VILNIUS TECH
Vilnius Gediminas Technical University

BUDAPEST EUCEET CONFERENCE 2025
Teaching Gen Z Civil Engineers

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Housing Decarbonisation Skills for Climate, Health and Jobs

The Skills4Deca project has received funding from the European Union's Digital Europe programme call "Specialised education programmes or modules in key capacity areas" DIGITAL-2022-SKILLS-03-SPECIALISED-EDU under Grant Agreement no. 101123311

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1. Introduction

1.1 The Need for Digital Transformation in Civil Engineering Education

❑ Key Context

- Rapid population growth, aging infrastructure, and global challenges (e.g., sustainability, climate change, resource shortages) demand a new generation of civil engineers.
- Despite this demand, engineering enrollment in Europe is declining due to:
  - Challenging curricula
  - Competing technical career paths
  - Uncertain long-term career prospects

❑ Role of Digitalisation

- Integrating digital skills in civil engineering education boosts student interest and aligns learning with industry needs.
- Higher education institutions are embracing digital tools to:
  - Attract Gen Z students
  - Enhance course quality and teaching methods
  - Support sustainable development goals

1. Introduction

1.2 Gen Z, Decarbonisation, and the Skills4Deca Project

❑ Generation Z & Education

- Born 1997–2012 — tech-savvy, multitaskers, raised in a digital world.
- Prefer interactive, digital, and practical learning over traditional methods.
- Need education that reflects the digital economy and real-world challenges.

❑ Decarbonisation Challenge

- Central issue in modern civil engineering — reducing CO_2 across infrastructure lifecycles.
- Offers a meaningful context to engage Gen Z through sustainability and technology.

❑ Digital Europe Programme Project Skills4Deca

- Collaboration among 3 Baltic countries universities (Lithuania, Latvia, Estonia), 2 SMEs.
- Goal: develop skills in housing decarbonisation and reduce CO_2 emissions.
- ~50 digital microcourses (Microlearning, Bachelor, Master levels) will be integrating into existing accredited programs.
- Digital tools (>13) will be incorporated into the microcourses, including: Adaptive Massive Open Online Courses (MOOCs), Computer Learning Systems, Adaptive Video and Text Systems, Web Text Mining, Access to E-Sources, Virtual Labs, Real-Time Virtual Labs, Virtual AI Learning Environments, 5D, 6D, and 7D Simulation Packages for Digital Twins, Learning Content on Sensors and Measurement Devices, and Educational Games within the Moodle Virtual Learning Environment.

2. Discussion

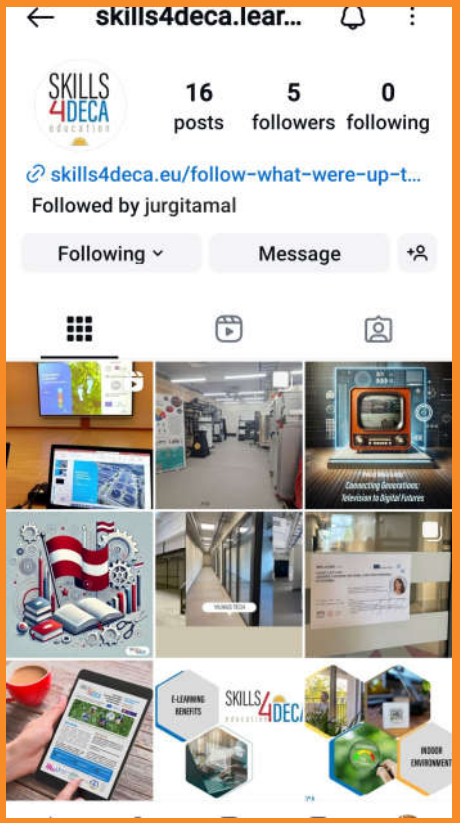
2.1 Challenges in Civil Engineering Education

❑ Key Issues Identified in the Baltic Region

- Consortium Partners: Riga Technical University, Vilnius Gediminas Technical University, Tallinn University of Technology, and 2 SMEs from digital innovation and energy efficiency and 2 Centres of Excellence.
- Main Challenges:
  - Limited use of digital tools among students and educators.
  - High first-semester dropout rates due to mismatch between student expectations and traditional teaching styles.
  - Gen Z disengagement in conventional learning environments lacking digital interactivity.
- Consequences:
  - Lower motivation and retention.
  - Missed opportunities to build digital and professional skills essential for the modern engineering workforce.

<u>Key Insight:</u>

👉 Integrating digital tools and interactive learning is essential to engage Gen Z and prepare them for future-ready civil engineering careers.



