

## UPR/MIT/TU PROFESSIONAL DEVELOPMENT PROGRAM

### REPORT FOR THE 5<sup>th</sup> YEAR JULY 1st 1998 THROUGH JUNE 30th 1999



#### INTRODUCTION AND OVERVIEW

The fifth year of the UPR/MIT/TU Professional Development Program followed the scope of work described in the agreement with the GMAEC. The program consists of six key elements: a summer course at MIT, a winter course at UPR, student research projects, summer internships and an annual visit to an operating transit system. At the UPR students are recruited in May. In July they go to a seminar where they are introduced to the Tren Urbano project. In this seminar they listen to presentations on the development of the San Juan Metropolitan area, changes in transportation needs and facilities, strategies for the design, construction and operation of the Tren Urbano and finally on long-term plans for expansion. Right after this seminar of two days, they travel to Boston for the summer course conducted by the MIT Center for Transportation Studies. Soon after the summer course, in August, students begin their research projects. Later on, in January, the UPR presents a conference on Tren Urbano. The annual site visit to an operating transit system takes place during Holy Week. Finally, after almost a year in the program, students are ready for summer internships with Tren Urbano consultant and contractors.

Student recruitment at the UPR began in March with an orientation offered by the CIRC. The students selected were notified in May. This year, seven graduate students and eighteen undergraduate students were identified as having the interest and research potential to work on the project. Six graduate students who participated in the fifth year activities continued in the program.

For the summer course at MIT during the fifth year twenty-five students, along with ten members of the faculty and research staff traveled to Boston. The course provided the students with the opportunity to see a rail system at work, to tour the city and get an idea of the transportation facilities and to exchange ideas with students and faculty from MIT.

The UPR faculty, research staff, and students hosted their counterparts from the MIT in January 1999 for the V UPR/MIT Conference on Tren Urbano. From January 8 to 15, twenty-five students and ten professors from UPR, and thirteen students and six professors from MIT participated in the Winter Conference.

The operating transit system visited this year was the Medellín Metro in Colombia. Twenty-four UPR students and ten professors visited this city from March 28 to April 1. Students and professors participated in activities including lectures and visits to stations, the control center and

maintenance facilities. One engineer from the Puerto Rico Highway and Transportation Authority and one engineer and the technology transfer manager from the Tren Urbano Office also accompanied this group.

In May of 1999 three graduate students who participated in this program graduated. Five graduate students are continuing research into the fifth year.

The level of funding for this year was \$408,761.20

It is important to note that after being part of the Civil Infrastructure Research Center since its beginning in 1994, the UPR/MIT/Tren Urbano Professional Development Program has become part of the Transportation Technology Transfer Center (TTTC). Dr. Antonio González ceased his activities as Coordinator of the mentioned program in January 1999. The new Program Coordinator is Dr. Benjamín Colucci, Co-director of the CTTT. Since January, the Program is under direct coordination of Dr. Benjamín Colucci.

The Civil Engineering Department created the Transportation Technology Transfer Center on April 1st, 1986 at the University of Puerto Rico, Mayagüez Campus. The purpose of this Center is to promote technology transfer and to develop technical activities related to transportation in Puerto Rico and the Virgin Islands. This Center operates with funds from the Federal Highway Administration, the Puerto Rico Department of Transportation and Public Works and the US Virgin Islands Department of Public Works.

## STAFF AND FACILITIES

The UPR/MIT/Tren Urbano Professional Development Program receives constant clerical and editorial support for student interns and faculty. Staff from the Transportation Technology Transfer Center provides this support. The following is a list of the names of the available staff:

Dr. Benjamín Colucci, Coordinator of the Program  
Eng. Gisela González, Assistant to the Coordinator  
Nereida Morales, Administrative Assistant  
Rosa I. Rodríguez, Secretary  
Waleska F. Morciglio, Editor  
Michael J. Santos, Webmaster  
Luis Palacios  
Saúl Vega  
René Maldonado, Librarian  
Héctor Torres, Technical Support

Since the Program is administered by the Transportation Technology Transfer Center, the facilities available to the Center are also available to the Program. Office space was reserved at the TTTC for the creation of the UPR/MIT/Tren Urbano library. This library has over 300 publications, which include documents such as the standard plans of the Tren Urbano project, theses and technical reports from student interns, photo albums highlighting the most significant activities of the Program and newsletters.

