December 23rd, 2010
Date

Invitation to review is extended by: Ernesto Vázquez-Barquet, President
Polytechnic University of Puerto Rico

Identify the program in Landscape Architecture to be reviewed and the name of the institution.

School of Landscape Architecture

This landscape architectural program certifies that it has been in operation since August 26, 2006 and is legally entitled to confer the following first professional degree:

Master of Landscape Architecture


1. April 17th – 20th, 2011

2. May 1st – 4th, 2011

Please give complete address for the program requesting review. Include the name, phone number, and e-mail address for the program administrator.
Marisabel Rodríguez, Program Director
Polytechnic University of Puerto Rico, School of Landscape Architecture
P. O. Box 192017, San Juan, Puerto Rico 00919-2017
Tel: 787-622-8000, ext. 663 Mobile: 787-529-6708 e-mail: mrodriguez@pupr.edu
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### PROGRAM SELF-EVALUATION REPORT

For the Academic Year **2010-2011**  
Institution: Polytechnic University of Puerto Rico  
Program: First Professional Degree

#### Degree Title/Degree Length
Master of Landscape Architecture

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Report Submitted by **Marisabel Rodriguez**  
**April 1st, 2011**
MINIMUM REQUIREMENTS
For Achieving And Maintaining Accredited Status

1. The program title and degree description incorporate the term "Landscape Architecture".

2. An undergraduate first-professional program is a baccalaureate of at least four academic years' duration.

3. A graduate first-professional program is a master's equivalent to three academic years' duration.

4. Faculty instructional full-time equivalence (FTE) shall be as follows:
   a. An academic unit that offers a single first-professional program has at least three FTE instructional faculty who hold professional degrees in landscape architecture, at least one of whom is full-time.
   b. An academic unit that offers first-professional programs at both bachelor's and master's levels, has at least six instructional FTE, at least five of whom hold professional degrees in landscape architecture, and at least two of whom are full-time.

5. The parent institution is accredited by a recognized institutional accrediting agency.

6. There is a designated program administrator responsible for the leadership and management functions for the program under review.

7. A program accredited by LAAB shall:
   a. Continuously comply with accreditation standards;
   b. Pay the annual sustaining and other fees as required; and
   c. Regularly file complete annual and other requested reports.

The program administrator shall inform LAAB if any of these factors fails to apply during an accreditation period.

The Landscape Architecture Graduate program meets the minimum conditions to apply for LAAB accreditation.

_____________________________  ______________________________
_ Marisabel Rodríguez_  _Director_

Program Administrator Name  Title

_____________________________  ____________________________
Program Administrator Signature  Date

April 1st, 2011
INTRODUCTION

“The relationship between man and nature; the progressive, unregulated interference on natural and artificial ecosystems; and the human instinct for dominance, in parallel with the constant deterioration of living conditions in cities and surrounding areas, constitute good cause for universities and professionals to expand their scope of work.”

Landscape Architecture Research Group
National University of Colombia

“Land, they ain’t makin’ it any more.”

Will Rogers, actor

Preamble

Polytechnic University of Puerto Rico is a private, non-profit, coeducational institution of higher education founded in September 1966 in the metropolitan San Juan area, adjacent to the heart of the financial district. The complex of eight buildings that make up campus was developed through incremental additions to an original early 20th century structure facing Ponce de León Avenue, one of the city’s main thoroughfares. A large green area mediates between the university’s front facade and the somewhat tight urban context on which it stands. As part of the process of expansion, the Graduate School and the School of Landscape Architecture operate from two buildings across a street from main campus.

In time, “La Poli”, as commonly referred to, has succeeded in becoming the only local university where multiple disciplines related to the construction industry come together. Thus, the establishment of a Landscape Architecture School at Polytechnic adds another strata to its professional profile. How and why did this program come about?

Myriad challenges related to historic, social, environmental, and economic conditions in the Caribbean Region underlined the need to address key issues related to landscape architecture from an academic vantage point:
1. **Increasing environmental concerns (local and worldwide)**

   Between 1935 and 2000, no single natural resource in the Metropolitan Area of San Juan, Puerto Rico's capital city, escaped the impact of urban sprawl. Said area experienced a growth of 1285% in already built sections, while protecting as open space only 4% of what was formerly farmland. Population growth, housing, vehicular and infrastructure development, among others, have left an imprint on previously open fields. This trend will continue in the future, given the current expansion of the construction industry, and feeble enforcement of existing applicable regulations. These same concerns are being contended at an international scale, demanding a more comprehensive approach to the degradation of the physical environment and the landscape. Without adequately preparing a group of qualified local professionals, our islands are at a disadvantage to reconcile the needs of its natural and built environments. Landscape Architecture can prove instrumental in helping us define a new paradigm for addressing environmental problems, a systems perspective that so far has eluded many in the region.

2. **Extended impact of the construction industry on the Antillean landscape.**

   Puerto Rico’s construction industry has seen heightened expansion during the past 40 years. Rural, bucolic panoramas of yesteryear have been superseded by suburban transformations. Puerto Rico built an average of 11,490 single-family dwellings per year in the decade spanning the years 1993 and 2003. Throughout the Caribbean, activity in the construction industry has consistently been considered an illusory measure of progress. The islands' development trends unabashedly endorse the expansion of the built environment and, as a consequence, an equally dramatic reduction of the stage upon which they are set – the land. This pattern has a burdening effect on the environment, the people who need to respond to them in a fast-paced milieu, and the professionals responsible for shaping change.

3. **Health implications in community design.**

   Environmental awareness has awakened sustainability issues pertaining to the interconnection of nature or natural-like settings to human health, physically and mentally. We now know that: “Patients whose hospital rooms overlooked trees required less pain medication and recovered more quickly than those whose rooms overlooked brick walls…” and how in the aftermath of September 11, citizens of New York City flocked to parks and open spaces in search of a sense of order (Howard Frumkin). Today, current concerns point
to landscape as a proactive design element, of decisive reach on matters related to health, mental balance, leisure, rest, and general well being. Said field of research remains largely unexplored in Latin America.

4. **A law without grip.**

In 1999, Puerto Rico’s Legislature approved Law #173, regulating landscape architecture as a licensed profession in the Island, acknowledging landscape architects as autonomous design professionals. Up to that time, landscape architectural functions were performed by: a) Mainland USA firms; b) a small group of unlicensed professionals trained abroad; and c) architects, engineers, agronomists, and other professionals traditionally and informally entrusted to do the job, in spite of lacking formal training. This contracting blurred professional definitions and responsibilities. In contrast, our continental counterpart – the USA - set those parameters early in the 20th century.

Law #173 legitimizes the need for qualified professionals that will execute this legislation in Puerto Rico, thus defining a necessity to prepare future landscape architects locally. Until 2006, a formal local academic offering in Landscape Architecture was lacking. Puerto Rican students interested in pursuing the field were required to conduct their studies abroad. All 26 registered landscape architects in Puerto Rico have degrees from accredited institutions in the United States out of which only 6 hold a Master’s degree. In that sense, the program now established will also be of benefit to a significant segment of professionals already committed to the field.

5. **Population and student growth.**

Between 1999 and 2010, Island data shows an increase from 69,542 to 107,810 in graduate degrees conferred. The difference of 38,268 represents a 35% increase in graduate or professional work over a decade. Of the total 107,810 persons, only 12,853 refer to doctoral candidates, showing a substantive preference for master’s and professional degree programs. Preliminary Census data for 2010 echoes that trend. The number of students now opting for a Master degree in Puerto Rico has grown considerably. The increase in candidates completing baccalaureate work, a raising demand for graduate studies, an expanded number of architecture graduates, and shifting trends in private higher education schools - when considered insieme - all underscore the pertinence of establishing a Landscape Architecture program in Puerto Rico.

6. **Rising costs of Landscape Architecture studies abroad.**
For a long time, the lack of opportunities to study Landscape Architecture in
Puerto Rico forced many to give up their intentions, or pursue studies elsewhere, primarily in the United States. That option, however, has been steadily facing the impact of skyrocketing higher education costs. Increasingly, by the time students graduate from college, their debt to income ratio represents a significant financial burden. Under these circumstances – and because approximately 60% of the Island’s population wages remain at poverty levels – the number of Puerto Rican students choosing to study abroad is declining. Whether these trends continue in the future remains to be seen, but for the time being, they suggest more students will remain closer to home. As such, Polytechnic University of Puerto Rico is well positioned to fill in this academic gap, providing a service to Puerto Rican students at more reasonable costs.

7. **Limited range of thematically related programs.**

Acknowledging rising local environmental concerns, a number of programs thematically related to Landscape Architecture have sprung throughout Puerto Rico within diverse institutions. Newly-created degrees now range from a Bachelor of Science in Environmental Science to a Master in Environmental Management Education, and Environmental Engineering, to name a few. And yet, these programs have traditionally focused on the scientific aspect of environmental issues, disregarding their relationship to design and planning of the built human environment as fundamental components in the quest for alternative solutions. The widespread biological “emergency-room” approach to environmental ailments leaves little room for long-range and regional planning, multidisciplinary approaches, and satisfaction of different stakeholders. Landscape architecture is acknowledged as a profession most discriminating towards and knowledgeable about natural systems, thus contributing comprehensive and innovative design solutions. As unscathed academic territory, Landscape Architecture might prove to be, after all, a renewed opportunity to ensure a broader understanding of community.

1. **History of the Program.**

The School of Landscape Architecture at Polytechnic University opened its doors on August 28, 2006, offering the first degree of its kind in Puerto Rico and the Caribbean Basin. Almost a decade before, other academic institutions on the Island flirted with the idea to no avail. The University of Puerto Rico (the public, land-grant institution) tried to implement a bachelor’s degree; Interamerican University (private) succeeded at offering an associate degree that never developed as a professional program and was ultimately shut down. The idea resurfaced a few years later – in a most natural way – within Polytechnic University’s Architecture program, founded in 1995.
Since those early years, landscape was underlined as a subject of relevance within the architecture program at Polytechnic. Courses such as Urban Design, History of Architectural Space, Theory (Basic and Advanced), History of Caribbean Architecture, Historiography, Mid-Career Research, and Ethics, expanded their syllabi to include related topics, readings, and exercises. More than once, visiting accrediting teams from the National Architectural Accrediting Board (NAAB) acknowledged the fact. Capstone projects often incorporated landscape concerns, mirroring the expanded scope of contemporary architecture in and outside Puerto Rico.

Students’ renewed interests challenged the architecture faculty and its administrators to provide ad hoc elective courses and revise curricular contents. However, interest in landscape was not brewing just in Academia. In 1999, the profession of landscape architecture as such was publicly acknowledged in the Island by Legislature. Subsequently, the local architects’ association became the Colegio de Arquitectos y Arquitectos Paisajistas de Puerto Rico. Finally, landscape architects could be licensed, and registered to practice in the Island but, ironically, no one could pursue academic degrees or study landscape architecture locally. For decades, everyone had to study abroad.

It should not come up as a surprise then, that Polytechnic University (PUPR) assumed self-imposed leadership for bridging that gap. Founded in 1966, and dedicated since then to academic offerings related to the construction industry, the not-for-profit institution is the largest private Hispanic Engineering School in the United States and its territories. Accredited programs offered at Polytechnic include undergraduate degrees in Land Surveying and Mapping, Civil, Industrial, Electrical, Mechanical, Chemical, and Environmental Engineering; Bachelor of Science in Computer Sciences, Computer Engineering, and Mechanical Engineering in Aerospace, as well as Business Administration and Architecture.

At the graduate level, PUPR offers programs in Engineering Management, Business Administration, Computer Information Systems and General Business, Environmental Protection Management, Manufacturing Engineering, Manufacturing Competitiveness, and also Civil, Electrical, and Computer Engineering. The most recent graduate degrees are the Master in Landscape Architecture (2006) and the Master in Mechanical Engineering in Aerospace (2009).

PUPR is accredited by the Middle States Association of Colleges and Schools. All programs are authorized to operate by the state-licensing agency, the Puerto Rico Council on Higher Education. The Engineering Accreditation
Commission of the Accreditation Board of Engineering and Technology (EAC-ABET) accredits all of PUPR’s engineering programs (Civil, Industrial, Mechanical, Electrical, Computer, and Environmental). The Applied Science Accreditation Commission (ASAC-ABET) accredits the program in Land Surveying. The National Architectural Accrediting Board (NAAB) accredits the Architecture program. The International Assembly for Collegiate Business Education (IACBE) accredits a Bachelor’s degree in Business Administration.

During 1999-2000 Architecture Dean Jorge Rigau convened four meetings with representatives of the Landscape Architecture profession in Puerto Rico to discuss the possibility of establishing a Master’s Degree Program. Possible approaches, venues and resources were explored. In 2002, Marisabel Rodríguez, ASLA, IFLA, was recruited to spearhead the effort. A graduate from Cornell University’s Master of Landscape Architecture Program, she was working at The Trust for Public Land in Minneapolis at the time. Ms. Rodríguez also holds a Bachelor of Arts in Education from the University of Puerto Rico, which made her an ideal candidate to undertake pedagogical responsibilities in the field. Her collaboration with the School of Architecture included teaching responsibilities as well as pre-planning tasks for implementation of the new Landscape Architecture Program.

After requesting advice from Ron Leighton, Honorary ASLA, Peter Trowbridge, former LAAB President, and Ann Milovsoroff, also an LAAB member visited the school in early 2003. We were interested in receiving a general orientation from them, as well as discussing our preliminary ideas for setting up a program. The three-day visit was instrumental for fine-tuning our curricular approach, faculty profile expectations, and time frame needed for implementation.

