MOONSHOT PROJECT

Experts Board Feedback

MSc Energy for Smart Cities

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InnoEnergy
Knowledge Innovation Community

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List of contents

Introduction

Moonshot Project is the brand new subject for MSc Energy for Smart Cities 2nd year students. This probject-based course aims to provide the students with skills in new project management methodologies, innovation, problem-solving, and rapid prototyping while addressing a huge problem in the field of energy.

"Moonshots" are the incredible, seemingly impossible, ideas that can reshape our world, and by using an approach similar to "Moonshot Thinking" this course will give the students the necessary resources and tools to generate these ideas, test them and iterate to improve them.

In early 2020, the team formed by Marc Jené, Andreas Sumper and Maria Marin, began to design course from an initial idea. In June 2020, and following the roadmap, their progress was shared with a diverse group of professionals to receive feedback, get different points of view, and iterate the course proposal.

This Experts Board feedback consisted of an online session in which the team presented the course and the different aspects of it, with a Q&A space to resolve doubts and discuss different topics of the course, and during the next week, calls with small committees of these professionals to obtain more specific feedback.

This document aims to collect all the information obtained from the Q&A and specific calls and to draw some conclusions to be applied in the design of the course.

Board Members

InnoEnergy – **Florian Bauer**

InnoEnergy – **Monica Mejli**

Endesa – **Jacob Rodriguez**

UPC Professor – **Enrique Velo**

UPC Professor – **Lluís Batet**

MSc EFSC alumnus ’18 – **Daniele Paratore**

MSc EFSC alumnus ’17 – **Noran Kamal**

Presentation Q&A

Clarification of doubts

Q (Lluís Batet): How many credits is the course?

A: 5 ECTS.

Q (Daniele): How are the companies or projects and the teams matched? Are they assigned by the tutor or are they free to choose?

A: We will have one big company or institution providing a big problem on which many different solutions can be found. Then, for the teams, we will have a session with a psychologist in order to make the teams based on the different students' profiles. Finally, we will include different startups and professionals working on fields related to the problem and, in this case, the students can choose which technologies they want to explore and with whom they want to talk.

Q (Florian): Is it exclusively for students coming to UPC?

A: Next year will be only for the 2nd year MSc Energy for Smart Cities students of the UPC. In the long term it can be opened to other students from the UPC or studying an InnoEnergy master program at other universities.

Q (Florian): From the examples you gave, there is a big problem but also a big solution, how will you do it with small groups and without access to big labs?

A: Our goal is not for students to produce a 10x solution, but to get in touch with this thinking methodology, to produce solutions, to be able to build prototypes and also to have a plan in mind on how they could scale these prototypes to end up producing 10x solutions.

Q (Florian): How would you open the course to other students?

A: The ideal is to have a combination, using the flipped classroom approach. We consider the possibility to have collaborations with other universities that can adapt the subject.

Q (Florian): When it is available online, how will you do the prototyping?

We are planning to have a physical laboratory, probably in Barcelona, and at least one person from each group with access to it. In the worst case, only the teacher would have access to this lab. Students can design remotely and send files to the lab.

Tackling Huge Challenges – Pros and Cons

Jacob:

In Endesa there are **two huge challenges**. One of them is regarding **digitalization** and the other is about **flexibility and new energy markets**.

Some **sessions explaining the energy market** would be really useful for the students in the context of the project. Instead, it would be interesting to have some information shared with students in order for them to know how is everything working right now.

Lluís Batet:

In terms of setting the goal, it might be more interesting if the **goal came from society** or from some social institutions, so the students could try to address some of the big challenges facing society, and since we are talking about long-term problems (5-years, 20-years...), the **same project could be taken up by the students in the following years**.

The "try to kill your best ideas first" mentality is very good and not normal for us. We have a confirmation bias, and here **we want a disconfirmation bias**. This is what makes great chess players successful. Probably, if we go to this huge challenge that maybe is out of the reach of companies (even if this may interest companies, because it could open new possibilities) we have here something like the Kobayashi Maru problem, **maybe there is no solution**, but you are not interested in the solution, you are interested in how students approach the challenge. Therefore, if you propose a problem without a solution (or that has not yet been found) it gives you the possibility to refine and perfect it during the following years. My main feedback point is **to open the field not only to companies but also to society's challenges**.

Monica Mejli:

Maybe, when addressing a societal challenge, we can **also integrate the company's point of view**.

