	*sustainable technologies*	*Technologies with the aim of reducing environmental and ecological risks, achieving at the same time, a positive economic, social, and environmental impact. They are innovative technologies designed to prevent, reduce and recover from the negative impact of humanity in the planet.*	*TRUE*	http://data.europa.eu/esco/skill/103f7814-d262-4df6-a1b6-759bc51f76cb	*Awareness*

P6.8 – Ensuring Health and Safety in Manufacturing

Partner name and ID	P6-IAL-FVG
Course ID	*P06.08*
Course version	*v.01*
Title	*Ensuring Health and Safety in Manufacturing*
Abstract	*Acquire the knowledge and practical skills to ensure health and safety in the manufacturing environment, manage risk, implement safety protocols, and address the economic and organizational aspects of maintaining a safe workplace.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3030
Contact details	
Name	*Marianna Muin*
Email	marianna.muin@ial.fvg.it
Additional information	
Learning hours	*30*
Course level	*Beginner*
Prerequisites	*Students with a good knowledge of computer science and English language*
Target group	*high-school students, technicians*
ECTS points	
ECVET points	
EQF Levels	*4*

Content	1. Introduction to Health and Safety in Manufacturing
	2. Importance of Health and Safety in Manufacturing
	    2.1. The role of health and safety in improving productivity
	    2.2. Impact on workers' well-being and business outcomes
	3. Health and Safety Legislation and Standards at EU level
	    3.1. Overview of international regulations (e.g., OSHA, EU directives)
	    3.2. Industry standards and codes of practice
	4. Key Roles and Responsibilities
	    4.1. Health and safety officers, workers, and management roles
	    4.2. Accountability in a manufacturing environment

Assessment	*Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
skill/competence	*promote health and safety*	*Promote the importance of a safe working environment. Coach and support staff to participate actively in the continuous development of a safe working environment.*	*TRUE*	http://data.europa.eu/esco/skill/93a68dcb-3dc6-4dbe-b196-f6d212228a50	*Awareness*
skill/competence	*advising on workplace health and safety issues*	*Promoting and providing information and advice on health and safety in the workplace.*	*TRUE*	http://data.europa.eu/esco/skill/08104c27-d4b2-4d40-ae97-dde65e71712f	*Awareness*
skill/competence	*inform on workplace safety standards*	*Inform managers and staff regarding workplace health and safety standards, especially in the case of dangerous environments, such as in the construction or mining industry.*	*TRUE*	http://data.europa.eu/esco/skill/41437077-2522-49bf-bcb2-083a23d52958	*Awareness*
skill/competence	*apply health and safety standards*	*Adhere to standards of hygiene and safety established by respective authorities.*	*TRUE*	http://data.europa.eu/esco/skill/dcc96a49-0bac-4a9c-8f8e-a32b4e47e6eb	*Awareness*
skill/competence	*prevent health and safety problems*	*Identify safety and health issues and come up with solutions to prevent accidents.*	*TRUE*	http://data.europa.eu/esco/skill/8006596d-605b-4088-a3f6-8e3aedec21ab	*Awareness*
knowledge	*health, safety and hygiene legislation*	*The set of health, safety and hygiene standards and items of legislation applicable in a specific sector*	*TRUE*	http://data.europa.eu/esco/skill/2dbdd054-896a-4167-8f11-e9b9ebcf199d	*Awareness*
skill/competence	*ensure health and safety in manufacturing*	*Ensure health and safety of personnel during manufacturing process.*	*TRUE*	http://data.europa.eu/esco/skill/60ccdd6a-c100-43cf-9797-543a5c42b922	*Awareness*

P7.1 – Sustainable Financial Literacy

Partner name and ID	*P7-ANCCP*
Course ID	*P07.01*
Title	*Sustainable Financial Literacy*
Abstract	*The aim of the Financial Sustainable Literacy (SFinLit) project is to apply the use of digital education technologies and pedagogies, alongside digital learning methodologies for the purposes of supporting students with the knowledge and skills they need to improve their financial literacy, digital literacy and learn to Learn competences. The course is a learning platform :A key innovation in this project is an open and flexible recommendation engine where students choose topics of interest and the learning platform presents them with relevant learning plans related to Sustainable Financial Education training.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2930
Contact details	
Name	*Marta Garcia*
Email	marta.garcia@bfs-ief.com
Additional information	
Learning hours	*30*
Course level	*Beginner*
Prerequisites	*Sustainable Financial Literacy Knowledge of finances and climate change*
Target group	*Secondary and VET Teachers and Students*
ECTS points	*2*
ECVET points	*2*
EQF Levels	*3*
Content	*1. Climate change and new business paradigms* *1.1. New challenges* *1.2. Business implications* *2. Introduction to sustainable finance, a tool to finance the transition to a sustainable economy* *2.1. Definition and basics of sustainable finance* *2.2. Role of sustainable finance* *3. Green finance and the circular economy* *3.1. Circular economy as an alternative economic model* *3.2. Green finance and basics of EU taxonomy of green activities* *4. Products and strategies in sustainable finance* *4.1. Main products and strategies in sustainable finance* *4.2. The impact of integrating sustainability in the financial industry*
Assessment	*Percentage of completion* *-Assessment based on completion materials (presentation, quizzes, etc.)* *-Knowledge check*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*S1 - Climate change and new business paradigms*	*K1- listen Assess the environmental impact of footwear manufacture and minimise environmental risks. Reduce environmentally harmful work practices in different stages of the footwear manufacturing.* *K2- browse some of the included external resources that may be of more interest to gain more knowledge related to the provided lessons and topics*	*PARTIAL*	http://data.europa.eu/esco/skill/1565b401-1754-4b07-8f1a-eb5869e64d95	*Awareness*
knowledge	*S2 -Introduction to sustainable finance, a tool to finance the transition to a sustainable economy.*	*K1- listen the process of integrating environmental, social and governance (ESG) considerations when making business or investment decisions, leading to increased longer-term investments into sustainable economic activities and projects.* *K2- browse some of the included external resources that may be of more interest to gain more knowledge related to the provided lessons and topics*	*PARTIAL*	http://data.europa.eu/esco/skill/203083ca-b051-4c28-8986-fc8731bacee5	*Awareness*
knowledge	*S3 - Green finance and the circular economy*	*K1- Listen the promote policies, actions and education programmes that encourage healthy lifestyles and proactive participation in sustainable consumption, and that lead to changes in consumers' attitudes, shopping habits and expectations.*	*PARTIAL*	http://data.europa.eu/esco/skill/e1da04bb-4de8-4d17-af8a-75ea893fe36a	*Awareness*
knowledge	*S3 - Green finance and the circular economy*	*K1- Listen materials and products in use for as long as possible, extracting the maximum value from them while in use and recycling them at the end of their life cycle. It improves resource efficiency and helps to reduce the demand for virgin materials.*	*PARTIAL*	http://data.europa.eu/esco/skill/22c45bf7-e52b-475f-847b-c32a87f65a5d	*Awareness*
knowledge	*S4 - Products and strategies in sustainable finance*		*FALSE*		*Awareness*

P7.2 – Effective equality for women and men in the workplace

Partner name and ID	*P7-ANCCP*
Course ID	*P07.02*
Title	*Effective equality for women and men in the workplace*
Abstract	*Spanish legislation has been adapting to the challenges of a changing reality. Since 2007 with Organic Law 3 2007 of March 22 to the present, there have been different milestones that have significantly affected the application of the regulations on GENDER EQUALITY and this forces us to analyze and adapt to the changes that have occurred. This course addresses the different challenges that new events bring with them in this area.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2940
Contact details	
Name	*Imma Miralles*
Email	imiralles@anccp.es
Additional information	
Learning hours	*2*
Course level	*Intermediate*
Prerequisites	*Future application as responsible or member of gender equality committee in the company*
Target group	*VET teachers and students*
ECTS points	*0*
ECVET points	*0*
EQF Levels	*3*
Content	*1. The Organic Law for Effective Equality for Women and Men* * 1.1. Regulatory framework on equality* * 1.2. Deadlines for implementation* *2. Guidelines and tools to carry out an equality plan* * 2.1. Definition of the equality plan (5 phases)* * 2.2. Tools for aiding the 5 phases of definition and implementation* * 2.3. Establishing equality commission in an organization* * 2.4. Appropriate measures and best practices*
Assesment	*Percentage of completion* *-Assessment based on completion materials (video)* *-Quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
skill/competence	*Regulatory framework on equality*	*Know the regulation of equality plans in the EU and in each country and what new developments they imply for companies*	*PARTIAL*	http://data.europa.eu/esco/skill/2e227d5d-649b-48dc-99ca-2389bbc1140f	*Practitioner*
skill/competence	*Guidelines and tools to carry out an equality plan*	*Know what the phases of the plan are and how an equality commission is formed.* *Know the tools that can be used* *Know the most common measures to apply*	*PARTIAL*	http://data.europa.eu/esco/skill/2e227d5d-649b-48dc-99ca-2389bbc1140f	*Practitioner*

P7.3 – Circuit Training with Analog Devices Direct Current (CTAD-DC)

Partner name and ID	*P7-ANCCP*
Course ID	*P07.03*
Course version	*v.01*
Title	*Circuit Training with Analog Devices Direct Current (CTAD-DC)*
Abstract	*The course is a learning platform. This course brings the analogue signal processing technology that Analog Devices has developed to the academic community in a way that is open and accessible to teachers and students to enrich students' education of analogue circuits. Integrated circuits design and system design. This course offers a foundational understanding of basic electrical concepts such as voltage, current, and resistance. Students will explore Ohm's law, resistor networks, and Kirchhoff's laws. The course covers linear circuit behaviour, the superposition theorem, and methods for simplifying circuits using Thévenin's theorem, equipping learners with essential tools for circuit analysis.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3002
Contact details	
Name	*Oscar Casanova*
Email	oscar.casanova@anccp.es
Additional information	
Learning hours	*25*
Course level	*Beginner*
Prerequisites	*Physical, Basic mathematical calculation, Knowledge of current and voltage sources*
Target group	*VET teachers and students*
ECTS points	*1*
ECVET points	*1*
EQF Levels	*4*

Content	*1. Introduction to electrotechnics*
	    1.1. Basic terms; voltage, current, resistance
	    1.2. Basic relationships between voltage, current and resistance; Ohm's law
	    1.3. Analysing resistors in serial and parallel connections (voltage division, current division)
	2. Basics of circuit theory and network analysis
	    2.1. Kirchhoff's first law (junction rule)
	    2.2. Kirchhoff's second law (loop rule)
	3. Linear circuits
	    3.1. Properties of linear circuits
	    3.2. Superposition theorem
	4. Simplifying circuit analysis
	    4.1. Reducing one-port networks
	    4.2. Thévenin's theorem

