

# Advanced Technologies and Micro-credentials in Vocational Education: Skills gaps and the development of innovative learning programmes

Dr. Achilleas Achilleos, Frederick University, Cyprus

2nd Session "Centre of Professional Excellence in the ICT Sector – INVESTech. Skills development and connection to the labour market"

EMPHASYS CENTRE | FREDERICK UNIVERSITY |  
CYPRUS RESEARCH & INNOVATION CENTRE |  
CENTRE OF SOCIAL INNOVATION

Thursday, 20/11/2025

# Agenda

- 1) Overview of Microcredentials
- 2) Development Process
- 3) Desk Research Findings
- 4) Microcredentials & EQF
- 5) The Developed Microcredentials
- 6) The INVESTech Web Portal

## PROJECT PARTNERS - CYPRUS



Partner Name	Description
Emphasys Centre	Country Leader – Education, ICT Training & Research
Frederick University (FredU)	Higher Education Institution
Cyprus Research and Innovation Center Ltd (CyRIC)	Research & Development Technology Company
Center for Social Innovation (CSI)	Research & Development on Social Innovation

## Overview of Microcredentials

### Specific Skill Focus:

Each Microcredential targets a specific skill or set of skills.

### Flexible Learning:

Often available online, allowing learners to study at their own pace and schedule.

### Stackable:

Many microcredentials can be stacked or combined to build towards a larger qualification or degree.

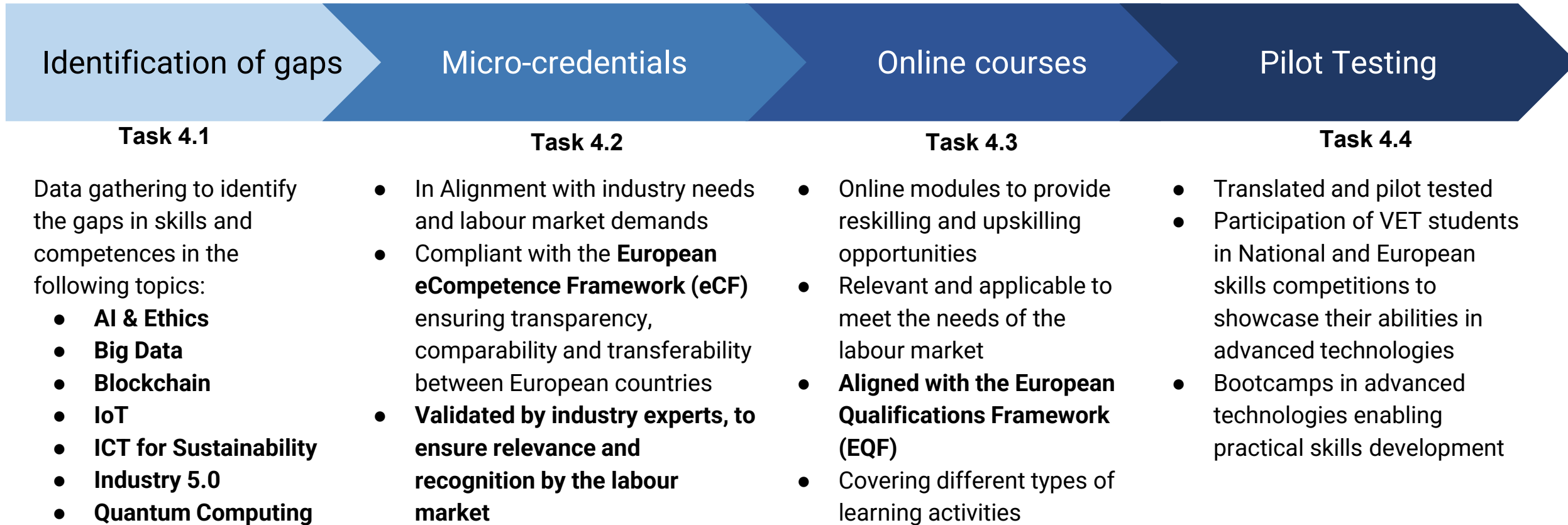
### Short Duration:

They are typically shorter in duration compared to traditional degree programs, often taking weeks or a few months to complete.

### Assessment and Certification:

Completion usually involves some form of assessment, such as exams, projects, or practical tasks, leading to certification.