The role of startups in sharing knowledge

Monica:

Startups could **work together with students** to find a solution to this social challenge. Another idea would be to try to **understand the needs of the startups** and later, once we have those needs and the KPIs, create some kind of project that fits. Both possibilities exist. We can also contact the startups to see if they can offer a challenge or a moonshot project. If students have the

possibility to work with startups for a semester or a year, at the end, those **projects with startups can be turned into a Master's Thesis.**

Relevance of the ILOs in the student's curriculum

Noran:

There's a lot of potential in this idea. With the smart plug project of Control and Automation, the EJ and this, it might be and overload to have 3 big prototyping ideas running at the same time. When working on innovation you don't want stress. Maybe, instead of merging between teams it would be better to merge with Control and Automation, to **reduce the workload**.

Daniele:

For the workload, if you can **reduce the ECTS on the internship** shouldn't be a problem. It would be interesting to **include not only Smart Cities' students** but also other InnoEnergy programs students in UPC, to have different insights and more teams.

Learning **rapid prototyping will give students something extra** that I would have liked to learn. It's an added value.

Noran:

Project Moonshot looks **different than EJ**. It's another way of thinking, which can never be a bad thing. My added value would not be the knowledge of startups or the companies, because we have witnessed them. My **best ILO would be the prototyping sessions**, and not only for the 3D printing, but also for the **coding, the website, the electronics**... which is really **useful in professional life**.

Course Methodology

Noran:

For the team creation, you could use the GC Index.

Florian:

Mar and Xavier are introducing something called **"Quality Teams"** that could be used also for the Moonshot Project.

Daniele:

There is one session that is about coding. **Some students didn't code** a lot during the bachelor. Maybe it's a little optimistic to spend only one session to fill a gap like this.

Noran:

The merging of two different codes could be an issue.

Enrique:

I believe in this kind of education. Actually, this is under the umbrella of **Project-Based Learning**. Your approach has different innovations in this field. And I would like to comment that in other IE programs there are similar projects, so maybe it would be a good idea **to join Cesar, Josep and me and share some experience** and kill your ideas. In RENE, at first, it was **tough to get the collaboration of companies**. It is difficult to match our point of view with companies needs.

The best thing of PBL is that students develop skills that will be useful for them in their future jobs. For me it's a very good idea. Obviously from the design to the pilot to the execution, you'll have to overcome many barriers, but a long way always starts with a first step.

In **RENE we also wanted to do prototyping** but it is really difficult with the means we have and the time students have. When it comes to workload, try to **do a detailed plan of each week** and think: "Well if they have to do this during this week, how many hours will they spend?". Just to see whether your approach is realistic or not. Try to **stick to the ECTSs** of the subject.

Specific Feedback Calls

Monica Mejli feedback call

Opinion:

- Idea with a huge potential.

Suggestions / Recommendations:

- Create a societal challenge integrating companies, governments, institutions… In the frame of Green Deal?
- The professor should act as the project coordinator and has permanent contact with the students. Someone from the company should meet the students once every month.
- Give continuity to the challenge with 6-month KPIs and deliverables that will be shared with the next batch of students.
- Startups have a limited amount of time to spend on these kinds of proposals, try to find a way to convince them. Maybe the key is the connection with the big company?

Challenges:

- A monetization plan should be considered. She proposes to use an InnoEnergy model in which companies give an economic prize at the end of the project.

Cooperation / To do:

- Create a shared document to propose ideas and explore solutions together.
- Once the proposal is better defined, share it with Business Creation Iberia to start working on the startups-university cooperation.
- Monica will try to involve Tesla (for 2021).
- Document the pilot test (March 2020).

UPC Teachers feedback call – Enrique Velo and Lluís Batet

In the feedback call with Enrique and Lluís we mainly discussed the academic part of the project and the methodology of Project-Based Learning.

General opinion:

- The design of the course is apparently fine, but we have to pay close attention to the details to make it work.
- Lluís really liked the “Kill your best ideas” approach.

- Social challenges rather than challenges coming from companies to give more room to the student.
- It seems to be a good subject to work on skills that are not usually taught in engineering careers.

About Project-Based Learning:

PROS: Students in contact with real life. They develop professional skills at the same time they acquire knowledge.

CONS: Students are not used to this type of learning. They might feel lost at some point.

Suggestions / Recommendations:

- Look for ways to foster interaction with students.
- Establish a direct relationship with the companies or institutions involved in the project.
- To motivate students at the beginning of the project, field visits can be made and examples from past years can be shared.
- It is important to explain the methodology of the course to the students in detail so that they understand how it works.
- To evaluate, we can use quizzes, self-evaluation, presentations, reports…
- When the team is formed, ask them to discuss their ambitions and the time they can devote to the project to ensure that everyone is on the same level. Have them write up the minutes and sign them, so that they have a greater commitment. We can use an Agile approach.

