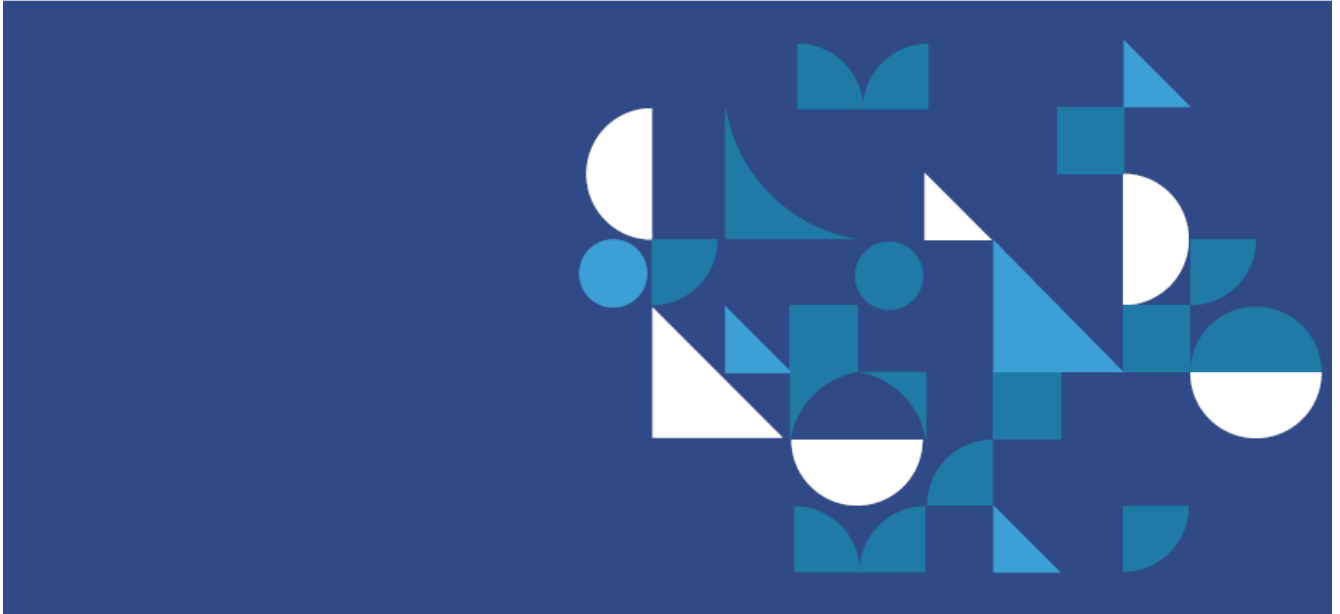




Industrial Engineering and
Management of European
Higher Education



IE3 Course Action Plan REPORT WP3 UPM

Date: 31/01/2022



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UNIVERSITY



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ESTIEM



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1 EXISTING COURSE MODULE

Course module: Project Management: Advanced Tools and Techniques.

Master Program: Industrial Organization Master

Effort: 6ECTS (165 h)

Students: ~ 70 students

It is a compulsory course in the master program.

1.1 Objectives

The course aims at endowing second level management engineers with the following knowledge:

- Main areas of activity for managing projects in current context.
- Different Project Management methodologies.
- Advanced techniques for managing projects with practicing by managing some academic projects.

1.2 Current Syllabus

The existing syllabus can be seen in Figure 1 below,

1. Introduction
2. Project Management Methodologies
3. Scope Management
4. Time Management
5. Cost Management
6. Risk Management
7. Procurement Management
8. Quality Management
9. Communication Management
10. Human Resources Management
11. Stakeholder Management
12. Project Execution Monitoring
13. Agile Project Management
14. Maturity Models

Figure 1.- Topics covered in the ancient version of the course.

Where the effort per point is 0.4 ECTS, including theory and practice except in the introduction accounting just for 0.1 ECTS (1h in presence) and Risk management and Project Execution Monitoring, which require 0.7 ECTS. Assessment uses the remaining 0.1 ECTS.

1.3 Teaching methods and assessment

The former approach was to split sessions between theory and practice. Concepts are presented in magisterial lessons (14 weeks, 2 hours theory and 2 hours practice per week).

The scoring process is based on written exams being related to the theoretical knowledge (50% of weight). Practical work is summarized by an integrated report as well as team presentation and discussion (50% weight).

When the COVID-19 emergency imposed distant learning, the approach moved to synchronous remote lessons leaving the recordings available for students on the institutional repository (Onedrive).

1.4 Need for revision

The main reason for revision is the ambition to provide master students with actual knowledge in the field of Project management consistent with industry needs.

It requires a significant shift from the traditional view promoted by institutions such as Project management Institute toward a multi-disciplinary view of different methodologies, but also to include digitalization dimension.

Therefore, better integration between practice, looking at bringing alive projects to be handled, in order to provide effective experience of things evolving in real contexts.

To create enough room for practical effort, several mythological changes need to be enforced, because of devoting more time in the face to face sessions to discuss issues and theoretical implications for different situations and deliverables found during practical work. In order to enable such approach, several strategies have been considered, such as:

- Put the theoretical acquisition in flipped classroom approach.
- Provide a microlearning approach with short readings and video content.
- Enable self-diagnosis about the gathered knowledge throughout the microlearning environment.
- Put the highest attention to the managerial deliverables as well as the decision making process, when complexity increases.
- Globally speaking, learners are going to be empowered to decide when they know enough or when they need more information or support.

2 REVISION RELATED TO THE BoK

The UPM is a Madrid-based university but we have international endeavors, and it is in this context in which we have to measure up. We operate in a global playing field, and this should be reflected in all our activities as a university.

The UPM has a lengthy history as an international university, of which it is proud. This strategy aims to build upon this tradition and reputation at the same time as securing a position for a changing future. UPM is already a strong and internationally respected university. It is the leading university in the Spanish-speaking world for engineering. But it is time to go global. We need to put Madrid and

the UPM more firmly on the international map or at least clarify its place in the world rather than just relying on rankings.

Global UPM Strategy: based on ten pillars, which are,

- Forge alliances with the best universities and institutions in the field of the technology.
- Develop mutual confidence and commitment with our partners, identifying common interests and opportunities, focusing on the longer term and opting for the development of joint programmes within the teaching, the research and the innovation fields
- Defend our public service status, preserving the principle of public service as a key component of the mission of our university.
- Be an asset to our country, aligning our international strategies with the policies of our region and country, go with Spanish technology companies in their international expansion.
- Take advantage of national and local strengths: Spanish language, gateway to Latin America and Africa.
- Develop innovative formats of collaboration.
- Be a reference in terms of sustainable development goals.
- Adopt a strategy mainly targeting positioning: defend and boost our brand.
- Do not go it alone: international networks and strategic partnerships.
- International offices as platforms upon which to build and boost the university's strategy in the respective region. The UPM has a networked structure of international offices. It is their job to support UPM students, staff and researchers and promote their internationalization, increase the visibility of the university in the respective region and recruit young researchers.

2.1 BoK considerations

After starting from the strategic pillars, the ambition for the course, connected with the planning phase was also established. Then, the BoK established standards were enforced, including new module configuration, resources, etc.

In the following, the main findings of the BoK affect the course module revision:

“By analyzing the knowledge demand expressed by companies in the quantitative survey (questionnaire), the following technical knowledge, skill, and competencies (KSCs) have been identified in descending order of importance:

Knowledge, Skill, and Competences

- **Project Management**
- *Operations Management*
- *Quality Management*
- *Strategic Management*

- *Safety of Work*”.

“As far as digital operational tools are concerned, the high companies’ demand values are observed for

(listed in order of descending importance):

- *Management Software Tools (e.g. ERP, CRP)*
- **Computer-based Statistic Competences**
- *Big Data Analysis.*”

Finally, results of the survey carried out in the IE3 project “forced the revision to focus on the “soft skills”

characterized by a high companies’ demand (listed in order of descending importance):

- **Problem Solving and Decision Making;**
- *Team Working;*
- *Communication Skills*”.

Another key aspect of the recommendations from the BoK, in addition to the consideration of the KSCs arose from the companies/employers, is to keep the learners in the middle of the learning process.

New generations of learners currently attending university courses exhibit specific behaviour, not observed in earlier generations, as the result of being exposed to internet and social media tools from the beginning.

Currently most of research studies are focused on Millennials, but the younger, lesser-known generation now named as Generation Z grew up without much fanfare [1]. The oldest of this post-Millennial generation arrived to college in 2014-2015, and more than four years later, Generation Z students fill our classrooms, and campus programs [2]. Although not everyone born in a generational period shares the same values or experiences, they do share a common context that shapes their world view. Thus, generational research can provide institutions with valuable information to design effective policies, programs, and practices.