Assessment	*Assessment based on completion materials (videos, quizzes, etc.); fixed quizzes, assessment based on software simulation activities*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	_
skill/competence	*interpret circuit diagrams*	*Read and comprehend circuit diagrams showing the connections between the devices, such as power and signal connections.*	*TRUE*	http://data.europa.eu/esco/skill/02c71cde-f513-43da-8952-0974763c7568	*Awareness*
knowledge	*electrical wiring diagrams*	*The visual schematic representation of an electrical circuit, its components, and the connections between these components.*	*TRUE*	http://data.europa.eu/esco/skill/ed291aa0-8b2f-4179-b2f7-540ea6f63bf3	*Awareness*
knowledge	*electronic components*	*Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.*	*TRUE*	http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b	*Awareness*
knowledge	*electronics*	*The functioning of electronic circuit boards, processors, chips, and computer hardware and software, including programming and applications.*	*TRUE*	http://data.europa.eu/esco/skill/95c35c3a-035f-47c2-90cf-7e934d20fc08	*Awareness*

P7.4 – Circuit Training with Analog Devices Alternating Current (CTAD-AC)

Partner name and ID	*P7-ANCCP*
Course ID	*P07.04*
Course version	*v.01*
Title	*Circuit Training with Analog Devices Alternating Current (CTAD-AC)*
Abstract	*The course is a learning platform. This course brings the analogue signal processing technology that Analog Devices has developed to the academic community in a way that is open and accessible to teachers and students to enrich students' education of analogue circuits. Integrated circuits design and system design. This course introduces the fundamentals of alternating current (AC), including signal properties, phase shift, and behaviour circuits consisting of passive components. Students will analyze transient responses in RC circuits and learn to determine time constants. The course also covers AC power concepts—real, reactive, and apparent power—and the power factor. Finally, it explores the principles and types of signal filters, including high-pass, low-pass, band-pass, and band-reject filters.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3003
Contact details	
Name	*Oscar Casanova*
Email	oscar.casanova@anccp.es
Additional information	
Learning hours	*25*
Course level	*Intermediate*
Prerequisites	*Physical, Basic mathematical calculation, Knowledge of current and voltage sources*
Target group	*VET teachers and students*
ECTS points	*1*
ECVET points	*1*
EQF Levels	*5*
Content	*1. Basics of alternating current (AC)* *1.1. Introduction to and properties of alternating current, and signals* *1.2. Phase difference and phase shift in AC circuits using passive components* *2. Transient analysis* *2.1. Response of RC circuits with external DC excitation* *2.2. Determining and understanding the time constant of RC circuits* *3. Power and Power Factor in AC circuits* *3.1. Time varying voltages, currents, and loads* *3.2. Definition of real power, reactive power and apparent power; deriving the power factor* *3.3. Lagging, leading and unity power factors* *4. Filters* *4.1. Basic principles of signal filters* *4.2. Types of signal filters; high-pass, low-pass, band-pass, and band-reject*
Assessment	*Assessment based on completion materials (videos, quizzes, etc.); fixed quizzes, assessment based on software simulation activities*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
skill/competence	*interpret circuit diagrams*	*Read and comprehend circuit diagrams showing the connections between the devices, such as power and signal connections.*	*TRUE*	http://data.europa.eu/esco/skill/02c71cde-f513-43da-8952-0974763c7568	*Practitioner*
knowledge	*electrical wiring diagrams*	*The visual schematic representation of an electrical circuit, its components, and the connections between these components.*	*TRUE*	http://data.europa.eu/esco/skill/ed291aa0-8b2f-4179-b2f7-540ea6f63bf3	*Practitioner*
knowledge	*electronic components*	*Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.*	*TRUE*	http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b	*Practitioner*
knowledge	*electronics*	*The functioning of electronic circuit boards, processors, chips, and computer hardware and software, including programming and applications.*	*TRUE*	http://data.europa.eu/esco/skill/95c35c3a-035f-47c2-90cf-7e934d20fc08	*Practitioner*
knowledge	*integrated circuits*	*Electronic components, made up from a set of electronic circuits which are placed on semiconductor material, such as silicon. Integrated circuits (IC) can hold billions of electronic components on a microscale and are one of basic components of electronic devices.*	*TRUE*	http://data.europa.eu/esco/skill/2b9f4584-da2e-44e2-a2fb-4dd4fc64c1a2	*Practitioner*
knowledge	*integrated circuit types*	*Types of integrated circuits (IC), such as analog integrated circuits, digital integrated circuits, and mixed-signal integrated circuits.*	*TRUE*	http://data.europa.eu/esco/skill/61c81161-b732-4c47-aba5-9e554d9a853f	*Practitioner*

P7.5 – Training in Electronic Circuits with Analog Devices TECAD

Partner name and ID	*P7-ANCCP*
Course ID	*P07.05*
Course version	*v.01*
Title	*Training in Electronic Circuits with Analog Devices TECAD*
Abstract	*The course is a learning platform. This course brings the analogue signal processing technology that Analog Devices has developed to the academic community in a way that is open and accessible to teachers and students to enrich students' education of analogue circuits. Integrated circuits design and system design. This course explores the fundamentals of semiconductor devices, starting with diodes and the behaviour of PN junctions. It covers the principles of transistors and both voltage- and current-controlled devices. The course includes topics on high-power transistors, BJT and MOSFET characteristics and bias. Students will learn about transistor applications in amplifiers and current sources. The course concludes with an introduction to operational amplifiers and their use in linear signal processing tasks.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3004
Contact details	
Name	*Oscar Casanova*
Email	oscar.casanova@anccp.es
Additional information	
Learning hours	*50*
Course level	*Intermediate*
Prerequisites	*electrical circuits, Thevenin and Norton theorem, knowledge of current and voltage sources*
Target group	*VET teachers and students*
ECTS points	*2*
ECVET points	*2*
EQF Levels	*5,6*
Content	*1. Diodes* 　*1.1. Introduction to semiconductor basics and PN junctions* 　*1.2. The forward-bias and the reverse-bias properties of PN junctions* *2. Characteristics of transistors* 　*2.1. Introduction to active devices* 　*2.2. Voltage-controlled active devices* 　*2.3. Current-controlled active devices* *3. BJT and MOSFET transistors* 　*3.1. Introduction to high power active devices* 　*3.2. Exploring the BIAS point of BJT and MOSFET transistors* *4. Applications of transistors* 　*4.1. Amplifiers with transistors and their integration in electronic circuits* 　*4.2. Current source circuits involving transistors.* *5. Operational amplifiers* 　*5.1. Introduction to OpAmps* 　*5.2. Basic building blocks of linear design* 　*5.3. Using OpAmps for signal operations, like addition, subtraction, integration, etc.*
Assessment	*Assessment based on completion materials (videos, quizzes, etc.); fixed quizzes, assessment based on software simulation activities*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
skill/competence	*interpret circuit diagrams*	*Read and comprehend circuit diagrams showing the connections between the devices, such as power and signal connections.*	*TRUE*	http://data.europa.eu/esco/skill/02c71cde-f513-43da-8952-0974763c7568	*Practitioner*
knowledge	*electrical wiring diagrams*	*The visual schematic representation of an electrical circuit, its components, and the connections between these components.*	*TRUE*	http://data.europa.eu/esco/skill/ed291aa0-8b2f-4179-b2f7-540ea6f63bf3	*Practitioner*
knowledge	*electronic components*	*Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.*	*TRUE*	http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b	*Practitioner*
knowledge	*electronics*	*The functioning of electronic circuit boards, processors, chips, and computer hardware and software, including programming and applications.*	*TRUE*	http://data.europa.eu/esco/skill/95c35c3a-035f-47c2-90cf-7e934d20fc08	*Practitioner*
knowledge	*integrated circuits*	*Electronic components, made up from a set of electronic circuits which are placed on semiconductor material, such as silicon. Integrated circuits (IC) can hold billions of electronic components on a microscale and are one of basic components of electronic devices.*	*TRUE*	http://data.europa.eu/esco/skill/2b9f4584-da2e-44e2-a2fb-4dd4fc64c1a2	*Practitioner*
knowledge	*integrated circuit types*	*Types of integrated circuits (IC), such as analog integrated circuits, digital integrated circuits, and mixed-signal integrated circuits.*	*TRUE*	http://data.europa.eu/esco/skill/61c81161-b732-4c47-aba5-9e554d9a853f	*Practitioner*
knowledge	*printed circuit boards*	*Printed circuit boards (PCB) are essential components to almost all electronic devices. They consist of thin wafers or substrates on which electronic components, such as microchips, are placed. The electronic components are electrically connected through conductive tracks and pads.*	*TRUE*	http://data.europa.eu/esco/skill/6a2bc03b-e30d-429b-9549-5784cb92ae2f	*Practitioner*

P9.1 – Introduction to MEMS Technology

Partner name and ID	*P09 - Tyndall*
Course ID	*P09.01*
Course version	*v.01*
Title	*Introduction to MEMS Technology*
Abstract	*The aim of this course is to Introduce Micro Electro Mechanical Systems (MEMS) development and give an overview of fabrication technology and applications. It will cover an introduction to Smart materials: Piezo Electric, Piezo resistive, Shape Memory Alloys; the need for miniaturization of devices, Micro Mechanical structures and Application of Smart Materials and Microsystems: Inkjet jet printer, RT PCR testing, Accelerometer etc. It will also provide an Introduction to Micro Machining:- Bulk and Surface micro machining, an overview of the steps in MEMS fabrication Case studies of issues in micromachining will be described as well as some basic concepts of Integration of Micro and Smart Systems with micro electronics and micro systems packaging.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3089
Contact details	
Name	*Veda Sandeep Nagaraja*
Email	veda.sandeep@tyndall.ie
Additional information	
Learning hours	*8*
Course level	*Intermediate*
Prerequisites	*Previous understanding of microelectronics technology. Bachelor degree in electrical engineering (or equivalent)*
Target group	*Students or R&D employees, without previous knowledge of MEMS*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*5,6*
Content	*1. MEMS Introduction* *2. MEMS Smart materials & Systems- Part 1* *3. MEMS Smart materials & Systems- Part 2* *4. MEMS Sensing and actuation mechanisms* *5. MEMS Fabrication - Part 1* *6. MEMS Fabrication - Part 2* *7. MEMS Fabrication and Packaging issues and challenges* *8. MEMS Applications*
Assessment	*N/A*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	_
knowledge	*microelectromechanical systems*	*Microelectromechanical systems (MEMS) are miniaturised electromechanical systems made using processes of microfabrication. MEMS consist of microsensors, microactuators, microstructures, and microelectronics. MEMS can be used in a range of appliances, such as ink jet printer heads, digital light processors, gyroscopes in smart phones, accelerometers for airbags, and miniature microphones.*	*TRUE*	http://data.europa.eu/esco/skill/b8b2a035-38f0-4c0e-94ee-edefc266c643	*Awareness*
knowledge	*microsensors*	*Devices with a size smaller than 1 mm that can convert a non-electric signal, such as temperature, into an electrical signal. Because of their size, microsensors offer better accuracy, range, and sensitivity compared to larger sensors.*	*TRUE*	http://data.europa.eu/esco/skill/e763b5c3-cfb3-48d2-9b83-fff97553ad95	*Awareness*
skill/competence	*package microelectromechanical systems*	*Integrate the microelectromechanical systems (MEMS) into microdevices through assembly, joining, fastening, and encapsulation techniques. Packaging allows for the support and protection of the integrated circuits, printed circuit boards, and associate wire bonds.*	*TRUE*	http://data.europa.eu/esco/skill/dc13a28b-39fd-4090-9e66-53a6003445a5	*Awareness*
skill/competence	*design microelectromechanical systems*	*Design and develop microelectromechanical systems (MEMS), such as microsensing devices. Make a model and a simulation using technical design software to assess the viability of the product and examine the physical parameters to ensure a successful production process.*	*TRUE*	http://data.europa.eu/esco/skill/c022ff1b-7783-4e64-89ef-0422c81ff51f	*Awareness*
skill/competence	*test microelectromechanical systems*	*Test microelectromechanical systems (MEMS) using appropriate equipment and testing techniques, such as thermal shock tests, thermal cycling tests, and burn-in tests. Monitor and evaluate system performance and take action if needed.*	*TRUE*	http://data.europa.eu/esco/skill/23236dce-adc6-47bc-91e2-6701a93ece58	*Awareness*