From 2003 through 2005, immersion with Landscape Architecture academic concerns included the development of specialized elective courses in the Architecture Department and co-teaching opportunities in History, Design, and Theory courses. Summer programs and general orientation sessions for high school students were revised to incorporate landscape issues. Long before the program was in place, lecturers were invited to address the university at large (Dorothée Imbert, José Ortega, and others).

In 2004, plans pertaining to the future program were officially presented by Polytechnic University to the local landscape architects’ association (Instituto de Arquitectos Paisajistas de Puerto Rico, IAPPR) for debate and advice. A formal proposal was submitted to Puerto Rico’s Council for Higher Education in August 2005. The evaluating agency visited our institution on March 2006. Niall Kirkwood (Chair, LA Program, Harvard) and Kathleen Gleason (Chair, LA Program, Cornell) were members of the evaluating team. After receiving
official approval, the program opened in Fall 2006. Our first offering was the three-year Master of Landscape Architecture.

For the opening year, classes were held within the existing facilities of the Architecture Department. By the second year, the Landscape Program was housed in an independent structure across campus, where it still operates. The first class included 34 students of diverse extractions. Yearly enrollment has averaged 20 students (for four years). With a 40% retention rate, 32 students are currently enrolled in the program. Our second academic offering, a two-year, post-professional degree, inaugurated in Fall 2008 with 2 students; it includes 4 now. The first commencement was held in 2009. To this day, 11 students have graduated; 14 are expected to graduate in June 2011.

Landscape Architect Marisabel Rodríguez, ASLA, has led the program since its inception, holding teaching and administrative duties simultaneously. In 2008, Olga Angueira, Associate ASLA, was hired to assist in academic and organizational tasks. Both, Rodríguez and Angueira hold full-time positions. At the institutional level, the program responds to the Provost (Office of the Vice-President for Academic Affairs).

Throughout the years, the Landscape Program has profited from the academic context in which it was conceived. Polytechnic University’s focus on the construction industry has nurtured curricular strategies, class contents, interdisciplinary efforts, and faculty diversity. Architects and engineers, also artists, surveyors, geographers, and computer scientists have taught at the Landscape Architecture program. Our students have shared with future colleagues at university laboratories, videoconferences, public presentations, design juries, trade shows and advocacy efforts.

In a short period of time, the program has established credibility in the community. The student-led organization – aLAs (Association of Landscape Architecture Students) was instrumental for institutionalizing Park(ing) Day in Puerto Rico. Throughout the years, faculty and students have consistently engaged in pro bono work, research and publications, collaboration with professional organizations, participation in design charrettes and exhibits, including local and international dissemination initiatives.

During the last year - as part of a self-assessment process (in preparation for accreditation) - administrators, faculty, students, and alumni have jointly acknowledged the assets and liabilities that, at this point in time, define a young program committed to impact the Caribbean Region. In order to fulfill its aspirations, the Landscape Architecture Program at Polytechnic University has identified key strategies to face the future: an “adjusted” curriculum, improved facilities, increased enrollment, and extended financial stability.
We feel confident and empowered to act upon them in order to grant continuity and further stature to the program.

2. Response to previous LAAB Review.

This constitutes our first report submitted to the LAAB for initial accreditation.

3. Describe current strengths and opportunities.

The creation of a Master’s Degree Program in Landscape Architecture embodies the first formal academic offering on the Island, and the first ever in the Caribbean basin. The program’s uniqueness lies not only in the way the curriculum itself is structured (even if still in need of some fine-tuning), but also on its potential regional ramifications.

A. Strengths

The School – through its faculty, students, and projects – and as a product of its public projection efforts – impacts at different levels of pertinence:

REGARDING STEWARDSHIP THROUGH LEADERSHIP

1. Instilling values in our student body to address current global environmental and sustainability concerns regarding the land as future legacy.

REGARDING THE LANDSCAPE ARCHITECTURE PROFESSION

2. Granting exposure to the profession through the opportunity of playing a major role in Puerto Rico, simultaneously encouraging introspection about its performance, past and present, as well as its community obligations.

REGARDING THE ARCHITECTURE PROFESSION

3. Laying out the groundwork for local architects and landscape architects to see each other eye-to-eye, as equal partners, thus challenging traditional roles and customary expectations.

REGARDING THE DESIGN AND CONSTRUCTION INDUSTRIES

4. Heightening awareness in construction industry professionals about the landscape architect’s fundamental role in a project and the promotion of quality of life.

REGARDING LICENSURE
5. **Proving instrumental** for clarifying and formalizing the local licensing process for landscape architecture graduates.

REGARDING FACULTY

6. **Attracting high-profile, well-prepared, committed individuals** and leaders to integrate a diverse, enthusiastic faculty body.

REGARDING THE CURRICULUM

7. **Contesting local practices** that traditionally rely solely on imported, “canned” ideas and plant material usage, and that ignore indigenous conditions and technological possibilities.

REGARDING RESEARCH

8. **Promoting pioneer efforts** to advance humanistic and intellectual research pertaining to the context and history of landscape architecture in the Caribbean.

REGARDING CREATIVITY

9. **Exploring different modes of representation** & communication of ideas.

B. Opportunities

1. **The generalized public recognition of impending environmental issues**, including official and media interest in the Green Movement.

   from sustainability concerns and policies to the Green “washout”...

2. **The breadth of landscape types and systems found in Puerto Rico**, an easily accessible, small-scaled territory of significant geographical and ecological diversity.

   from macro to micro, from urban to “rurban”, from exotic to endemic...

3. **The dual cultural heritage** and bilingualism of graduates as enabling assets for professional opportunities and bridging of North American and Latin American traditions regarding design.

   we speak of “machetes” and trimmers, and “setos” and swales indistinctly...
4. Polytechnic University’s specific academic focus on the construction industry.

understanding the Landscape Architecture Program as Richard T. Forman’s “stepping stones” for interdisciplinary initiatives...

5. Inmediacy of communication between academia, profession, and practice in Puerto Rico.

ease of interprofessional access makes collaborative efforts viable, promoting transdisciplinary “seepages”.

4. Describe current weaknesses and challenges.

C. Weaknesses

1. Reliance on a limited number of qualified landscape architects to enrich the curricular sequence.

The number of landscape architects who hold a Masters’ degree in Puerto Rico is limited (10); visa requirements and salary standards make recruitment abroad difficult.

2. Program financing costs currently exceed the institution’s income expectations.

The pool of applicants has decreased in the last two years. Program courses target almost exclusively MLA students, most of which are enrolled part-time.

3. Limited tools and facilities to further the achievement of the program mission and objectives.

Lack of dedicated studio space and offices for faculty. Need to improve technological resources and support, as well as equipment maintenance. Reference and library resources need to be expanded. As an out of campus facility (even if adjacent to it), students worry at night, particularly when locked out from the parking garage.
Challenges

1. **Reducing the program’s administrative and academic costs** per student, also identifying alternate venues like scholarships.

2. **Raising the students’ expectations of competitiveness** and excellence at Masters’ degree level, while acknowledging that most of them attend school on a part time basis.

3. **Reassessing the curricular structure** in tune with the diverse backgrounds of our student body, also cultivating further representational skills and basic knowledge on pertinent behavioral sciences.

4. **Identifying and validating alternative local practice venues** for students and alumni.

5. **Expanding and consolidating student recruitment efforts.**

6. **Furthering interdisciplinary collaborations** within the institution, in Puerto Rico, the Caribbean, and at an international level.

7. **Disseminating the program’s academic research findings**, incorporating them to the curriculum when pertinent.

8. **Articulating a public stance on issues of civic pertinence** and current debate.

9. **Incorporating alumni to the program structure**, as a way of “investing” on key potential faculty members.

The above mentioned challenges integrate our main academic aspiration: to make a difference in the Landscape Architecture profession once our graduates become a majority in Puerto Rico, and also wherever any one of them chooses to practice.

Qualitative Considerations

When broadening the scope of this self-evaluation of challenges and opportunities further, arguments of a qualitative nature - though harder to grasp - carry as much weight as quantifiable reasoning, because they are imbued with meaning, values, and judgments.

As landscape architect Garrett Eckbo warned earlier:
“The most important issue facing landscape architects and all environmental planners and designers in the 21st century will be precisely the integration, perhaps by shotgun, of current economic / political thinking with ecological reality.”

As the current century unfolds, more and more, academic arenas are required to respond to the multiplicity of issues our world wrestles with:

1. **A symbiotic understanding of the built and un-built environments**

   Renewed interest in humankind’s interaction with the environment has added depth to the work of landscape architects, now seen as potential weavers of often disconnected patches of landscape. Broader intervention approaches will not only expand performance expectations, but also foster “refreshed” professional credibility.

2. **The legacy of cities, suburbs and country**

   As the world increasingly becomes urbanized, eroding the edge between city, suburb and countryside, landscape architects will prove a critical resource in reconciling (identifying strategies) that tenuous perimeter, while simultaneously addressing issues related to quality of life and engagement with the environment.

3. **The acknowledgement of technology’s cultural dimension**

   Novel technologies offer fresh optics as retrospective tools, which help deepen our understanding of culture and the way in which we perceive our surroundings. Societies faced with consumption patterns of natural and industrial resources will be required to rise to the challenge of addressing technologies best suited to cultural limitations and possibilities, ascertaining in parallel, the imminence of self-sustainable models.

5. Describe any substantial changes in the program since the last accreditation review.

   N/A This constitutes a first accreditation request.

6. Describe who participated in preparing this self-evaluation and briefly state their roles.

   Various stakeholders were engaged in preparing and reviewing this report, including faculty, administrators, students, and alumni. Student and
alumni surveys were conducted to assess myriad topics and issues. Faculty meetings held during the past year and a half facilitated introspection on specific subjects. Consultation meetings with selected faculty and administrators from the Architecture School yielded significant comparative data.
1. PROGRAM MISSION and OBJECTIVES

STANDARD 1: The program shall have a clearly defined mission supported by goals and objectives appropriate to the profession of landscape architecture and shall demonstrate progress towards their attainment.

A. Program Mission

1. State the current program mission and date adopted.

   **Mission:** “At Polytechnic University’s Landscape Architecture Master Degree Program, humanistic, intellectual, creative, and technological endeavors encourage individuals from diverse backgrounds to explore and excel in a discipline that impacts the quality of life, the environment, and the future... the stewardship of the landscape entrusted to them and to the people who everyday live, work and play in it.”

   **Vision:** Our program strives to imbue students with social, ecological, and global responsibilities, empowering them with professional skills essential for inquiry, critical thinking, competent and creative ‘engagement’, and leadership through outstanding scholarship.

   This mission was adopted at the time of program’s submittal to the Puerto Rico Council on Higher Education, August 8th, 2005.

2. Describe how the mission statement reflects the purpose and values of the program and how it relates to the institution’s mission statement.

   **Institutional Mission:**

   “As an institution of higher education, Polytechnic University of Puerto Rico provides opportunities for individuals from diverse backgrounds in different locations using multiple methods of delivery to cultivate their potential for leadership, productivity and competitiveness with the purpose of providing greater social responsibility toward their communities, through exposure to intellectual, humanistic and technological advancement.”

   Students of diverse extractions, representing different economic levels, age ranges and ethnic heritage, enrich the Landscape Architecture
Program at Polytechnic. Individuals from diverse backgrounds come together to cultivate jointly their leadership, productivity and competitiveness through design, research, and hands-on experiences. Puerto Rico’s complex social profile becomes an effective litmus paper for promoting serious social engagement as integral to the profession’s ethical commitments.

On the other hand, architects, engineers, and landscape architects only holding a Bachelor’s degree are able to pursue specialization through our graduate program, learning to become managers and decision makers, keeping ahead in technology and science. Our linkages with industry, government, commerce, professional associations and other learning institutions are thus strengthened.

As such, the philosophy, goals and objectives set forth early on enrich the vision of the program, and underline the larger institutional commitment to society, the environment and the construction industry.

B. Educational Goals

1. State the academic goals of the program.

Any school’s curriculum is nurtured by philosophical stances made evident — but also contested — through course work and institutional initiatives. The multiple purposes pertaining to our Landscape Architecture Program include:

A. **To highlight the critical role of landscape architecture** in our local context and everyday life, pursuing an integrated understanding of human needs, built space, and natural systems and resources.

B. **To develop an ethic towards the land**, global, regional and local landscapes, their challenges, opportunities, and interconnections, framed within contemporary society’s obligations and needs.

C. **To challenge “myopic” positions regarding landscape in Puerto Rico**, from an asset to be exploited to an identity-defining asset.
D. **To promote landscape architectural research**, as pertinent to professional practice, validating effective instances at which history, theory, and practice can meet.

E. **To contest technology as myth**, discourse, resource and possibility, given the Caribbean’s perennial efforts to contemporize.

F. **To build on pedagogical tools and experiences anchored in Puerto Rico** and the Caribbean as a point of departure to understand self and “home”, in order to understand “other” realities. Based on Piaget’s theories of learning, we adhere to the premise that students will learn best when their education is based on their concrete, immediate context and life experience, in order to conceptualize and extrapolate from it.

G. **To foster the identification and development of spatial conceptions characteristic of the Caribbean**, specifically of the Hispanic Antilles, endorsing landscape architecture education’s possibilities in terms of the region’s unique geographic milieu.

H. **To encourage debate and critical analysis of the built legacy of landscape architecture locally**, throughout the Caribbean basin and beyond, as a critical stepping stone towards innovative solutions for the future.