## Development of Micro-credentials and Online Modules

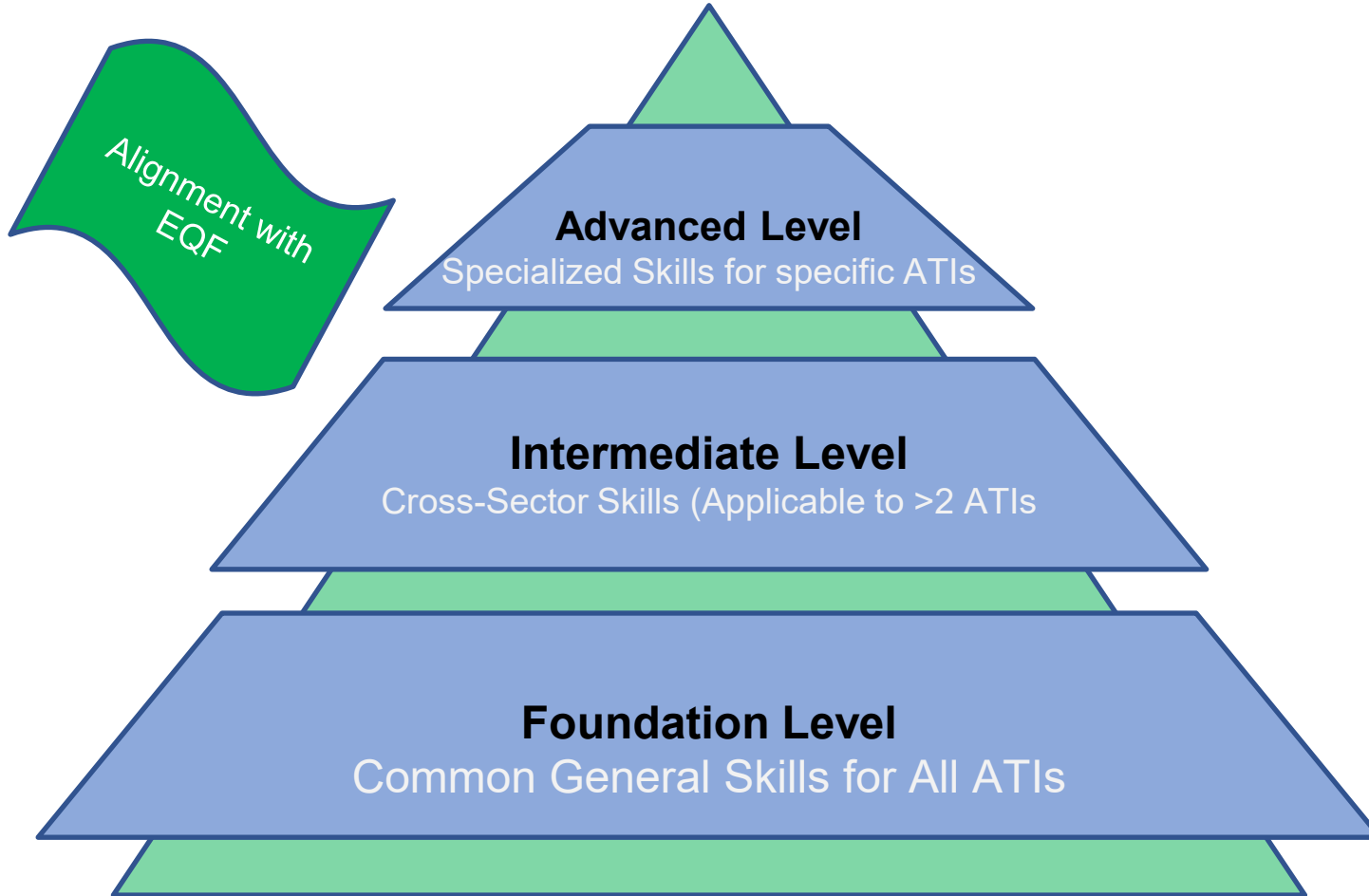


## Microcredentials Desk Research Findings – 5 partner countries

- **Cyprus:** No dedicated MC law; universities and VET actors are experimenting with MC pilots, but accreditation and QA frameworks are still undeveloped.
- **Greece:** No legal definition of MCs; early discussions within lifelong learning bodies, with fragmented pilots but no national framework or recognition pathway yet.
- **Slovakia:** MC ecosystem in infancy; no regulatory basis, only exploratory initiatives tied to labour-market upskilling. National QA and standards still missing.
- **Lithuania:** No binding MC legislation; ministries and agencies are testing modular learning ideas, and accreditation practices are still being designed.
- **Bulgaria:** No formal MC policy; scattered VET/HE experiments exist, but national standards, registers, and recognition procedures are still under development.