No different from generations before them, Generation Z's focus when coming to college is to learn and acquire the skills necessary for their future careers. Learning for them, however, is markedly different from that of previous generations. Findings from North-eastern University's Innovation Survey highlight that Generation Z students prefer to engage in hands-on learning opportunities in which they can immediately apply what they learn to real life, and they describe the ideal learning environment as “need[ing] to be actively doing the learning to obtain the most information.” University officials continue to face new challenges in meeting the needs of an increasingly diverse student body and fulfilling an expansive institutional mission [3]. To configure more efficient learning procedures is a requirement, but this

behaviour can be identified as well as to professionals looking to enlarge their knowledge.

Because of the highlighted characteristics of over-stimulation, digital multichannel sources, lack of patience, it becomes even harder managing classes lasting one hour and a half and involving many slides and concepts. Providing a vibrant learning environment for Generation Z will require creative approaches that combine social interactions, technology, and assignments that simulate real-life work situations or are community outreach projects. New technology platforms may be required as well as faculty development to learn methods for teaching Gen Z that includes more than technical approaches.

Micro learning combined with the Knowledge Graph representation (KG) as well as an advance competence approach enabling embed assessment of knowledge related to both nodes/concepts and arcs/relationships seems to be consistent with the renovation spirit.

The interest of such learning structure is that enables self-guided, independent asynchronous learning of concepts as auxiliary but yet relevant elements. By giving learners the option for such learning path, when the course involves blending or synchronous activities, such organization opens a bigger space for innovation. This is because when formal lecture presentations of contents are removed, more options for training oriented approaches appears, including open discussions about relationship between concepts or case studies.

More practical application to real cases, including software tools are well suited, emphasizing the opportunities to acquire additional soft skills linked to the cooperative work and noisy environments.

In the next section of this report more details about the revised course design will be provided as well as details for course implementation, always inside the section 3.3 of the BoK.

2.2 Contents

The revised content of the course “Project management: Advanced Tools and Techniques” looks to introduce a far more digitalized version of some topics, such as Time and Cost Management, where many different alternatives to the classical scheduling techniques are available, with dozens of cloud and local pieces of software helping to this end.

The same happens with the topic related to Project Execution Monitoring.

Despite of the previous aspects, a specific topic related to Digitalization and Projects, presenting to learners the two way of thinking: managing projects to digitalize processes and digitalization of project management processes.

2.3 Teaching Methodology

According to the main findings and suggestions from the BoK, the following teaching methodologies have been adopted for the pilot course module:

- Asynchronous Learning by LMS in either distant or blended configurations.
- Microlearning approach implemented with LMS (see Figure 2).
- Single path per student can be selected based on their existing knowledge (assessed by specific quizzes) inside each competence.
- Quiz based selftesting for the individual microlearning content.
- Gamification to refresh and review content (see Figure 3).
- Teams to manage in a practical way on-going projects.
- Theory is secondary and serving the decision making and work carried out to manage the assigned projects.
- Minutes of meetings as well as deliverables are assessed and feedback is timely provided.
- Video based presentations for the integrated project as well as for the individual contribution are developed.
- Conferences and E-Conferences have been configured as extra content as optional activities.

The screenshot displays a Moodle course page. The left-hand navigation menu includes categories such as MIO-DPHTA, Participants, Badges, Competencies, Grades, INITIAL, GENERAL, **SCOPE** (selected), AGILE, PLANNING, COST, RISK, PROJECT TRACKING, QUALITY MANAGEMENT, and STAKEHOLDER & COMMUNICATION MANAGEMENT. The main content area is titled 'SCOPE' and features a 'Restricted' warning: 'Not available unless:'. The requirements listed are: 'You achieve a required score in QZ: Prjs&PM (2 min)', 'You achieve a required score in QZ: PrjChars (2 min)', 'You achieve a required score in QZ: Project vs PM (2 mins)', and 'You achieve a required score in QZ: PM Methodologies (2 min)'. Below this, there is a 'Session 02' section with a 'Mark as done' button and a 'Hidden from students' label. Further down, the 'Project LifeCycle vs PM LifeCycle' section has a 'Mark as done' button. Below that are two video items: 'VD: PM LifeCycle (4.14 min) (copy)' and 'RD: PLC vs PMLC (5 min) (copy)', each with a 'Mark as done' button. At the bottom, a quiz item 'QZ: PMLC & PLC (2 min)' is shown with 'Receive a grade' and 'Receive a pass grade' buttons.

Figure 2.- LMS content with microlearning video and readings, as well as quizzes.

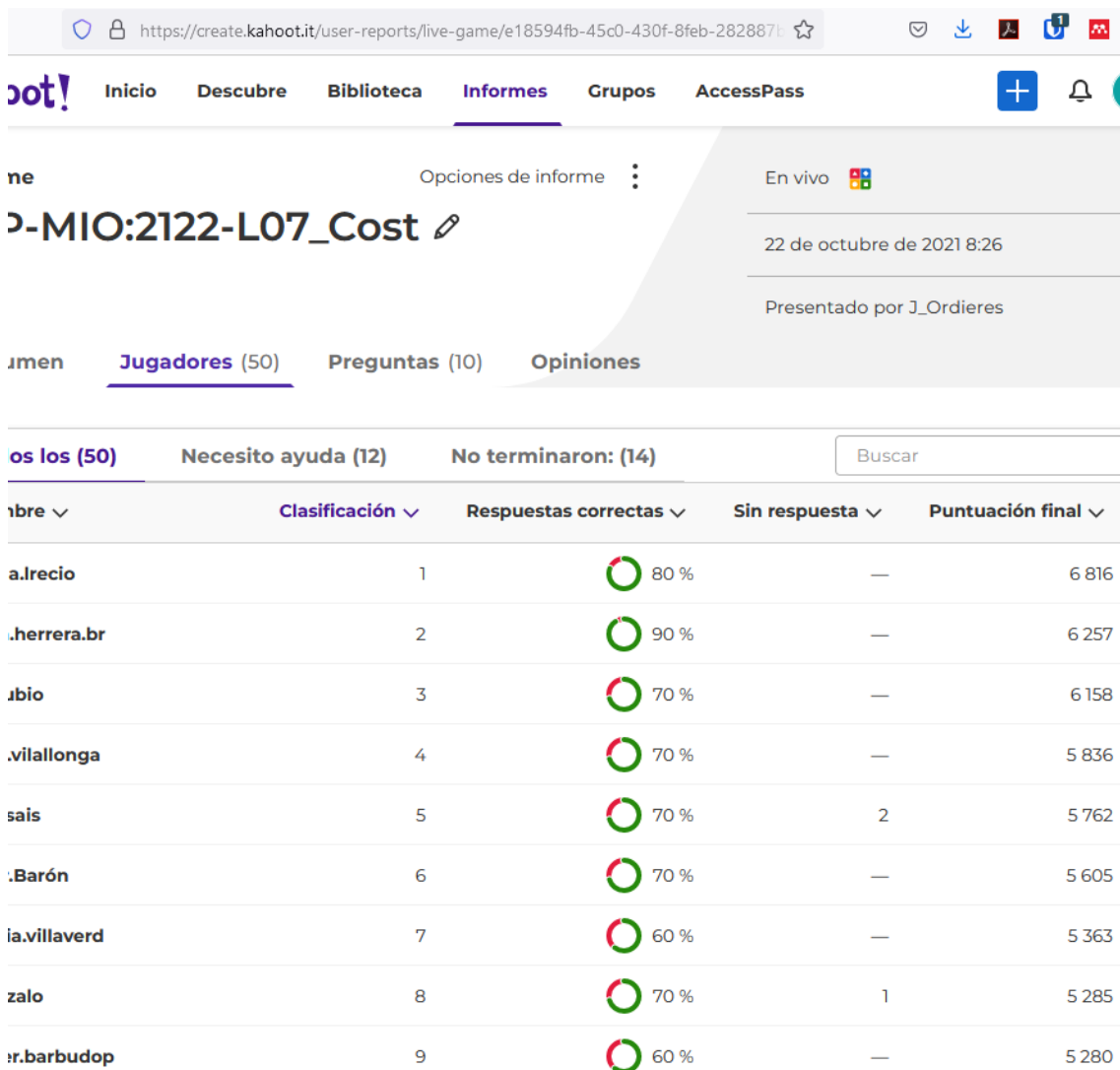


Figure 3.- Scoring in gamification serious games used to test knowledge gathering.