I. **To stimulate excellence in landscape architectural design in Puerto Rico**, while remaining **sensitive to change**, transformations and trend-setting ideas and ideals, while promoting competence in the fundamental skills of the profession.

J. **To collaborate in kindling a new spirit of stewardship for the landscape**, partnering with different stakeholders: other academic and research institutions, government agencies, decision-makers, and community and advocacy groups.

To summarize the academic goals of the program, we quote John B. Frazier, ASLA, who lived several years in Puerto Rico and half-a-century ago gave advice about what a school’s obligations should be: “to broaden individual experience and destroy a student’s clichés and irrelevant inhibitions” [to promote] “a way of thinking – a why to do it approach instead of a how to do it approach.” (“Teaching Landscape Architecture”, *Landscape Architecture Magazine*, January 1961, p. 134)

2. Describe how the academic goals relate to the program’s mission.
Detailed above, the program’s educational goals embrace all considerations stated within the mission, addressing four (4) main areas of concern: academic excellence, technical proficiency, and professional and social responsibility.
Academic goals acknowledge the local milieu and the Hispanic cultural context of the Program, while fully aware and pursuant of relevant international overlaps. They have been designed in full awareness of the multivectorial provenance and potential projection of our student body.

3. Describe how the program regularly evaluates its progress in meeting its goals.

A young program – one concerned with introspection as ours is – “rehearse” multiple evaluation strategies since its inception, even if the assessment process leading to accreditation proves to be the most important one.

Various efforts (formal and informal) have rendered an impartial profile of who we are, what we do, where we stand, and where we need (and want) to go. Among these, the following have proven to be instrumental: holding student assemblies and polls; implementing faculty seminars and meetings; as well as benefitting from comparable institutional experience; requesting comments from jurors, particularly licensed professionals, after student presentations; faculty self-evaluations and evaluations by students; and soliciting occasional feedback from communities served.

C. Educational Objectives

1. List the educational objectives of the program:

   Eight main objectives vertebrate the program’s goals:

   A. Educate candidates to become competent professionals and avid inquirers about landscape architecture in Puerto Rico, the Caribbean, and elsewhere, commanding mature problem solving skills to challenge future predicaments. (Goals 1, 3, 5, 8)

   B. Teach students about precedents, history, current issues and trends in landscape architecture and the solutions brought to bear for those questions, as well as additional and newly-created questions. (Goals 2, 4, 5, 6, 7, 8, 9)

   C. Raise the level of debate about the discipline within academic and professional communities, underlining ethical responsibilities, as well as engaging other fields in the process. (Goals 1, 2, 5, 8, 10)
D. Provide a forum for exploring design ideas that are responsive to context respecting and enhancing existing site conditions, acknowledging requirements of public health, safety and welfare, and expectations regarding a sustainable environment. (Goals 1, 3, 4, 5, 6, 7, 8, 9)

E. Prepare students to understand their leadership role and the world-wide ramifications of the profession, given the object of the discipline to address a larger community within a potentially expanded radius of action including the neighboring Caribbean, the United States, Canada and Latin America. (Goals 2, 5, 8, 10)

F. Convey to students the collaborative frame within which landscape architects operate, connecting with other professionals, incorporating different stakeholders, and the multicultural values of environmental planning and design. (Goals 1, 2, 10)

G. Empower students to contest and explore science and technology as integral to the preservation of land and landscape, but predicated upon society’s possibilities and capabilities. (Goals 1, 3, 5, 8, 9)

H. Encourage in students excellence in communication skills inside and outside the profession as a vehicle for expanding the public’s awareness and discernment about the profession. (Goals 4, 6, 8, 10)

2. Describe how educational objectives fulfill the academic goals.

As indicated above, the program’s educational objectives correlate specifically with the breadth, complexity, and reach of the academic goals, acknowledging their pertinence, immediacy and intensity.

These objectives are not only reiterated throughout the curriculum in diverse courses addressing different subjects, but also articulated to students as they come to terms with them during their tenure at school, ranging from more basic to more complex understandings.

Various pedagogical instruments enable measurement of the educational objectives: research initiatives, studio projects, class presentations, on-site visits, ad-hoc activities, and more traditional venues like tests and papers, among others.

D. Long Range Planning Process
1. What is the program’s long-range planning process?

From 2009 to 2010, the program director participated as member of the university’s committee entrusted with developing Polytechnic University’s 2010-2115 Long Range Strategic Plan. Based on the objectives stated in said plan, the Landscape Architecture Program developed its first strategic plan this year. The plan is based on peer and institutional consultation vis à vis self-assessment tools that have proven to be integral to the accreditation process.

2. Does the long-range plan describe how the program mission and objectives will be met and document the review and evaluation process.

Yes. See Appendix #1: School of Landscape Architecture, STRATEGIC PLAN 2010-2015

3. Describe how the long-range plan is reviewed and revised periodically and how it presents realistic and attainable methods for advancing the academic mission.

See Appendix #1: School of Landscape Architecture, STRATEGIC PLAN 2010-2015

E. Program Disclosure

1. Describe how program information is disseminated to the public. Provide a link to material on the internet and copies of other materials to the visiting team.

Program information appears in the university’s Graduate School Course Catalogue, accessible on line (www.pupr.edu); see Appendix #2. The MLA program’s brochure (Appendix #3) can be found at the institution’s Admissions Office, the Graduate School and at the School of Landscape Architecture. Persons interested in the School’s offering are sent an admissions application package electronically or physically, according to their needs.

Further dissemination to the public is addressed through the university’s web site, the library’s blog, Face book, newspaper ads, articles in professional journals and local press, as well as other publications. Participation in radio programming is recurrent and has proven an efficient medium for dissemination.
Professional conferences, lectures, and official professional venues allow us to engage a range of individuals and groups and entities: from the public at large, to persons from various professions.
2. PROGRAM AUTONOMY, GOVERNANCE & ADMINISTRATION

STANDARD 2: The program shall have the authority and resources to achieve its mission, goals and objectives.

A. Program Administration

1. Is the program seen as a discrete and identifiable program within the institution?

   The School of Landscape Architecture is housed under the Graduate School, which serves as the umbrella unit for all Master’s level programs at Polytechnic University. The School of Landscape Architecture’s Administrator reports to the Office of the Vice President for Academic Affairs (Provost).

2. Does the program administrator hold a faculty appointment in landscape architecture? If not, where is he/she appointed?

   The Landscape Architecture Administrator holds a faculty position as Assistant Professor in the program, with a teaching load of 18 credits per year.

3. How does the program administrator exercise the leadership and management functions of the program? Describe the primary responsibilities and authority of the administrator.

   The primary responsibilities of the Administrator are:

   A. Direct and manage daily activities of the School of Landscape Architecture, while establishing administrative and service processes, enabling all institutional and departmental policies and procedures with staff members.

   B. Design, implement and evaluate curricula, and its respective syllabi.

   C. Establish academic quality standards and requirements and the necessary criteria to ensure those.

   D. Orchestrate academic activities according to goals and objectives established by the School of Landscape Architecture.

   E. Manage and oversee Program accreditation processes and participate in akin institutional efforts.
F. Initiate, maintain and meet all requirements and dispositions of professional accreditation institutions applicable to the program, and also organize accreditation visits.

G. Set policy regarding academic issues about staff selection, recruitment, evaluation, and training, while promoting professional development of faculty and staff.

H. Define and manage annual budgets and work plans in agreement with Institutional policies and requirements.

I. Direct and coordinate program dissemination, advertisement, promotion and projection efforts locally and internationally.

J. Create, promote and coordinate activities, conferences and initiatives with industry, government, the profession, alumni and the community.

K. Develop, implement, and evaluate student mentorship program.

L. Represent the School of Landscape Architecture before institutional and external fora.

The Administrator convenes faculty, faculty subcommittees, and students to convey official institutional information and policies, and to consult and inform on internal matters. Memoranda, e-mail blasts, and personal communication constitute important tools to exercise authority, at Polytechnic University.

In parallel, the Administrator generates and participates actively in extracurricular events, whether in-house or professional and public, engaging students and faculty in the process. The Program’s Chair promotes personally official involvement of students and faculty with ASLA, IFLA, academic institutions at national and international level, as well as their diverse activities.

B. Institutional Support

1. Is funding available to assist faculty and other instructional personnel with continued professional development including support in developing funded grants, attendance at conferences, computers and appropriate software, other types of equipment, and technical support?

Funding is adequate to meet basic operational costs. The program’s reduced enrollment and the current recession limit allocations for activities
other than those necessary for daily operations and needs. In spite of these constraints, the program administrator and the other full-time faculty member have attended professional conferences under the university’s sponsorship. For a student trip to Mexico, the institution financed the travel costs of two faculty members.

Currently two faculty staff receives support for individual research and design grants by means of in-kind contributions in terms of workspace, materials, reproductions and equipment.

2. **What are student/faculty ratios in studios? How does the program influence student/faculty ratios? What is considered normal?**

The program establishes a maximum of 15 students per class, and a minimum of 6, though exceptions have been made for students who are candidates for graduation. Ten (10) persons are considered as a normal range of students per studio.

3. **Is funding adequate for student support, i.e., scholarships, work-study, etc?**

Currently, funding for these purposes is scarce. The university assists students through federal loan programs.

Local government’s Puerto Rico Development Company funds a limited number of research assistantships awarded to second and third year graduate students who demonstrate financial need and meet academic performance standards established by the university’s Graduate School. The establishment of scholarships constitutes one of the short range objectives of the program's Strategic Plan.

4. **Are adequate support personnel available to accomplish program mission and goals?**

Support personnel at institutional level are ample and effective, but insufficient at program level. Given the global pressing economic circumstances, progress in this direction will be tempered as enrollment numbers increase.

C. **Commitment To Diversity**

1. **How does the program demonstrate its commitment to diversity in the recruitment and retention of students, full-time faculty and staff?**

The university’s recruitment and retention policies state the institutional
commitment to diversity in all official communications. As stated in Polytechnic University’s Graduate Catalogue for the Academic Years 2010-2011 to 2011-2012, Section XVII. DECLARATIONS AND CERTIFICATIONS (NON-DISCRIMINATION CLAUSE):

“Polytechnic University of Puerto Rico does not discriminate against any individuals for reasons of gender, political or religious affiliation, economic or social status, ethnic origin, or for any other reason considered unlawful. This policy applies both in the recruitment of personnel and in the acceptance of students.”

In addition, Polytechnic University’s Strategic Plan 2010-2015 states the need to further efforts in the recruitment of underrepresented students.

The Program’s official brochure incorporates the institution’s diversity statement. (See Appendix #3: MLA Program Brochure)

In addition, gender, age, and ethnic diversity are underlined whenever students and faculty at public and private co-ed colleges, also some high schools, offer orientations.

Ads for recruitment of full-time faculty and staff adhere formally to the university’s equal opportunity policies (See Appendix #4: Faculty Recruitment Advertisement in ASLA Online/May 14, 2008). In terms of gender, the student body profile currently renders 43% male and 57% female students, ranging from 22 to 62 (!). Registered students include two from the Dominican Republic and one from Guatemala.

Regarding faculty, ages and training vary and percentages approximate 77% male and 23% female. At present, women hold the 2 full-time positions.

D. Faculty Participation

1. Does the faculty make recommendations on the allocation of resources and do they have the responsibility to develop, implement, evaluate, and modify the program’s curriculum and operating practices?

The two full-time faculty members participate fully in the allocation of resources. Faculty (full and part-time) partakes fully in curriculum design and implementation, also evaluation and modifications. Regular and ad hoc meetings facilitate this process.
2. Does the faculty participate, in accordance with institutional guidelines, in developing criteria and procedures for annual evaluation, promotion and tenure of faculty?

According to the Faculty Manual, the institution’s Administrative Board determined that, effective June 21, 2001, all tenure positions would cease. Some of the faculty members that held tenure position prior to that date would maintain their positions. In August 2001, the Board of Trustees approved multi-annual contracts for faculty. This policy applies to full time professors without tenure and to new ones recruited as of August 2005.

The multi-annual contracts are awarded upon completion of three evaluations: one by the Director of the Program, a second one by peers, and a third one by students. Each program determines which faculty members will evaluate their peers. With these evaluations, the Director recommends to the Dean of the Graduate School candidates for advancement in ranking level and or multi-annual contracts.

3. Does the program or institution adequately communicate and mentor faculty regarding policies, expectations and procedures for annual evaluations, and for tenure and promotion to all ranks?

See # Item D.2, above.

E. Faculty Numbers

1. Does an academic unit that offers a first professional program have a minimum of 3 full-time faculty members who hold professional degrees in landscape architecture?

The School has operated with two (2) full-time faculty members. Three (3) part-time adjuncts, being landscape architects of varied professional backgrounds, contribute contrasting optics much needed in an incipient, small-scale program.

2. Does an academic unit that offers first professional programs at both bachelor’s and master’s levels have a minimum of 7 full-time faculty members, at least 5 of whom hold professional degrees in landscape architecture?

N/A
3. Does the strategic plan or long range plan include action item(s) for addressing the adequacy of the number of faculty?

Yes. See Appendix #1: School of Landscape Architecture Strategic Plan 2010-2015, Short Range Objectives, Item 3.