This captures the core message: **all five countries are at an early, pre-regulatory stage where MC ecosystems are really only now forming.**

# Hierarchical pyramid model proposal



## Foundation level

- Digital literacy and computational thinking
- Cybersecurity awareness, data protection compliance
- Basic programming (Python, C++, Java)
- Analytical & problem-solving skills
- Project management & communication skills
- Ethical and regulatory knowledge

## Intermediate level

- AI & Machine Learning
- Cloud Computing & Distributed Systems
- Embedded Systems & IoT Communication Protocols
- Digital Twin & Simulation Technologies Blockchain & Smart Contract Development
- Energy-Efficient Computing & Green IT
- Cyber-Physical Systems & Robotics

## Specialized skills

- Quantum Programming & Cryptography
- Advanced IoT Security & Edge Computing
- Human-Robot Interaction & Digital Twin Engineering
- Decentralized Finance & Compliance
- Sustainability Analytics & Circular Economy IT
- Explainable AI & Algorithm Auditing
- High-Performance Computing & Quantum Simulation

# The discussions across **all 5 countries** revealed

- **experts** from various sectors are **fully aware** of the human centrality as the main feature of Industry 5.0.
- a shared **struggle** with education-industry misalignment, slow curriculum adaptation
- **collaboration** between businesses, educators, and policymakers **is the foundation for success**
- each country has unique challenges, they all face **similar obstacles** in integrating advanced technologies & preparing the workforce for Industry 5.0.
- **social & soft skills as equally crucial as technical skills**
  - particularly in the context of Industry 5.0 with a human-centric approach to technology & innovation
  - strong demand for adaptability, collaboration, emotional intelligence, and interdisciplinary skills
- **a major transformation in education and workforce training is needed**

Good basis for  
cooperation

# Message from experts on how to close the existing skill gaps

- Strengthen core digital literacy across all roles
- Introduce early-stage STEM/ICT training in schools
- Offer specialized courses/certifications in ML, Big Data, cloud deployment
- Encourage practical projects to move from theory to real-world
- Integrate ethics modules into tech curricula (bias mitigation, data privacy)
- Provide ongoing GDPR/AI Act compliance workshops
- Support professional development, **upskill continuously**, use microcredentials



## EU Recommendations on Microcredentials and ECTS

- **The European Commission's Council Recommendation of 16 June 2022:**
  - Emphasizes the importance of integrating microcredentials within existing qualification frameworks
  - Notably the European Qualifications Framework (EQF) and the European Credit Transfer and Accumulation System (ECTS).
  - This integration aims to enhance transparency, recognition, and portability across institutions and borders.
    - <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX%3A32022H0627%2802%29>

## Microcredentials and Accreditation – EU Desk Research & Recommendations

- **ECTS as the Preferred Accreditation in EU Projects and Pilots**
  - Several EU-funded initiatives, such as the [EU-CONEXUS project](#), [Microbol Project](#), [MCE Project](#), [ECIU Universities Initiative](#), [Utrecht University](#) recognize microcredentials with an ECTS credit value, ensuring that learners can stack, transfer, and combine microcredentials towards larger qualifications within formal education pathways.
- **Enhancing Mobility and Recognition through ECTS**
  - The European approach to microcredentials supports their inclusion in National Qualifications Frameworks (NQFs), facilitating formal recognition across different EU countries and institutions.
  - This alignment enhances the mobility of professionals and students, allowing their certified skills to contribute seamlessly to career development and lifelong learning opportunities.
- **Ensuring Quality and Valid Assessment with ECTS**
  - Linking microcredentials with ECTS ensures adherence to established European Standards and Guidelines (ESG) for quality assurance, as defined in [ENQA report](#).
  - This alignment guarantees that the learning process, assessment methods, and workload are rigorously validated, making microcredentials a reliable and valuable tool for upskilling and reskilling in the labour market.