## ACTIVITIES

### SUMMER COURSE AT MIT



From July 15 to July 26, 1998, twenty-five students and ten faculty members from the University of Puerto Rico participated in the summer course at the MIT Center for Transportation Studies. This intensive short course included an introduction to the Tren Urbano, and presentations by transit practitioners, researchers and professors. There were also numerous field trips to view different transportation facilities.

### 1999 WINTER CONFERENCE

The UPR/MIT/Tren Urbano Winter Conference has two objectives: to provide an introduction and overview of Tren Urbano to the MIT and UPR students, with opportunity of acquiring hands-on experience by visiting the TU facilities; and to provide an introduction to the socio-cultural background and issues affecting the Tren Urbano project, complemented with a tour of the Metropolitan area. These objectives serve the aim of transferring the technology of planning, designing, building, operating and maintaining a rail transit system.

This year, like other years, the course consisted of lectures, presentations, field trips and socio-cultural activities prepared by the UPR Civil Infrastructure Research Center, with assistance from the Training and Technology Transfer Department of the Tren Urbano Office. Faculty and research staff lectured on various topics ranging from aspects of Puerto Rican culture to specific technical details about the Tren Urbano project. Representatives from major contractors such as Siemens Transportation Partnership of Puerto Rico, provided status reports on the design and construction of the project. Also, important government officials such as the Secretary of the Department of Transportation and Public Works and the Executive Director of the Puerto Rico Highway and Transportation Authority, gave talks on critical issues concerning the project. These talks and reports gave students the opportunity to learn first-hand about the general progress of the project.

In addition to lectures and presentations, field trips were conducted with the purpose of having students learn first-hand about the problems of the city and the role the Tren Urbano will play in their solution. Students visited the Phase I alignment and the facilities of government agencies playing a major role in the project. They also went on a helicopter ride above the alignment.

## **ANNUAL SITE VISIT: MEDELLIN METRO FACILITIES**

The operating transit system visited this year was the Medellín Metro in Colombia. Twenty-four UPR students and ten professors visited this city from March 28 to April 1. Students and professors participated in activities including lectures from the Metro management and visits to stations, the control center and maintenance facilities. One engineer from the Puerto Rico Highway and Transportation Authority and one engineer and the technology transfer specialist from the Tren Urbano Office also accompanied this group.

The technical sessions were geared towards the importance of early preparation of the users and the importance of marketing based on the culture of the users of public transportation systems. (See Appendix F for a detailed schedule of the trip)

Before the trip to Medellín, Colombia, Dr. Jaime Gutiérrez oriented the students in issues related to Colombia's culture and public transportation systems. The activity took place at the University of Puerto Rico, Mayagüez Campus, on March 24, 1999.

## **CLOSURE ACTIVITY**

The TTTC coordinated a Closure Activity with the purpose of giving students the opportunity to present their finished research projects. This activity took place at the Tren Urbano Office, San Juan, on May 26, 1999. The activity started with student presentations and ended with a certificate award ceremony. (See Appendix G for a detailed schedule)

## **SUMMER INTERNSHIPS**

An integral part of the Program is the summer internship work experience with Tren Urbano consultants and contractors. The Tren Urbano Office is in charge of coordinating the internships. These internships enhance the classroom learning experience by offering a real life work environment, which emphasizes professional performance and productivity. As part of their responsibilities, students participate in bi-weekly intern meetings. They also receive stipends during their internship. This year a total of \_\_\_\_ students participated in student internships.

## **OUTREACH AND MARKETING ACTIVITIES**

### **Presentations**

#### **March 21-25, 1999**

Dr. Benjamín Colucci presented the paper "Human Resources Development Program for the Tren Urbano" (Appendix B) co-authored by Dr. Felipe Luyanda, Dr. Antonio González, Dr. Nigel Wilson, Dr. Ken Kruckermeyer and Lydia Mercado at the First Urban Public Transportation Systems Conference. This activity was sponsored by the American Society of Civil Engineering and took place in Miami, Florida. In this conference over 25 countries presented their public transportation systems.

#### **May 21, 1999**

Dr. Benjamín Colucci presented the UPR/MIT/Tren Urbano Professional Development Program at the NSF-EPSCoT Convetion. This Convention took place at the Best Western Hotel,

Mayaguez. The title of the presentation was "Professional Development Program in a University Setting: Tren Urbano Initiative." (See Appendix A)

### **June 1-3, 1999**

The Region IV office of the Federal Transit Administration sponsored a Regional Conference on "Transportation Partnerships for the New Millennium". Dr. Benjamín Colucci traveled to Atlanta, Georgia to present the Program at the Conference.