4. Is the number of faculty adequate to achieve the program’s mission and goals and individual faculty development?

Yes, given the program’s young age, the amount of students currently enrolled, and the limited number of landscape architects holding a Masters’ degree in Puerto Rico. For example, out of 26 registered Landscape Architects, only 5 hold an MLA.
3. PROFESSIONAL CURRICULUM

STANDARD 3: The first professional-degree curriculum shall include the core knowledge skills and applications of landscape architecture.

a. In addition to the professional curriculum, a first professional degree program at the bachelor's level shall provide an educational context enriched by other disciplines: liberal and fine arts, natural sciences, and social sciences, as well as opportunities for students to develop other areas of interest.

b. In addition to the professional curriculum, a first professional degree at the master's level shall provide instruction in and application of research and or/scholarly methods.

c. A first professional degree at the master's level that does not require all students to have an undergraduate degree before receiving the MLA shall meet the requirements for a and b.

State whether paragraphs a, b, or c (above) are relevant to this review.

Paragraph b

A. Mission And Objectives

1. How does the curriculum address the program’s mission, goals, and objectives?

In response to the Program Mission, the curriculum promotes a balanced fulfillment of humanistic, intellectual and technical endeavors through courses in history, theory, design, technological, and ecological aspects and, urging the integration of all of these aspects. Focused on the local context as immediate laboratory, the curriculum fosters students' awareness towards stewardship of the landscape.

Specific program goals are emphasized throughout the curriculum, stressing at various instances the command of critical thinking skills; the pertinence of research methodologies, analysis and debate; the technical grasp required for the creative representation, communication, and execution of ideas, not forgetting the ethical introspection demanded by the profession.

For the fulfillment of program objectives, course contents and class projects promote engagement with academic and professional communities, as well as different stakeholders. Our students' work so far encompasses a wide
spectrum of experiences: preparing a research report for the Office of Puerto Rico’s First Lady; designing for a low-income community threatened by displacement; and, among others, engaging in disaster response after a large scale industrial fire that contaminated a watershed basin in San Juan’s metropolitan area.

Raising awareness concerning public health, safety and welfare is a priority in most curricular components. Compliance with codes and standards is underlined in design and representation courses. As expected, they figure prominently in Ecology and Technology, LA 6440; Site Engineering, LA 6420; and Site Construction, LA 6430. Enhanced awareness on these subjects has allowed students to develop thesis projects capable of acknowledging, among others, the impact of dissecated wetland and levels of salinity on public health, and the benign influence of Nature on children’s learning capabilities.

The last two design studios (The Rural and Regional Studios, LA 6140, LA 6150) expose students to current predicaments: the changing profile of rural milieus in small-scale territories; or how to translate those problems inherent to a regional scale into design solutions tailored for the human scale. Related issues, and others alike, are reconsidered in the Professional Practice and Ethics, LA 6510. As students progress throughout the program, they are urged to address current conditions, and, in tandem, to decipher future possibilities.

2. How does the program identify the knowledge, skills, abilities and values it expects students to possess at graduation?

LAAB and LARE contents criteria have guided the identification of knowledge, skills, and abilities expected from our graduates. These have been complemented by specific contextual needs of relevance identified by faculty members. Feedback from landscape architects and professional organizations was also taken into consideration for the definition of our graduate students’ profile. Graduates are expected to pursue the ideas and ideals of figures like John Muir and Beatrix Farrand, but also John R. Stilgoe and Ann Spirn, including Jean Claude Forestier (Cuba), Manuel Delgado Podestá (Dominican Republic), and Fernando Chacel (Brazil).

Key pedagogical aspirations have been modeled after teaching concerns previously articulated by landscape architects John Frazier and Carl Steinitz. After four years of the program’s operation, faculty ideals and values have been woven into the fabric of courses and their subject matter. By means of
periodic reassessments of student performance, we ascertain the pertinence and viability of our expectations. Because shared commitment nurtures any up and coming program, faculty and students often come together to simultaneously, evaluate, contest, and celebrate the curriculum’s goals.

In recognition of the multidisciplinary nature of this career, faculty and administration acknowledge those precepts set forth by LAAB Standards regarding the students’ level of competence in three different arenas: social, environmental and aesthetic. An aspiration to balance guides our effort, particularly after becoming aware that “just under 1/3 (29.6%) [Landscape Architecture] schools noted an emphasis in all four core areas: design, ecology, history, and theory”, as expounded in the Education Section of Landscape Architecture Magazine, March 2010, p. 68.

To that effect, these are the program’s expectations for graduates from the program:

**SOCIAL**

*Be aware of* the values, needs, and ethics that guide human behavior.

*Be aware of* methods of historical inquiry.

*Be aware of* the implications of economic systems and policies in the development of the built environment.

*Understand* the impact of various cultural values and societal settings on the social responsibilities and the role of landscape architects.

*Understand* how individuals and groups respond to and affect their environmental settings.

**ENVIRONMENTAL**

*Be aware of* the principles governing the natural world.

*Be aware of* theories and methods that clarify the interrelationships between human behavior and the physical environment.

*Be aware of* the principles and theories that deal with environmental context, and the landscape architect’s responsibility with respect to global environmental issues.
Understand how a specific site influences, and is influenced by, its physical characteristics and its ecological context.

Understand the ecological impact of built landscapes and the people who occupy them.

AESTHETIC

Understand basic principles and systems of order underlying two- and three-dimensional design.

Understand history, theories, and principles that serve as basis in the making of landscape architecture.

Understand design methodologies and their application to landscape architectural design.

Understand the pertinence for building and how those purposes are realized and given meaning through landscape architectural form.

Understand ways in which different forms are successful or unsuccessful in satisfying programmatic, technical, accessibility and contextual objectives in a design proposal.

B. Program Curriculum

1. How does the program curriculum include coverage of:
   a. History, theory and criticism.
   b. Natural and cultural systems including principles of sustainability.
   c. Public policy and regulation.
   d. Design, planning and management at various scales and applications including but not limited to pedestrian and vehicular circulation, grading, drainage, and storm water management.
   e. Site design and implementation: materials, methods, technologies, applications.
   f. Construction documentation and administration.
   g. Written, verbal and visual communication.
   h. Professional practice.
   i. Professional values and ethics.
   j. Plants and ecosystems.
   k. Computer applications and other advanced technologies?

Having been formally trained in Pedagogy, the School’s Director has been insistent upon the fact that how students learn is as important as what they learn. In tailoring LAAB’s expectations to suit our program’s objectives, the
aforementioned areas of knowledge were restructured, detailed as eleven criteria included in Table #1, below.
Table #1. The eleven (11) criteria addressed by the Polytechnic University's curricular sequence for the School of Landscape Architecture.

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Landscape architectural history and theory</td>
</tr>
<tr>
<td>2</td>
<td>Natural and cultural systems</td>
</tr>
<tr>
<td>3</td>
<td>Design theories, methodologies and applications</td>
</tr>
<tr>
<td>4</td>
<td>Landscape planning and management at various scales and applications</td>
</tr>
<tr>
<td>5</td>
<td>Site design and construction such as grading, drainage and circulation</td>
</tr>
<tr>
<td>6</td>
<td>Communication in written, verbal and visual applications</td>
</tr>
<tr>
<td>7</td>
<td>Plants and ecosystems at various scales and situations</td>
</tr>
<tr>
<td>8</td>
<td>Construction materials, methods, technologies and applications</td>
</tr>
<tr>
<td>9</td>
<td>Professional practice methods, values, and ethics</td>
</tr>
<tr>
<td>10</td>
<td>Computing applications and other advanced technology</td>
</tr>
<tr>
<td>11</td>
<td>Research applications and scholarly work</td>
</tr>
</tbody>
</table>

Table #1 has proven valuable for ascertaining the way in which course contents warrant compliance with LAAB’s curricular coverage requirements. Table #2 illustrates how contents and courses are correlated throughout the curricular sequence in a matrix prepared by faculty to that effect. In addition, Table #2 distinguishes between introductory and in-depth approaches to the subject.

The program’s course load balances creative and scientific responsibilities, as reflected in the percentage of credit hours awarded to these major curricular components:

<table>
<thead>
<tr>
<th>Curricular Component</th>
<th># of Credits</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design/Representation</td>
<td>34</td>
<td>44</td>
</tr>
<tr>
<td>Scientific/Theoretical</td>
<td>35</td>
<td>45</td>
</tr>
<tr>
<td>Electives</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>100</td>
</tr>
</tbody>
</table>
The curriculum has been organized around four pedagogical strategies “christened” as follows: 1) **Iteration**; 2) **Increased complexity and scale**; 3) **Linkages**; and 4) **Thematic overlaps**.

These strategies constitute the methodological scaffolding that facilitates key curricular decisions in our program: topic distribution and proper teaching approach; definition of student projects in terms of subject, scale, and scope; and a constant, but gradual assessment of academic performance.

Implementation of the four strategies happens in sequence throughout the three years, but with intentional overlaps. Every year, course work emphasizes two strategies; one of which is reiterated the subsequent year:

**Year 1**  
Iteration  
Increased complexity and scale

**Year 2**  
Increased complexity and scale  
Linkages

**Year 3**  
Linkages  
Thematic overlaps

Knowledge attainment is underscored through repetition, increased complexity, and interconnections, as evidenced in the curricular sequence.

**CURRICULAR SEQUENCE**

**FIRST YEAR**

| First Term | Design Foundations & Drawing, LA 6110  
|           | History of Landscape Architecture, LA 6210  
|           | Plant Material & Establishment, LA 6310  
| Second Term | Design: The Garden Studio, LA 6120  
|            | Soils, LA 6320  
|            | Representation: Tools and Techniques, LA 6710  
| Third Term | Design: The Urban Studio, LA 6130  
|           | Program Elective, LA 6600 |
SECOND YEAR

First Term
Environmental Resources, LA 6410
Historiography, LA 6220

Second Term
Design: The Rural Studio, LA 6140
Site Engineering, LA 6420

Third Term
Design: The Regional Studio, LA 6150
Advanced Plant Material & Establishment, LA 6330
Site Construction, LA 6430

THIRD YEAR

First Term
Theory & Research of Landscape Architecture, LA 6230
Open Graduate Elective, XXXX
Ecology & Technology, LA 6440

Second Term
Professional Practice & Ethics, LA 6510
Program Elective, LA 6600

Third Term
Design Thesis, LA 6800

In order to facilitate understanding the interrelationship of classes and their content within the curricular structure, brief course descriptions are included below, as they appear in Polytechnic’s Graduate School Catalogue. They are here cross-referenced with the eleven (11) criteria that vertebrate the curricular sequence, as defined in Table #1.

COURSE DESCRIPTIONS

LA 6110 - Design: Foundations and Drawing
Criteria #3, 5, 6, 8, 11
Five credit hours. Pre-requisite: None.
Two three-and-a-half hour lecture/studio periods per week.

As the introductory course of the Landscape Architecture program, this design course serves as foundation work, confronting students with the discipline. A range of basic design principles and techniques for graphic representation as applied to landscape architectural design are explored focusing on the development of spatial thinking, and its communication.

LA 6120 - Design: The Garden Studio
Criteria #3, 4, 5, 6, 7, 8, 11
Five credit hours. Pre-requisites: LA 6110, LA 6310.
Two three-and-a-half hour lecture/studio periods per week.

The first of four landscape architecture design studios addresses issues of landscape design at a small scale, while applying concepts presented during the design foundations course. Design projects explore the domestic context by scrutinizing garden design from theoretical and formal vantage points, placing emphasis on the development of critical thinking, spatial literacy, and design process.

**LA 6130 - Design: The Urban Studio**  
(Criteria #3, 4, 5, 6, 7, 8, 11)  
Five credit hours. Pre-requisite: LA 6120.  
Two three-and-a-half hour lecture/studio periods per week.

The second studio in the design-course series covers the urban context through projects of moderate to high complexity. Urban and suburban development is the focus of this studio where design will be examined as it relates to the philosophies and theories that have shaped neighborhoods, villages, towns, cities, suburbs, and regions of the world throughout history.

**LA 6140 - Design: The Rural Studio**  
(Criteria #3, 4, 5, 6, 7, 8, 9, 10, 11)  
Five credit hours. Pre-requisite: LA 6130.  
Two three-and-a-half hour lecture/studio periods per week.

This advanced design course covers complex large-scale analysis, planning and design within rural and peri-urban contexts. The expansion of urban areas to the rural fringe and the impact of humans on places of co-habitation with animal and vegetative life are addressed. An interdisciplinary approach to teaching and learning highlights relevant social, environmental, aesthetic, and economic issues.

**LA 6150 - The Regional Studio**  
(Criteria #2, 3, 4, 5, 6, 7, 8, 10, 11)  
Five credit hours. Pre-requisite: LA 6140.  
Two three-and-a-half hours lecture/studio periods per week.

As the last in the sequence of design studios, this course confronts students with complex large-scale regional issues. Contemporary topics and trends such as sustainable design, gray and green infrastructure, watershed and coastal zone management, among others, guide discussion.

**LA 6210 - History of Landscape Architecture**  
(Criteria #1, 3, 6, 11)  
Three credit hours. Pre-requisite: None.  
One four-hour lecture period per week.

The first in a sequence of three history, theory and research courses, this
class provides a historical survey of landscape architectural development from ancient times to the present. History is explored with the understanding that the relationship of humans to the land translates into forms, which derive from expressions of function, social values, technological influences, economics and politics – landscape as the footprint of culture.

**LA 6220 - Historiography**  
(Criteria #1, 2, 3, 6, 11)  
Three credit hours.  
Pre-requisite: LA 6210 (non-applicable to students in the MLA II track).  
One four-hour lecture period per week.

In this course the “history of history” will be examined to provide students with an acute, critical sense of how to interpret processes and events (past and present). Using the history of landscape architecture “as text” students will be able to apprehend history as a science and grow familiar with the discipline’s attributes and limitations.