2. Discussion

2.2 Skills4Deca: Bridging the Digital Skills Gap

❑ Project Focus

- Launch Year: 2024
- Goals:
  - Strengthen digital literacy in civil engineering education.
  - Support energy efficiency and EU Green Deal objectives.
  - Bridge the digital skills gap among:
    - Housing managers
    - Construction engineers
    - Energy auditors
    - Designers

❑ Expected Outcomes

- Graduates gain digital, technological, legal, and financial competencies for sustainable housing solutions.
- Empower professionals to reduce energy consumption in existing and future buildings.
- Designed to attract both Gen Z students and industry specialists seeking upskilling opportunities.

2. Discussion

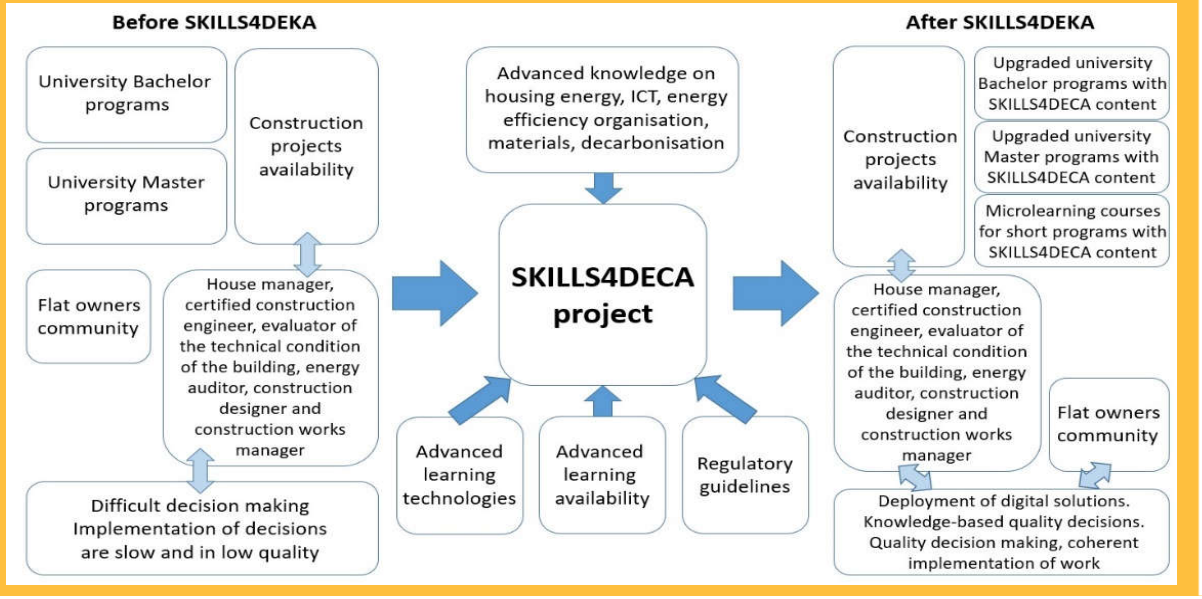
2.3 Integrating Innovative Learning into Civil Engineering Education

❑ Strategic Integration of Digital Learning

- Skills4Deca introduces innovative pedagogical content into existing undergraduate and graduate programs to strengthen education in building decarbonisation.
- The project enhances course relevance, digitalisation, and student engagement.
- Figure 1 (visual diagram) illustrates the interconnections between Skills4Deca activity blocks and the expected improvements in digital education.

❑ VILNIUS TECH Implementation Example

- Plans to embed Skills4Deca e-microcourses (1 ECTS each) within existing 6 ECTS courses.



2. Discussion

2.4 VILNIUS TECH Contribution to Skills4Deca

❑ Expertise & Role

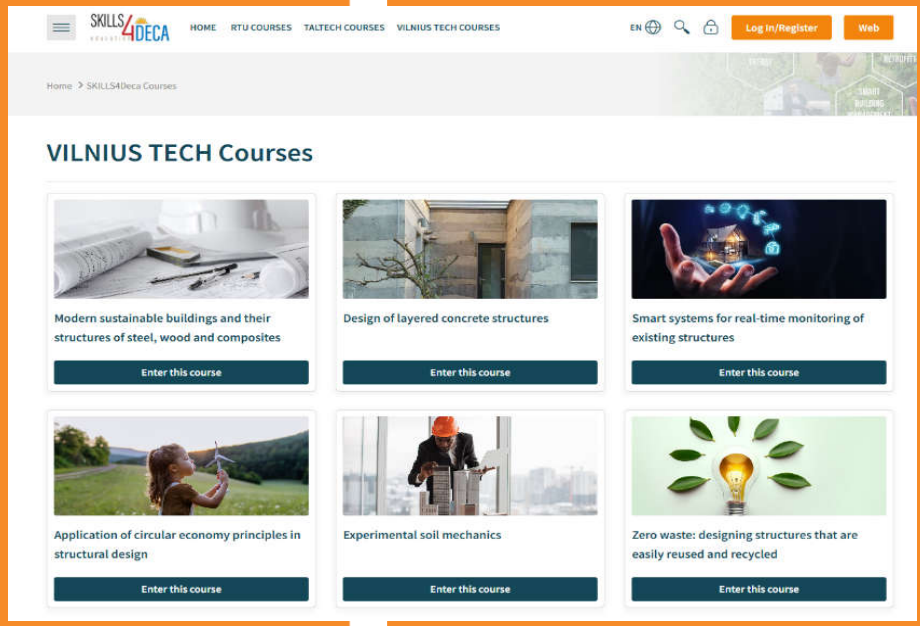
- VILNIUS TECH contributes strong expertise in Civil & Structural Engineering, Construction, and Real Estate Management.
- Responsible for developing 18 innovative microcourses (see *Figure*).