Synchronous sessions will be used to discuss topics based on dynamic html content created with markdown (see Figure 4):

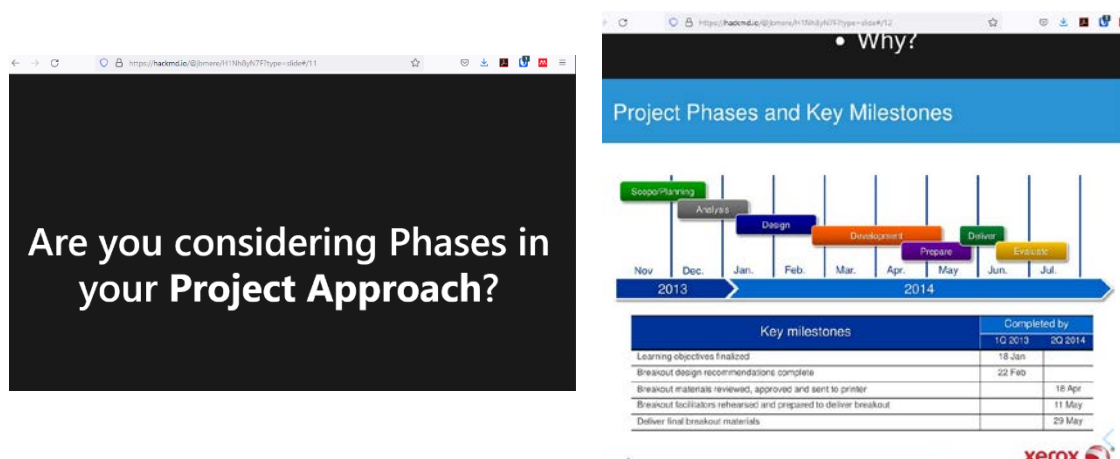


Figure 4.- Dynamic HTML content material to guide interactive synchronous discussions.

3 REVISED COURSE MODULE: Project management: Advanced Tools and Techniques.

Course parameters are the same for this upgraded release of the course:

Course module: Project Management: Advanced Tools and Techniques.

Master Program: Industrial Organization Master

Effort: 6ECTS (165 h)

Students: ~ 75 students

It is a compulsory course in the master program.

3.1 Expected Learning outcomes

Based on the preliminary work carried out in [4] the competence concept was adopted by following the current status of the art, where scholars have identified two main categories of competences, Individual and organizational competencies. Still, independently from the adopted taxonomy, it is convenient to fix the competence understanding, which will require, a definition, a description, and a measurement criteria (see Figure 5).



Figure 5.- Competence understanding.

Indeed, in order to refine the goals, a case base analysis was adopted as methodology. To this end, aiming to present specific ways of implementing transformed IE&M courses, a Project Management module was selected. Then the KG was established, as summarized in Table 1, where the first column represents the knowledge area, in close relationship with the competences to be mastered, and then the already mentioned triplets are presented for a few cases.

Table 1 Random Entries from the KG for the PM course

Knowledge Area	Subject	Relationship	Object
General	PM	has management capabilities in	Project Integration
General	Phase	has common	Processes
General	Project Management	is different from	Project
General	Project Management	is different from	Project Deliverables
Scope	Scope	aims to deliver	Deliverables
Scope	Scope Management	aims to deliver	Required Deliverables
Scope	Scope Management	includes	Scope Planning
Planning	ROY	is a	Network Diagram

3.2 Revised Syllabus

In Figure 6 the new designed course content is introduced. Therefore, main aspects already discussed have been implemented.

1. Introduction
2. **Digitalization and Projects.**
3. Project Management Methodologies
4. Scope Management
5. **Time and Cost Management**
6. **Project Execution Monitoring**
7. Risk Management
8. Quality Management
9. Communication and Stakeholder Management
10. Agile Project Management
11. **Management of the R&D projects**
12. Maturity Models

Figure 6.- Renovated syllabus.

It is easy to realize that the renovation involves strong changes (media preparation (many small pieces of content) but also knowledge graphs as per big competence (see Figures 7 and 8), including tests for individual assessment and for global one. Indeed, preparation of seminars for flipped approach.

It was decided to use classical Learning Management System (LMS) as a convenient tool to implement the Competence framework, and Moodle was selected for this purpose, as indicated in Figure 2, where its different entries are grouped under the taxonomy keyword [5]. It looks to define every framework row, by setting the language string keys used to describe competencies at each level of the framework [6]. In present case, the adopted taxonomy organizes the knowledge in four layers, where the concept is the atomic item and skill is the capability of getting concepts working together, either for knowledge or just when used by a specific tool to carry out detailed outcome. Combination of skills will provide integrated perspective in a higher level, named competency. Finally, competencies are arranged by Domains of knowledge [7].

For the presented implementation Domains are 'General Knowledge/Organizational', 'Scope', 'Cost', 'Risk', 'Stakeholders', 'Assessment', 'Reporting', and 'Maturity'. For each of the domains or knowledge areas, several competences can be linked. Therefore, when Organizational Domain is considered, it was decided to highlight competency for Setting up the Project Characteristics, as well as Project agents recognition and relevant activities and roles. Finally, it was decided to include the competence to recognize different methodologies relevant for project management (see Figure 5).

By following the same approach, when a single competency is selected different skill entries become relevant. Just as an example, when Project agents is selected as competence, relevant skills are identifiable, such as,

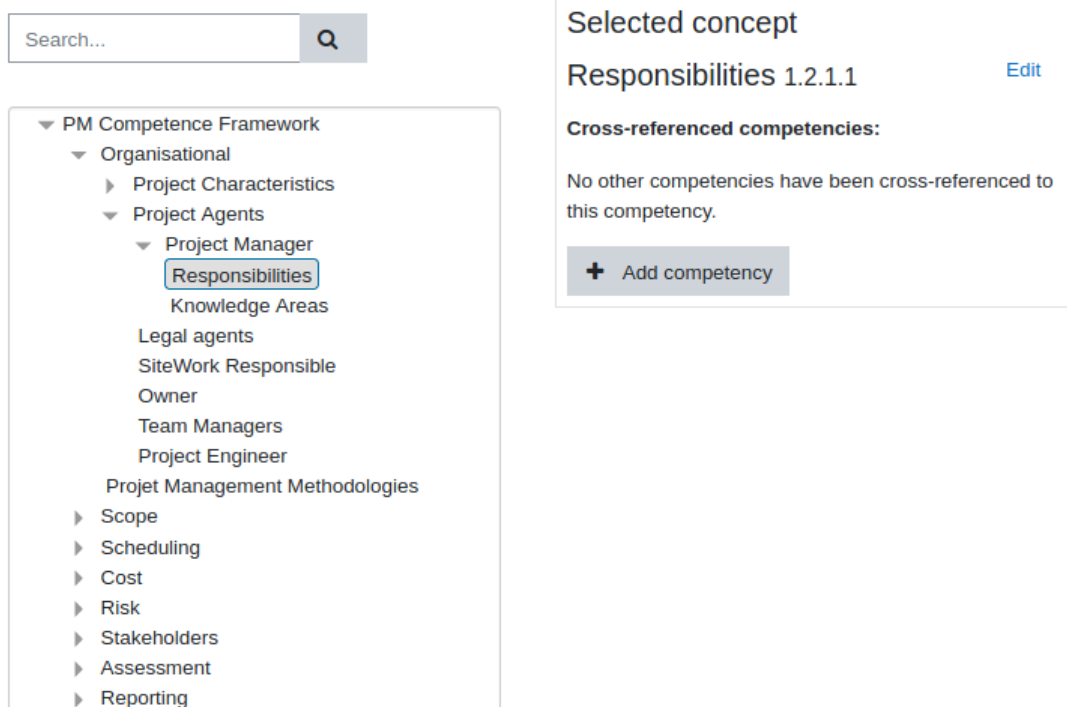
- understand the value creation for Project Manager as well as their typology,
- understand the relevance and responsibilities for all the legal entities around the project,
- understand the work for different contractors as well as their relationship,
- understand the implications for the project owner / product owner,
- understand the Project Engineering roles and responsibilities,
- understand the team work involved in both, project execution and project management.

Such structure can be realized at the competence framework definition in Figure 6, where the atomic elements can be related to them as appropriate. In our case, the skill related to the Project Management understanding can rely on her responsibilities, the relevant knowledge areas s/he will be required to manage.

PM Competence Framework

Framework of Competencies in Project Management

Competencies



The screenshot displays the 'PM Competence Framework' interface. At the top left is a search bar with the text 'Search...' and a magnifying glass icon. Below it is a tree view of the competence framework. The tree is expanded to show 'Project Manager' > 'Responsibilities', which is highlighted with a blue box. Other visible items in the tree include 'Organisational', 'Project Characteristics', 'Project Agents', 'Knowledge Areas', 'Legal agents', 'SiteWork Responsible', 'Owner', 'Team Managers', 'Project Engineer', 'Project Management Methodologies', 'Scope', 'Scheduling', 'Cost', 'Risk', 'Stakeholders', 'Assessment', and 'Reporting'. On the right side, there is a 'Selected concept' panel for 'Responsibilities 1.2.1.1' with an 'Edit' link. Below this, it states 'Cross-referenced competencies:' and 'No other competencies have been cross-referenced to this competency.' At the bottom of this panel is a '+ Add competency' button.