**LA 6230 - Theory & Research of Landscape Architecture**  
(Criteria #1, 2, 3, 6, 7, 10, 11)  
Five credit hours.  
Pre-requisites: LA 6130, LA 6210, and LA 6220.  
Two three-and-a-half lecture period per week.

Theories and research pertinent to the practice and study of landscape architecture, aesthetic and cultural principles, and values related to the ecological aspects are debated upon. The relationship between humans and the design environment are reviewed. A single authored written document is developed as theoretical backdrop for the design phase of the final thesis project.

**LA 6310 - Plant Material & Establishment**  
(Criteria #2, 3, 7)  
Three credit hours. Pre-requisites: None. Co-requisite: LA 6110.  
One four-hour lecture period per week.

This course is intended to familiarize the landscape architect with environmental constraints affecting successful plant establishment and growth. Successful planting design will ultimately depend upon knowledgeable analysis, appropriate placement, and installation and maintenance specifications by the design professional.

**LA 6320 - Soils**  
(Criteria #2, 7)  
Three credit hours. Pre-requisites: None.  
One four-hour lecture periods per week.

This course covers in depth soil’s ecological processes and management in
terrestrial environments. The class discusses soil’s biological and physical properties, and its interaction with land uses and human interventions in different ecosystems. The emphasis of the course is on plant response to soil conditions, and their interface with building material.

LA 6330 - Advanced Plant Material & Establishment  
Three credit hours. Pre-requisite: LA 6310.
One four-hour lecture period per week.

LA 6410 - Environmental Resources  
Three credit hours. Pre-requisite: None.
One four-credit lecture period per week.

LA 6420 - Site Engineering  
Three credit hours. Pre-requisite: None.
One four-hour lecture period per week.

LA 6430 - Site Construction  
Three credit hours. Pre-requisite: None.
One four-hour lecture period per week.

Coursework exposes students to the processes and materials required in the assemblage of physical features for landscape construction. It introduces
candidates to the properties, uses and qualities of materials inherent to landscape architecture applications, and associated construction techniques. Materials and methods are additionally explored as a source of design ideas, form and expression in landscape architecture.

LA 6440 - Ecology & Technology  
Three credit hours. Pre-requisite: LA 6410.  
One four-hour lecture period per week.

Current concerns regarding environmental conservation are examined and questioned against their impact on available and developing technologies including green roof technology. Appropriateness to resources and culture are discussed in relationship to cost and time effectiveness. Laboratory type projects constitute an integral part of the course.

LA 6510 - Professional Practice and Ethics  
Three credit hours. Pre-requisites: None.  
One four-hour lecture periods per week.

The role of the practitioner is questioned from the ethical, financial and managerial standpoint. Personnel organization, supervision, office procedures, payments for service, marketing and career options are examined. Critical analysis of moral dilemmas inherent to professional practice, considering wide-ranging implications of ethics in a globalized society where disciplines overlap but also obscure responsibilities form part of class readings, discussions and debates.

LA 6710 - Representation: Tools & Techniques  
Three credit hours. Pre-requisites: None.  
One four-hour lecture period per week.

An introductory class to the skills required for landscape architectural representation, communication of design intent is sought through the use of various two-dimensional and three-dimensional drawing and modeling media. This course concentrates on the use of representation as complement to the design process.

LA 6800 - Design Thesis  
Six credit hours.  
Pre-requisites: LA 6150, LA 6230, LA 6330; LA 6430, and LA 6510.  
One four-hour studio period per week.

The last in a series of five design studios this course is intended to provide students the forum to pursue an in-depth design exploration based on the
previously developed single-authored research project. Completion of this work will demonstrate students’ ability to define a contemporary problem and overarching strategies with which to address it. The course provides an opportunity for the student to integrate the theoretical frameworks and technological skills acquired in a comprehensive manner.

**LA 6801 – Design Thesis Extension**  
(Criteria #1, 2, 3, 4, 5, 6, 7, 8, 11)  
Zero credit hour. Pre-requisite: LA 6800.  
One four-hour studio period per week.

This course provides students the opportunity to continue and complete design thesis work required for graduation.

Throughout the development of the program, further areas of interest and need were identified and incorporated into elective courses like the following:

**PROGRAM ELECTIVES**

**LA 6240 – Contemporary Landscape Architecture Issues** *(Criteria #1, 2, 3, 8, 10, 11)*  
Three credit hours. Pre-requisites: None.  
One four-hour lecture period per week.

A graduate seminar designed to explore vital current topics in the theory and practice of landscape architecture. Students will examine and critically discuss important theoretical texts and landscape architectural projects that represent the variety of issues and multitude of complexities confronted in contemporary practice.

**LA 6610 – Modes of Representation** *(Criteria #3, 6, 8, 11)*  
Three credit hours. Pre-requisites: None.  
One four-hour lecture period per week.

This course delves into concepts, techniques and methods related to the representation of forms and space on a two-dimensional, flat surface, and three-dimensional work.

**LA 6611 – Computer Representation for Landscape Architects** *(Criteria #3, 6, 10)*  
Three credit hours. Pre-requisites: None.  
One four-hour lecture period per week.

The course aims to inform the design process of landscape architects through the application of digital media. Decision-making using the information garnered through digital drawings is clearly articulated to the
designer as well as others involved in the implementation process. The course explores the representation of complex geometrical forms, their spatial organization, materiality, interaction with the context, and tectonics.

**LA 6650 – Gardens: Types, typologies and design approaches** (Criteria #1,3,6,11)
Three credit hours. Pre-requisites: LA 6210, LA 6220.
One four-hour lecture period per week.

The course focuses on the study of gardens around the world, identifying different types, characteristic elements, typologies and design issues that have changed or remained constant through time. Coursework will unravel design intentions through the analysis of the relation of human activities, epochs, places, function and form.

**LA 6640 – Special Topics: Sculptural Landscape** (Criteria #3, 6, 8,10, 11)
Three credit hours. No pre-requisite.
One four-hour lecture period per week.

This class addresses the principles and foundations guiding the art of sculpture and its role in landscape. Materials and object cohesiveness – including that of the object in situ – are among topics discussed. Special attention is given to the exploration of the existing relationship between solids, the surrounding void (the context), and the levels of relevance that void space can attain.

2. **How does the curriculum address the designated subject matter in a sequence that supports its goals and objectives?**

Complementary to the goals of the Institution and the Landscape Architecture School, the curricular sequence has been conceived around five (5) key concerns regarding the student’s advancement through the program:

A. Exposure to current predicaments.

B. Acknowledgement of current conditions and future possibilities.

C. Engagement with Academia, the profession and different stakeholders.

D. Awareness concerning public health, safety and welfare.

E. Encouragement opportunities for leadership.
To become proficient in any subject, individuals must be exposed to it on a continuing basis. Educators have long known that, but in the case of students embarking in a first professional degree at the Masters’ level, iteration becomes a vital vehicle for in-depth knowledge. Given the imbrication of the pedagogical strategies adopted for the development of the curriculum, an explanation of how they prove to be effective is hereby provided.

Repetition yields self-confidence, granting students’ the will to navigate topics of greater complexity. This proves to be most important at Polytechnic University, given the institutional mission to serve and empower individuals who might, otherwise, not have access to a higher education degree. That is why, as our landscape architecture students move up through their tenure in the program, thematic subjects appear and reappear subsequently in greater scale and/or complexity. Furthermore, specific linkages are pursued, as is the case when students (or faculty) choose to carry a project from one course to fine-tune it in another. For example, the seed of a student investigation for an urban design studio is cultivated at thesis level.

All along the curricular sequence, students are made aware of myriad thematic overlaps that characterize all environmentally related disciplines. Since early on, they are urged to understand how the social, political, and natural spheres intertwine locally and globally. That is why the question of pertinence becomes central to the School’s pedagogy:

- What is the relevance of your work to pressing contemporary issues?

As can be expected, a heightened student alertness regarding these matters comes to fruition in upper level courses like Design: The Regional Studio, LA 6150, Design Thesis, LA 6800 and Professional Practice & Ethics, LA 6510.

On a more individual level, students can benefit from in house and “outside” electives that prove useful to either expand on familiar subjects or explore new interests.

An overview of what students are exposed to – year-by-year - best demonstrates how the curriculum addresses the diversity and complexity of subject matter in support of the School’s goals and objectives.

**YEAR ONE**

**FALL** The curriculum sequence opens with a simultaneous emphasis in creative, historic, and scientific concerns. The Design:
Foundations & Drawing, LA 6110 has been conceived as preamble to the specific design studios that will follow: Garden, Urban, Rural, and Regional. In this first design studio course, projects are of a conceptual nature, underlining the importance of abstraction and design strategy. Representation problems include abstract and analytical drawings, as well as basic plans and sections.

Conceptual thinking enriches the introductory course History of Landscape Architecture, LA 6210. While including chronological, stylistic and artistic information, the syllabus also underlines the value of past achievements as auxiliary design tools. A class exercise centers on oral history and research methods. These have allowed students to investigate, among others, biographies of gardeners that tend high-profile facilities in Puerto Rico; the long-standing tension between architects and landscape architects, and; the accomplishments of the latter. Regional history and local context, including the subject of cultural landscapes, are also woven into the global, traditional timeline. Plant Material and Establishment, LA 6310, understood as key tool for design, constitutes the third course introduced in the first trimester.

WINTER During the second trimester, the subjects of design and representation are pursued further, underscoring (iterating) critical thinking and analytical skills. In Representation: Tools & Techniques, LA 6710, students tackle freehand and mechanical drawing in different media. Having previously been introduced to the subject of plant material, students take Soils, LA 6320, where they assess considerations critical to the “proper” usage of vegetation. Theoretical issues are related to concrete problems and sites for the first time in Design: The Garden Studio, LA 6120. At this level, projects have included the reinterpretation of garden concepts in terms of their specific application in a local park; social context as frame and support in a historic neighborhood garden, and; notions of “finding”, “landing”, “grounding”, “founding” as related to differently-scaled interior patios.

SPRING Issues addressed during the third trimester relate to increased complexity and scale, moving from micro approaches to macro concerns in Design: The Urban Studio, LA 6130, where traditional and contemporary theories of urban design are debated. Exercises can range from concocting an “ideal” city; devising a master plan for a low-income community lodged within an environmentally sensitive area; or proposing pedestrian connections to interweave densely-populated areas like San Juan’s financial district. Full completion of the first year includes an
elective option. So far, most students have chosen to strengthen representational skills or expand their historical background (Computer Representation for Landscape Architects, LA 6611; Modes of Representation, LA 6710; and Garden Types: Typologies and Design Approaches, LA 6650).

YEAR TWO

FALL Problems of an intricate nature continue to be debated along second year in history, technology, and design classes. During the first trimester, historical knowledge is “filtered” through the lens of historiography, that is, “the history of history” (Historiography, LA 6220). This course enables students to reaffirm history as the product of human discourse, that is, as only “alleged” truth. Having shed naïve understandings of the discipline, future landscape architects feel empowered to examine and critically assess ethical conundrums and current professional predicaments. Command of research skills – integral to the course - has been pursued in diverse venues by different professors.

Students have been requested to develop a research paper on a subject of their choosing (say, a public cemetery), its history, and the theoretical implications or ambiguities pursuant to the topic. On another occasion, a whole class studied lost gardens as an opportunity to theorize on the subjects of memory and nostalgia as related to culture. Yet further, students have also been challenged to synthesize theoretical stances and translate them into three-dimensional form (an object). Throughout the years, several students have been able to link their initial research efforts in historiography to their thesis project, successfully expanding upon them.

Technical and scientific matters are highlighted throughout the year, beginning with Environmental Resources, LA 6410, where future professionals identify and deliberate about natural systems with regards to design decisions. Ecosystems are gauged in terms of methodologies that best articulate their interrelatedness. Course contents were conceived in linkage with the upper level studios, as instrumental for empowering enrollees by enabling command of precise, technical vocabulary, and analytical skills.

WINTER Technical proficiency remains prototypical at mid-career level, when geophysical and regulatory constrictions are reiterated, as well as examined in terms of their application to construction practices. Site Engineering, LA 6420, engages students in issues of site intervention and conservation, addressing in parallel, design responsibilities regarding public health, safety, and welfare. For class exercises, projects developed
in The Urban Studio are used as point of departure, elucidating for students the underlying connections that anchor curricular components. These associations are further grounded in Design: The Rural Studio, LA 6140. The syllabus considers projects that deal with the interface between the suburban and rural milieus, expounding issues of “blurring” edges and design typologies from a landscape architecture standpoint.

Students come to terms with communities of diverse profile and varied stakeholders: from company towns sited in rural settings, but operating within a suburban framework, to long-standing underprivileged settlements - once rural - now an enclave in metropolitan center. The breadth of landscape contexts in a small island yields the opportunity of coming to terms with the ample dimensions of the contemporary rural world. In Puerto Rico, “rural” may refer to a dry forest system, a trampled and polluted wetland, or a coastal fishing community. When “rural” represents a far cry from a bucolic, romanticized setting, lessons of public health and safety in landscape “jump drive” for students the immediacy of professional responsibilities and liabilities. In training students to appreciate “the sublime” in the 21st century, appealing to more visceral tasks proves helpful to convey the message effectively.

SPRING

Along the curriculum, diverse courses acknowledge the conservation of natural systems, but students face said imperative in full complexity in Design: The Regional Studio, LA 6150. Multiple issues of relevance and reach condition class exercises. Regions are explained from multiple perspectives: as terrains sharing a common geography; as jurisdictions defined by politics, and as cultural ideations, among others. To fulfill course objectives, students have developed projects based on varied strategies. A proposal advocated for the joint consideration of municipalities with shared attributes; another purported to conceive of the Antillean basin as region; yet another explored Trade winds and their impact on Island visitors.

