



Engineering Twinning Program: Universidad de Monterrey (UDEM), MEXICO and Nagaoka University of Technology (NUT), JAPAN

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ABSTRACT

This paper describes the requirements, procedures, benefits, and results to date in the development of a dual degree program for engineering students from the Universidad of Monterrey (UDEM) and Nagaoka University of Technology (NUT), certainly the most successful program of its kind in Mexico because of its results and the peculiarities that had to be resolved. It is also an example of collaboration with regional industry, because there is a great amount of Japanese investment.

In the fifteen years that the program has lasted, more than 100 students have graduated from Mechanical Engineering and Information Systems careers, and more than 20 Japanese professors have visited UDEM to evaluate and enrich the program.

The program consists of an intensive Japanese-as-a-foreign-language program, in which UDEM students study Japanese ten hours each week (two hours a day), taught by two Japanese teachers based in Mexico. This program lasts five semesters. At the end of the program, students prepare for an entrance exam in the Japanese language that evaluates their engineering knowledge and their mastery of the technical Japanese language, spoken and written with Kanji. Those students who manage to pass the exam will spend the next four semesters in Nagaoka to complete their university degree. At NUT all instruction is in Japanese. At the end of nine semesters and successful completion of all requirements, NUT will grant a BS degree and UDEM will grant a *licenciatura* degree in engineering. This means that graduates will master three languages (Spanish, English, and Japanese), will have two degrees issued in two countries, and will have acquired significant international experience and intercultural sensitivity.

This program is now in its 15th year. It has transformed lives and has helped to improve society by having global professionals.

Keywords: Double-Degree, Engineering

1. INTRODUCTION

In 2006, a delegation from UDEM visited East Asia to explore possible agreements for internationalization. Among the universities that were visited, was Nagaoka University of Technology (NUT).

The visit was very productive and led to the establishment of a dual degree program. The program was conceived by NUT Professor Kozo Ishizaki (Mechanical Engineering), as he had already implemented such agreements with other countries such as Vietnam. Japanese government funds were also available to send teachers of Japanese language to other countries.

NUT is a research university with about 2,000 students, of which more than half are graduate students. Its research output is impressive. Nagaoka is a city located 400 km northwest of Tokyo.

UDEM is a Catholic-inspired institution founded in 1969 with more than 40,000 alumni. It currently has about 17,000 students in its graduate, professional or undergraduate, and baccalaureate programs. In recent years, the boost to research

has been remarkable. UDEM counts with accreditation in the U.S. by SACS-COC.

After the first trip to Japan, NUT and UDEM professors and academic program directors proceeded to make a comparative analysis of curricula in NUT and UDEM. Analyses were made for undergraduate degree programs in Mechanical Engineering, Computer Systems Engineering, Information Systems Engineering, and Digital Graphic Design Engineering.

Communication continued electronically to initiate preparations needed and in 2006, a delegation from NUT led by its rector visited UDEM to sign the agreement and adjust final details.

Under the agreement, students study the first five semesters at UDEM and then another four semesters at NUT, after which they are awarded two degrees. It is expected that graduates of the program work for Japanese companies in Mexico or continue graduate studies at NUT.

The first generation initiated in fall 2007. The criteria for a student to be admitted to the program include the high school grade point average, proficiency in English (TOEFL), the score on the UDEM entrance exam, and an interview for the verification of interest and explanation of the honors program. Admitted students are asked to submit a letter signed by their parents in which they must commit to supporting their children when they go to NUT, because they must pay tuition there (which is coincidentally very similar to UDEM's tuition).

The first Japanese language teachers arrived in fall 2007. NUT also sent special Japanese language computers, books, dictionaries, and instrumentation for the program.

During spring 2008, NUT asked UDEM to receive two graduate students from NUT (one from the area of Information Systems and other from Mechanical Engineering) for an internship including teaching the first cohort of UDEM students. The two NUT students stayed at UDEM from October 2008 to March 2009. UDEM obtained funds to house these teachers in the university dorms. For this activity, NUT also sent special equipment for PETrocket experiments and developed technical manuals in Japanese. The NUT interns designed exciting learning activities that were incorporated into the program for future generations.

NUT also sent visiting professors, one of whom was Professor Ishizaki who taught Thermodynamics in Japanese to the students in the program and gave a public lecture about Japanese culture. Later, Professor Noboru Yamada and other teachers from NUT visited UDEM in order to deliver lectures. Each year, UDEM has received at least two teachers from NUT to provide intensive training in technical Japanese language for the dual degree program.

UDEM professors have also visited NUT regularly; first two professors in March 2007 to attended NUT's biannual symposium for internationalization experiences (Demófilo Maldonado and Salvador Barrera). In 2009, Elizabeth Gutierrez also attended and discussed the dual degree program between NUT and UDEM. Friendly teachers were our hosts and talked to us about their research projects and laboratories where our students can learn as soon as they arrive to Nagaoka.