## Microcredentials and Accreditation – EU Desk Research & Recommendations (National Quality Assurance Agencies – ENQA report)

- **Most of the quality assurance agencies** that participated in interviews for the ENQA report **are not planning to evaluate alternative providers nor their provision of micro-credentials.**
- The main reasons are that
  - 1) there is no legal ground for such activity and the agencies have no mandate and
  - 2) the workload for the agency staff would be unmanageable.
- However, **quality assurance agencies agree that it is beneficial for HEIs to partner with alternative providers when developing and offering micro-credentials**, not only to make sure that the needs and expertise of employers are taken into account, but also to guarantee the quality of provision.
- In most of such cases, **the body awarding the micro-credential is the HEI and as such it bears the responsibility for assuring their quality.**

## Quality Assurance in Assessment

- Ensure consistency, fairness, transparency, and alignment of learning outcomes with the European Qualifications Framework (EQF 4–6).
- Formative:
  - Self-assessment quizzes and knowledge checks used to reinforce learning.
- Summative:
  - Online quiz-based exams to validate cognitive understanding and applied technical competence.
  - Projects, reports, and essays measure integration of theory and practice.
  - Case studies and lab exercises assess real-world problem-solving and professional readiness.
  - Overall the focus should be on hands-on practical and project oriented skills.

# Microcredentials for Vocational Education and Training (VET) Co-Creating Skills for a Digital & Green Society under Industry 5.0

## Microcredentials Ecosystem

- **Stackable & Pathways** → build towards higher qualifications.
- **Aligned with ESCO & EQF** → recognised across Europe.
- **CoVEs Network** → national and transnational Centres of Vocational Excellence.
- **Stakeholder Involvement** → employers, VET providers, policymakers, learners.




## Format

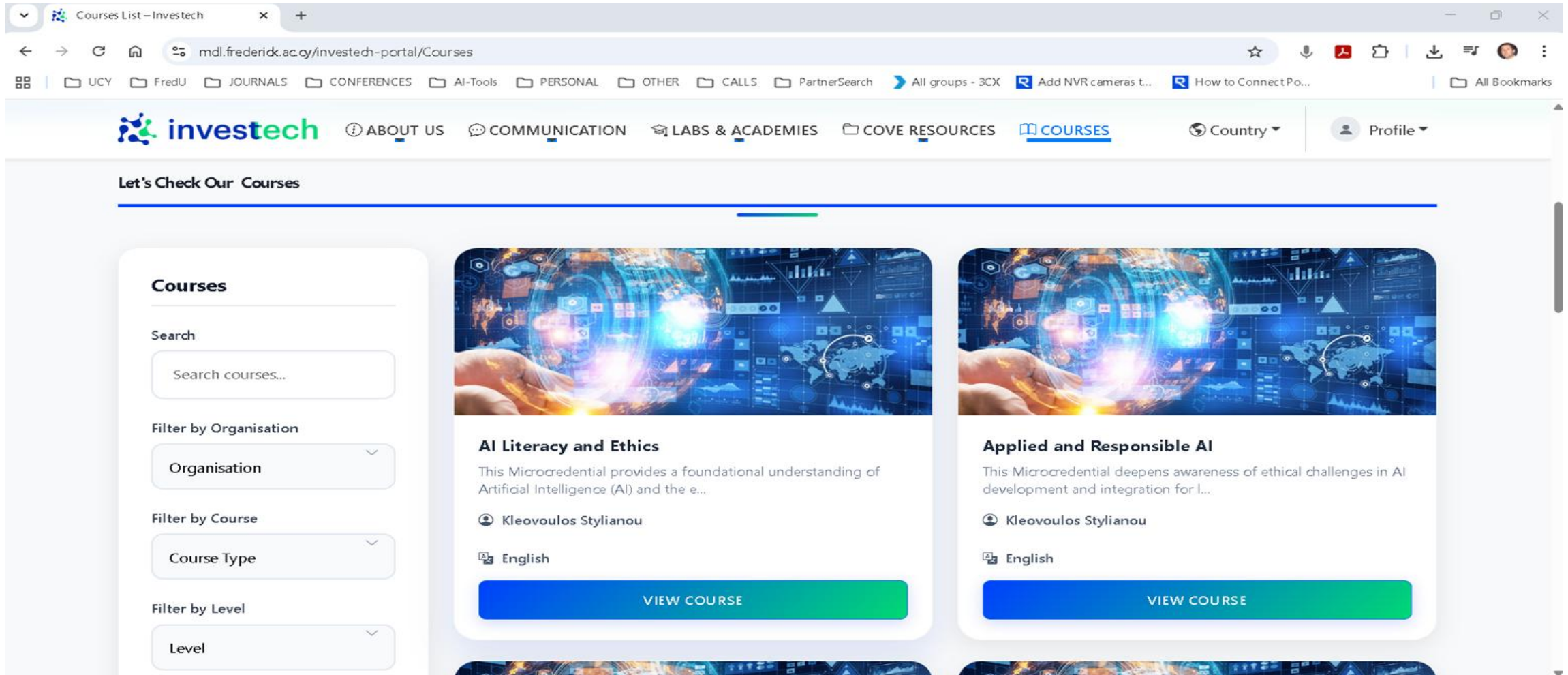
**Duration:** 0–2 ECTS (≈ 50 hours, 4–6 weeks).  
**Effort:** 8–12.5 hrs/week (1–2 hrs/day).  
**Learning Mix:**  
     **Asynchronous:** 40–45 hrs (self-paced, online).  
     **Synchronous:** 5–10 hrs (live sessions, group work).  
**Hands-on Labs:** 50% practical skills.  
**Assessment:** Activity reports + project-based tasks.