### **Publications**

One way to market the Program is by publishing papers explaining what the Program is all about. This year this marketing option has been used quite effectively, since papers have been published in widely read magazines in Puerto Rico and the United States.

The paper "UPR/MIT/Tren Urbano Professional Development Program", by Dr. Benjamín Colucci and Dr. Antonio González, was published in the UTRC Newsletter, Region II, City University of New York in Spring 1999. The same paper was also published by Tecno-Mundo Magazine on March 1999. (See Appendix C)

The Cronicas Magazine published the paper "Un nuevo enfoque para el desarrollo profesional de nuestros estudiantes: Iniciativa UPR/MIT/Tren Urbano", written by Dr. Benjamín Colucci. The paper was published in June 1999. (See Appendix D)

Apart from these publications in magazines, an informative brochure describing the Program was also developed and published. (See Appendix E)

## **OTHER ACTIVITIES**

- **Research Trip**

The Program co-sponsored a trip for two students and a professor to Sacramento, California. Sergio Pujols, Gustavo Toledo, and Dr. Iván Baigés met with executives from SIEMENS Corporation in order to gather information that would help them in their research project.

- **ASME Annual Convention**

Sergio Pujols and Gustavo Toledo presented their research project entitled "Transportation Options for Finished Vehicles" at the American Society of Mechanical Engineers Annual Convention. The presentation was on April 16, 1999 at Hofstra University, New York.

- Second Tren Urbano Fair Co-Sponsored by the UPR/MIT/TU Program



This year was the Second Tren Urbano Fair co-sponsored by the UPR/MIT/Tren Urbano Professional Development Program. This fair took place in the new Chemistry building at the UPR-Mayagüez. Among the guests were Dr. Fred Soltero Harrington, Dr. Carlos Pesquera and Ramón Vázquez.

- Junior Technical Meeting

The following is a list of the students who participated in the Junior Technical Meeting: 34<sup>th</sup> JTM and 19<sup>th</sup> Puerto Rico Scientific Meeting:

Libby Goyco	Sergio Pujols	Eduardo Ortíz
Víctor Avilés	Joel Martínez	Damaris Rivera
Carmen Rawls	Abigail Marcano	Nahir Mendoza
Clary Barreto		

- 11<sup>th</sup> Engineering and Surveying Congress

The student Libby Goyco presented her research project at the “11vo Congreso de Ingeniería y Agrimensura” that took place on March 25-26 in Bayamón.

- First Tren Urbano Fair

Students from the Program participated in the First Tren Urbano Fair at the Luis Muñoz Rivera Park. Libby Goyco and other students went to evaluate the marketing strategies used by the Tren Urbano Office.

- The 11<sup>th</sup> EPSCoR Annual Meeting

The 11<sup>th</sup> EPSCoR Annual Meeting took place at the Ponce Hilton and Casino, Ponce, P.R., from April 30 to May 2, 1999. The theme of this activity was "The Academia/Industry Junction: Technology Transfer as the Bridge to Economic Development". EPSCoR and the Caribbean Division of the American Association for the Advancement of Science sponsored this event.

- Sigma Xi Poster Day

The Sigma Xi Poster Day took place on \_\_\_\_\_ at the University of Puerto Rico, Mayaguez Campus. The students Carmen Centeno and Víctor Avilés presented their posters in this event.

## **DEVELOPMENT OF THE WEB PAGE**

The Transportation Technology Transfer Center began to work in the web page immediately after accepting the responsibility of taking over the UPR/MIT/Tren Urbano Professional Development Program. Once the ideas were put together, a staff was assigned and the work began in February 19, 1999. The web page was presented for the first time at the Second Tren Urbano Fair co-sponsored by the Program in March 10, 1999. This page is constantly being updated with the most recent information concerning the Program. The page is at [circweb.upr.clu.edu/trenurbano](http://circweb.upr.clu.edu/trenurbano). (See Appendix H for visuals of the primary features)

The web page is divided into the following parts:

- Overview – an introduction to the UPR/MIT/Tren Urbano Professional Development Program
- Objectives – a brief summary of the objectives of the Program
- Student Interns – information and photos of the students participating in the Program
- Faculty Advisors – information on the professors and their academic backgrounds and on their relationship to the Tren Urbano Project and the Tren Urbano Program
- Research Projects – abstracts from the research projects of Group V
- Activities – recent and future activities related to the Tren Urbano Project, and to the scientific community. There is also information on different forums for presenting research projects and on activities directly related to the Program
- Photo Gallery – photos from different activities, and from the different groups of students who have participated in the Program
- Sponsors
- Acknowledgements
- Links – links to the Highway and Transportation Authority, the Massachusetts Institute of Technology, the Department of Transportation and Public Works, the Transportation Technology Transfer Center, the University of Puerto Rico at Mayagüez, and the University of Puerto Rico at Río Piedras
- Application Form – a form available for students wishing to participate in the Program

## **STUDENT RECRUITMENT AND SELECTION FOR YEAR V**

In March a handout explaining the program and its scope was prepared in order to inform the target audience. The students who can participate are those in third, fourth or fifth year, or students entering in the graduate programs from Civil, Electric, Industrial or Mechanical Engineering, Planning and Architecture. Then a meeting with the purpose of orienting the students was held at the end of March. Mid April was the deadline for handing-in the application form along with curriculum vitae, transcript and essay explaining why they would like to participate, what is their area of interest in the Tren Urbano project and what are the research skills, special abilities or work experience that qualify them to participate in the project. The students are evaluated by the Selection Committee and informed of the results of the evaluation in May. (See appendix for a copy of the handout and application form)

Planning and architecture students are typically graduate students, while civil or electrical engineering students are mainly undergraduates.

The interests of the students range from public transportation, management, design, illumination, to security, type of user, and frequency of use of rail transit systems.

## STUDENT RESEARCH PROJECTS

Because of the nature of the UPR/MIT/TU program, research must reflect the priorities of the Tren Urbano project. Therefore, research agenda shifts according to the progress of the project. Right now the priorities are construction and operation of Phase I. Students are asked to select a topic, which combines their particular interests with questions in the development of the Tren Urbano project. Since students from the UPR begin to participate in the program in July, when they go to MIT for the summer course, they benefit from the MIT students' presentations by getting ideas for their own research and possible collaboration. For this reason, the UPR students are expected to begin their research projects in August.

Undergraduates at the UPR do research for 6 credit hours (3 per semester) as part of the undergraduate research course. The code of the course is 4998 in the different departments. Graduate students, on the other hand, do research for 2 years as part of their theses.

There were a total of twenty-seven UPR students involved in the program during the fifth year. All the students presented their research projects. Up to the fifth group there is a total of 114 research projects from MIT and UPR.

Other forums are available to students who want to disseminate their research results. For several years students have presented their papers at the Junior Technical Meeting, an activity that usually takes place in March. In 1999, ten UPR students participated. The Junior Technical Meeting is the only islandwide forum for university students to present their research results to the scientific community. Another forum is the PR-EPSCoR Annual Meeting, where two UPR students made oral presentations in 1999. Some students also prepare posters for the Sigma Xi Student Poster Day, and two students participated this year.

## FACULTY PARTICIPATION

This year, twelve UPR faculty and research staff participated in the project: Professors Antonio González, Felipe Luyanda, Amado Vélez, Benjamín Colucci, Nelson Irizarry and Juan Bernal of the Department of Civil Engineering at UPR-Mayaguez; Professor Gerson Beauchamp of the Department of Electrical Engineering at UPR-Mayaguez; Professor Iván Baigés of the Department of Mechanical Engineering; Professor Sonia Bartolomei of the Department of Industrial Engineering; Professor Jaime Gutiérrez of the Department of Social Sciences at UPR-Mayaguez; Professor Aníbal Sepúlveda of the Graduate School of Planning at Rio Piedras; and finally, Professor Esteban Sennyey of the School of Architecture at Rio Piedras.

Dr. Antonio González had overall responsibility for the project up until January 1999. His responsibilities included recruiting and selecting students, coordinating program details with MIT and the Tren Urbano Office, and coordinating faculty participation. Dr. Antonio González and Lydia Mercado coordinated the January (1997 and 1998) educational activities with the assistance of the CIRC's staff. The core faculty of the project composed of Antonio González, Benjamin Colucci, Felipe Luyanda, José Pérez, Gerson Beauchamp, and Amado Vélez has provided and will continue to provide program continuity. All professors serve as research advisors to students.