At UDEM the program is staffed by two teachers of Japanese. Every generation studies Japanese for five semesters, ten hours per week of Japanese during the 16 weeks of the semester. Students also spend an intensive summer course in NUT, until they complete 1000 hours of technical Japanese before presenting the Japanese language exam in order to be accepted by NUT.

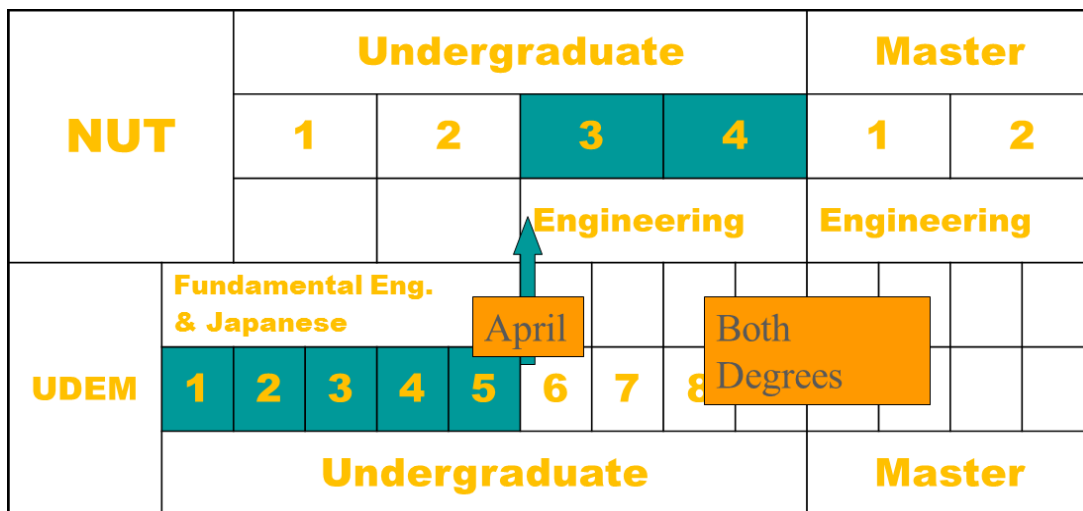
When students visit NUT during the summer to improve their Japanese language skills, they live with host families in Nagaoka, get to know the university, and participate in important events such as the visit in 2009 of the Ambassador of Mexico to Japan, to celebrate the 400-year-old relationship between the two countries.

RESUME OF THE PROCEDURE:

- 1) Select students interested in the program under the criteria of level of English and high school grades.
- 2) Selected students register the full load of their undergraduate engineering program at UDEM and study Japanese two hours daily including summers. Japanese language teachers are sent by NUT to that effect.
- 3) At least two NUT professor visit UDEM during the first year to discuss technical issues and learn about the students' progress in Japanese language.
- 4) Additionally, an employee of NUT visits UDEM to audit the work of the Japanese language teachers at UDEM.
- 5) In the summer of their second years in the program, UDEM students visit Nagaoka University for three weeks for an intensive course in Japanese and for a cultural adaptation program.
- 6) In the November before the departure in March of the UDEM students, a committee of NUT visits UDEM to apply the test of Japanese language skills and engineering subject knowledge.
- 7) Students begin their two-year stay at NUT in March. All classes at NUT are taught in Japanese.
- 8) Upon completion of their degree requirements, students are awarded two degrees, one from NUT and one from UDEM.

The calendar of the program is shown in Figure 1.

Figure 1. Calendar (time line) of the Dual Program



It is important to mention that this is the only dual-degree program of its kind in the Americas for undergraduate students studying engineering. The challenge is great, but so is the value and are the rewards.

2. RESULTS

All of the students who have completed this program comment that it is an experience that has a positive impact on their professional development and that it has changed their lives, since the program allows them to acquire a view of the world that they did not have before.

To date we have had twenty-eight graduates of the program, in addition to over 40 visiting professors from mechanical materials and TI engineering (all with PhD degrees), and more than fifty exchange students who came from NUT mainly from mechanical engineering and IT (all from undergraduate programs).

In addition, the agreement that was initially created for one academic program applies now to seven programs and is well accepted by the regional industry and by those seeking to hire our graduates.

Of approximately 50 students who apply for admission each year, only 25 are admitted and approximately 20% of each cohort finish the program. Approximately 50% are from mechanical engineering, and the rest of the three other academic programs listed before

During the pandemic, we came to think of canceling the program, but in the face of adversity, new ideas emerged and with the use of technology and goodwill from both institutions, we have managed to keep the program alive using online instruction despite the 13-hour time difference. According to the the students, the quality was maintained and did not suffer from the online mode of instruction.

This is an important initiative to promote global engineering as different authors support this learning objective to understand, design, and solve global engineering challenges. [1]



Figure 2: First UDEM students to graduate from NUT in 2012 and graduation ceremony at Nagaoka

REFERENCES

- [1] Greengard Samuel (2009). "Learning goes Global", *CACM*, Vol. 52., No. 5, pp 18.