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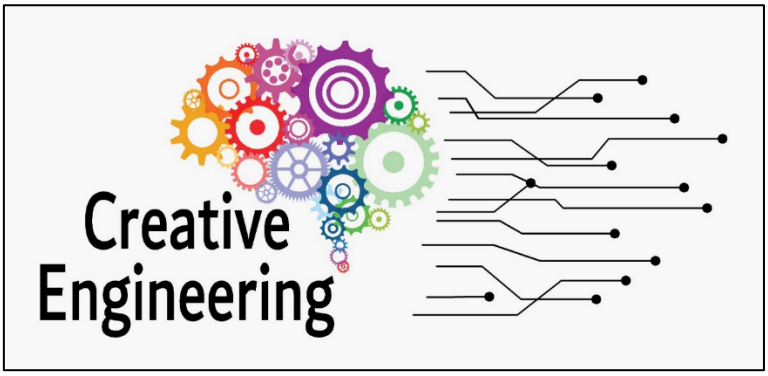

Curriculum “Introduction to CREATIVE ENGINEERING”

2022-1-SK01-KA220-HED-000090102

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1 INTRODUCTION TO CREATIVE ENGINEERING

Core Unit Title: Creative Engineering

Training Module Title: Introduction to Creative Engineering

1.1 Competence Unit

This unit introduces students to the fundamentals of creative engineering, focusing on foundational concepts, innovation principles, and cross-disciplinary thinking. It aims to build an understanding of how creativity and engineering interact to generate innovative solutions and foster design thinking.

1.2 Learning Outcomes

In the end of the module, students will demonstrate the following competencies, skills, and knowledge:

1.2.1 Competencies

A – Specific Competences (related to the core unit)

Code	Competence Description
A1	Understand the role of creativity in the engineering process.
A2	Apply basic design thinking methodologies to conceptualize innovative ideas.
A3	Identify and explore emerging technologies and their applications in engineering contexts.

A4	Recognize the importance of ethics and responsibility in creative engineering
A5	Demonstrate curiosity and initiative in approaching engineering challenges creatively.

B – Basic Engineering Competences

Code	Competence Description
B1	Describe key engineering processes and their creative potential
B2	Interpret technical and non-technical information to inspire innovative approaches.
B3	Use basic visualization tools to express engineering concepts.
B4	Organize and plan small-scale creative projects.
B5	Reflect on personal and team-based creative practices.

C – Transversal Competences

Code	Competence Description
C1	Work collaboratively in diverse teams.
C2	Present creative ideas clearly through visuals and speech.
C3	Practice ethical awareness in creative design processes.
C4	Engage in reflective thinking for personal development
C5	Show adaptability and openness to new ideas and perspectives

1.2.2 Knowledge

By the end of the module, students will be able to understand:

Topic	Description
Creativity in engineering	Core principles and definitions of creativity within engineering
Design thinking	Introduction to stages of design thinking
Emerging technologies	Overview of AI, IoT, and sustainable technologies
Engineering ethics	Integrity, transparency, responsibility, and real-world case studies
Innovation ecosystems	Interaction between creativity, entrepreneurship, and technology

1.2.3 Skills

Skill	Linked Competences
Creative ideation	A1, B2, B5
Design thinking application	A2, B1, C1
Technical visualization	B3, C2
Collaborative innovation	A5, B4, C1
Ethical reasoning	A4, C3

1.3 Evaluation Criteria

The assessment strategy in this module is designed to measure the learner's ability to apply and generate creative solutions. Each competence unit includes a mix of individual and group-based tasks

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- **Total: 100%**

Assessment is structured into three components:

1.3.1 Creative Concept Portfolio – 30%

Students submit sketches and concepts inspired by a comprehensive set of skills that demonstrate a comprehensive vision of the basic concepts of the creative engineering by design thinking methods.

Assessed Competences: A1, A2, B1, B2, C2

Evaluation Tool: Case study analysis form + ideation rubric

Criteria: Methodology of analysis, originality of ideas, clarity of presentation

1.3.2 Mini Project Presentation – 40%

Group presentation of a creative engineering concept

Assessed Competences: A3, A5, B3, B4, C1, C5

Evaluation Tool: Prototype/project rubric + peer assessment

Criteria: Functionality, innovation, practicality, teamwork and adaptability

1.3.3 Reflection and Report – 30%

Each student submits a reflective journal addressing:

- Ethical dimensions of their design decisions
- Their role in the team
- What they learned and how they will apply it in future problem-solving situations

Assessed Competences: A4, B2, C1, C2

Evaluation Tool: Reflection rubric

Criteria: connection to module content, personal learning outcomes

1.4 Methodological strategies

The Introdution to Creative Engineering module employs active, learner-centered teaching methods designed to emphasize experiential learning, collaboration, and critical reflection, these pedagogical approaches are well-aligned with the constructivist foundations of the CEDE Learning Model

1.4.1 Lectures and Theoretical Foundations

Introduction to creativity, innovation, and design thinking.

PowerPoint presentations, videos, and short case illustrations are used.

Used for: building conceptual clarity and shared vocabulary

Related Competence Units: A1, A4, B1, B4

1.4.2 Interactive Exercises

- Understanding the problem's complexity
- Prototyping challanges

Used for: scenario framing, project context

Related Competences: A2, B1, C3

1.4.3 Interactive Workshops

- Diverse teams work on small projects

Used for: practicing innovation, reflect on learning

Related Competences: A1, A3, B3, C2

1.4.4 Guest Talks

Invited professionals share practical experiences with:

- Creative engineering solutions

Used for: connecting theory with professional context

Related Competences: A5, B3, C2

2 RECOMMENDED OR REQUIRED READING

John E. Arnold (2016): CREATIVE ENGINEERING Promoting Innovation by Thinking Differently

Engel. (2018). Practical creativity and innovation in systems engineering. Wiley.

Cross (2008): Engineering Design Methods: Strategies for Product Design. Wiley.

Kuimova, M.V., Burleigh, D.D., Rodionov, D.A. (2017). Creativity in engineering education. Ponte Academic Journal, 73 (2).

IDEO, Kelley, Littman (2001): The Art of Innovation. Crown Business

Dorst (2015): Frame Innovation: Create New Thinking by Design. MIT Press.

3 DETAILED CONTENT FOR THE COURSE

Language of the course:

Names of the lectures:

Teaching hours: 15 hours

Mode of delivery: distance, online

Notes:

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1. Introduction to Creativity in Engineering (2 hour)

- Importance of creativity and innovation in engineering
- Analyzing Real-World Engineering Challenges
- Identifying key elements and constraints

3. Creativity, Emerging Technologies and Visualization Techniques (3 hour)

- Examples and practical exercises
- Visualization tools

4. Prototyping in Engineering Contexts (2 hour)

- Group ideation and exercises
- Techniques for enhancing creative idea generation

5. Teamwork and Collaboration (4 hour)

- Introduction to prototyping tools
- Prototyping activities

6. Invited speakers (2 hour)

- Rflective ideas and discussion

8. Reflection, Improvement and presentation (2 hour)

- Importance of reflective practice in engineering
- Developing continuous improvement plan