P10.1 – Introduction to Test Engineering for IC Development

Partner name and ID	*P10 - IFAT*
Course ID	*P10.01*
Course version	*v.1*
Title	*Introduction to Test Engineering for IC Development*
Abstract	*Test engineering is a key role within an IC company but it is generally unknown to students and graduates without work experience. This course aims to close this learning gap by giving a deep overview to test engineering, including theory and practical examples. The course is kept at a general abstraction level to be independent from the specific test equipment and processes which might be in use in a particular IC company.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3019
Contact details	
Name	*Dunja Suttnig*
Email	dunja.suttnig@infineon.com
Additional information	
Learning hours	*4*
Course level	*Beginner*
Prerequisites	*Previous understanding of microelectronics technology, hardware and software development.Bachelor degree in electrical engineering (or equivalent)*
Target group	*Students or R&D employees, without previous knowledge of test engineering*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*5,6*
Content	*1.Introduction: what is production test?* *2.Test Engineering Team: overview about the different roles in the test engineering group* *3.Test Equipment: hardware used in production test* *4.ATE (Automatic Test Equipment) Architecture: architectural description of the modern automatic test equipment* *5.Test Methods: applied numerical methods for test (ramps, search methods, digital processing)* *6.Mixed Signal Testing: overview about most common tests and issues*
Assessment	*e.g., Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
skill/competence	*measure electrical characteristics*	*Measure voltage, current, resistance or other electrical characteristics by using electrical measuring equipment such as multimeters, voltmeters, and ammeters.*	*TRUE*	http://data.europa.eu/esco/skill/270de514-3206-4cf9-b122-0f148ab06fa1	*Awareness*
knowledge	*hardware testing methods*	*Those processes in which hardware components or systems are tested, such as the system test (ST), the ongoing reliability test (ORT), and the in-circuit test (ICT).*	*TRUE*	http://data.europa.eu/esco/skill/53456d90-8c0d-4bd2-9f1b-312619b6e2a6	*Awareness*
skill/competence	*perform test run*	*Perform tests putting a system, machine, tool or other equipment through a series of actions under actual operating conditions in order to assess its reliability and suitability to realise its tasks, and adjust settings accordingly.*	*TRUE*	http://data.europa.eu/esco/skill/465ff64a-1271-4064-8ed1-e969cb68d8b4	*Awareness*
knowledge	*instrument performance elements*	*Elements that indicate or influence instrument performance. A first indication of the performance of the instrument is the accuracy or precision of the instrument, such as its response time, resolution, and range. A second indication of performance is the technical performance of the instrument, such as its power level, the electromagnetic interference, and transient voltages. A third indication of performance are environmental factors that can influence instrument performance, such as humidity, operating temperatures, or dust.*	*TRUE*	http://data.europa.eu/esco/skill/69fe6624-bc7f-412e-ad6d-35c7b0df842e	*Awareness*
knowledge	*electronic test procedures*	*Testing protocols that enable a variety of analyses of electronic systems, products, and components. These tests include the testing of electrical properties, such as voltage, current, resistance, capacitance, and inductance as well as the testing of specific electronic components, such as the electron tubes, semiconductors, integrated circuits, and batteries. These tests include visual inspection, performance tests, environment tests, and safety tests.*	*TRUE*	http://data.europa.eu/esco/skill/0e9e3a56-3b26-4fa5-91df-6d9bfbea4259	*Awareness*
skill/competence	*test microelectronics*	*Test microelectronics using appropriate equipment. Gather and analyse data. Monitor and evaluate system performance and take action if needed.*	*TRUE*	http://data.europa.eu/esco/skill/7957b5f9-1f33-4ff8-84e9-e258b17882c2	*Awareness*
skill/competence	*analyse test data*	*Interpret and analyse data collected during testing in order to formulate conclusions, new insights or solutions.*	*TRUE*	http://data.europa.eu/esco/skill/81a2db2c-7e55-44d0-9cd9-74c25147d7cd	*Awareness*

P10.2 – Introduction to Plasmaetching

Partner name and ID	*P10 - IFAT*
Course ID	*P10.02*
Course version	*v.01*
Title	*Introduction to Plasmaetching*
Abstract	*Plasma etching is one of the four big methods to structure semiconductors.* *This course develops an understanding to the basic concepts of plasmaetching in a today state of the art Semiconductor manufacturing environment. Upon successful completion of this course, students should be able to demonstrate a comprehensive understanding of plasma etching techniques. Specifically, they should be able to explain the different kinds of plasma etching that exist, allowing them to identify the most suitable method for a particular application.* *Students should also be able to judge whether plasma etching is an effective method for solving a specific topographic structuring requirement. This involves analyzing the requirements of the project and determining whether plasma etching can meet those needs.* *In addition to understanding the general principles of plasma etching, students should have an idea of which plasma chemistry is best suited for specific etching requirements. This knowledge will enable them to select the most effective plasma chemistry for a given application.* *Another key aspect of plasma etching that students should understand is endpointing of plasma processes. They should know how endpointing works and where it is needed, allowing them to optimize the plasma etching process for their specific requirements.* *Students should also be familiar with the basic expressions used in plasma etching, including plasma potential, self-bias, external bias, and DC/AC plasma working principle. Understanding these concepts is essential for designing and optimizing plasma etching systems.* *Finally, students should know the basic plasma chamber configurations, which will enable them to design and build effective plasma etching systems.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3048
Contact details	
Name	*Dunja Suttnig*
Email	dunja.suttnig@infineon.com
Additional information	
Learning hours	*5*
Course level	*Beginner*
Prerequisites	*Basic technical understanding, no specific knowledge*
Target group	*Engineers, Technicians, highshool students*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*5,6,7*
Content	*1. Definition of plasma and the role of electrons* *1.1. Magnetic fields in plasma* *1.2. The interesting species in plasma* *1.3. The meaning of free mean path* *2. What to etch / chemicals to etch / chemical reactions for etch* *3. The plasma zoo* *3.1. The numbers of molecules and various particles in plasma* *3.2. The effect of plasma potential and plasma self bias* *3.3. Principle chamber configurations and applications for isotropic etch* *4. Typical daily work troubles to tackle* *5. Summary*
Assessment	*e.g., Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
skill/competence	*apply advanced manufacturing*	*Improve production rates, efficiencies, yields, costs, and changeovers of products and processes using relevant advanced, innovative, and cutting edge technology*	*TRUE*	http://data.europa.eu/esco/skill/4f0e579d-ca7b-427c-ace6-9e2de3eb19c7	*Awareness*
knowledge	*manufacturing processes*	*The steps required through which a material is transformed into a product, its development and full-scale manufacturing.*	*TRUE*	http://data.europa.eu/esco/skill/3786b61f-f22e-48d1-af8d-ad4c354534db	*Awareness*
knowledge	*semiconductors*	*Semiconductors are essential components of electronic circuits and contain properties of both insulators, such as glass, and conductors, such as copper. Most semiconductors are crystals made of silicon or germanium. By introducing other elements in the crystal through doping, the crystals turn into semiconductors. Depending on the amount of electrons created by the doping process, the crystals turn into N-type semiconductors, or P-type semiconductors.*	*TRUE*	http://data.europa.eu/esco/skill/e5e17773-3a63-40c5-99e4-10e036cf7b99	*Awareness*

P10.3 – Semiconductor Carrier Systems

Partner name and ID	*P10 - IFAT*
Course ID	*P10.03*
Course version	*v.1*
Title	*Semiconductor Carrier Systems*
Abstract	*In this training the different types of Wafer-Carrier-technologies are presented. After a historic development of different carrier-technologies, the most efficient reversible and irreversible techniques are presented. The different mechanism of bonding and debonding is explained and the use of different carrier for different purpose are shown.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3026
Contact details	
Name	*Dunja Suttnig*
Email	dunja.suttnig@infineon.com
Additional information	
Learning hours	*3*
Course level	*Beginner*
Prerequisites	*Basic principles of semiconductor manufacturing processes*
Target group	*Process-Engineers, Product-Developer, Young Professionals*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*6,7*
Content	*1. Introduction; Classification and physical / chemical basics of Wafer-Support-Carrier* *2. Reversible Carrier technologies* *　2.1. "Foil"-Carrier* *　2.2. REVALPHA®-Carrier* *　2.3. 3M®-Carrier / long-, mid- & short Thin-Wafer-Process* *　2.4. "DBG&M"-approach* *　2.5. Bow-topics* *3. Irreversible Carrier technologies* *　3.1.SOI- / Direct- / Anodic-bonding* *　3.2. "GlassGrid"-approach e*
Assessment	*e.g., Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	integrated circuits	Electronic components, made up from a set of electronic circuits which are placed on semiconductor material, such as silicon. Integrated circuits (IC) can hold billions of electronic components on a microscale and are one of basic components of electronic devices.	TRUE	http://data.europa.eu/esco/skill/2b9f4584-da2e-44e2-a2fb-4dd4fc64c1a2	Awareness
knowledge	microelectronics	Microelectronics is a subdiscipline of electronics and relates the study, design, and manufacture of small electronic components, such as microchips.	TRUE	http://data.europa.eu/esco/skill/4b164a27-849f-4be2-ae79-d26a4969b677	Awareness
knowledge	semiconductors	Semiconductors are essential components of electronic circuits and contain properties of both insulators, such as glass, and conductors, such as copper. Most semiconductors are crystals made of silicon or germanium. By introducing other elements in the crystal through doping, the crystals turn into semiconductors. Depending on the amount of electrons created by the doping process, the crystals turn into N-type semiconductors, or P-type semiconductors.	TRUE	http://data.europa.eu/esco/skill/e5e17773-3a63-40c5-99e4-10e036cf7b99	Awareness

P10.4 – Integrated Circuits design flow and transfer of digital / analog macros into system on chip (SoC)