Figure 7.- Implementation of skill items into the Competence Framework.

PM Competence Framework

Edit competency framework

▼ Collapse all

▼ General

Name	<input type="text" value="PM Competence Framework"/>
Description	<div><p>Framework of Competencies in Project Management</p></div>
ID number	<input type="text" value="10.0.1"/>
Scale	<input type="text" value="Separate and Connected ways of knowing"/> <input type="button" value="Configure scales"/>
Visible	<input type="text" value="Yes"/>
Category	System

▼ Taxonomies

Level 1	<input type="text" value="Domain"/>
Level 2	<input type="text" value="Competency"/>
Level 3	<input type="text" value="Skill"/>
Level 4	<input type="text" value="Concept"/>

Figure 8.- Implementation of the Competence Framework in Moodle LMS.

The next step to implement a proper micro-learning context is to generate different learning artifacts, including concept and relationship explanations as well as some exercises able to demonstrate gaining enough insights. In Figure 5 different micro-learning items are presented, some of them text based for reading, some of them video based and, to validate the gathered knowledge a quiz linked to a competence rule.

3.3 Evaluation criteria

In opposition to the evaluation criteria depicted in section 1.3, the following scores have been considered for this pilot course:

- 360° assessment inside the project management team (7%).
- 360° assessment with the technical project team (7%).
- Participation and performance for the in-class discussions (6%).

- Proper answer to questions addressed by the course advisor (10%).
- Quizzes performance (20%).
- Practical team performance (35%).
- Individual performance (15%).

For the coming years gamification activities are going to be considered as part of the scoring system as well.

4 IMPLEMENTATION OF THE REVISED COURSE MODULE

The pilot revised course module, designed and developed to meet the goal under the constraints defined in sections 1.4 and section 3, has been delivered between September and December 2021.

Every topic from the syllabus was reviewed in one-week time (2h), whereas the remaining 2h were used for checking the topic implementation in the running projects, and to discuss related aspects including theoretical and practical implications.

Preparing learning experiences to emphasize shared learning, to be developed at least partially at classrooms strongly depend on the topic and the practical capabilities being mobilized. In our particular case, for different project contexts, they are connected to the following topics:

- Project Scope Plan
- Project Schedule Plan
- Project Cost Plan
- Risk management plan.
- Assessment of the project development
- Crisis management, when different issues happen.

It was implemented a proper micro-learning context is to generate different learning artifacts, including concept and relationship explanations as well as some exercises able to demonstrate gaining enough insights.

As the approach is addressing Z-gen participants, which are fully digital, it is clear according to introduction that there are some constraints to consider, such as digital based media where the central element are video content, but also their lack of patience, with attention limited to 8 secs, and clear motivation for the added value for the concepts gathered in relation towards the labor market. Actually, such characteristic behavior is a key element to select a micro-learning based approach to gather fundamental concepts, which is also well connected with some other characteristics from the targeted learners, as they also exhibit social behavior but also individualism for learning patterns and experiences [8], [9].

It is worth to consider some degree of complementarity between the theoretical knowledge background (with good characteristics to be acquired on their own pace, according to their preferences and already existing knowledge) and practical skills, when applied to solve specific engagements (in this case the value comes from sharing different alternative solutions among participants able to understand each alternative as well as to discuss values and limitations).

Providing a hybrid design involving both, synchronous and asynchronous activities as well as individual and social behavior, if combined properly, can make the difference against more classical courses, in particular when new generations are targeted, as they are also concerned with applicability of the university time and opportunities after college.

Competencies describe the level of understanding or proficiency of a learner in certain subject-related skills [10]. On the other side, competency-based learning or skills-based learning, refers to systems of assessment and grading where learners demonstrate these competencies.

The course main references are:

- Managing Knowledge in project Environments [11]
- The major PM Methodologies, such as PMBoK, IPMA ICB4, PM² and Prince2

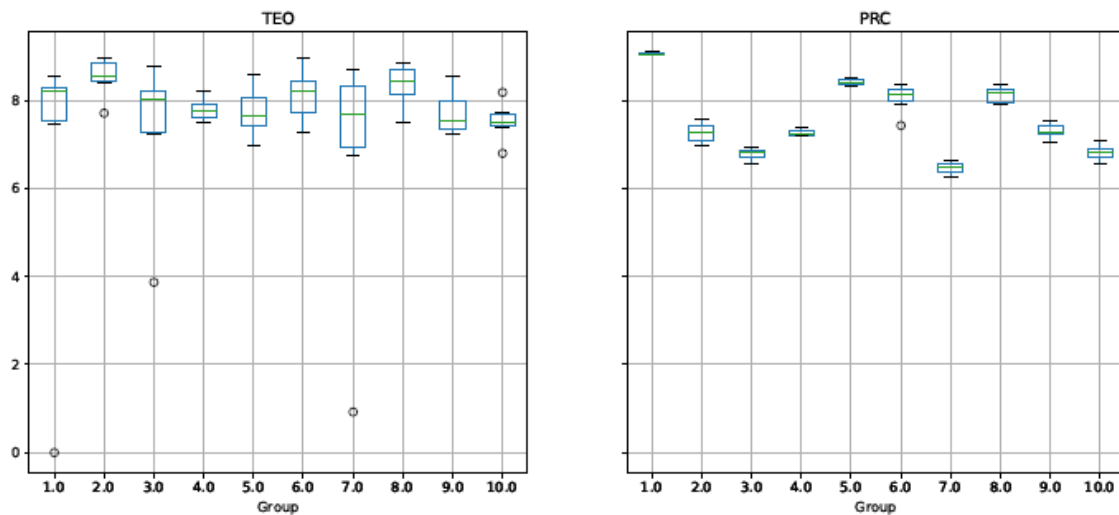


Figure 9.- Theoretical and Practical performance of students.

In addition, still room remains to implement additional serious gamification techniques for synchronous experiences, when competition stimulates participation between learners. Literature show that serious games have a potential of creating learning environments to better reach the educational and training goals [12]. The game design characteristics and game elements are need to be explored in

detail for increasing the expected benefits of the gaming environments, in particular when the synchronous dimensions are used to increase the engagement levels.

Assessment was conducted for both, theoretical and practical dimensions, where performance was measured by practical team, as presented in Figure 9.

On the basis of the current experience, several types of outcome have been identified. The first one is that digital technologies can help the learning process in different ways the learning process. Such ways included not only the content level, but also to improve peer-to-peer assessment. Indeed, it becomes a natural way to check the learners' communication skills.

Initial experiments have been introduced during synchronous sessions through gamification (by using kahoot® tool) to check the degree of penetration of the theoretical knowledge gathered. However, although promising, better integration within the adopted methodology is required. Such activities will be configured for the next releases of the course.

In Figure 10 some of the produced videos are presented

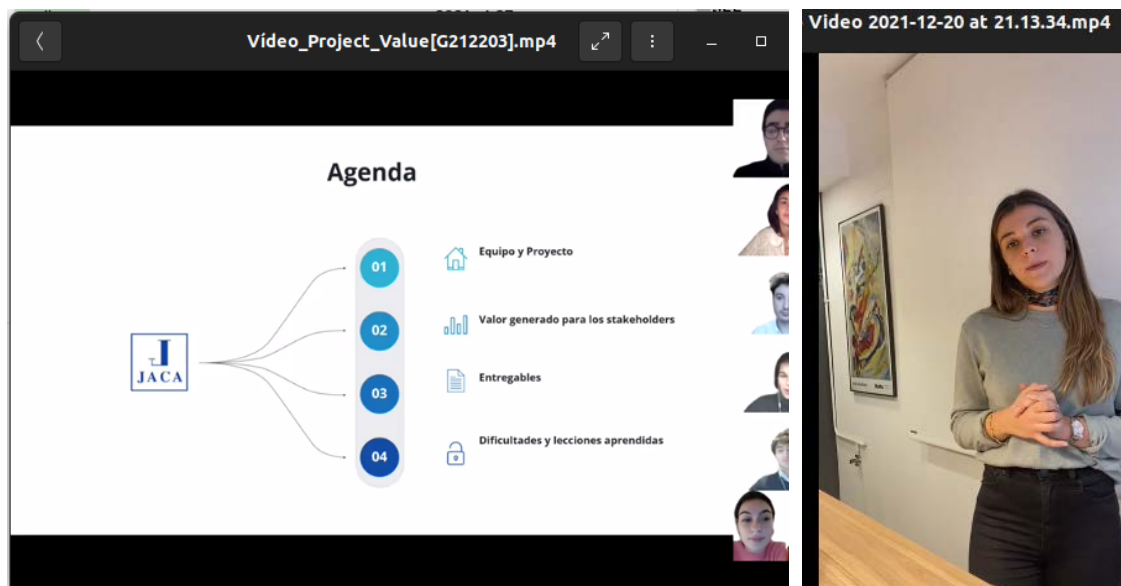


Figure 10.- Videos created by teams (presentations) and by single members to describe their contributions.

