# Interview: Agustín Rullán – Dean, College of Engineering, UPR Mayagüez, Puerto Rico

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*Agustín Rullán, Dean of the College of Engineering at UPR Mayagüez, discusses the institution's latest developments in engineering courses and their applicability in a practical industrial setting for students to jumpstart their professional careers.*

**As a leading engineering college with 4,300 undergraduates and 400 graduates, the College plays a very important role in Puerto Rico. What are your main priorities as Dean?**

One of our main goals at the College is to focus on becoming a research university, particularly for engineering. In order to do this, we are initiating several new programs in 2015. One of them is a graduate program in bio-engineering, which is a multi-disciplinary effort involving all engineering departments that may have an impact on the pharmaceutical, medical device and healthcare industries here in Puerto Rico. The program began in August and we already have two students; although it may not sound impressive, this is very good because we had not even publicized the program yet. I hope that within the next couple of years we will have between ten and twenty students studying bioengineering at the Master's and PhD level. We also have graduate programs such as a PhD in Mechanical Engineering, and a PhD in Electrical Engineering, which are in the final

stages of approval at the Puerto Rico Council of Education. We are confident we will receive approval to begin the programs in January. In addition, we have a Master's program in materials science and engineering being evaluated and recently started two undergraduate programs in software engineering and computing science and engineering. We are also offering a minor in pharmaceutical engineering which is available within the Chemical Engineering program.

Moreover, this increase in program offerings is complimented by exponential growth in research funding over the past decade for the college and the whole university. We therefore hope to continue providing the best human resources for the industry and the pharmaceutical and medical device sectors in particular. So our main goals are to develop our graduate offerings, research and funding and to support the local industry.

**From where is this explosion of external funding coming?**

We receive funding from federal agencies such as the National Science Foundation, the National Institute of Health, the US Department of Agriculture, NASA, the Department of Defense, and others. We also get funding from local industry. We have specific contracts to work with the industry and we are looking to increase this to develop specific programs geared towards the local industry.

**Has the development taking place here been recognized by the US? What is the College's positioning within the national context?**

The American Society for Engineering Education (ASEE) publishes the results of a survey taken once a year from around 350 engineering schools in the US and Canada. We are consistently the number one producer of Hispanic engineers in the US, according to that survey. Every year we graduate around 600 engineers from different levels and through our efforts in research projects, we have also increased the number of research collaborations with other universities. A center of particular significance is the Engineering Research Center for Structured Organic Particulate Systems (C-SOPS), funded by the National Science Foundation (NSF) and geared towards pharmaceutical and process engineering. Rutgers University, along with Purdue University and New Jersey Institute of Technology, lead this center and we were invited to participate in their research because of our presence within the academic community and the importance of the pharmaceutical industry here in Puerto Rico. As part of that research center, we have built a local center here called CPEDaL (Center for Pharmaceutical Engineering and Learning). The objective of CPEDaL is to help local industry develop new processes and products and academic offerings in our engineering programs so our engineers are more prepared to work in this type of industry and

undertake research linked to the pharmaceutical industry.

We are currently investing significant effort in our research project for continuous manufacturing at pharmaceutical plants. A prevalent mode of manufacturing is batch manufacturing, which requires very large facilities with specific controls so the cost of manufacturing is very high. We hope that continuous manufacturing can open up opportunities for small facilities to create small batches.

We also try to get high school students interested in the pharmaceutical industry. Every year, we have an outreach activity, which is a summer camp for pharmaceutical engineering. We invite high school students to spend one or two weeks at CPEDaL to learn about the different processes such as mixing and granulation to give them a better insight into pharmaceutical manufacturing.

**As the pharmaceutical industry has had such a significant presence in Puerto Rico for several decades, there is this unique culture engrained in the Puerto Rican people focused on this sector. Would you say that culture is as strong nowadays as in the past?**

The local industry has had some difficulties, particularly the pharmaceutical sector. Nonetheless, it is still a very strong industry that directly employs 80,000 people here and so it is still very important for us. It is not difficult getting students interested in the industry and in engineering; in fact, this year we have a record number of new students in engineering. We have around 850 new students in 2015, which is the highest it has been for at least ten years.

The College of Engineering at UPR Mayagüez has some of the most demanding admission requirements on the island and thus we have the top five percent of high school students in Puerto Rico. Our students have lots of initiative; they participate in many student competitions here and abroad and they often win. We participated recently in a competition called Pace, geared towards the automotive industry in which eight groups from universities across the world had to design a zip car; our students took second place. In addition, the high number of undergraduate students that wanted to participate in research in the last few years surprised us. Many of them present their work in international conferences and they come back with prizes for the best presentation or paper.

**Could you elaborate on how some of these research centers are able to use the College’s students?**

Some of the centers are local and linked to a particular department whereas as others are the result of collaborations with other universities. Our researchers have a network of people working in similar areas and they present their proposals, go through the review process and we have been

successful in gathering interest from people wanting to know what we can do. Around 98 percent of our professors have PhDs from top universities in the US, Europe and even Japan. We only hire people with PhDs in engineering so that has helped us to build a good reputation for our researchers.

**How accessible are internships for students to get involved with the local industry?**

Internships are very accessible to students. These internships require successful application and tough interviewing processes but they have many opportunities. Almost all the main companies in Puerto Rico have UPR engineering students taking on internships and co-op internships. We have an office here in the college called the Co-operative Education Program office, which gives credits to students who carry out internships. They are required to work full-time for specific periods in these companies on engineering related projects. We have a professor here who ensures that the work they undertake is relevant to the program and they have to give presentations here about the work they do for these companies. One individual in each company supervises the students and together with the professor they evaluate the student and we give them a grade, which contributes towards their graduation requirements. Although it is not a compulsory component of the degree, we currently have around 60% of the students participating in these internships. We really encourage our students to participate because, although it is essential to have the theoretical knowledge, it is very important to have the practical experience, which we are unable provide in the classroom. Being in that industrial setting allows them to learn how to interact with others, learn how procedures work in real life and many of the students get job offers from these companies later on. However, this is not free for the companies; they are required to pay the students.  We have had this program for around 35 years and it has been so successful that we have received awards for it.

**In terms of translational research, how effective would you say that technology transfer is here?**

The bulk of our research, which as I mentioned has seen exponential growth in recent years, has been in basic research. Nevertheless, over the last few years we have been focusing on transferring that knowledge to companies. We have been trying to teach our researchers the importance of intellectual property and orientating what they do to applying for intellectual property rights. In order to be successful, there has to be a market. In that regard, we are not at the level where we would like to be but we are taking specific action to reach that goal of having more translational research, which could create jobs and new business opportunities.

**What are your expectations for the College over the next few years?**

I would like there to be a more entrepreneurial mindset within the College for our graduates, professors and researchers. I would like students studying here to be aware that there is an alternative to going into the industry and that there may be a chance to commercialize their innovative ideas and enter the market. We have specific projects such as Pathways to Innovation, which is an initiative that began at Stanford University. So far, we have been very successful in gaining the interest of our students for these kinds of projects.

In addition, this year we are starting a pilot program for students to have a multidisciplinary Capstone experience. All universities which want to have the ABET accreditation for engineering need to offer their students the Capstone experience and, up until now, the Capstone experience here has been particular to each discipline. For the new pilot program, we are collaborating with the Business Administration School here and are trying to involve students from Sciences and Arts. The engineers are going to bring their ideas about new products, processes and services to the table and develop them from different perspectives for a specific market. Once they have the customer discovery process set up at the end of the semester, they will develop all the engineering and design aspects.

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