Partner name and ID	*P10 - IFAT*
Course ID	*P10.04*
Course version	*v.1*
Title	*Integrated Circuits design flow and transfer of digital / analog macros into system on chip (SoC)*
Abstract	*Analog and digital IP blocks are developed using different methodologies and EDA tools. But when integrating them into one SoC they have to function together. This is a big challenge with respect to fulfilling the required functionality, reliability, performance and quality.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3023
Contact details	
Name	*Dunja Suttnig*
Email	dunja.suttnig@infineon.com
Additional information	
Learning hours	*5*
Course level	*Beginner*
Prerequisites	*Previous understanding of microelectronics and computer aided design in electronics*
Target group	*Students, young professionals*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*6,7*
Content	*1. High level presentation about analog mixed signal flow and PDK for IC design* *2. Introduction to Analog/Mixed Signal IC Design and Verification Flow* *3. Presentation about the digital chip/IP flow and verification* *4. Presentation how the transfer of analog IP blocks into digital „System on Chip" is done*
Assessment	*Moodle like quiz test - part 1*

Type[1)]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3)]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
skill/competence	*develop product design*	*Convert market requirements into product design and development.*	*TRUE*	http://data.europa.eu/esco/skill/fd4386c5-96f0-4c6e-970c-c08729ae0cc6	*Awareness*
knowledge	*integrated circuits*	*Electronic components, made up from a set of electronic circuits which are placed on semiconductor material, such as silicon. Integrated circuits (IC) can hold billions of electronic components on a microscale and are one of basic components of electronic devices.*	*TRUE*	http://data.europa.eu/esco/skill/2b9f4584-da2e-44e2-a2fb-4dd4fc64c1a2	*Awareness*
knowledge	*microelectronics*	*Microelectronics is a subdiscipline of electronics and relates the study, design, and manufacture of small electronic components, such as microchips.*	*TRUE*	http://data.europa.eu/esco/skill/4b164a27-849f-4be2-ae79-d26a4969b677	*Awareness*
knowledge	*semiconductors*	*Semiconductors are essential components of electronic circuits and contain properties of both insulators, such as glass, and conductors, such as copper. Most semiconductors are crystals made of silicon or germanium. By introducing other elements in the crystal through doping, the crystals turn into semiconductors. Depending on the amount of electrons created by the doping process, the crystals turn into N-type semiconductors, or P-type semiconductors.*	*TRUE*	http://data.europa.eu/esco/skill/e5e17773-3a63-40c5-99e4-10e036cf7b99	*Awareness*
skill/competence	*interpret electronic design specifications*	*Analyse and understand detailed electronic design specifications.*	*TRUE*	http://data.europa.eu/esco/skill/e76dd90d-91c4-49c0-bfd0-dfa2c4c90c81	*Awareness*
knowledge	*system design*	*The process of defining the architecture for different components and modules of a system, as well as the relevant data, for satisfying specific requirements.*	*TRUE*	http://data.europa.eu/esco/skill/fae27053-8924-4bfd-b565-c9fe502044c9	*Awareness*

118

skill/competence	design microelectronics	Design and develop microelectronic systems, products, and components according to specifications, such as microchips.	TRUE	http://data.europa.eu/esco/skill/8712b176-c063-462f-9d0f-2e3c54d9a2eb	Awareness
skill/competence	model microelectronics	Model and simulate microelectronic systems, products, and components using technical design software. Assess the viability of the product and examine the physical parameters to ensure a successful production process.	TRUE	http://data.europa.eu/esco/skill/ce6242a1-a2d9-43e6-a481-ae89b9ec0460	Awareness
skill/competence	design circuits using CAD	Draught sketches and design electronic circuitry; utilise Computer Aided Design (CAD) software and equipment.	TRUE	http://data.europa.eu/esco/skill/9ba355be-f119-42b6-a7d6-52f6ce2e4a3f	Awareness
skill/competence	design integrated circuits	Design and draft integrated circuits (IC) or semiconductors, such as microchips, used in electronic products. Integrate all necessary components, such as diodes, transistors, and resistors. Pay attention to the design of input signals, output signals, and power availability.	TRUE	http://data.europa.eu/esco/skill/6d12ac9b-5ec0-49b9-bd70-5a19352585cb	Awareness

P10.5 – Process Control Monitoring - measurement in wafer manufacturing

Partner name and ID	*P10 - IFAT*
Course ID	*P10.05*
Course version	*v.1*
Title	*Process Control Monitoring - measurement in wafer manufacturing*
Abstract	*Process Control Monitoring is an electrical measurement at PCM test structures to ensure that the manufacturing processes have been executed as specified. Process deviations can be detected early long before the chip is delivered to the customer by stability monitoring.* *The course focuses on the manufacturing part of the PCM wafer testing by explaining the overall measurement process and giving some insights to used equipment/recipe components.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3033
Contact details	
Name	*Dunja Suttnig*
Email	dunja.suttnig@infineon.com
Additional information	
Learning hours	*2*
Course level	*Beginner*
Prerequisites	*Basic understanding of semiconductor manufacturing*
Target group	*students, young professionals*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*6*
Content	*1. Purpose of PCM* *　1.1. Function: detect deviations, stability monitoring, corrective actions* *　1.2. PCM in the overall manufacturing process flow* *2. PCM measurement process at wafer level* *　2.1. Measurement location at wafer: PCM modules* *　2.2. Equipment: Tester, Prober, Probecard* *　2.3. Recipe components: Test program, Limits, Userfile, Wafermap, Module coordinates, Prober setup*
Assessment	*e.g., Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*quality assurance methodologies*	*Quality assurance principles, standard requirements, and the set of processes and activities used for measuring, controlling and ensuring the quality of products and processes.*	*TRUE*	http://data.europa.eu/esco/skill/c7cc6dc5-d56b-4323-8e5c-47c4022f615f	*Awareness*
knowledge	*quality assurance procedures*	*The procedures to inspect a product or system to ensure that it is according to specifications and requirements.*	*TRUE*	http://data.europa.eu/esco/skill/1177c6f5-09c5-4c35-873c-afd22d170ad3	*Awareness*
skill/competence	*conduct quality control analysis*	*Conduct inspections and tests of services, processes, or products to evaluate quality.*	*TRUE*	http://data.europa.eu/esco/skill/41a3240f-58ba-44e2-a688-edeb21ea5c16	*Awareness*
skill/competence	*measure electrical characteristics*	*Measure voltage, current, resistance or other electrical characteristics by using electrical measuring equipment such as multimeters, voltmeters, and ammeters.*	*TRUE*	http://data.europa.eu/esco/skill/270de514-3206-4cf9-b122-0f148ab06fa1	*Awareness*
knowledge	*hardware testing methods*	*Those processes in which hardware components or systems are tested, such as the system test (ST), the ongoing reliability test (ORT), and the in-circuit test (ICT).*	*TRUE*	http://data.europa.eu/esco/skill/53456d90-8c0d-4bd2-9f1b-312619b6e2a6	*Awareness*
knowledge	*in-circuit test*	*Test to assess the correct manufacture of printed circuit boards (PCB). The in-circuit test (ICT) tests for shorts, resistance, and capacitance, and can be performed with a "bed of nails" tester or with a fixtureless in-circuit test (FICT).*	*TRUE*	http://data.europa.eu/esco/skill/f4b3b063-02df-4a92-bb0e-d01e45642c6f	*Awareness*
skill/competence	*test microelectronics*	*Test microelectronics using appropriate equipment. Gather and analyse data. Monitor and evaluate system performance and take action if needed.*	*TRUE*	http://data.europa.eu/esco/skill/7957b5f9-1f33-4ff8-84e9-e258b17882c2	*Awareness*

P10.6 – Introduction to power MOSFETs

Partner name and ID	*P10 - IFAT*
Course ID	*P10.06*
Course version	*v.1*
Title	*Introduction to power MOSFETs*
Abstract	*The participant will learn power MOSFET electrical behaviour and device physics. They will understand factors to consider when using power MOSFETs in their applications and understand how these factors depend on the underlying power MOSFET technology. (They will understand the key processes involved in manufacturing a power MOSFET : optional).*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3020
Contact details	
Name	*Dunja Suttnig*
Email	dunja.suttnig@infineon.com
Additional information	
Learning hours	*2*
Course level	*Beginner*
Prerequisites	*Basic understanding of physics*
Target group	*Engineers, Technicians*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*6,7*
Content	*1. Basic overview of Power MOSFETs* *2. Structure of a power MOSFET* *3. Electrical behaviour of power MOSFETs* *4. Device physics of power MOSFETs*
Assessment	*e.g., Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	electronic components	Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.	TRUE	http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b	Awareness
knowledge	electronics	The functioning of electronic circuit boards, processors, chips, and computer hardware and software, including programming and applications.	TRUE	http://data.europa.eu/esco/skill/95c35c3a-035f-47c2-90cf-7e934d20fc08	Awareness
knowledge	integrated circuit types	Types of integrated circuits (IC), such as analog integrated circuits, digital integrated circuits, and mixed-signal integrated circuits.	TRUE	http://data.europa.eu/esco/skill/61c81161-b732-4c47-aba5-9e554d9a853f	Awareness
knowledge	integrated circuits	Electronic components, made up from a set of electronic circuits which are placed on semiconductor material, such as silicon. Integrated circuits (IC) can hold billions of electronic components on a microscale and are one of basic components of electronic devices.	TRUE	http://data.europa.eu/esco/skill/2b9f4584-da2e-44e2-a2fb-4dd4fc64c1a2	Awareness
knowledge	semiconductors	Semiconductors are essential components of electronic circuits and contain properties of both insulators, such as glass, and conductors, such as copper. Most semiconductors are crystals made of silicon or germanium. By introducing other elements in the crystal through doping, the crystals turn into semiconductors. Depending on the amount of electrons created by the doping process, the crystals turn into N-type semiconductors, or P-type semiconductors.	TRUE	http://data.europa.eu/esco/skill/e5e17773-3a63-40c5-99e4-10e036cf7b99	Awareness