Additional benefits can be carried out from the digitalization technology applied to these deliverables, as an audio to text converter, followed by NLP pipeline processing can produce a part of speech analysis, giving some quantitative indicators about topics being covered in presentations.

For the basic knowledge acquisition, where concepts, tools and basic relationships are involved, a micro-learning based context has been proposed, where different type of media content are available, according to the learning preferences of the audience and where some

kind of asynchronous learning is encouraged. In this way implementations of flipped classroom methodologies fit perfectly with the proposed framework.

For the social learning, the focus is to address more sophisticated problems or issues where different solutions can be proposed and where discussing advantages and limitations of each of them are valuable. Indeed, where implementation of specific ideas provides benefits to the participants as they can analyze their own work as well as the work of competitors. Such aspects can be emphasized either by synchronous serious gamification tools, or because of asynchronous assessment tools.

With separation between individual asynchronous concept based learning and synchronous social oriented activities focused on increasing learning practical dimensions through team participation on case study analysis, team oriented project development, discussions, and similar activities, the course design is in accordance to the interest the new generations exhibit regarding its education pattern. Indeed, visual content for learning and micro-learning also match with their requirements for attention and gamification stimulates competitiveness as a key for increasing their engagement. The remaining aspect to be carefully considered is the vertical and horizontal integration, which requires deeply strategic design for the degree, including links to other requirements which are out of the scope of the current planning level as identified in this contribution.

From the formal point of view all the elements required to digitally improve the Industrial Engineering and Management concepts have been reviewed.

5 INVOLVEMENT OF THE INDUSTRIAL PARTNERS

The strong aspect to be emphasized is work carried out in continuous discussion with our industrial partner Arruti Catenaria SA. Different approaches and tools have been discussed, and connection between competences and project contexts were also under review.

In addition, they have reviewed the content of one of the modules, which was selected for the elearning implementation. The company is considering to use such content as part of its internal training program.

6 COURSE MODULE EVALUATION

A survey for which participants of the study voluntarily agreed and gave informed consent to their participation was conducted to collect the learners' opinions about the course and the methodology. All data

from the survey was anonymized before publication. The raised questions are:

- Q1.- With this course, have you acquired valuable knowledge useful in the labor market? (0:Not at all / 5: Excellent)',
- Q2.- Compared to classical methodologies, I appreciate the one used in this course: (-5: The best is the classical / 5: Best this one)',
- Q3.- I prefer the short media content instead long readings or lectures to present concepts (-5: Preferred long readings or lectures / 5: Preferred Short Media Content)',
- Q4.- I prefer asynchronous learning of theoretical contents (blended learning) and use synchronous for discussions / teamworking) (0: Not preferred at all / 5: Fully supported)',
- Q5.- Regarding the practical assignment, I appreciate how it helps to implement Project Management: (0: Strong disagree / 5 Strong agree)',
- Q6.- I am happy with my performance in this course and the provided takeaway (0: Not at all / 5: Excellent)'

The outcome of the survey can be seen in Figure 11.

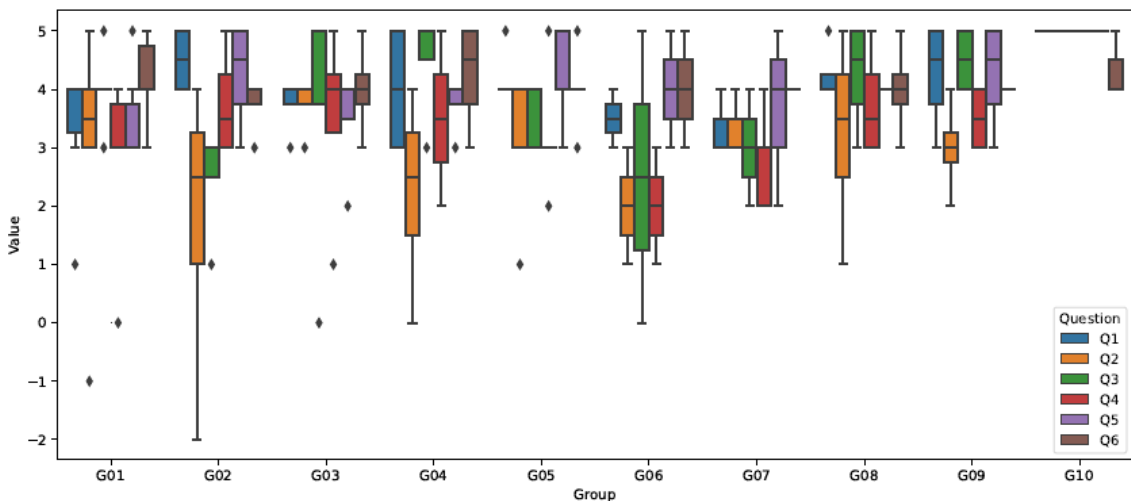


Figure 11.- Assessment of students according to the internal survey.

Main aspects to be highlighted are that in general learners appreciate the way this course was conducted, where the asynchronous blended solution was adopted to gather basic concepts, while discussions were used to clarify doubts or case-based situations. All in all, it was possible to identify a few learners willing to return the magisterial methodology instead of the more participative one, although it was just detected in a few groups.

It was also possible to confirm that learners prefer short video media content to gather knowledge, rather than reading documents or attending long presentations.

It was confirmed that Gen Z learners want to learn by doing, so they appreciate the practical assignment as the natural way of the learning process.

Additionally, international students (G10) are much more homogeneous and they better appreciate the participative methodologies.

In addition to the internal survey, the official University assessment for the course was undertaken.

To compare the effectiveness of the improvement carried out, the same assessment report covering the former course implementation (Academic year 2019-20, the last not affected by pandemic disease) and the renovated version of the course (Academic year 2021-22) are presented both, in summary as well as in the Annexes I and II. Although in Spanish language, it is worth to compare main results.

For the summary the next two figures (Figures 12 and 13) are significant enough:

