ENVIHEI

Title of the PBL challenge: **Aerospace Engineering Project developed by large groups**

Name of the responsible lecturer

Manuel Castejón Limas

University / Department / Degree program

University of León / Text / Bachelor's Degree in Aerospace Engineering

Course / Subject in which implemented

4th Course / Project Management

Implementation period (dates)

September 10, 2025 – December 10, 2025

Total duration (weeks/hours)

13 weeks / 26 hours

Number of students involved

58 students

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Spanish Service for the Internationalization of Education (SEPIE). Neither the European Union nor SEPIE can be held responsible for them. [2024-1-ES01-KA220-HED-000246733]

Erasmus+ Enriching lives, opening minds. Co-funded by the European Union

P. No.: 2024-1-ES01-KA220-HED-000246733

1. Project Design

1.1 Brief description of the project and the challenge proposed

The students form two different groups, with separated practice sessions for each one. Each group chooses their case study: a project to be developed by a large group of students and related with their engineering degree and sustainability. In the experience described in this report the groups decided to develop these projects:

- Airline company business case
- Modification to an existing airport

1.2 Expected learning outcomes (academic and transversal competences)

- Design, plan, and manage an engineering project throughout its full lifecycle, including scope definition, requirements analysis, task decomposition, scheduling, and risk management.
- Apply project management tools and methodologies (e.g., Work Breakdown Structure, project scheduling software, and technical documentation standards) in a realistic context.
- Coordinate technical development processes within a project framework, ensuring alignment between planning, execution, and final deliverables.
- Develop a business case or technical project documentation
- Work effectively in large teams, assuming roles and responsibilities, and contributing to the organization and monitoring of collaborative work.
- Document project activities and decisions in a clear, structured, and professional manner, following engineering standards.
- Communicate and defend project results effectively in a professional context, including presentations to external stakeholders.

- Manage time and resources efficiently, including the tracking of individual contributions and workload distribution.
- Apply critical thinking to evaluate alternative solutions and justify technical and organizational decisions.
- Integrate sustainability considerations into engineering practice, reflecting on the environmental impact of the proposed projects.

1.3 Targeted sustainability competences

- Apply a systems-thinking approach to understand the environmental impact of the proposed projects.
- Evaluate how engineering decisions affect resource consumption, waste generation, and energy efficiency.
- Integrate sustainability considerations into problem-solving and decision-making in engineering projects.
- Promote responsible use of digital technologies, considering principles of green computing.
- Demonstrate critical thinking in assessing trade-offs between performance and environmental impact.

1.4 Sustainability approach and how it is integrated into the project

Sustainability is considered in each of the projects developed as a concrete item. In the case of the modification of an airport, the soil management, acoustic impact and impact on animals, has been considered. In the case of the airline business case, the environmental impact was assessed.

1.5 Methodologies and tools used (PBL structure, facilitation techniques, etc.)

The experience is based on Problem-Based Learning (PBL) where students are confronted with real aviation challenges—spanning commercial airline business strategy and airport infrastructure modification—and are required to develop complete solutions within a student-centred learning environment for two different cases: an Airline Business Case and an Airport Modification Case

Students act as specialized consultancy or management teams responsible for delivering solutions that meet industry and regulatory requirements.

The project is developed following a progressive approach moving from initial analysis to final validation. The process includes problem definition, task planning, development of technical or financial models, and final presentation to a simulated executive panel.

The lecturer acts as a facilitator and advisor, guiding the learning process through regular follow-up sessions, technical reviews, and feedback. Weekly coordination meetings track progress, address strategic or engineering conflicts, and review key decisions. Students document these sessions using formal project minutes.

Collaborative work and roles: Students work in large teams, assuming professional roles (e.g., Chief Commercial Officer, Revenue Manager, Lead Airport Engineer, Operations Specialist, Risk Coordinator). This structure enforces accountability, cross-functional communication, and structured task organization.

The Project management tools employed are, e.g., Work Breakdown Structure (WBS), Gantt charts, Activity Dictionaries, Project Charter, Scope Management Plan, to name a few.

1.6 Organization of the project (group formation, timeline, milestones)

The groups are form allowing the student to choose the practice session and project challenge. They choose the leading managers and different subgroups devoted to each of the project tasks. The have weekly meetings to discuss and share information, as well as making decisions about the performance observed and needed actions. They must complete their project before the 10th of December. Otherwise, they define the chronogram and milestones they will need to follow.

1.7 Deliverables requested from students (type, format, deadlines)

The students are asked to hand in:

- The technical documentation of their project (text, pdf).
- The management templates following the Project Management Institute methodology (text, pdf).
- A presentation describing their case (video or PowerPoint with voice recording).

1.8 External collaborators involved (mentors, companies, experts...) and their role

No external collaborators were involved in this implementation.

2. Project Evaluation

2.1 Assessment criteria and methods used

The projects were evaluated by considering the three deliverables handed in. The technical documentation was evaluated by considering the students' performance in terms of goal description and accomplishment, list of requirements, alternatives considered and rationale for each decision made. The management documentation was evaluated by considering the students' performance in terms of detail in the information provided, depth in planning and analysis, breadth in aspects covered, and proper role definition and assignment.

2.2 Evidence of student learning (examples, outputs, results)

The two groups participating in this implementation demonstrated a high level of achievement in both project management and technical development, successfully delivering a solution to the project assigned.

The group in charge of developing the airport modification successfully delivered the engineering project in accordance with the structured defined by the standard body AENOR, in particular the standard UNE-157001 regulating the contents for the documentation of engineering projects. The group in charge of the business case followed, as expected, a different format, delivering a complete report with the business case analysis. They both delivered compliant project management forms with the corresponding information to their projects.

3. Reflections and Recommendations

3.1 Main achievements and strengths of the project

The students successfully achieved the expected outcomes while gaining experience in working as part of a large group. They took on management

responsibilities and worked autonomously, while collaborating in an environment that reflected the dynamics of engineering teams involved in real-world projects.

3.2 Challenges faced and how they were addressed

The students had to organize themselves and take responsibility for the outcomes of their decisions. In the context of large groups, this often led to conflicts arising from the numerous interactions among team members. These conflicts were addressed during the weekly meetings by identifying the available alternatives and discussing their respective advantages and disadvantages.

3.3 Lessons learned for future implementations

An attempt was made to implement a peer-review approach for the evaluation of deliverables. However, this proved difficult to implement given the current status of the activities on the Moodle platform and would require more careful planning to ensure satisfactory implementation.

4. Supporting Material

4.1 Lecturers' materials and project documentation

Lecturers' materials and project documentation are available in the following link:

https://drive.google.com/drive/folders/1HLLX_60M9CqNAv1xm9WDTPTab1q6yox8?usp=drive_link

4.2 Deliverables produced by students, final presentations or pitch materials

An example of deliverables produced by students is available in the following link:

https://drive.google.com/drive/folders/1JHinVZksks8l3dFl3NBKckZsEwj4QTJ2?usp=drive_link

Students' final presentations are available in the following link:

https://drive.google.com/drive/folders/1MJaOFWyMOfm91pzcrW93vl7TlVI7wo-a?usp=drive_link

4.3 Images/videos (with consent)

No photographs or videos of the students were taken during the course.

4.4 Any other relevant material

All the materials, including this report, are available in the following link:

https://drive.google.com/drive/folders/1_IstSZAzwaj9Zk6Ta_TzSiezXRGe3DcH?usp=drive_link