P10.7 – Introduction to Lithography

Partner name and ID	*P10 - IFAT*
Course ID	*P10.07*
Course version	*v.1*
Title	*Introduction to Lithography*
Abstract	*Photolithography is used to define the lateral structures and patterns of semiconductor devices. The wafers are coated with a photoactive resist layer, and exposure tools transfer the image from a mask or a reticle into the resist, which is subsequently developed. This resulting pattern is a temporary mask, aiding subsequent processes such as etch or implant to modify defined areas of the device. State of the art semiconductor devices often require dozens of lithography layers. This training offers a short but concise overview of different lithographic processes and typical tools, and gives an insight into how basic physical laws interact with the real-world mass manufacturing environment. The examples and principles described cover broadband exposure as well as 365 nm and 248 nm lithography processes on steppers, scanners, and mask aligners. The examples selected aim to highlight, how the process' outcome relies on a combination of basic principles of natural science, highly advanced production materials and equipment, as well as properties of the incoming wafers.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3039
Contact details	
Name	*Dunja Suttnig*
Email	dunja.suttnig@infineon.com
Additional information	
Learning hours	*8*
Course level	*Beginner*
Prerequisites	*Basic knowledge of natural sciences (physics, chemistry) or engineering and interest in aspects of manufacturing processes in the semiconductor industry.*
Target group	*Students, Engineers, Technicians; anyone with technical interest*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*6,7*
Content	*1. Introduction to Lithography* *2. Resists in photolithography* *3. Exposure* *4. Tools and components* *5. Imaging* *6. Processing wafers*
Assessment	*Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	*nanoelectronics*	*Quantum mechanics, wave-particle duality, wave functions and inter-atomic interactions. Description of electrons on a nanoscale. Use of nanotechnology in electronic components on a molecular scale.*	*TRUE*	http://data.europa.eu/esco/skill/bc1a03da-e78c-4956-9dc2-0da70711df80	*Awareness*
knowledge	*semiconductors*	*Semiconductors are essential components of electronic circuits and contain properties of both insulators, such as glass, and conductors, such as copper. Most semiconductors are crystals made of silicon or germanium. By introducing other elements in the crystal through doping, the crystals turn into semiconductors. Depending on the amount of electrons created by the doping process, the crystals turn into N-type semiconductors, or P-type semiconductors.*	*TRUE*	http://data.europa.eu/esco/skill/e5e17773-3a63-40c5-99e4-10e036cf7b99	*Awareness*
skill/competence	*apply advanced manufacturing*	*Improve production rates, efficiencies, yields, costs, and changeovers of products and processes using relevant advanced, innovative, and cutting edge technology.*	*TRUE*	http://data.europa.eu/esco/skill/4f0e579d-ca7b-427c-ace6-9e2de3eb19c7	*Awareness*
knowledge	*manufacturing processes*	*The steps required through which a material is transformed into a product, its development and full-scale manufacturing.*	*TRUE*	http://data.europa.eu/esco/skill/3786b61f-f22e-48d1-af8d-ad4c354534db	*Awareness*
skill/competence	*maintain lithographic printing plates*	*Produce and store plates used in lithographic offset printing by running a previously imposed and ripped file to plate or exposing and developing the plate using hand tools or machines.*	*TRUE*	http://data.europa.eu/esco/skill/3786b61f-f22e-48d1-af8d-ad4c354534db	*Awareness*

P10.8 – Probabilistic System Architecture - Definition and Verification

Partner name and ID	*P10 - IFAT*
Course ID	*P10.08*
Course version	*v.1*
Title	*Probabilistic System Architecture - Definition and Verification*
Abstract	*Problems related to the design and investigation of submicron and nanoscale MOS integrated circuits are covered by this course. Currently there are some nanotechnologies in the means of 14 nm design kits, which are available via the EUROPRACTICE organization. The main attention is drawn to the theoretical and practical usage of state-of-the-art industrial CAD systems, e.g. CADENCE, SYNOPSYS and others. The designers who use those systems can implement nanoscale elements from the relevant standard cell libraries. The specific parameters, related to the nanoscale effects are represented in the embedded system models of the elements.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3041
Contact details	
Name	*Dunja Suttnig*
Email	dunja.suttnig@infineon.com
Additional information	
Learning hours	*8*
Course level	*Beginner*
Prerequisites	*Bachelor degree in electrical/electronic/mechatronics engineering*
Target group	*students with ongoing bacherlor studies; engineers*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*6,7*
Content	*1. Introduction and Motivation and Meadurement Uncertainty* *2. General Uncertainty Propagation* *3. First Order Taylor Series Approximation* *4. Uncertainty Propagation Tooling and Applications of Uncertainty Propagation and Optimization*
Assessment	*e.g., Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	system design	The process of defining the architecture for different components and modules of a system, as well as the relevant data, for satisfying specific requirements	TRUE	http://data.europa.eu/esco/skill/fae27053-8924-4bfd-b565-c9fe502044c9	Awareness
skill/competence	design microelectronics	Design and develop microelectronic systems, products, and components according to specifications, such as microchips.	TRUE	http://data.europa.eu/esco/skill/8712b176-c063-462f-9d0f-2e3c54d9a2eb	Awareness
skill/competence	model microelectronics	Model and simulate microelectronic systems, products, and components using technical design software. Assess the viability of the product and examine the physical parameters to ensure a successful production process.	TRUE	http://data.europa.eu/esco/skill/ce6242a1-a2d9-43e6-a481-ae89b9ec0460	Awareness
skill/competence	create a product's virtual model	Create a mathematical or three-dimensional computer graphic model of the product by using a CAE system or a calculator.	TRUE	http://data.europa.eu/esco/skill/53403f06-6c51-4a24-9491-d8a6200526ce	Awareness
skill/competence	design sensors	Design and develop different types of sensors according to specifications, such as vibration sensors, heat sensors, optical sensors, humidity sensors, and electric current sensors.	TRUE	http://data.europa.eu/esco/skill/fe4a9fb8-2963-4b23-8a18-e033197304f2	Awareness
skill/competence	measure electrical characteristics	Measure voltage, current, resistance or other electrical characteristics by using electrical measuring equipment such as multimeters, voltmeters, and ammeters.	TRUE	http://data.europa.eu/esco/skill/270de514-3206-4cf9-b122-0f148ab06fa1	Awareness

P10.9 – Magnetic Sensors

Partner name and ID	*P10 - IFAT*
Course ID	*P10.09*
Course version	*v.1*
Title	*Magnetic Sensors*
Abstract	*The measurement of the rotational speed and angle of a rotating shaft is one of the most frequently used measurement in all fields of mechanical engineering. Different sensing principles are commonly used. This course shortly introduces the sensing arrangement for speed measurement of a rotating shaft. The state of the art magnetic sensing technologies (Hall, AMR, GMR, TMR) are described and their limitations are shown. The key parameters of magnetic speed sensors as well as the challenge on real applications.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3031
Contact details	
Name	*Dunja Suttnig*
Email	dunja.suttnig@infineon.com
Additional information	
Learning hours	*4*
Course level	*Beginner*
Prerequisites	*Basic understanding of microelectronic, circuit design, signal processing and system development*
Target group	*bacherlor studies and young proffessionals*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*6,7*
Content	*1. Types of magnetic field sensors (Hall, AMR, GMR and TMR)* *2. Incremental speed and position detection sensing using encoders* *3. Linear measurement of magnetic fields* *4. Measurement of magnetic field angle including auto calibration* *5. Applications of magnetic field sensors in automotive applications*
Assessment	*e.g., Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*electronic components*	*Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.*	*TRUE*	http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b	*Awareness*
knowledge	*microsensors*	*Devices with a size smaller than 1 mm that can convert a non-electric signal, such as temperature, into an electrical signal. Because of their size, microsensors offer better accuracy, range, and sensitivity compared to larger sensors.*	*TRUE*	http://data.europa.eu/esco/skill/e763b5c3-cfb3-48d2-9b83-fff97553ad95	*Awareness*
skill/competence	*design sensors*	*Design and develop different types of sensors according to specifications, such as vibration sensors, heat sensors, optical sensors, humidity sensors, and electric current sensors.*	*TRUE*	http://data.europa.eu/esco/skill/fe4a9fb8-2963-4b23-8a18-e033197304f2	*Awareness*

P10.10 – Power Semiconductors Overview

Partner name and ID	*P10 - IFAT*
Course ID	*P10.10*
Course version	*v.1*
Title	*Power Semiconductors Overview*
Abstract	*The goal of this course is to introduce audience to the bigger picture of the world today and to emphasize why power semiconductors are important today and in the future. Learners will hear about semiconductor industry and market trends as well to understand what are power semiconductors, what is their application and why they are so important. Also, some chapters will refer to the challenges of the power semiconductor design. In addition, course should help learners understand big picture" and how power semiconductors are contributing to the more sustainable world from the energy point of view*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3035
	Contact details
Name	*Dunja Suttnig*
Email	dunja.suttnig@infineon.com
	Additional information
Learning hours	*2*
Course level	*Beginner*
Prerequisites	*None needed. Basic physics knowledge would be beneficial but not necessary.*
Target group	*Everyone*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*5*
Content	*1. What are power semiconductors* *2. Sustainable energy – how do we save energy and what is role of Power semiconductors* *3. Power semiconductors design – little box challenge* *4. Look into the future – fight for efficiency*
Assessment	*e.g., Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	*semiconductors*	*Semiconductors are essential components of electronic circuits and contain properties of both insulators, such as glass, and conductors, such as copper. Most semiconductors are crystals made of silicon or germanium. By introducing other elements in the crystal through doping, the crystals turn into semiconductors. Depending on the amount of electrons created by the doping process, the crystals turn into N-type semiconductors, or P-type semiconductors.*	*TRUE*	http://data.europa.eu/esco/skill/e5e17773-3a63-40c5-99e4-10e036cf7b99	*Awareness*
knowledge	*sustainable technologies*	*Technologies with the aim of reducing environmental and ecological risks, achieving at the same time, a positive economic, social, and environmental impact. They are innovative technologies designed to prevent, reduce and recover from the negative impact of humanity in the planet.*	*TRUE*	http://data.europa.eu/esco/skill/103f7814-d262-4df6-a1b6-759bc51f76cb	*Awareness*
skill/competence	*design microelectronics*	*Design and develop microelectronic systems, products, and components according to specifications, such as microchips.*	*TRUE*	http://data.europa.eu/esco/skill/8712b176-c063-462f-9d0f-2e3c54d9a2eb	*Awareness*
knowledge	*integrated circuit types*	*Types of integrated circuits (IC), such as analog integrated circuits, digital integrated circuits, and mixed-signal integrated circuits.*	*TRUE*	http://data.europa.eu/esco/skill/61c81161-b732-4c47-aba5-9e554d9a853f	*Awareness*
skill/competence	*design integrated circuits*	*Design and draft integrated circuits (IC) or semiconductors, such as microchips, used in electronic products. Integrate all necessary components, such as diodes, transistors, and resistors. Pay attention to the design of input signals, output signals, and power availability.*	*TRUE*	http://data.europa.eu/esco/skill/6d12ac9b-5ec0-49b9-bd70-5a19352585cb	*Awareness*
knowledge	*market participants*	*The businesses, relations and opportunities of different participants in the market.*	*FALSE*		*Awareness*

P10.11 – Basics of GaN power devices: material, design and reliability challenges

Partner name and ID	*P10 - IFAT*
Course ID	*P10.11*
Course version	*v.1*
Title	*Basics of GaN power devices: material, design and reliability challenges*
Abstract	*Gallium nitride (GaN) offers fundamental advantages over silicon. In particular, the higher critical electrical field makes it very attractive for power semiconductor devices with outstanding specific dynamic on-state resistance and smaller capacitances compared to silicon MOSFETs, which makes GaN HEMTs great for high speed switching. Not only because of the resulting power savings and total system cost reduction, it also allows a higher operating frequency, improves the power density as well as the overall system efficiency. The training will give a comprehensive overview of Gallium Nitride technology, covering different aspects like material properties, physics, technology and reliability.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3022
Contact details	
Name	*Dunja Suttnig*
Email	dunja.suttnig@infineon.com
Additional information	
Learning hours	*3*
Course level	*Beginner*
Prerequisites	*Basic physical concepts, principal operation and functioning of the main semiconductor devices used in electronic applications as well as the technological processes used to manufacture semiconductor devices.*
Target group	*Students in Electrical and Electronic engineers, Physics, Material science*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*6,7*