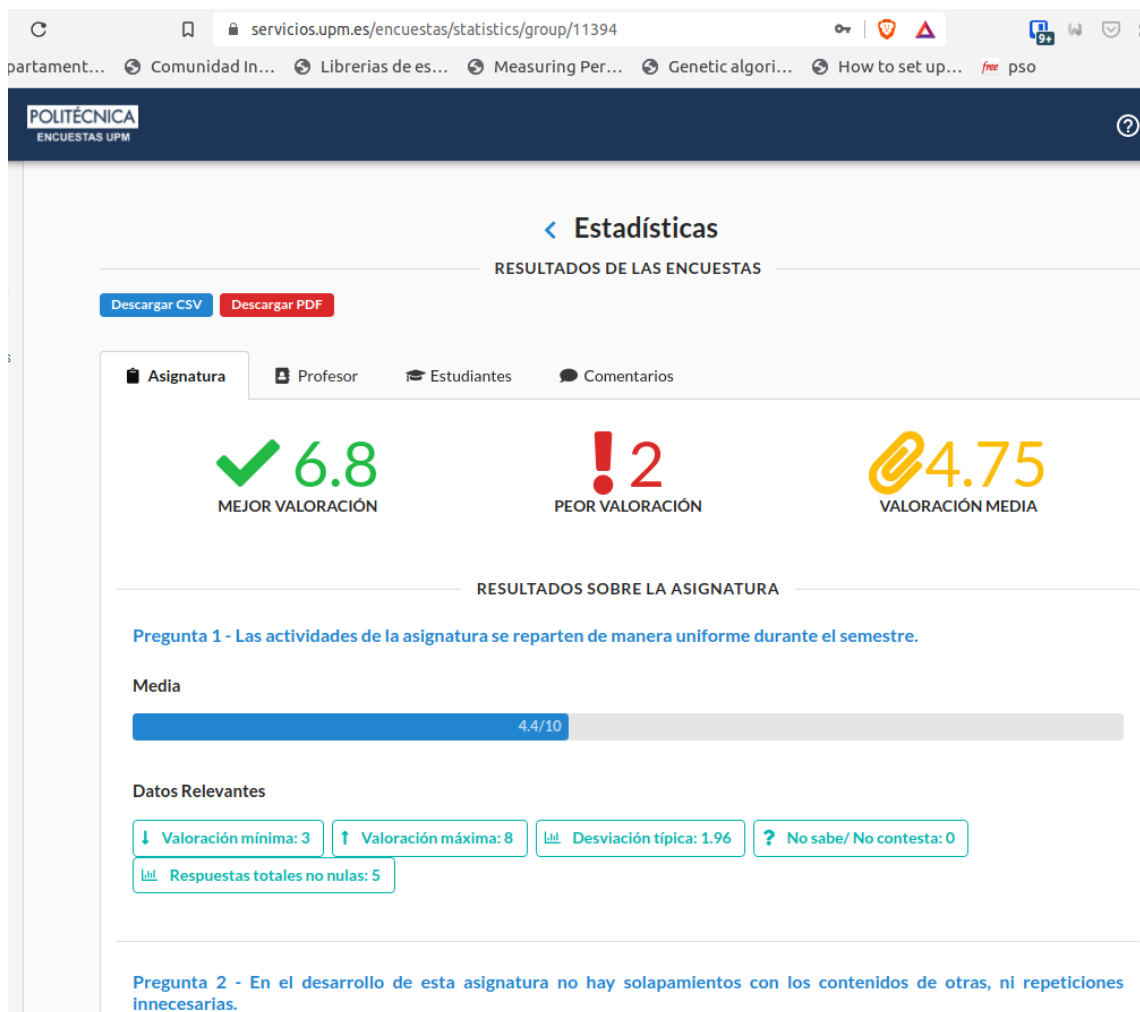


Figure 12.- Summary for the assessment of the 2019-20 edition of the course (former design) as elaborated by the UPM. Big numbers are for the best score, the lowest and the average.

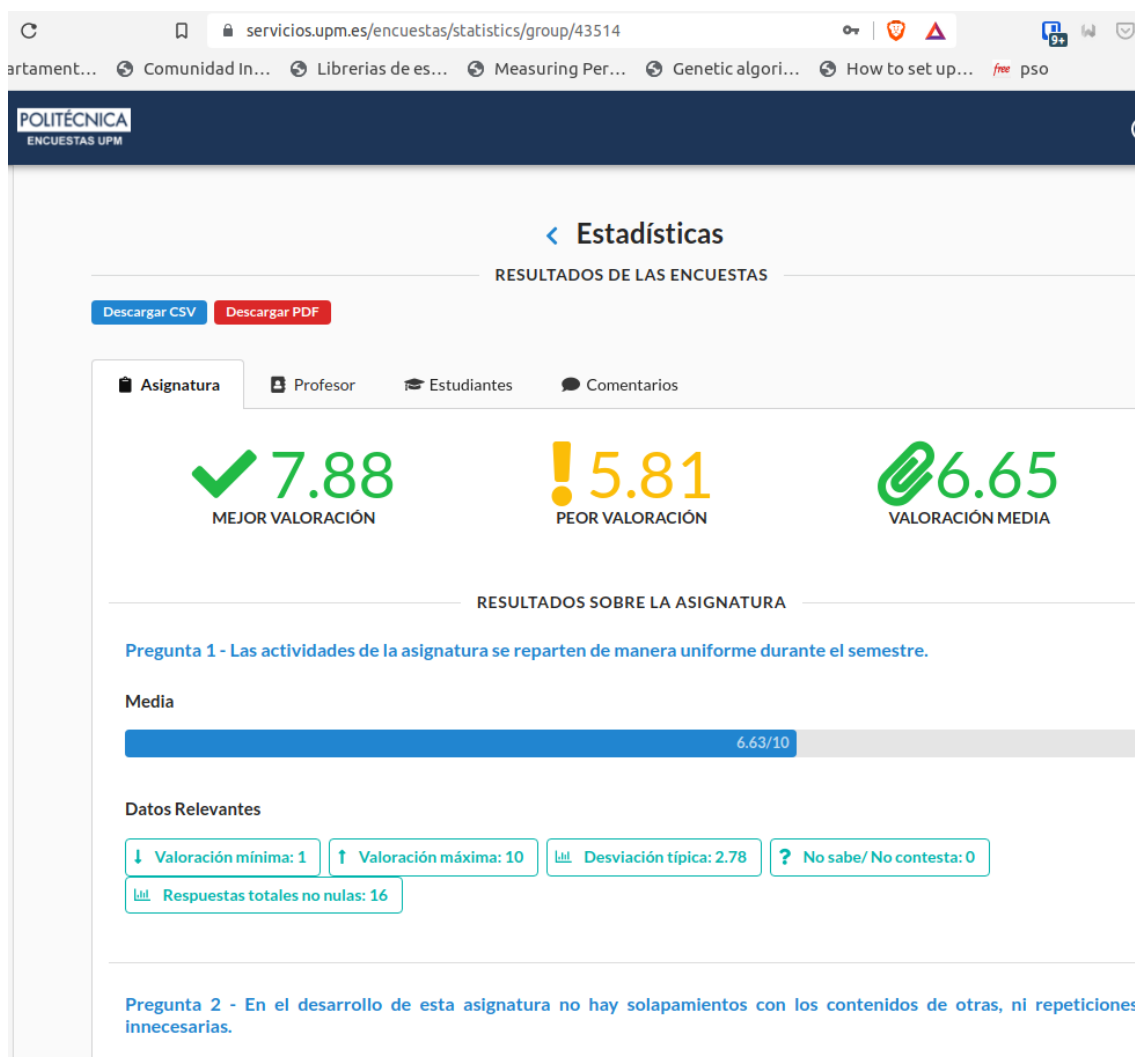


Figure 13.- Summary for the assessment of the 2021-22 edition of the course (former design) as elaborated by the UPM. Big numbers are for the best score, the lowest and the average.

The effectiveness of the implemented changes is clearly demonstrated, with an increase in the averaged scoring of two points out of 10. Despite of it, there are still room for improving and we will continue the transformation towards more added value.

As a takeaway for the IE3 project, it becomes clear that it is not just a matter of content renewal, but also of incorporating digital tools and solutions, while the courses shall incorporate practical work allowing participants to do things and assess the outcome. Indeed, to work in large teams is challenging for Gen Z learners, therefore, additional skills need to be constructed by means of different experiences.

7 REFERENCES

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8 ANNEXES I and II



Asignatura

1-Las actividades de la asignatura se reparten de manera uniforme durante el semestre.

4.4/10

Valoración mínima: 3

Valoración máxima: 8

Desviación típica: 1.96

No sabe/No contesta: 0

Respuestas totales no nulas: 5

2-En el desarrollo de esta asignatura no hay solapamientos con los contenidos de otras, ni repeticiones innecesarias.

6.8/10

Valoración mínima: 3

Valoración máxima: 10

Desviación típica: 2.32

No sabe/No contesta: 0

Respuestas totales no nulas: 5

3-Se han coordinado adecuadamente las clases teóricas y prácticas previstas en el programa.

5.4/10

Valoración mínima: 2

Valoración máxima: 9

Desviación típica: 2.94

No sabe/No contesta: 0

Respuestas totales no nulas: 5

4-Las prácticas de laboratorio y las actividades complementarias (conferencias, seminarios, visitas de estudio, etc....) ayudan a la comprensión de la asignatura.

4.4/10

Valoración mínima: 1

Valoración máxima: 9

Desviación típica: 2.8

No sabe/No contesta: 0

Respuestas totales no nulas: 5

5-Los métodos utilizados para mi evaluación (exámenes, memorias de prácticas, trabajos individuales o de grupo, etc.) son adecuados para el tipo de actividades y contenidos de la asignatura.

2/10

Valoración mínima: 1

Valoración máxima: 3

Desviación típica: 0.89

No sabe/No contesta: 0

Respuestas totales no nulas: 5

6-La carga de trabajo que comprende esta asignatura es adecuada para el número de créditos que tiene asignados.

5.4/10

Valoración mínima: 1

Valoración máxima: 8

Desviación típica: 2.58

No sabe/No contesta: 0

Respuestas totales no nulas: 5

7-Los conocimientos adquiridos en esta asignatura son importantes para mi actividad profesional.

6.2/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 3.92

No sabe/No contesta: 0

Respuestas totales no nulas: 5

8-En general, estoy satisfecho con el desarrollo de la asignatura.

3.4/10

Valoración mínima: 1

Valoración máxima: 8

Desviación típica: 2.5

No sabe/No contesta: 0

Respuestas totales no nulas: 5



Profesor/a JOAQUIN BIENVENIDO ORDIERES MERE

1-El profesor cumple con su horario de clase establecido.

8.75/10

Valoración mínima: 8 Valoración máxima: 10 Desviación típica: 0.83 No sabe/No contesta: 0 Respuestas totales no nulas: 4

2-El profesor asiste regularmente a clase.

9.5/10

Valoración mínima: 8 Valoración máxima: 10 Desviación típica: 0.87 No sabe/No contesta: 0 Respuestas totales no nulas: 4

3-El profesor está accesible para tutorías o consultas por parte de los estudiantes en su horario establecido.