Concomitantly with design - but contrasting in scale approach - Site Construction, LA 6430, provides a close-up view of the designer’s choices and limitations in assembling the individual components of projects. An existing landscape architecture project (for which no plans are available) is analyzed to ascertain detail fabrication. Having “figured it out”, students draw their own understanding of components and fitting. The possibilities rendered by materials, the way in which they come together, and the restrictions rendered by regulatory matters as part of the design process, are further reinforced by way of a discrete project that develops a set of formal construction drawings.
The third component in this trimester’s trilogy and the last, from a science viewpoint, *Advanced Plant Material & Establishment, LA 6330*, sets the academic experience in the real world. Field visits enable students to come to terms with the endemic plant material available to them as designers. The topic is addressed in class at site scale and, simultaneously systemic range. Students put together tightly focused design proposals (using material from previous classes) that have included landscaping under elevated train tracks; a spatial reinterpretation of “Alice in Wonderland” as a park; and a healing garden for the visually impaired.

By now, upon completion of the second year, students have experienced an educational process leading them from conceptualization and stand-alone projects to a systematic understanding of design (as well as natural) elements and their interconnections

**YEAR THREE**

**FALL** The curriculum’s goals and objectives come together during the (last) year, particularly emphasizing the pertinence of landscape architecture, its current predicaments, the importance of civic engagement with professional and community stakeholders, and the unavoidability of ethical questions and leadership, all in the interest of a comprehensive understanding of the discipline.

Stewardship of the land threads the syllabus of *Ecology & Technology, LA 6440*. A geographer - and a biologist in tandem with a social ecologist - has taught the course, one that encompasses theoretical exploration, scientific methods, and design applications, all in linkage. Raised awareness of shared global conditions stimulates responsiveness and a call for action from students taking the course, who become familiar with local and international civic initiatives of social breadth. Among notable, recent project topics, two surface: one that required design, re-design, construction, and cost estimating of green wall prototypes in a laboratory experience, another where ecologically responsive landscape strategies were prioritized after community outreach and consultation.

Opinion polling, oral history, and scientific measuring – understood in overlap – are skills students will carry over to the investigation requested from them in *Theory & Research of Landscape Architecture, LA 6230*. Said research paper constitutes the theoretical backdrop against which the thesis design will be developed in the following trimester. Themes are open, but students must argue their contemporary pertinence. Text and project scope synthesize the myriad aesthetic, technological, theoretical, and practical concerns pursuant to Landscape Architecture. Moreover,
students are expected to frame these concerns within an in-depth acknowledgment of contemporary issues and values (i.e. conservation, sustainability, management).

**WINTER**
Current conditions, predicaments, and possibilities are critically analyzed from the profession’s standpoint – more specifically - in Professional Practice and Ethics, LA 6510. The course examines the role of the practitioner (sometimes as leader, others as consultant) though discussions and debates on ethical and moral dilemmas inherent to “the ways of doing” Landscape Architecture. Topics of pragmatic consequence are dissected to understand the complexity in minutiae as well as in their comprehensive scope: career options, salary expectations, licensure, contracting procedures, construction and personnel administration, financial considerations, and project and office management. Students are required to interview landscape architects holding a practice in order to benefit from their extended experience. Findings are compared in class. In addition, enrollees must prepare a portfolio of work. Understood as a “business card”, their collection of projects must reflect a two-fold purpose: employment seeking in an organization, and appealing to potential individual customers.

As coursework approaches conclusion, students can choose an Open Graduate Elective, benefitting from the multiple options granted by the university’s rainbow of departmental offerings. (See Appendix #5: Partial Sample of non-departmental courses that fulfill the Open Elective requirement) Electives warrant renewed points of view, empowering students to assume better-informed stances, considered paramount as critical tools for decision-making.

**SPRING**
Before students exit School, the Program Elective, LA 6600, constitutes an additional opportunity for an in-depth experience in a topic of their choosing. Curricular aspirations (in terms of goals and objectives) coalesce in Design Thesis, LA 6800. Coursework completed previously (LA 6230, Theory and Research of Landscape Architecture) provides the groundwork for a design experience based on the integration of conceptual and theoretical frameworks with technical and technological skills previously concentrated upon.

Each student develops a comprehensive project to addresses contemporary challenges of pertinence to the landscape architecture profession as litmus paper of the human footprint on the environment. Projects are evaluated in terms of thematic overlaps, complexity of scale, and rigor applied to systemic approach. Class sessions assess the coherence of problem argumentation and the identification of effective,
overarching design strategies. At this point in professional training – “forced” to fly solo- thesis students reconfirm the difficulties inherent to the translation of problems and ideas into form. Fulfillment of thematic overlaps and students’ aptitudes is evident in the assortment of projects completed so far. Among these, we can highlight a brief sample:

(Re)Configuration of a coastal boardwalk within a historic context as a catalyst for economic, recreation and leisure growth.

(Re)Articulation of edges at a botanical garden to incorporate the surrounding communities by recuperating public wetland areas.

(Re)Conceptualization of peripheral spaces at rural settlements as potential public realm.

(Re)Validation of a river and a historic bridge as locus and seat of permanent and semi-permanent activities.

(Re)Connection of water availability in rain forest communities by means of a riparian corridor.

(Re)Formulation of an inactive landfill to grant metropolitan scale to an existing urban park.

(Re)Habilitation of creeks in an urban financial district through daylighting, to render them as recreational amenities.

Currently, the following subjects constitute the object of exploration within some of our thesis students:

Multifold natural and historic strata within the site of a centuries’ old salt mine, partially abandoned.

Remnant ruins – illegitimate children of the English Garden tradition in the Caribbean - as qualifiers of the surrounding landscape.

Historic, coastal cemeteries now challenged by erosion and contemporary burial trends reconfigured as ritual and leisure spaces.

Sugarmills reduced to brownfields, as urgent agenda for the conservation of a vanishing industrial heritage.

In conclusion, regarding the curricular sequence, the Landscape Architecture School at Polytechnic University, has structured its students’
advancement through the program taking into account the indispensability of pedagogy: how academic subjects interrelate, how some topics lead into others, how one theme expands upon the previous... in short, how learning occurs through sedimentation... yet, never underestimating what students bring to the table.

During the past years, faculty and students (and family!!!) have contributed in assessing curricular effectiveness, at times contesting it, on other occasions celebrating it, yet, in the end, contributing to its consolidation.

3. How do student work and other accomplishments demonstrate that the curriculum is providing students with the appropriate content to enter the profession?

Key school projects require a statement of pertinence regarding contemporary issues relevant to the discipline and/or the profession at local and/or international level. Purposely, problems are often defined in terms of real life scenarios, allowing students to confront the repertoire of players, information, and limitations that precede decision-making in the professional world. In parallel, case studies are chosen according to their potential to draw the students' attention to the proactive role of the landscape architect, for example:

A. Translation of an urban beautification request for Cantera (a longstanding, low-income, grassroots community) into the acknowledgement of vital surface runoff and sewage problems, and pressing urban renewal transformations due to political influence.

B. A Master Plan for Aguirre, the Island’s largest company town from the 19th century, partially abandoned, as an example of how the “land rich/money poor” condition, imposes compromises to which the landscape architects is often cohort.

C. A collaborative project to research and document the gardens of an historic, colonial residence dating from the 1500’s as mediation after public uproar opposing the removal of existing, mature forest coverage by the Office of the Governor. In presenting their findings, students learnt how research recommendations – in spite of the rigor observed – often have to be tempered to government officials, their intentions, and direction, including those of the Island’s First Lady... in person.

Student work completed outside the curriculum per se, reiterates how the course sequence empowers students to face the demands of practice.
On several instances, for example, students have volunteered to participate in charrettes sponsored by the local architects’ and landscape architects’ association, as well as civic entities. At instances of the former, students from our School have participated in interdisciplinary ad hoc design teams alongside architects, engineers, planners, and decision-makers. Charrettes have focused on subjects of public interest like: the re-habitation of a former military base, one of the largest in the Caribbean basin; the development of a tourism strategy of regional reach for Puerto Rico’s western shore; and, marketing strategies for adjacent municipalities in the south-central region in terms of shared attributes as common denominators.

As another instance characteristic of students’ command of acquired skills, Casa Pueblo, an environmental advocacy group at the heart of Puerto Rico’s central mountain range (acknowledged nationally and internationally for its initiatives) requested design support from the School. The final product – after a 3-day sojourn – included ideograms (à la Beth Meyer) and designs for educational stations to be erected in what future landscape architects labeled as a BosquEscuela (school in the woods).

Student awareness regarding leadership materialized last summer in a singular way. Several of them participated and succeeded in getting projects exhibited at Barcelona’s 6th Architecture and Landscape Biennial, amongst peers from the USA and Europe. Other accomplishments attest to the verve of the curriculum and its appropriation from students:

A. **Student commitment to the celebration of Parking Day**, in coordination with the international community’s observance of the event.

For two years in a row, the student led group aLAs (Association of Landscape Architecture Students), has spearheaded this public critique targeting the misuse of urban space. On each occasion, the organization has successfully convened other universities, entities, and individuals to join this claim for “spatial accountability”. At both instances, media coverage has been significant.

B. **Volunteer work from students for an advocacy project** to open Puerto Rico’s early 20th century irrigation channels as ecotourism trails, co-sponsored by the State Historic Preservation Office, with collaboration from the Department of Education.

Students contributed as interpreters leading tours for 3,000 visitors in a two-day event. They proved instrumental for the development of information
venues to inform an audience comprised of adults and young people. They managed groups fluently, improvising with ways of transmitting their knowledge to teenagers, children, and members of the scientific community, environmental activists, as well as Puerto Rico’s Secretary of State, and local folk. In an activity that purported the appropriation of government land for public purposes, students proved able at explaining the arrested tension inherent to a somewhat polarized situation. Their leadership was grounded on arguments and issued addressed by the curriculum.

C. Institutional acknowledgement of the Program’s bent on green technologies by inclusion of the School in Technotron, an Island-wide event at the Puerto Rico Convention Center to promote technological advancement.

Polytechnic University sponsored the construction and exhibition of a green wall designed and installed by landscape architecture students, garnering ample media exposure through printed press and Internet. Students proved to be well equipped to handle client demands and overcome construction glitches (Oops! wrong-sized, steel washer...)

D. Repeated recognition by the Cultural Landscape Foundation (through its Landslide initiative). National selection and dissemination of student entries based on school research projects.

One pertained to a modern garden designed by Hideo Sasaki for Puerto Rico; another for an emblematic Ficus nekbuda, cloth-bark tree strangled by a seven lane expressway.

E. Student achievements based on individual resourcefulness, underlining merits and efforts deemed useful or pertinent by a third party:

Though portfolio submittal one of our students was selected to integrate an interdisciplinary design competition in Costa Rica, whose project attained Third place. Initially engaged to collaborate in rendering, the student’s participation was expanded to include his ideas and coordination skills in synthesizing design strategies.

Another student, by her own aegis, succeeded at presenting her thesis proposal to the US Forest Service, given her commitment to underscore the relevance of re-connecting residents to rivers located within their watersheds.
In the light of all previous examples – and even if much remains to be done in this respect – we feel assured of our students capability to apply what they learn when demanded from them.

4. How do the curriculum and other program opportunities enable students to pursue academic interests consistent with institutional requirements and entry into the profession?

Curriculum and program opportunities, in a way, elucidate the students’ grasp of their future. Contrasting scales, programs and typologies keep students alert about the array of problems a practitioner may face or choose to dedicate him of herself to.

The course Professional Practice & Ethics, LA 6510, deliberately explicates the many options open to the landscape architecture discipline as a means for living, but also as a vehicle for fulfilling a socially responsible mission. Role models are presented and debated upon in class. Guest lecturers further exemplify the amalgam of opportunities, nurturing the student’s ambition to extend and to excel. Jury members are selected keeping in mind their capacity for “representativity” in terms of career possibilities.

Site visits, a regular activity for the Program, carry similar effect, with the advantage of immediacy. As evidenced before regarding the School’s involvement in diverse interdisciplinary charrettes, the close collaboration of the our program with Puerto Rico’s Architects and Landscape Architects Association, has proven seminal for an early, solid exposure of our students to the nuances of both professions.

C. Syllabi

1. How do syllabi include educational objectives, course content, and the criteria and methods that will be used to evaluate student performance?

All program syllabi incorporate a description of the objectives, contents and topics to be covered, being specific about pre-requisites, credit hours, evaluation methods for grading, in addition incorporating a bibliography of references for each course. Syllabi are read out loud and discussed the first day of class. (See Appendix #6: Sample Course Syllabus.)
2. How do syllabi identify the various levels of accomplishment students shall achieve to successfully complete the course and advance in the curriculum?

Syllabi clearly identify the skills, knowledge and values to be attained in order to fulfill course objectives.

D. Curriculum Evaluation

1. How does the program evaluate how effectively the curriculum is helping students achieve the program’s learning objectives in a timely way at the course and curriculum levels?

2. How does the program demonstrate and document ways of:

a. assessing students’ achievements of course and program objectives in the length of time to graduation stated by the program?

b. reviewing and improving the effectiveness of instructional methods in curriculum delivery?

c. maintaining currency with evolving technologies, methodologies, theories and values of the profession?

3. How do students participate in evaluation of the program, courses, and curriculum?

Throughout the years, feedback requested to that effect at faculty meetings and student assemblies – as well as informal conversations and emailing - has proven crucial to determine curricular effectiveness.