Content	*1. Introduction to GaN semiconductor material and devices compared to Si and SiC*
	   1.1. Device principles Si. vs SiC vs. GaN (lateral vs vertical device concept)
	   1.2. Material advantages
	   1.3. Key figure of merit
	2. The key building blocks of GaN power devices
	   2.1. GaN epitaxy with focus on GaN on Si
	   2.2. GaN/AlGaN heterojunction and 2DEG formation
	   2.3. Gate module (normally-on vs. Normally-off)
	   2.4. Power metallization for later devices
	3. The reliability challenges
	   3.1. Time-dependent dielectric breakdown
	   3.2. Charge trapping, dynamic RDSon and current collapse
	   3.3. Gate module reliability
	4. Manufacturing aspects
	   4.1. GaN wafer production in high-volume Si fab
	   4.2. Ga cross-contamination control

Assessment	*e.g., Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	electronic components	Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.	TRUE	http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b	Awareness
knowledge	integrated circuit types	Types of integrated circuits (IC), such as analog integrated circuits, digital integrated circuits, and mixed-signal integrated circuits.	TRUE	http://data.europa.eu/esco/skill/61c81161-b732-4c47-aba5-9e554d9a853f	Awareness
knowledge	semiconductors	Semiconductors are essential components of electronic circuits and contain properties of both insulators, such as glass, and conductors, such as copper. Most semiconductors are crystals made of silicon or germanium. By introducing other elements in the crystal through doping, the crystals turn into semiconductors. Depending on the amount of electrons created by the doping process, the crystals turn into N-type semiconductors, or P-type semiconductors.	TRUE	http://data.europa.eu/esco/skill/e5e17773-3a63-40c5-99e4-10e036cf7b99	Awareness
knowledge	manufacturing processes	The steps required through which a material is transformed into a product, its development and full-scale manufacturing.	TRUE	http://data.europa.eu/esco/skill/3786b61f-f22e-48d1-af8d-ad4c354534db	Awareness

P10.12 – A/D and D/A Converters Fundamental Considerations and Definitions

Partner name and ID	*P10 - IFAT*
Course ID	*P10.12*
Course version	*v.1*
Title	*A/D and D/A Converters Fundamental Considerations and Definitions*
Abstract	*Analog-to-Digital- and Digital-to-Analog converters (ADCs and DACs) are the binding elements connecting the analog and the digital world. A fundamental understanding is needed to successfully use the right ADC / DAC at the right place for the right purpose. Several different metrics are used to describe the behavior of a data converter. This training explains these metrics and tries to give some motivation what to use when and why.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3034
Contact details	
Name	*Dr. Dieter Draxelmayr*
Email	
Additional information	
Learning hours	*2*
Course level	*Beginner*
Prerequisites	*Very basic understanding of signal processing (signals, bits, sampling, Fourier transform, Nyquist theorem)*
Target group	*Students and Engineers*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*5,6*

Content	*1. Principlesof ADCs and DACs*
	   1.1. Sampling
	   1.2. Quantization, reconstruction, severe errors (e.g. offset, gain, INL, DNL, missing codes, (non)monotonicity, SNR, SNDR, SFDR, THD)
	2. Some fundamental relations
	   2.1. Timing / quantization with respect to SNR)
	   2.2. Introduction to FoM (Figure of Merit).

Assessment	*e.g., Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
skill/competence	*interpret electronic design specifications*	*Analyse and understand detailed electronic design specifications.*	*TRUE*	http://data.europa.eu/esco/skill/e76dd90d-91c4-49c0-bfd0-dfa2c4c90c81	*Awareness*
knowledge	*instrument performance elements*	*Elements that indicate or influence instrument performance. A first indication of the performance of the instrument is the accuracy or precision of the instrument, such as its response time, resolution, and range. A second indication of performance is the technical performance of the instrument, such as its power level, the electromagnetic interference, and transient voltages. A third indication of performance are environmental factors that can influence instrument performance, such as humidity, operating temperatures, or dust.*	*TRUE*	http://data.europa.eu/esco/skill/69fe6624-bc7f-412e-ad6d-35c7b0df842e	*Awareness*
knowledge	*signal processing*	*The algorithms, applications and implementations that deal with the processing and transferring of information through analog or digital frequencies.*	*TRUE*	http://data.europa.eu/esco/skill/cfa2be0d-96d5-4017-a866-962efb9c5070	*Awareness*
skill/competence	*interpret circuit diagrams*	*Read and comprehend circuit diagrams showing the connections between the devices, such as power and signal connections.*	*TRUE*	http://data.europa.eu/esco/skill/02c71cde-f513-43da-8952-0974763c7568	*Awareness*
knowledge	*system design*	*The process of defining the architecture for different components and modules of a system, as well as the relevant data, for satisfying specific requirements.*	*TRUE*	http://data.europa.eu/esco/skill/fae27053-8924-4bfd-b565-c9fe502044c9	*Awareness*
knowledge	*electronic components*	*Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.*	*TRUE*	http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b	*Awareness*

P10.13 – Selected Topics on Chip Assembly for Chip Designers

Partner name and ID	*P10 - IFAT*
Course ID	*P10.13*
Course version	*v.1*
Title	*Selected Topics on Chip Assembly for Chip Designers*
Abstract	*In order to be able to optimize the complete product in terms of size and cost, it is essential for chip designers to collaborate with their packaging and assembly colleagues. Therefore, it is beneficial to understand the challenges in chip assembly and to know the various available technologies. Especially novel approaches in heterogeneous integration ("More than Moore") like system-in-package, die-stacks, wafer-level-packages, and 3D-integration will be the basis of miniaturization and innovation in future electronic products. This course will provide a basic overview about different assembly technologies, their process steps, and integration opportunities for product design.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3049
Contact details	
Name	*Dunja Suttnig*
Email	dunja.suttnig@infineon.com
Additional information	
Learning hours	*10*
Course level	*Beginner*
Prerequisites	*Basic knowledge of analog or digital chip design and chip layout*
Target group	*Students, chip circuit designers, layout engineers, and chip concept engineers*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*6*

Content	*1. Motivation and Introduction*
	   1.1. "More Moore" vs "More than Moore"
	2. Basic Challenges in Chip Assembly
	   2.1. Interconnect gap, area efficiency, thermal expansion, mixture of materials, reliability
	3. Overview of package platforms
	   3.1. Difference in 1st and 2nd level interconnect (chip-package-PCB)
	   3.2. Difference in interconnect re-distribution (leadframe, laminate, thin-film)
	   3.3. Going to 3D (package-on-package, die-stacks, …)
	   3.4. Chip embedding
	   3.5. JEDEC package naming convention
	   3.6. Leadframe Packages
	   3.7. Process steps
	4. Leadframe manufacturing, pre-assembly, adhesive bonding, soldering
	   4.1. Wirebonding
	   4.2. Materials, nailheads, wedge, special options
	   4.3. Molding
	5. Laminate/BGA Packages
	   5.1. Laminate/substrate material
	   5.2. Substrate manufacturing
	   5.3. Special layout techniques (plating lines, etch-back, back-drill, vias)
	   5.4. Bumps, Copper-Pillars
	6. Chip-Embedding, Wafer-Level-Packages
	   6.1. Embedding in mold compound, laminate, PCB
	   6.2. Wafer level packages (WLP)
	   6.3. Process steps (chip first, face up/down, reconstituted wafer, …), Infineon eWLB, TSMC InFO
	   6.4. Package-on-Package, Through-Mold-Vias
	   6.5. Passives and antennas in WLP
	   6.6. Panel Level Packaging
	7. 3D IC & Silicon Integration
	   7.1. Through-Silicon-Vias (TSV)
	   7.2. 3D Die Stacks
	   7.3. Passive interposers (2,5D integration), TSMC Chip-on-Wafer-on-Substrate (CoWoS), Intel Embedded Multi-Die Interconnect Bridge (EMIB)
	   7.4. 3D Silicon Integration, Wafer-to-Wafer Bonding – adhesive, metal, hybrid bonding, True 3D-VLSI – LETI CoolCube
	8. Product examples
	   8.1. Xilinx Virtex7 FPGA, Nvidia Pascal GPU, Apple A12, Apple S4

Assessment	*e.g., Moodle like quiz test*

Type[1)]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3)]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
knowledge	*electronic components*	*Devices and components that can be found in electronic systems. These devices can range from simple components such as amplifiers and oscillators, to more complex integrated packages, such as integrated circuits and printed circuit boards.*	*TRUE*	http://data.europa.eu/esco/skill/8a2f841c-fe35-46c0-90bd-51858a88a83b	*Awareness*
knowledge	*electronic equipment standards*	*The national and international quality and safety standards and regulations with regards to the use and manufacture of electronic equipment and its components, such as semiconductors and printed circuit boards.*	*TRUE*	http://data.europa.eu/esco/skill/19ec88aa-c0b1-4515-ba10-56b6cf27369e	*Awareness*
skill/competence	*develop product design*	*Convert market requirements into product design and development.*	*TRUE*	http://data.europa.eu/esco/skill/fd4386c5-96f0-4c6e-970c-c08729ae0cc6	*Awareness*
skill/competence	*assemble microelectronics*	*Build microelectronics using microscopes, tweezers, or pick-and-place robots, such as SMT machines. Slice substrates from silicon wafers and bond components onto the surface through soldering and bonding techniques. Bond the wires through special wire bonding techniques and seal and encapsulate the microelectronics.*	*TRUE*	http://data.europa.eu/esco/skill/aec13d38-b54b-425a-90c5-b0daac6f0776	*Awareness*
skill/competence	*solder electronics*	*Operate and use soldering tools and soldering iron, which supply high temperatures to melt the solder and to join electronic components.*	*TRUE*	http://data.europa.eu/esco/skill/26ed52cf-30ca-451e-9699-a6c04a30649f	*Awareness*
knowledge	*microassembly*	*The assembly of nano, micro or mesoscale systems and components with dimensions between 1 μm to 1 mm. Because of the need for precision on a microscale, micro assemblies require reliable visual alignment equipment, such as ion beam imaging systems and stereo electronic microscopes, as well as precision tools and machines, such as microgrippers. The microsystems are assembled according to techniques of doping, thin films, etching, bonding, microlithography, and polishing.*	*TRUE*	http://data.europa.eu/esco/skill/9cd87d80-9718-47e1-9ed4-cd85cbfebd0a	*Awareness*
skill/competence	*apply advanced manufacturing*	*Improve production rates, efficiencies, yields, costs, and changeovers of products and processes using relevant advanced, innovative, and cutting edge technology.*	*TRUE*	http://data.europa.eu/esco/skill/4f0e579d-ca7b-427c-ace6-9e2de3eb19c7	*Awareness*