6.33/10

Valoración mínima: 2 Valoración máxima: 9 Desviación típica: 3.09 No sabe/No contesta: 1 Respuestas totales no nulas: 3

4-El profesor prepara, organiza y estructura bien las actividades o tareas que se realizan en la clase (o laboratorio, taller, trabajo de campo, seminario, etc.).

3.75/10

Valoración mínima: 1 Valoración máxima: 7 Desviación típica: 2.17 No sabe/No contesta: 0 Respuestas totales no nulas: 4

5-El profesor explica de forma clara y comprensible los contenidos de la asignatura.

2.25/10

Valoración mínima: 1 Valoración máxima: 5 Desviación típica: 1.64 No sabe/No contesta: 0 Respuestas totales no nulas: 4

6-El profesor ha cumplido con lo planificado en la guía de aprendizaje.

4.75/10

Valoración mínima: 1 Valoración máxima: 8 Desviación típica: 2.86 No sabe/No contesta: 0 Respuestas totales no nulas: 4

7-El profesor resuelve las dudas y orienta a los alumnos en el desarrollo de las tareas.

2.5/10

Valoración mínima: 1 Valoración máxima: 5 Desviación típica: 1.66 No sabe/No contesta: 0 Respuestas totales no nulas: 4

8-Los materiales docentes utilizados y/o recomendados son útiles para cursar la asignatura y se encuentran disponibles.

2.5/10

Valoración mínima: 1 Valoración máxima: 6 Desviación típica: 2.06 No sabe/No contesta: 0 Respuestas totales no nulas: 4

9-El profesor utiliza las Tecnologías de Información y Comunicación (TIC) y técnicas docentes innovadoras de forma adecuada.

5/10

Valoración mínima: 2 Valoración máxima: 8 Desviación típica: 2.55 No sabe/No contesta: 0 Respuestas totales no nulas: 4

10-El profesor despierta mi interés por esta asignatura.

2/10

Valoración mínima: 1 Valoración máxima: 3 Desviación típica: 1 No sabe/No contesta: 0 Respuestas totales no nulas: 4

11-El profesor ha contribuido en mi adquisición de competencias y destrezas al cursar esta asignatura.

2/10

Valoración mínima: 1 Valoración máxima: 3 Desviación típica: 1 No sabe/No contesta: 0 Respuestas totales no nulas: 4



12-En general, estoy satisfecho con la labor docente del profesor.

2.75/10

Valoración mínima: 1

Valoración máxima: 4

Desviación típica: 1.09

No sabe/No contesta: 0

Respuestas totales no nulas: 4

13-Señala los aspectos positivos de la docencia impartida por este profesor.

Parece tener gran conocimiento y experiencia en el tema

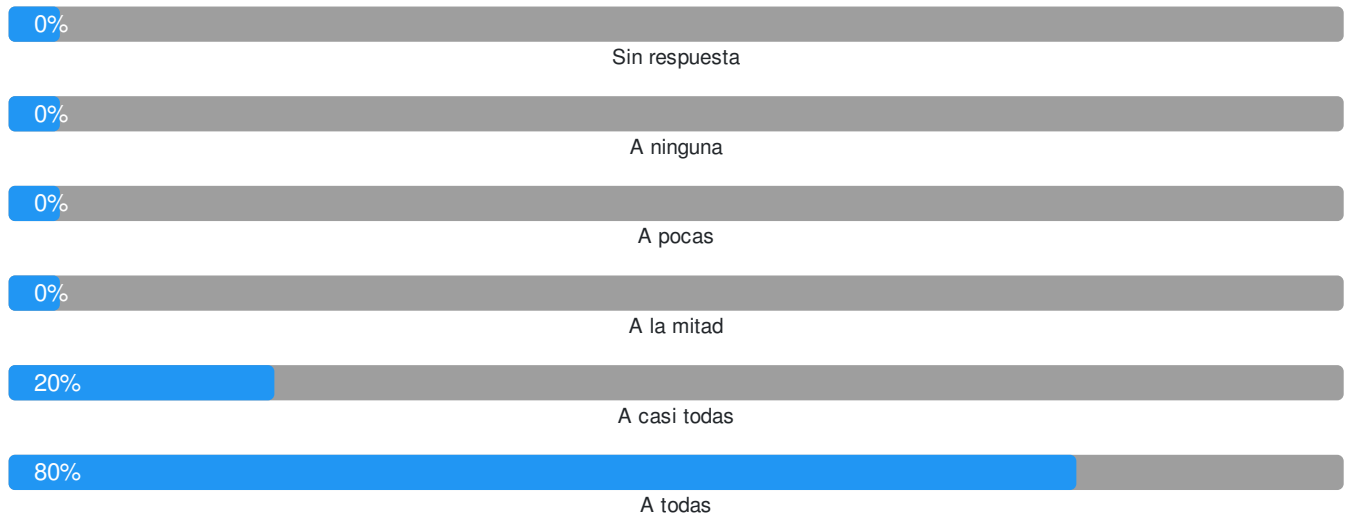
14-Señala los aspectos negativos de la docencia impartida por este profesor.

Es muy caótico y desordenado, cuesta mucho seguir sus explicaciones, da la sensación de hablar horas y horas sin decir nada, y se empeña en usar un vocabulario poco claro y ambiguo que hacen innecesariamente complicada la asignatura. Le iría bien aplicar el principio de la navaja de Occam



Estudiantes

A-¿A cuántas clases has asistido en esta asignatura?



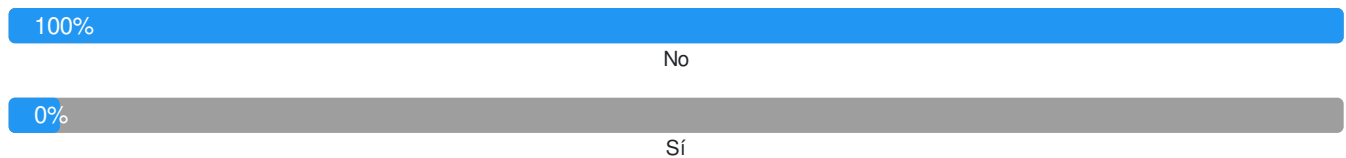
A.1-Motivo por el cual los alumnos respondieron no haber asistido a ninguna clase de la asignatura. (Pregunta A)

No hay datos

A.2-Otros motivos a la pregunta A.1 (Otro)

No hay datos

B-¿Has preparado esta asignatura con la ayuda de un profesor particular o academia?



B.1-Motivo por el cual los alumnos respondieron haber acudido a la ayuda de un profesor particular o academia. (Pregunta B)

No hay datos

B.2-Otros motivos a la pregunta B.1 (Otro)

No hay datos

C-Número medio de matriculas por alumno en la asignatura.

1



Comentarios

Señala los aspectos positivos de la docencia impartida en esta asignatura.

Señala los aspectos negativos de la docencia impartida en esta asignatura.

Sinceramente no sé cual es el objetivo de esta asignatura. No tengo nada claro el temario, ni el objetivo de los temas, ni su estructura ni como estudiarlos. La mayor parte del tiempo siquiera entiendo qué me están contando. Por el amor de Dios, ordenad este temario, dejar de ir por las ramas, fijad un objetivo para el temario y seguidlo.

El tipo de examen para una asignatura tan práctica debería ser del mismo estilo.



Asignatura

1-Las actividades de la asignatura se reparten de manera uniforme durante el semestre.

6.63/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.78

No sabe/No contesta: 0

Respuestas totales no nulas: 16

2-En el desarrollo de esta asignatura no hay solapamientos con los contenidos de otras, ni repeticiones innecesarias.

7.88/10

Valoración mínima: 2

Valoración máxima: 10

Desviación típica: 2.37

No sabe/No contesta: 0

Respuestas totales no nulas: 16

3-Se han coordinado adecuadamente las clases teóricas y prácticas previstas en el programa.

5.94/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.99

No sabe/No contesta: 0

Respuestas totales no nulas: 16

4-Las prácticas de laboratorio y las actividades complementarias (conferencias, seminarios, visitas de estudio, etc....) ayudan a la comprensión de la asignatura.

5.86/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.53

No sabe/No contesta: 9

Respuestas totales no nulas: 7

5-Los métodos utilizados para mi evaluación (exámenes, memorias de prácticas, trabajos individuales o de grupo, etc.) son adecuados para el tipo de actividades y contenidos de la asignatura.

7.44/10

Valoración mínima: 2

Valoración máxima: 10

Desviación típica: 2.26

No sabe/No contesta: 0

Respuestas totales no nulas: 16

6-La carga de trabajo que comprende esta asignatura es adecuada para el número de créditos que tiene asignados.