In 2008, the Program Director – in consultation with faculty from the MLA Program - designed an internal evaluation form with which students evaluate, among others, delivery and scope of contents, the effectiveness of project sequences, and the adequacy of time allotted for each exercise. The form provides for students to make recommendations, some of which have been incorporated throughout time. In response to student suggestions, for example, the theory course that constitutes a prerequisite for thesis was “moved up” in the curricular sequence. Students advocated for more time in between one course and the other, allowing them to expand (“mature”) on the subject of their investigation. (See Appendix #7: Internal Evaluation Form for Course Assessment).

Samples of representative projects have been collected from different course installments, stored for reference, and exhibited publicly. Teachers,
students, and new faculty... also potential candidates interested in the career consult these. A recent survey conducted to gather student opinions on curricular and other issues, polled students on the length of their stay at school. To this date, approximately 60% of our alumni have finished the program on schedule.

Furthermore, in 2009, elaborating on the curriculum’s objectives and LAAB Standards, a matrix was developed to cross-reference courses with criteria taken into account when formulating course content. Said matrix has proven useful for faculty to keep focused, but also - having distributed it amongst students - to underline what constitutes the backbone of a landscape architect’s education. (See Appendix #8: MLA Program Course Matrix)

As academics, we adhere to the bi-fold responsibility of articulating the correlations that underlie all subjects related to a given discipline, but also those that inspire how and when they should be delivered. After all, what colleague John Frazier stated in 1967 continues to be true: -“One of the major skills which the landscape architect must learn very early in his career is to comprehend the magnetic-relatedness between things.” Such an understanding can begin at school... in more than one way.

More recently, since 2010, the self-assessment process pursuant to the upcoming accreditation visit has yielded many introspective venues. These have proven most helpful in weighing how curricular expectations have been met and can be improved.

As complement, other activities contribute to an increased awareness of how we rate against our peers and other schools, particularly in terms of: theoretical advancement, teaching methodologies, technological resources, and endorsement of values. The Program Director participates in ASLA/IFLA meetings and corresponds with other school administrators in Dominican Republic, Colombia, Costa Rica, and the US. She has visited different programs: University of Maryland at College Park; Morgan State University, in Washington, D.C.; and Virginia Tech, in Alexandria, among others. Familiarity with comparable programs is always fundamental for effective benchmarking.

Ms. Rodríguez has held office in the Institute of Landscape Architects and the Colegio de Arquitectos y Arquitectos Paisajistas, both in Puerto Rico. She is IFLA’s representative in the Island and committee member in ASLA. As the program grows, further involvement from faculty in comparable initiatives is expected.
E. Augmentation of Formal Educational Experience

1. How does the program provide opportunities for students to participate in internships, off campus studies, research assistantships, or practicum experiences?

Given the economic panorama, opportunities of this kind are scarce. Currently, the school supports a faculty member’s research project by assigning two students as assistants of investigation, and providing space as in-kind match. In the meantime - in order to make viable comparable experiences - students are stimulated to engage in pro bono work of substance and grassroots ambition.

2. How does the program identify the objectives and evaluate the effectiveness of these opportunities?

No instrument for measuring these experiences has been defined yet. So far, we have relied on the open channels of communication that prove so effective in a small-scaled program to which the goal of accreditation grants direction.

3. Do students report on these experiences to their peers? If so, how?

Aware of the lack of practicum experiences, teachers in charge of the course Professional Practice & Ethics, LA 6510, make the effort to counteract the need by promoting direct interaction with local professionals. Students interview landscape architects; visit their studios and dialogue with their classmates about it.

At thesis level, students are required to engage landscape architects as consultants. Before graduation, a representative from the Professional Practice Committee at the local architects and architects association offers orientation on practice options and duties, as well as licensure and registration procedures.

Soon – we hope - our own graduates will provide practice opportunities for those who join the school in the future; opportunities they missed for having led the way.

F. Coursework: (Bachelor’s Level) N/A

G. Areas of Interest: (Bachelor’s Level) N/A

H. Research/Scholarly Methods: (Master’s Level, if responding to Standard 3b or 3c, above)
1. How does the curriculum provide an introduction to research and scholarly methods and their relation to the profession of landscape architecture?

All design courses provide activities and exercises for which library resources are indispensable. On a recurrent basis, students consult specialized bibliographies, style manuals, and methodological references. The demands of research are introduced formally in History of Landscape Architecture, LA 6210, where students are required a paper of limited focus, yet able to expand the local knowledge of landscape architecture. Subjects have included an oral history exercise on the lives of Puerto Rican gardeners, and the identification and documentation of public gardens long-gone.

To succeed at their task, students are informed about available archival sources and collections of relevance to the profession. Differences in terms of contents and breadth of references are articulated in class, enabling students to apply their knowledge further in Historiography, LA 6220, where another research paper is a requisite. On one occasion, were asked to identify references to the Island’s landscape history in the arts (literature, painting, music, and others).

Written projects are developed throughout the trimester, simultaneously examining position papers on professional queries.

2. How does the program demonstrate that theses or terminal projects exhibit creative and independent thinking and contain a significant research/scholarly component?

Thesis topics respond foremost to the student’s interest, his (her) background, and/or to subjects studied during their involvement with the program. Anchored in contemporary theories and concerns, the development of a thesis project springs from investigative work and interpretation of landscape architectural theories deemed relevant. Each student identifies a problem to be reckoned as preface to choice of site. Furthermore, He (she) is responsible for interpreting site conditions, context profile and conflicts, as well as key stakeholders. Interpretation of these components establishes the groundwork over which students formulate a hypothesis supported in terms of social, environmental, and professional pertinence. Students are urged to engage in rigorous literature review. However, methodological approaches and strategies pursued are always varied. In the end, in spite of being developed in accordance with clearly established course requirements, each thesis project reflects the student’s own proclivities...as expected from someone exiting graduate school. (See this reports’ Section 3, B.3)
STANDARD 4: The program shall prepare students to pursue careers in landscape architecture.

A. Student Learning Outcomes

1. Does student work demonstrate the competency required for entry-level positions in the profession of landscape architecture?

Yes. For key course projects, students are required to emphasize on the breadth, depth and pertinence of those questions addressed. Dexterity in managing complex landscape problems is evidenced in the student’s final product, one that, in most cases, exemplifies awareness of multiple disciplinary overlaps. Research and thesis projects bear witness to familiarity with precedents, archival sources, environmental systems, and current theoretical issues. Moreover, our graduates’ projects demonstrate command of plant material, with a special bent on the pertinence of endemic vegetation to current sustainability concerns. Six-months shy of completing their degree, students, class debates, discussions, and exercises, expose to legal procedures and professional regulations.

The students’ ability to develop construction details of relative complexity while in school remains a challenge to be met by our program, one acknowledged as such in our short-range strategic plan.

Looking at this question from a different, yet valid perspective, out of eleven (11) graduates, eight (8) are currently employed, equaling 73%.

2. How does the program assess student work and how it demonstrates students are competent to obtain entry-level positions in the profession?

Fulfillment of course objectives is measured routinely through individual crits, exams, quizzes, reports, pin-ups, preliminary project presentations, and final juries. Above and beyond, additional mechanisms allow us to assess progress on a comparative basis: school presentations, lectures by students themselves, joint juries with architecture students, and inclusion of practicing professionals from different disciplines as jurors. From these, written comments and suggestions are often requested.
Extracurricular activities like the previously mentioned charrettes for the local architects' and landscape architects' association have also proven instrumental in determining how well are our students are assimilating classroom lessons and deliberations.

The unconditional support local landscape architects grant to our program has provided a unique opportunity to rate the competence of our students. For two years in row, an exhibit dedicated to the work of landscape architects has included both student and professional work side by side.

3. How do students demonstrate their achievement of the program’s learning objectives, including critical and creative thinking and their ability to understand, apply and communicate the subject matter of the professional curriculum as evidenced through project definition, problem identification, information collection, analysis, synthesis, conceptualization and implementation?

Students demonstrate their academic achievement most conclusively in their design thesis project, developed in two phases (courses): Theory & Research of Landscape Architecture, LA 6230, and Design Thesis, LA 6800. Both require from students to evidence skill at analysis and synthesis in handling a problem of their choosing. As a preamble to design, the topic of interest is identified and defined, urging the students to engage in critical thinking. Students research and document relevant background information, oral history, precedents (local and international), and applicable case studies. They also consult related governmental programs and plans, and pertinent legislation.

Students’ findings, theoretical stances and arguments are summed up in a 40-page paper and an audiovisual presentation. Both text and visual graphics are evaluated, amended, and resubmitted at various stages of development. Effective communication of subject matter is underlined as essential at both research and design phases. Formats and final presentation venues are open to stimulate individual creativity. Capitalizing upon it, students have presented thesis in freehand drawings, mixed media and, of course, computer aided design.

Even if imagination and inventiveness are highly encouraged throughout the curriculum, students are reminded often about the importance of the viability of ideas. Thesis proposals, therefore, are required to incorporate project implementation concerns from different perspectives. Students are responsible for the identification of stakeholders and potential (and real) conflicts between them. Client and audience definition is a must for all projects: Who wants this? Who will sponsor it? Who will be benefitted?
As a practical consideration, projects must respect feasibility in terms of construction systems and accessible technologies, even if not in terms of cost. Financial viability of a thesis project does not constitute a course objective, however, students are customarily made aware of partial costs related to specific project components.

To produce a coherent, all-inclusive design solution, students are urged to be critical, not only about problem contents, but also about the process itself, and how both - problem and process - are best communicated.

-"It’s you who must make complexity comprehensible, first to yourself, then to others". John Lewis Gaddis, The Landscape of History.

4. How does the program assess the preparation of students in the above areas?

Faculty from different program components come together in preliminary reviews and juries; evaluation of student aptitudes and performance is requested from jurors (in house and visiting); different thesis consultants and readers advice students and report on it; input from faculty from other university departments; professional response to public presentations and exhibitions.

B. Student Advising

1. How does the student advising and mentoring program function?
2. How does the program assess the effectiveness of the student advising and mentoring program?
3. Are students effectively advised and mentored regarding academic and career development?
4. Are students aware of professional opportunities, licensure, professional development, advanced educational opportunities and continuing education requirements associated with professional practice?

Although a formal institutionalized venue does not operate at this time, mentoring for students at the School occurs at an informal level by way of: meetings with students at registration time, not “a la Facebook”; examination of students’ transcripts prior to entering their final year, in order to identify outstanding issues, and more informally, through e-mail correspondence.

At this point in time, within such a young school, a sophisticated system of checks and balances has yet to be developed. We are confident that, as
the number of graduates grows, alumni feedback will prove effective to define a more comprehensive strategy for advising and mentoring.

As program faculty and administrators become aware of internship, employment or other opportunities for career development that relate to the specific interests of our students, individuals are approached directly and forwarded related information. Moreover, students interested in pursuing academic advancement constantly receive input from professors on an ad hoc basis.

Close ties with the professional and licensure associations, as explained before, ensure full access to career information, and the School makes sure it occurs on a consistent basis. Board members of the Colegio de Arquitectos y Arquitectos Paisajistas, as well as directives from the State’s licensing board that administers LARE’s exam are regular guests at juries. With faculty members simultaneously partaking of leadership roles within said entities, students remain well-informed (when not cooperative with) seminars, conferences, conventions, and continuing education opportunities in and outside Puerto Rico.

At present, 6 out of 11 graduates are currently registered with the local landscape architecture association. Over ten (10) of them are student affiliate members of ASLA.

5. How satisfied are students with academic experiences and their preparation for the landscape architecture profession?

In a survey conducted last February, alumni were requested to list the assets and liabilities of the program. In terms of satisfaction with the program, all expressed themselves as very satisfied or satisfied. Many acknowledged as excellent their experiences at school in relevance to their professional needs. When asked about the school activities that have proven helpful to their professional performance, many responded “all”; others highlighted the Thesis Project.

Most agreed on three assets: faculty commitment to the pedagogy of Design and the environment; complementary lectures and events; and the articulation of theory and practice. Others underlined access to financial aid, professional advocacy, as well as faculty enthusiasm and availability.

On the other hand, requested to point out areas of improvement, most students agreed on: lack of parking space; cramped facilities; and lack of
exchanges with other programs. In addition, some mentioned the trimester system as inconvenient; the lack of job opportunities as a challenge; and the need to strengthen specific academic areas like grading, representation, and water management.

At a more specific level, alumni were required to comment on how the Program prepares them for the license exam, highlighting three aspects. It was argued that School has equipped them to conceptualize situations as problems and to transfer these into a design. Another former student expressed satisfaction with his basic preparation in site engineering and site development but, admittedly, others want more. Yet another alumnus feels the Program prepares them well to address health and security issues.

C. Participation in Extra Curricular Activities

1. What opportunities do students have to participate in institutional/college organizations, community initiatives, or other activities? How do students take advantage of these opportunities?

2. To what degree do students participate in events such as LaBash, ASLA Annual Meetings, local ASLA chapter events, and the activities of other professional societies or special interest groups?

Members of the Class of 2010 created the current leading venue for student leadership and involvement with the Program. Mentioned before in this report, aLAs (Association of Landscape Architecture Students) has proven influential in shaping the students' voice within the school and the community at large. Student-led, the organization has been responsible for design recommendations to be implemented at the university campus; implementing a lecture series (Inside the Landscape Designer’s Studio), engaging local practitioners in round table discussions, Park(ing) Day, as already mentioned... and a baby shower (!!). The School supports aLAs by providing storage and vending space, clerical aid, and the assistance of a faculty member as mentor.