P10.14 – Ion Implantation for Semiconductor Industry

Partner name and ID	*P10 - IFAT*
Course ID	*P10.14*
Course version	*v.1*
Title	*Ion Implantation for Semiconductor Industry*
Abstract	*Ion Implantation processes contribute significantly to the development of semiconductor devices. This course covers different types and details of ion implantation equipment along with security topics. From a process point of view theory of the implantation process as well as process control concepts are discussed. Accurate treatment of the wafer frontside and backside structures as well as sometimes influencing the bulk material itself play a crucial role to guarantee for key parameters such as highest power densities and minimal losses at required switching behaviour. Some representative examples of the needs of high, medium and low power devices based on silicon technology are described and challenges for ion implantation processing are concluded.* *Additionally, other semiconductors like SiC and GaN obtain superior material characteristics compared to silicon and are therefore about to get of economic importance in the near future. That is why considerable development effort is put into the understanding of how to fabricate devices based on those materials. One ingredient is the knowledge how ion implantation can affect and tailor their semiconductor properties.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/3037
Contact details	
Name	*Dunja Suttnig*
Email	dunja.suttnig@infineon.com
Additional information	
Learning hours	*2*
Course level	*Beginner*
Prerequisites	*Basic understanding of microelectronics technology, solid state physics and ion physics.*
Target group	*Students, Process Engineers*
ECTS points	*N/A*
ECVET points	*N/A*
EQF Levels	*6*
Content	*1. Introduction* *2. Development and use of ion implantation, implantation tool types* * 2.1. Theory of the implantation process: Deceleration of ions and their range in solids, crystal damage, channeling, activation* * 2.2. Implantation concepts: Ion source, ion transport and mass separation, homogeneous scanning of the ion beam, process chambers and dosimetry* * 2.3. Security: Toxic gases, high voltage, radiation* *3. Process control* * 3.1. Dose and energy* * 3.2. Contamination* * 3.3. Charge exchange* * 3.4. Interactions with masks, implantation angle* *4. Proton implantation:* * 4.1. Physical basics* * 4.2. Implantation concept* * 4.3. Security concept, radiation, process control* *5. Implantation in new materials* * 5.1. Specialities for SiC, GaN* *6. Summary and Outlook*
Assessment	*e.g., Moodle like quiz test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	_
knowledge	*semiconductors*	*Semiconductors are essential components of electronic circuits and contain properties of both insulators, such as glass, and conductors, such as copper. Most semiconductors are crystals made of silicon or germanium. By introducing other elements in the crystal through doping, the crystals turn into semiconductors. Depending on the amount of electrons created by the doping process, the crystals turn into N-type semiconductors, or P-type semiconductors.*	*TRUE*	http://data.europa.eu/esco/skill/e5e17773-3a63-40c5-99e4-10e036cf7b99	*Awareness*
skill/competence	*apply advanced manufacturing*	*Improve production rates, efficiencies, yields, costs, and changeovers of products and processes using relevant advanced, innovative, and cutting edge technology.*	*TRUE*	http://data.europa.eu/esco/skill/4f0e579d-ca7b-427c-ace6-9e2de3eb19c7	*Awareness*
knowledge	*manufacturing processes*	*The steps required through which a material is transformed into a product, its development and full-scale manufacturing.*	*TRUE*	http://data.europa.eu/esco/skill/3786b61f-f22e-48d1-af8d-ad4c354534db	*Awareness*

P11.11 – Introduction to Scrum & Kanban for semiconductor product development

Partner name and ID	*Melexis*
Course ID	*P11.01*
Title	*Introduction to Scrum & Kanban for semiconductor product development*
Abstract	*Learn to use Scrum & Kanban frameworks to speed up the semiconductor product development and improve the product quality based on the closed collaboration with the customers.*
Link	*https://learn.chipsacademy.eu/knowledge-hub/courses/2952*
Contact details	
Name	*Anastasiia Besova*
Email	*nbs@melexis.com*
Additional information	
Learning hours	*3*
Course level	*Intermediate*
Prerequisites	*1. Basic understanding of semiconductor product development cycle* *2. Basic knowledge of lean & agile principles and practices relevant to improve the semiconductor product development lifecycle*
Target group	*Engineers invloved in semiconductor product development*
ECTS points	
ECVET points	
EQF Levels	*4*

Content	*1. Lean/agile mindset, principles and frameworks*
	2. Introduction to scrum
	   2.1. The work: release, epic, backlog, work package
	   2.2. Working in a team
	   2.3. Planning & reviewing: sprint, stand up & retro
	3. Introduction to kanban

Assessment	*Short, quiz-like test*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	_
knowledge	*lean project management*	*The learner understands how to apply **Kanban** as a lean project management tool to semiconductor product development*	*TRUE*	http://data.europa.eu/esco/skill/da6393d5-a53c-4863-abc7-51f36281d74e	*Awareness*
knowledge	*Agile development*	*The learner understands how to apply the principles of **Scrum** agile framework to semiconductor product development*	*TRUE*	http://data.europa.eu/esco/skill/dba46f87-0831-49cd-a1c7-340a653c0221	*Awareness*

P13.1 – ECS Summer School - Fascinating electronics for a cool world

Partner name and ID	*P13-AENEAS*
Course ID	*P13.01*
Title	*ECS Summer School - Fascinating electronics for a cool world*
Abstract	*Over this 5-day programme, 40 students from universities all over Europe and associated countries are introduced to some of the possibilities offered by present microelectronics devices and foreseen future applications, showing the fascinating world of microelectronics in various fields such as sensor interfaces, power devices, radio-frequencies and digital.*
Link	*https://learn.chipsacademy.eu/knowledge-hub/courses/2953*
Contact details	
Name	*Patrick Cogez*
Email	*cogez@aeneas-office.org*
Additional information	
Learning hours	*50*
Course level	*Advanced*
Prerequisites	*2 years of STEM Bachelor education. Easy understanding of course delivered in English, ability to express oneself in English*
Target group	*This programme is targeted towards STEM students achieving their 2nd year of bachelor studies, so that they later, at the end of their Bachelor, select to continue studying or work in the domain of Electronics Components and Systems*
ECTS points	
ECVET points	
EQF Levels	*6*

Content	*1. Setting the scene - ubiquitous applications of microelectronics and of the electronic devices*
	2. Microelectronics technology
	  2.1. Moore's law – Rationale and history of the Moore's law through the equipment point of view
	  2.2. Manufacturing Process – From the sand to your smartphone: Manufacturing process of a digital device
	  2.3. Our world in semiconductors
	    • Sensors and actuators connecting semiconductors to the outside world
	    • Applications of AI in Improving spatial resolution and accuracy of wellbeing and technical systems
	  2.4. Greener world
	    • The move from thermal to electrical vehicles (Power electronics)
	    • Reducing the carbon footprint of the electronics industry (introduction of the power consumption of cloud computing, AI, chip manufacturing…)
	  2.5. Demonstrators
	3. Electronics design
	  3.1. Past and Future of Microelectronics. The sensor case
	  3.2. The Power of Microwaves
	  3.3. The digital world
	  3.4. Microelectronic solutions for a sustainable future
	4. Digital systems
	  4.1. Introduction
	  4.2. Embedded Computing and real-time embedded software

	4.3. Edge/Cloud communication 5G/6G
	4.4. Edge and Federated AI
	4.5. Safety and cybersecurity
	4.6. Industrial control applications/Flexible automation
	4.7. Automotive technologies
	4.8. Agrifood and smart agriculture
	4.9. Demonstrators
	5. Integration - From Village Huts to Cities of Skyscrapers – Revolution in Electronics Packaging
	   5.1. Architectures
	     • Smart sensors and much, much more
	     • Photonics solutions
	   5.2. Technologies
	     • Flexible, sustainable, printed / wearables
	     • Other technology topics
	   5.3. Demonstrators
	   5.4. The Heat of Daily Life – Thermal challenges and solutions in high-performance electronics
	   5.5. Electronics in Europa – Made for Grown-up Applications – It never fails when needed…
	     • The 'power box' -> automotive, industrial, and energy electronics
	     • Space Electronics
	   5.6. Demonstrators
	6. Career testimonies
	7. Graduation ceremony

Assessment	*No assessment in the first editions*

Type[1)	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3)
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
skill/competence	*Design integrated circuits*	*Design and draft integrated circuits (IC) or semiconductors, such as microchips, used in electronic products. Integrate all necessary components, such as diodes, transistors, and resistors. Pay attention to the design of input signals, output signals, and power availability.*	*TRUE*	http://data.europa.eu/esco/skill/6d12ac9b-5ec0-49b9-bd70-5a19352585cb	*Awareness*
skill/competence	*Design microelectronics*	*Design and develop microelectronic systems, products, and components according to specifications, such as microchips.*	*TRUE*	http://data.europa.eu/esco/skill/8712b176-c063-462f-9d0f-2e3c54d9a2eb	*Awareness*
skill/competence	*Design sensors*	*Design and develop different types of sensors according to specifications, such as vibration sensors, heat sensors, optical sensors, humidity sensors, and electric current sensors.*	*TRUE*	http://data.europa.eu/esco/skill/fe4a9fb8-2963-4b23-8a18-e033197304f2	*Awareness*
knowledge	*Fabrication of semiconductor devices*	*Understanding of the basic principles and dynamics over time of the manufacturing of semiconductor devices, including packaging aspects.*	*PARTIAL*		*Practitioner*
knowledge	*Operation of a MEMS*	*Understanding of the physics of a MEMS (Micro Electrical Mechanical Device)*	*PARTIAL*		*Practitioner*
knowledge	*Lithography basics*	*Understanding of the physics of lithography*	*PARTIAL*	http://data.europa.eu/esco/skill/38dbdfc4-427e-4fc8-b394-b00ec29dbe3a	*Practitioner*
knowledge	*Various types of semiconductor devices*				

knowledge		Electronics	*The functioning of electronic circuit boards, processors, chips, and computer hardware and software, including programming and applications.*	*TRUE*	http://data.europa.eu/esco/skill/95c35c3a-035f-47c2-90cf-7e934d20fc08\	*Awareness*
knowledge		Materials engineering	*The study of existing materials and substances properties to produce new materials or enhance several existing properties such as chemical or physical ones. It involves knowledge on the structure, on the performance of diverse materials and on the transferability of the new or improved materials to different industries.*	*TRUE*	http://data.europa.eu/esco/skill/614fdb7f-637f-4501-a80a-53c14a9804e5	*Awareness*
knowledge		Nanomaterials	*The characteristics of engineered nanoparticles that conform to a specific set of properties such as being manufactured at nanoscale, being composed of nano-objects as defined by ISO. Some of the well known nanomaterials could be carbon nanotubes,quantum dots gold or titanium dioxide.*	*TRUE*	http://data.europa.eu/esco/skill/badbd33c-3da8-43ae-a504-de388b988f4a	*Awareness*
knowledge		Semiconductors	*Semiconductors are essential components of electronic circuits and contain properties of both insulators, such as glass, and conductors, such as copper. Most semiconductors are crystals made of silicon or germanium. By introducing other elements in the crystal through doping, the crystals turn into semiconductors. Depending on the amount of electrons created by the doping process, the crystals turn into N-type semiconductors, or P-type semiconductors.*	*TRUE*	http://data.europa.eu/esco/skill/e5e17773-3a63-40c5-99e4-10e036cf7b99	*Awareness*