It is important to note that after being part of the Civil Infrastructure Research Center since its beginning in 1994, the UPR/MIT/Tren Urbano Professional Development Program has become part of the Transportation Technology Transfer Center (TTTC). Dr. Antonio González ceased his activities as Coordinator of the mentioned program in January 1999. The new

Program Coordinator is Dr. Benjamín Colucci, Co-director of the CTTT. Since January, the Program is under direct coordination of Dr. Benjamín Colucci.

## **CONCLUSIONS FROM YEAR V AND RECOMMENDATIONS FOR YEAR VI**

The objectives of the program, which are geared towards developing a cadre of bilingual professionals able to plan design, construct, operate and manage railway transit systems and specifically the Tren Urbano, were achieved once again in our fifth year of the program. Specifically:

- MIT graduate and undergraduate students came to the UPR for an 8-day program.
- UPR graduate and undergraduate students went to MIT for an intensive summer course and participated in the study tours to the Medellín Metro. These are cross-cultural components that contribute to our interdisciplinary approach.
- Knowledge in railway systems as related to Puerto Rico and the Tren Urbano was fortified by hands-on participation in cross-disciplinary interactions.
- Sharing expertise and applying theory to a real world situation was possible due to the opportunity created to bring together faculty and students in engineering planning and architecture, and professionals from public and private sectors.
- MIT and UPR students exchanged ideas, research and collaboration.
- The Advisory Committee Meeting was established and met in February, March and May to discuss the general guidance of the program.
- The use of the Internet for graduate and undergraduate research was stressed.
- Students were motivated to pursue a carrier in transportation.
- Students developed technical skills.

Even when the objectives were achieved and the FTA designated the program as a model project for its new national technology transfer program, there is always room for improvement. The following recommendations were made for year 6:

- There should be a primary consultant who is involved directly in the Tren Urbano project for each student researcher.
- The courses should have more direct participation from people involved in the Tren Urbano project.
- The Program should concentrate on interdisciplinary activities.
- Joint research projects between MIT and UPR should be emphasized
- The Program should have an active outreach program in transportation

## **FUTURE PLANS**

The UPR/MIT/Tren Urbano Professional Development Program will continue its commitment with the Engineering Faculty at the University of Puerto Rico, Mayaguez Campus, the Graduate School of Planning and the School of Architecture. However, in an effort to strengthen the interdisciplinary nature of the Program we have added the School of Business. Furthermore, we will establish contact with professors from the Psychology Department in order

to incorporate aspects that should be considered in the process of implementing an infrastructure project of this nature.

## **Appendix A**

### ***Professional Development Program in a University Setting: Tren Urbano Initiative***

Benjamín Colucci, Ph.D., P.E.  
Coordinator, UPR/MIT/Tren Urbano

Civil Engineering Department  
University of Puerto Rico, Mayagüez Campus

This presentation was used at the ASCE, EPSCoT and FTA conferences

## **Appendix B**

### ***Human Resources Development Program for the Tren Urbano***

Benjamín Colucci, Ph.D.  
Antonio González-Quevedo, Ph.D.  
Lydia Elena Mercado-Sherman  
Kenneth Kruckemeyer, Ph.D.  
Nigel H.M. Wilson, Ph.D.

Paper presented at and published by the American Society of Civil Engineers in the First  
International Conference on Urban Public Transportation Systems

## **Appendix C**

### ***UPR/MIT/Tren Urbano Professional Development Program***

Benjamín Colucci, Ph.D., P.E.  
Coordinator, UPR/MIT/Tren Urbano

Antonio González-Quevedo, Ph.D.  
Director, Civil Infrastructure Research Center

Published in:  
Tecno-Mundo Magazine, March 1999

UTRC Newsletter, Spring 1999

**Appendix D**

***Un nuevo enfoque para el desarrollo profesional de nuestros estudiantes***

Benjamín Colucci, Ph.D., P.E.  
Coordinator, UPR/MIT/Tren Urbano

Civil Engineering Department  
University of Puerto Rico, Mayagüez Campus

Published in:  
Crónicas (June 1999 edition)

**Appendix E**

***Oportunidad de Desarrollo Profesional y Multidisciplinario:  
Proyecto UPR/MIT/Tren Urbano  
1999-2000  
(Brochure)***

**Appendix F**

***Trip to Medellín, Colombia  
Schedule***

**Appendix G**

***Closure Activity  
Schedule***

**Coordinated by**

**Dr. Benjamín Colucci, coordinator of the Program  
Lydia Mercado, Technology Transfer Specialist, Tren Urbano Office**

**Appendix H**

*Primary features of the web page*