		Artificial Intelligence and Ethics	Big Data	Internet of Things (IoT)	Blockchain	ICT for Sustainability	Industry 5.0	Quantum Computing
EQF Level	Level 6	Advanced AI Systems and Ethical Governance	Data Engineering and Business Intelligence	Building Scalable and Autonomous IoT Solutions	Secure and Ethical Blockchain Systems	ICT Solutions for Circular and Smart Cities	Cyber-Physical Architectures, Governance, and Human-Centred Innovation in Industry 5.0	Not Applicable
	Level 5	Applied and Responsible AI	Managing Big Data in the Cloud	Programming and Securing IoT Systems	Applied Blockchain Development and Integration	Smart Systems and Green Data Practices	Cyber-Physical Systems and Digital Transformation for Industry 5.0	Not Applicable
	Level 4	AI Literacy and Ethics	Big Data Foundations and Infrastructure	IoT and Smart Systems Fundamentals	Blockchain Foundations and Digital Ledgers	Digital Skills for a Sustainable Future	Industry 5.0 Foundations and Smart Environments	Quantum Basics: Introduction to the Quantum World Quantum Technologies for Cybersecurity

## Cross-Cutting Skills:

- Strong need for interdisciplinary learning (digital + green + social + soft skills)
- Microcredentials as rapid response to evolving skills
- National gaps differ, but European-level convergence: shortages in advanced digital and sustainability skills, as well as Soft Skills (communication, project management etc.)

 Flexible Learning	 Rapid Response	 Work-Relevant
<ul style="list-style-type: none"> <li>▶ Short, modular units (2–5 ECTS)</li> <li>▶ Stackable → pathways to full qualifications</li> <li>▶ Available online, hybrid, or in-person</li> </ul>	<ul style="list-style-type: none"> <li>▶ Designed from real-time industry feedback</li> <li>▶ Developed quickly (6–12 months vs. years for traditional curricula)</li> <li>▶ Address emerging skills (AI, blockchain, green transitions)</li> </ul>	<ul style="list-style-type: none"> <li>▶ 50% hands-on labs and projects</li> <li>▶ Aligned with ESCO/EQF frameworks</li> <li>▶ Recognition across Europe through CoVEs</li> </ul>



**Courses**

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**AI Literacy and Ethics**

This Microcredential provides a foundational understanding of Artificial Intelligence (AI) and the e...

Kleovoulos Stylianou

English

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**Applied and Responsible AI**

This Microcredential deepens awareness of ethical challenges in AI development and integration for l...

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<https://mdl.frederick.ac.cy/investech-portal> (To be officially launched soon)

Thank you for your attention!

Any Questions?

[www.investech-cove.eu](http://www.investech-cove.eu)