5.81/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 3.52

No sabe/No contesta: 0

Respuestas totales no nulas: 16

7-Los conocimientos adquiridos en esta asignatura son importantes para mi actividad profesional.

7.81/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.4

No sabe/No contesta: 0

Respuestas totales no nulas: 16

8-En general, estoy satisfecho con el desarrollo de la asignatura.

5.81/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.72

No sabe/No contesta: 0

Respuestas totales no nulas: 16



Profesor/a JOAQUIN BIENVENIDO ORDIERES MERE

1-El profesor cumple con su horario de clase establecido.

8.69/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.23

No sabe/No contesta: 0

Respuestas totales no nulas: 16

2-El profesor asiste regularmente a clase.

8.94/10

Valoración mínima: 3

Valoración máxima: 10

Desviación típica: 1.78

No sabe/No contesta: 0

Respuestas totales no nulas: 16

3-El profesor está accesible para tutorías o consultas por parte de los estudiantes en su horario establecido.

8.13/10

Valoración mínima: 3

Valoración máxima: 10

Desviación típica: 2.25

No sabe/No contesta: 1

Respuestas totales no nulas: 15

4-El profesor prepara, organiza y estructura bien las actividades o tareas que se realizan en la clase (o laboratorio, taller, trabajo de campo, seminario, etc.).

6.63/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.5

No sabe/No contesta: 0

Respuestas totales no nulas: 16

5-El profesor explica de forma clara y comprensible los contenidos de la asignatura.

4.75/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.61

No sabe/No contesta: 0

Respuestas totales no nulas: 16

6-El profesor ha cumplido con lo planificado en la guía de aprendizaje.

7.19/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.48

No sabe/No contesta: 0

Respuestas totales no nulas: 16

7-El profesor resuelve las dudas y orienta a los alumnos en el desarrollo de las tareas.

5.75/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.49

No sabe/No contesta: 0

Respuestas totales no nulas: 16

8-Los materiales docentes utilizados y/o recomendados son útiles para cursar la asignatura y se encuentran disponibles.

4.44/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.87

No sabe/No contesta: 0

Respuestas totales no nulas: 16

9-El profesor utiliza las Tecnologías de Información y Comunicación (TIC) y técnicas docentes innovadoras de forma adecuada.

5.53/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.96

No sabe/No contesta: 1

Respuestas totales no nulas: 15

10-El profesor despierta mi interés por esta asignatura.

5.19/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.67

No sabe/No contesta: 0

Respuestas totales no nulas: 16

11-El profesor ha contribuido en mi adquisición de competencias y destrezas al cursar esta asignatura.

5.88/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.47

No sabe/No contesta: 0

Respuestas totales no nulas: 16



12-En general, estoy satisfecho con la labor docente del profesor.

5.63/10

Valoración mínima: 1

Valoración máxima: 10

Desviación típica: 2.57

No sabe/No contesta: 0

Respuestas totales no nulas: 16

13-Señala los aspectos positivos de la docencia impartida por este profesor.

Sabe muchísimo de dirección de proyectos y podría enseñarnos muchísimo

Un excelente docente, digno de destacar y elogiar, todo lo que esperé al venirme de intercambio a la mejor universidad de ingeniería de toda España !

14-Señala los aspectos negativos de la docencia impartida por este profesor.

No hay material docente, lo que hay son links de internet y poco más. Estos links están todos en inglés, lo que dificulta en gran medida la comprensión de la asignatura. Tareas sin especificar bien qué hay que hacer y creando incertidumbre que dificulta y hace realmente difícil poder realizar una tarea correctamente.

La falta de organización y la forma de afrontar las clases no han sido las más adecuadas dado que a los alumnos se nos complicaba seguir las clases (sin acceso a la diapositivas) y no sabíamos que era lo que teníamos que incluir en las entregas

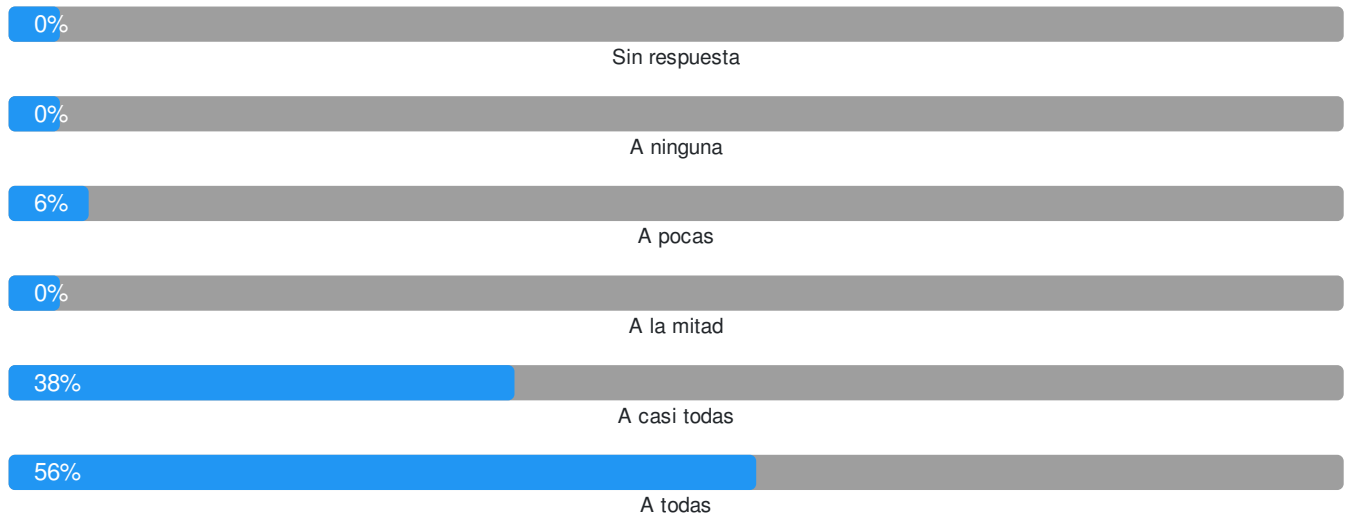
Muy poca organización con la asignatura, nos habla en español y los correos los redacta en inglés sin sentido. Se pasa mucho de la hora, sin respetar los descansos. Debería planificarnos la asignatura y saber lo que se nos pide.

Las clases inversas son confusas para la realización del proyecto final de la asignatura. Me habría gustado algo más de guía por parte del profesor en este asunto, ya que las primeras semanas debíamos hacer entregables sin tener mucha idea de qué es lo que teníamos que hacer.



Estudiantes

A-¿A cuántas clases has asistido en esta asignatura?



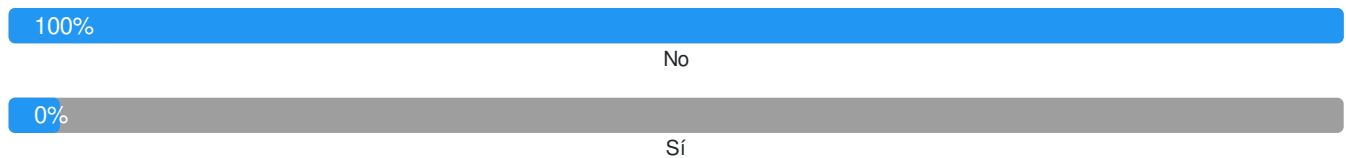
A.1-Motivo por el cual los alumnos respondieron no haber asistido a ninguna clase de la asignatura. (Pregunta A)

No hay datos

A.2-Otros motivos a la pregunta A.1 (Otro)

No hay datos

B-¿Has preparado esta asignatura con la ayuda de un profesor particular o academia?



B.1-Motivo por el cual los alumnos respondieron haber acudido a la ayuda de un profesor particular o academia. (Pregunta B)

No hay datos

B.2-Otros motivos a la pregunta B.1 (Otro)

No hay datos

C-Número medio de matriculas por alumno en la asignatura.

1



Comentarios

Señala los aspectos positivos de la docencia impartida en esta asignatura.

Asignatura interesante

La docencia es completamente destacable, el profesor demuestra completo dominio de la asignatura y lo sabe transmitir de forma positiva y motivadora a los alumnos, además, demuestra preocupación por los proyectos de los alumnos y entrega mucho apoyo a los alumnos extranjeros, cosa que se agradece en demasía.

Señala los aspectos negativos de la docencia impartida en esta asignatura.

Poco aprovechada para el potencial que podría tener, mal organizada

Como no hay material docente realmente (diapositivas explicativas de la materia), se hace muy difícil entender algo.

La carga de trabajo es improvisada, no es estructurada a lo largo del semestre. No tiene sentido que la asignatura se imparta en español y las diapositivas estén en inglés, y los correos también. Además, se nos dan unos contenidos escasos, y luego se nos exige un trabajo excelente sin saber demasiados conceptos

Ninguno.