About digitalization:

- Start with what we already have (slides, videos, articles…) and mix it with exercises or short tests.
- Before preparing new videos, think what you want to include and design it properly.
- Try to use the same tools that are already being used in other subjects (such as Control and Automation for the Efficient Use of Energy).

Endesa feedback call – Jacob Rodriguez

In the feedback call with Jacob we talked about three different aspects related to the participation of a company such as Endesa in the project.

Long-term challenges – Future vision.

- Companies such as Endesa have a future vision that arise different long-term challenges.
- These long-term challenges are broad and can be divided into sub-challenges.

- The two long-term challenges Endesa considers right now are Digitalization (internal and external) and New Markets. These challenges are related between them.

Possible outcomes.

- Actually, they organize the "Cátedra-challenge", in which they provide an open challenge so students can propose solutions. The best solution gets a one-year internship so the student can work mainly in the idea in a professional environment while getting to know how Endesa works internally.
- The challenges they are proposing align with what they would propose for the Moonshot Project, a similar reward for the students could be designed.

Communication between company and students.

- They propose to establish a communication with the teacher so that he can filter the information and better guide the students in the framework of the project.
- Regular meetings could be arranged with the professor.
- It would be interesting to have an initial session with the students to explain the challenge and answer some questions. After this, one or two feedback sessions could be arranged in which the students present the solutions and the company gives direct feedback.

Alumni feedback call – Noran Kamal and Daniele Paratore

In the feedback call with Noran and Daniele we talked about how students can feel about this subject in the context of 2nd year EFSC students at UPC.

Workload

- Noran experienced a huge workload between December and January at the UPC with reports, presentations and exams. She believes that adding this subject could increase this workload and students wouldn't be able to enjoy it.
- Daniele, on the other hand, did not experience a great workload. Probably the main reason is that the delivery date of the internship report was moved to the beginning of April. It is also important to say that the length of the report was reduced.

Methodology

- Both of them had a great experience with the flipped classroom approach in Control and Automation for the Efficient Use of Energy and believe it will work in the Moonshot Project.

- It is important to make it clear to the student how important it is to prepare the lesson in advance to make the most of the time spent in the classroom.
- In a course like this, it is important that the teachers are close and available, they must act as guides and at the same time they have to transmit passion and motivation to the students.
- They believe that an assistant teacher would help make the subject more fluid and make the flipped classroom approach easier to implement.
- They recommend to take advantage of the tools used in CAPUEE so that the student obtains a deeper knowledge spending less time.

Other comments

- Noran offers herself to pitch the idea to her company (IAB), in case we are interested.
- Noran's a little skeptical about the merging. She believes that it takes time to get a team feeling, and changing the group can delay the project. She proposes holding a co-creation session instead. One idea is that the prototype test could be designed by another team.
- They propose that alumni could also be included as mentors. There are people who specialize in different fields, so once the students have outlined their project, they can be assigned an ex-student who works in the indicated field as a mentor.

Outcomes of the Experts Board

1. Once the challenge is defined, material will be prepared so that students are familiar with the topic and the cross-cutting issues. We will combine a professional presentation with videos and online material.
2. For the enormous challenge, a combination of social challenge will be sought together with the collaboration of large companies. A collaboration with Endesa will be considered for the pilot test. For the following year, efforts will be made to include the project within the Green Deal framework. A monetization plan will be considered.
3. A working group will be set up with Monica Mejli to align the collaboration of startups with their needs. A formula will be sought for the project to have continuity in the form of a Master's thesis.
4. We intend to agree with the Master to balance the workload for the students. In addition, with the Flipped Classroom approach, class time will be allocated to working on the project to motivate students.
5. Priority will be given to building a solid block of Rapid Prototyping as it is one of the ILOs that arouses most interest. This block will be shared with other InnoEnergy programs so that they can include it in their innovation and entrepreneurship projects.
6. Throughout the pilot, meetings will be held with UPC professors who have worked with PBL to exchange insights.
7. A detailed plan of the first sessions will be designed throughout July to ensure an adequate workload. A draft of the rest of the sessions will also be made, which will be outlined as the course progresses.
8. The pilot test will be documented and shared with the InnoEnergy network.
9. When the team is formed, we will ask them to discuss their ambitions and the time they can devote to the project to ensure that everyone is on the same level. We will have them write up the minutes and sign them, so that they have a greater commitment.
10. Digital material will be created following the Digital Learning Toolkit.
11. For classroom time there will always be 2 teachers or TAs to provide adequate support to students. Involving alumni as mentors will be considered.