knowledge		Integrated circuits	Electronic components, made up from a set of electronic circuits which are placed on semiconductor material, such as silicon. Integrated circuits (IC) can hold billions of electronic components on a microscale and are one of basic components of electronic devices.	*TRUE*	http://data.europa.eu/esco/skill/2b9f4584-da2e-44e2-a2fb-4dd4fc64c1a2	*Awareness*
knowledge		Integrated circuit types	Types of integrated circuits (IC), such as analog integrated circuits, digital integrated circuits, and mixed-signal integrated circuits.	*TRUE*	http://data.europa.eu/esco/skill/61c81161-b732-4c47-aba5-9e554d9a853f	*Awareness*
knowledge		Manufacturing processes	The steps required through which a material is transformed into a product, its development and full-scale manufacturing.	*TRUE*	http://data.europa.eu/esco/skill/3786b61f-f22e-48d1-af8d-ad4c354534db	*Awareness*
knowledge		Microelectronics	Microelectronics is a subdiscipline of electronics and relates the study, design, and manufacture of small electronic components, such as microchips.	*TRUE*	http://data.europa.eu/esco/skill/4b164a27-849f-4be2-ae79-d26a4969b677	*Awareness*
knowledge		Microprocessors	Computer processors on a microscale that integrate the computer central processing unit (CPU) on a single chip.	*TRUE*	http://data.europa.eu/esco/skill/8a211052-4bec-49c2-9b4e-7914c37d21b4	*Awareness*
knowledge		Microassembly	The assembly of nano, micro or mesoscale systems and components with dimensions between 1 µm to 1 mm. Because of the need for precision on a microscale, micro assemblies require reliable visual alignment equipment, such as ion beam imaging systems and stereo electronic microscopes, as well as precision tools and machines, such as microgrippers. The microsystems are assembled according to techniques of doping, thin films, etching, bonding, microlithography, and polishing.	*TRUE*	http://data.europa.eu/esco/skill/9cd87d80-9718-47e1-9ed4-cd85cbfebd0a	*Awareness*

knowledge	Micromechanics	*The design and production of micromechanisms. Micromechanisms combine mechanical and electrical components in a single device that is less than 1mm across.*	TRUE	http://data.europa.eu/esco/skill/b27411a8-c401-4241-841b-c742ae32a8d3	*Awareness*
knowledge	Microsensors	*Devices with a size smaller than 1 mm that can convert a non-electric signal, such as temperature, into an electrical signal. Because of their size, microsensors offer better accuracy, range, and sensitivity compared to larger sensors.*	TRUE	http://data.europa.eu/esco/skill/e763b5c3-cfb3-48d2-9b83-fff97553ad95	*Awareness*

P15.1 – Agile Product Owner

Partner name and ID	*P15-Knolyx*
Course ID	*P15.01*
Title	*Agile Product Owner*
Abstract	*Elevate your role as a Product Owner with this comprehensive course on Agile Product Ownership. Explore fundamental principles and practices, mastering Scrum events like Sprint Planning and Review. Refine user stories, prioritize product backlogs, and engage stakeholders effectively. Navigate dynamic product development landscapes, driving continuous improvement. With practical techniques like story mapping and Kano analysis, optimize product value delivery and enhance customer satisfaction.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2941
Contact details	
Name	*Adrian Sita*
Email	*adrian@knolyx.com*
Additional information	
Learning hours	*4*
Course level	*Beginner*
Prerequisites	*At least 2 years experience in a Scrum Master role.*
Target group	*Basic understanding of project management concepts, understanding of the role of product owner in Agile development*
ECTS points	*-*
ECVET points	*-*
EQF Levels	*5,6,7,8*
Content	*1. Introduction* *2. Agile mindset* *3. Scrum framework* *4. Traditional techniques for gathering requirements* *5. Definition of Done* *6. Scrum planning* *7. User stories* *8. Practices*
Assessment	*Quiz*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	50 characters max	500 characters max	if present in ESCO	Concept URI	
Knowledge	ICT project management methodologies	*The methodologies or models for planning, managing and overseeing of ICT resources in order to meet specific goals, such methodologies are Waterfall, Incremental, V-Model, Scrum or Agile and using project management ICT tools*	*TRUE*	*http://data.europa.eu/esco/skill/bec4359e-cb92-468f-a997-8fb28e32fba9*	*Practitioner*
Knowledge	business requirements techniques	*The procedures required to identify and analyse business and organisational needs.*	*TRUE*	*http://data.europa.eu/esco/skill/0ee94c0a-3716-494a-95a2-dcbab9e58be2*	*Awareness*
Knowledge	business analysis	*The research field which addresses the identification of business needs and problems and the determination of the solutions that would mitigate or prevent the smooth functioning of a business. Business analysis comprises IT solutions, market challenges, policy development and strategic matters.*	*TRUE*	*http://data.europa.eu/esco/skill/633a3637-2c6b-40ae-ac38-289eb2a62aa6*	*Practitioner*
Skill/Competence	analyse business requirements	*Study clients' needs and expectations for a product or service in order to identify and resolve inconsistencies and possible disagreements of involved stakeholders.*	*TRUE*	*http://data.europa.eu/esco/skill/b04f377b-ee80-4b38-aca1-19d266a23b17*	*Practitioner*
Skill/Competence	work in teams	*Work confidently within a group with each doing their part in the service of the whole.*	*TRUE*	*http://data.europa.eu/esco/skill/60c78287-22eb-4103-9c8c-28deaa460da0*	*Practitioner*

P15.2 – SCRUM Framework Fundamentals

Partner name and ID	*P15-Knolyx*
Course ID	*P15.02*
Title	*SCRUM Framework Fundamentals*
Abstract	*In this course, learners will delve into the fundamentals of the Scrum framework, gaining a solid understanding of its core principles. They will explore various techniques for handling uncertainty, employing Agile methodologies, drafting effective user stories, guiding teams, and managing technical debt. Moreover, they will appreciate the significance of adopting a growth mindset and its transformative potential. Throughout the course, participants will encounter real-life examples and practical scenarios, facilitating the application of Scrum concepts in diverse situations.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2943
Contact details	
Name	*Adrian Sita*
Email	*adrian@knolyx.com*
Additional information	
Learning hours	*4*
Course level	*Beginner*
Prerequisites	*Basic understanding of software development, openness to learning.*
Target group	*Software developers, project managers, test engineers, business analysts, team leaders, anyone interested in Agile*
ECTS points	*-*
ECVET points	*-*
EQF Levels	*5,6*
Content	*1. Introduction* *2. Agile mindset* *3. Scrum framework* *4. Scrum events* *5. Scrum planning* *6. Definition of done* *7. User stories* *8. Self organizing teams* *9. Practices*
Assessment	*Quiz*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
knowledge	*Agile project management*	*The agile project management approach is a methodology for planning, managing and overseeing of ICT resources in order to meet specific goals and using project management ICT tools.*	*TRUE*	*http://data.europa.eu/esco/skill/0e62eba3-d076-47e5-b22d-340a8faccb3b*	*Practitioner*
knowledge	*Project management*	*Understand project management and the activities which comprise this area. Know the variables implied in project management such as time, resources, requirements, deadlines, and responding to unexpected events.*	*TRUE*	*http://data.europa.eu/esco/skill/7111b95d-0ce3-441a-9d92-4c75d05c4388*	*Awareness*
skill/competence	*use ICT systems*	*Select and use ICT systems for a variety of complex tasks in order to meet a variety of needs.*	*TRUE*	*http://data.europa.eu/esco/skill/31d35d3d-2bf2-49aa-9c20-92566ef80277*	*Practitioner*
skill/competence	*define technical requirements*	*Specify technical properties of goods, materials, methods, processes, services, systems, software and functionalities by identifying and responding to the particular needs that are to be satisfied according to customer requirements.*	*TRUE*	*http://data.europa.eu/esco/skill/d9e5349e-8791-49c2-8ba4-839fdd1606c2*	*Practitioner*

P15.3 – Agile Scrum Master

Partner name and ID	*P15-Knolyx*
Course ID	*P15.03*
Title	*Agile Scrum Master*
Abstract	*This Agile Scrum Master course covers a range of topics essential for Agile practitioners, particularly those involved in Scrum roles such as Scrum Masters. Covering a wide array of topics, from culture change to effective leadership and coaching techniques, participants will gain a deep understanding of how to foster a culture of continuous improvement and self-organization within Agile teams. Through real-world examples and actionable strategies, attendees will learn to navigate common challenges, optimize team performance, and drive successful Agile transformations within their organizations.*
Link	https://learn.chipsacademy.eu/knowledge-hub/courses/2942
Contact details	
Name	*Adrian Sita*
Email	*adrian@knolyx.com*
Additional information	
Learning hours	*4*
Course level	*Intermediate*
Prerequisites	*At least 2 years experience in a Scrum Master role.*
Target group	*Software developers, project managers, business analysts, team leaders, with a Scrum background.*
ECTS points	*-*
ECVET points	*-*
EQF Levels	*5,6,7,8*
Content	*1. Introduction* *2. Agile mindset* *3. Debate Agile Principles* *4. Culture* *5. Scrum Master challenges* *6. Coaching* *7. Dysfunction Daily stand-up* *8. Team dysfunctions* *9. Self organizing teams* *10. Agile Retrospectives*
Assessment	*Quiz*

Type[1]	Name	Description of the learning outcome	ESCO - https://esco.ec.europa.eu/en/classification/skill_main		Level of Maturity[3]
ESCO - https://esco.ec.europa.eu/en	**50 characters max**	**500 characters max**	**if present in ESCO**	**Concept URI**	
Knowledge	*Agile project management*	*The agile project management approach is a methodology for planning, managing and overseeing of ICT resources in order to meet specific goals and using project management ICT tools.*	*TRUE*	*http://data.europa.eu/esco/skill/0a9acb6b-1139-4be9-b431-3a80a959f2f4*	*Practitioner*
Knowledge	*Agile development*	*The agile development model is a methodology to design software systems and applications.*	*TRUE*	*http://data.europa.eu/esco/skill/dba46f87-0831-49cd-a1c7-340a653c0221*	*Practitioner*
Knowledge	*Lean project management*	*The lean project management approach is a methodology for planning, managing and overseeing of ICT resources in order to meet specific goals and using project management ICT tools.*	*TRUE*	*http://data.europa.eu/esco/skill/da6393d5-a53c-4863-abc7-51f36281d74e*	*Practitioner*
Skill/competence	*use communication techniques*	*Apply techniques of communication which allow interlocutors to better understand each other and communicate accurately in the transmission of messages.*	*TRUE*	*http://data.europa.eu/esco/skill/7ff2c668-0e86-418a-a962-4958262ee337*	*Practitioner*
Skill/competence	*leadership principles*	*Set of traits and values which guide the actions of a leader with her/his employees and the company and provide direction throughout her/his career. These principles are also an important tool for self-evaluation to identify strengths and weaknesses, and seek self-improvement.*	*TRUE*	*http://data.europa.eu/esco/skill/d5145a9a-602e-40bf-b3e1-f04cf9c3ef86*	*Practitioner*