❑ Examples of Microcourses

•Human-Centred Cognitive Buildings
•Blockchain and the Built Environment
•Green & Friendly House Building Materials (from Waste)
•Circular Economy in Structural Design
•Modern Sustainable Buildings (Steel, Wood & Composites)

❑ Digital Tools will be Integrated:

•Adaptive MOOCs & Computer Learning Systems
•Virtual AI Learning Environments
•5D–7D Simulation Packages for Digital Twins
•Sensor & Measurement Content
•Educational Games via Moodle VLE



2. Discussion

2.5 Structure and Interactivity of Micro-Courses

❑ Micro-Course Design in Moodle VLE

- Includes: information about lecturer, course content, adaptive tests, knowledge assessments, student tasks, and final online exam.
- Interactive learning activities:
  - Reading program-generated texts
  - Watching selected videos
  - 3D virtual tours in laboratories
  - Using e-calculators and analyzing e-data sets
  - Playing educational games

❑ Key Features

- Fully interactive, enabling remote learning without face-to-face sessions.
- Based on educational research to optimize learning outcomes.

❑ Adaptive & Inclusive Assessments

- Gender-inclusive adaptive testing to ensure fairness.
- Constructed-response questions balanced to support performance differences between male and female students.

2. Discussion

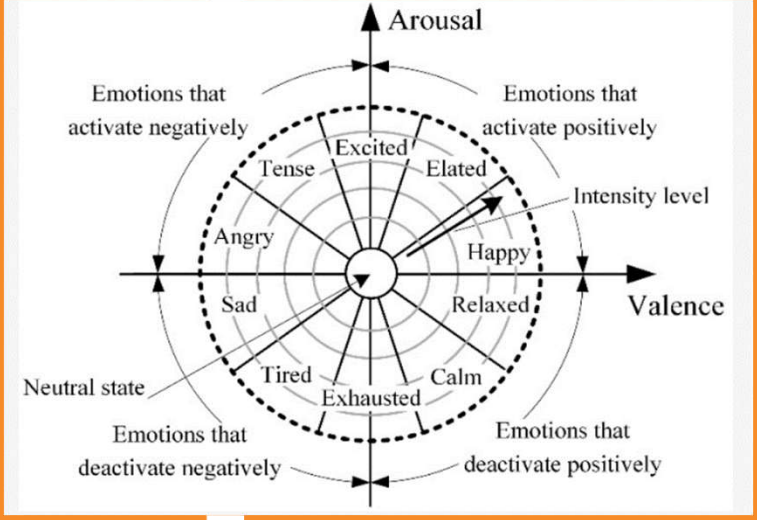
2.6 Advanced Digital Tools and Virtual Laboratories

❑ Emotion recognition techniques tailor content to students' emotional state.

- Uses Russell's circumplex model to adapt learning based on:
  - Interest level
  - Difficulty of study
  - Stress levels
- Biometric technologies enhance personalized learning.

❑ Virtual Laboratories

- Cost-effective, accessible, and safe alternatives to physical labs.
- At least 3 virtual laboratories being developed:
  - Soil Mechanics & Additive Manufacturing Lab
  - Building Materials Testing Lab
  - Applied Lab of Buildings, Constructions & Materials
- Laboratories include:
  - Equipment descriptions and methodologies
  - Instructional videos and databases
  - 3D virtual tours to familiarize students with modern lab equipment



Russel's circumplex model of emotions

3. Conclusion: Skills4Deca and the Future of Civil Engineering Education

- ❑ **Digital integration** enhances engagement and aligns civil engineering education with **modern technologies** and **industry needs**.
- ❑ **Decarbonization** is a critical challenge, especially for **Gen Z learners**, linking sustainability with practical skills.

➢ Skills4Deca Approach:

- Interactive **e-microcourses** embedded in existing 6 ECTS modules
- Focus on **energy efficiency**, **EU Green Deal**, and bridging the **digital skills gap**
- Pedagogically sound innovations:
  - Gender-inclusive adaptive testing
  - Emotion-aware learning
  - Virtual laboratories simulating hands-on experience

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SKILLS 4 DECA education

DIGITAL EUROPE PROGRAMME

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Thank you for your attention!

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