Given the fact that people already holding a job primarily comprise our student body, it should not come up as a surprise that students readily participate of the local professional association’s activities. Many join in volunteer efforts, annual conventions, special events, and attend lectures. For the past two years, a student-project category was added to the local landscape architects’ association annual exhibit as a result of the School’s request and in acknowledgement of the quality of students’ work.
In the near future, School ties with ASLA will be strengthened to include increased membership from our faculty and students in the profession’s leading national organization. With increased local awareness of the benefits pursuant to “belonging” to ASLA, student participation will be consolidated. To this date, short of an official chapter in the Island, ASLA lacks presence in Puerto Rico... an omission our alums – we trust -should correct in time.
5. FACULTY

STANDARD 5: The qualifications, academic position, and professional activities of faculty and instructional personnel shall promote and enhance the academic mission and objectives of the program.

A. Credentials

1. Is the faculty’s balance of professional practice and academic experience appropriate to the program mission?

Most faculty members teach and practice, several keeping a high-profile career. Some are engaged in public service, others in private practice. Among these are included: architects, urban planners, an engineer, an environmental scientist, a social ecologist, a tropical demonomist, one geographers, one historian, two conservationists, a pair of artists and, as expected, landscape architects. Variety feeds the balancing act: young professionals bring freshness to the curriculum and program, while seasoned ones weigh in on reality checks. Individual academic backgrounds for each faculty member are here listed:

**Landscape Architecture**
Olga Angueira Andraca
Edmundo Colón Izquierdo
Ramón Irizarry Acevedo
Marisabel Rodríguez Toledo
José J. Terrasa-Soler

**Architecture/Urban Design**
Viviana Cora Bonet
José Lorenzo Torres
Jaime Suárez Toro
Jamille Victorio Sánchez

**History/Preservation**
Mercedes Martínez Gueric
Jorge Rigau Pérez

**Technology**
Edmundo Colón Arizmendi
Ismael García Ortega
Edgardo González González
Alejandro Torres Abreu
Faculty composition merits some comments: 16 out of 20 hold Masters' degrees; two hold a PhD, and two of them an ABD, and the single faculty member with a Bachelor's degree, brings with him over 40 years in practice and government service. Three full time professors shared with the Architecture Department teach at the School: Jorge Rigau, Jaime Suárez, and Juan Carlos Velázquez. The most experienced professor has taught for over 35 years; the youngest one, one year. Four professors are licensed professionals; eight are in the process of seeking licensure. Nine faculty members are engaged in private practice. The median faculty age is 46 years, with a female to male ratio of three (3) to eight (8). Women represent 23% of the faculty.

Nine of our faculty members have an interdisciplinary education involving more than one field of study as follows:

- Education/ Landscape Architecture
- Architecture/ Landscape Architecture (2 persons)
- Architecture/History
- Arts/Architecture
- Biology/Environmental Science/ Landscape Architecture
- Architecture/Architectural Conservation
- Geography/ Public Administration
- Architecture/Urban Planning

Other institutions in Puerto Rico where faculty members have taught include: University of Puerto Rico, (Río Piedras, Mayagüez, Cayey campuses); Inter American University, (San Germán, Guayama campuses); Metropolitan University, (Cupey campus); and the School of Visual Arts. Listed below are the Faculty credentials:


Areces Mallea, Alberto - Ph.D., Biology, CUNY, New York, 2003; Master of Philosophy, Biology, CUNY, New York, New York, 1996; Licensure in Biological Sciences and Botany, University of Havana, Cuba, 1969.

Colón Arizmendi, Edmundo - BS in Civil Engineering, University of Puerto Rico, Mayagüez 1974.

Colón Izquierdo, Edmundo - Master of Landscape Architecture, Harvard University, Graduate School of Design, Massachusetts, 2006; BArch, Polytechnic University of Puerto Rico, Hato Rey, Puerto Rico, 2004.


González, Edgardo - Doctoral candidate, Yale University, New Haven, Connecticut, 2004; Master in Forestry, School of Forestry and Environmental Studies, Yale University, New Haven, Connecticut 1986; Bachelor in Science, University of Puerto Rico, Río Piedras, Puerto Rico, 1983.


Irizarry Acevedo, Ramón - Master of Landscape Architecture, Louisiana State University, Baton Rouge, Louisiana, 2003; Bachelor of Science, Agriculture, University of Puerto Rico, Mayagüez, 1998.

Lorenzo Torres, José - Master of Urban Design, Harvard University, Graduate School of Design, Massachusetts, 2005; BArch, Polytechnic University of Puerto Rico, 2001.

Olivieri Cintrón, Luis - MS Agricultural Sciences, University of Puerto Rico, Mayagüez, 1985; BS Agricultural Sciences, University of Puerto Rico, Mayagüez, 1982.


Terrasa Soler, José Juan- Master of Landscape Architecture, Harvard University, 2007; Master of Environmental Studies, Yale University, 1997; MS, Biology, University of Michigan, 1992; BS, Biology, Mount Saint Mary’s College, Maryland, 1990.

Torres Abreu, Alejandro - Ph.D. Environment and Society, Lancaster University, United Kingdom; M.Sc. Human Ecology, Free University of Brussels, Belgium; Bachelor of Arts, Interdisciplinary Studies University of Puerto Rico, Río Piedras, Puerto Rico.

Velázquez Figueroa, Juan Carlos - Master of Fine Arts, Universidad Complutense, Madrid, Spain, 1988; Bachelor of Fine Arts, School of Fine Arts, San Juan, Puerto Rico, 1985.


As expected, faculty members are committed to government initiatives and civic causes, directly and indirectly;

Landscape Architecture
Olga Angueira Andraca
Past President, Instituto de Arquitectos Paisajistas de Puerto Rico
Past Board Member, Colegio de Arquitectos y Arquitectos Paisajistas de Puerto Rico
Ramón Irizarry Acevedo
President, Instituto de Arquitectos Paisajistas de Puerto Rico
Marisabel Rodríguez Toledo
Member, Education Committee, Colegio de Arquitectos y Arquitectos Paisajistas de Puerto Rico
Member, Public Practice Committee, ASLA (2009-11)
Liaison between IFLA and the Colegio de Arquitectos y Arquitectos Paisajistas de Puerto Rico
Director, Urbanism Committee, DoCoMoMo Puerto Rico
Grantee, SHPO, “The Landscape Legacy of the Modern Movement in Puerto Rico”

José J. Terrasa Soler
Puerto Rico Tourism Company, Deputy Executive Director, Planning & Development, Convention District

Architecture/Urban Design
Viviana Cora Bonet
Architect for Comprehensive Land Use Planning, Urbanism Division, Department of Public Works
Member, Continuing Education Committee, Colegio de Arquitectos y Arquitectos Paisajistas de Puerto Rico

José Lorenzo Torres
Visiting Critic in Panamá, Mexico and the Dominican Republic
Former Treasurer, DoCoMoMo Puerto Rico
Master Plan Coordinator, Urbanism Division, Department of Public Works, for the towns of Aguadilla, Hatillo, Moca, Rincón.

Jaime Suárez Toro
Ceramist and Architect; responsible for emblematic pieces of public art in the Island
Past Member of the Board, School of Visual Arts, San Juan, Puerto Rico

Jamille Victorio Sánchez
Planner for Comprehensive Land Use Planning, Urbanism Division, Department of Public Works
Auditor for Construction Permits, Architecture Foundation

History/Preservation
Mercedes Martínez Guerric
Past Director, Visual Resources Library, School of Architecture, Polytechnic University
Grantee Public Art Project, Office of the Governor

Jorge Rigau Pérez
Team Member/Evaluator, Accrediting Committees, Puerto Rico Council of Higher Education
Evaluator, National Endowment for the Arts, Washington, D.C.
Visiting critic at Rice, Cornell, and University of Miami, Coral Gables, Panama and Mexico
President, La Casa del Libro, a rare book collection and museum
**Technology**
Edmundo Colón Arizmendi  
Former Director, Puerto Rico Codes and Permits Administration  
Member, Ad hoc committees on Codes and Permits for the Office of the Governor

Ismael García Ortega  
Assistant Dean, Geography Department, University of Puerto Rico  
Designed and taught first-ever course on green surfaces (“naturación”) offered in Puerto Rico

Edgardo González González  
Former Director, Forest Service Bureau, Department of Natural Resources  
Co-founder, Center for the Conservation of Landscape

**Sciences**
Alberto Areces Mallea  
Director, Doña Inés Mendoza Park, a 20 hectares tract of land dedicated to endemic flora, operated by the Luis Muñoz Marín Foundation  
Former Director, National Botanical Gardens in Cuba, Superior Plants Collection

Luis Olivieri Cintrón  
Early Advocate for use of GIS System in Puerto Rico

Fernando Payán Aparicio  
Former Director, Associate Degree Program in Landscape Architecture, Inter American University, Guayama, Puerto Rico

**RECENT & ON-GOING FACULTY RESEARCH**
Alberto Areces Mallea: Classification system for the Caribbean flora, ongoing research

Marisabel Rodríguez Toledo: General Reconnaissance Survey of the Landscape Legacy of the Modern Movement in Puerto Rico, SHPO Grant, 2010

José Juan Terrasa Soler: La Parguera Green Infrastructure Plan, NOAA Grant, 2010

Jorge Rigau Pérez, José Lorenzo Torres: Survey for the Isabela Irrigation channels system, SHPO Grant, 2008
2 Are faculty assignments appropriate to the course content and program mission?

The academic training and expertise of faculty members becomes a priority when assigning program courses by component. Landscape Architects and Architects customarily co-teach Design: The Garden Studio, LA 6120 and Design: The Urban Studio, LA 6130. Planners and architects have joined Landscape Architects in Design: The Regional Studio, LA 6140. An environmental scientist (with a bachelors’ in Biology) teaches Environmental Resources, LA 66410. A seasoned engineer (former Director of Puerto Rico’s Administration for Construction Permits and Regulations) teaches Site Engineering, LA 6420. Both courses handling vegetative material, Plant Material & Establishment, LA 6310 and Advanced Plant Material & Establishment, LA 6330, have been offered by a tropical plants dasonomist. A geographer, a social ecologist and a biologist have addressed technical, technological and sustainability issues in the Ecology and Technology, LA 6440, course. A recently created elective course additionally underlines this pairing of expertise and areas taught, with an artist and craftsman teaching Sculptural Landscape, LA 6640.

Moreover, the underlying curricular structure has also been informed by faculty members’ trainings and expertise. A leading local architectural historian designed the framework for the history component, History of Landscape Architecture, LA 6210, and Historiography, LA 6220, as the School spearheads investigate work on the local professionals’ contribution. Several faculty members purporting high profile careers and professional positions are assigned to courses within their areas of know-how, as a way to complement theoretical stances with practical experience. Concomitantly, the Program Director’s academic formation in Education serves to inform excellence and variety in the delivery of content to students, quality in teaching, and in raising the bar in students’ expectations.

3. How are adjunct and/or part-time faculty integrated into the program’s administration and curriculum evaluation/development in a coordinated and organized manner?

Part time faculty participates in all faculty meetings in unison with the two full time members. Together, they comprise the backbone with which curricular decisions are handled, whether addressing sequential or content matters, and administrative issues, or regarding methodological questions.

A minimum of four meetings is held each academic year to address enrollment, School promotion, lectures, and also, matters pertaining to the
profession. Early on in the School’s evolution (2008) teacher discussions supported the creation of a course content evaluation mechanism, which is used every trimester in all classes. For the past year, a series of faculty meetings have proven critical in preparing for the accreditation process, yielding matrixes that include LAAB’s and LARE’s topic standards for inclusion in the curriculum. These initiatives have established a tool for self-assessment that fosters curricular discussions and debate between faculty and students.

B. Faculty Development

1. How are faculty activities – such as scholarly inquiry, research, professional practice and service to the profession, university and community – documented and disseminated through appropriate media, such as journals, professional magazines, community, college and university media?

Faculty activities are disseminated within the program and, more informally, within the university, on a case-by-case basis. Articles and publications written by, or about faculty, are displayed in the School’s bulletin board, discussed in classes, sent to students in email blasts and to the institution through “infonews” (intranet). Copies are kept in record for future reference. However, efforts to convey this information outside the university warrant strengthening.

The participation of our faculty in the annual landscape architects’ professional exhibit receives local press exposure and is used for class references. Collaborative projects, such as the public opening of Puerto Rico’s Irrigation Channel System, involved student and faculty participation, receiving press, radio, and television coverage. Dissemination of the event within the School of Landscape Architecture and the Architecture School as well as internal communications at university level was further pursued. The Student Publication, Volume #34 from the North Carolina State University College Design included an article on this initiative. Issue #65 of Topos magazine included a brief profile of the school as an emerging program in 2008, Landscape Architecture in Central America and the Caribbean.

2. How do faculty teaching and administrative assignments allow sufficient opportunity to pursue advancement and professional development?

The two full time faculty members have attended ASLA/IFLA Conventions. Some faculty members are currently working on research grants. One studies “gardens of the Modern Movement in Puerto Rico” for the State Historic Preservation Office. Another, analyzes sustainable practices in storm water
management, under the sponsorship of the National Oceanographic and Atmospheric Administration. In the past years, faculty has also served on the board of the Colegio de Arquitectos y Arquitectos Paisajistas.

3. **How are the development and teaching effectiveness of faculty and instructional personnel systematically evaluated?**

Students evaluate faculty on a trimester basis. Findings are tabulated and distributed to teachers, who discuss it with the Program Director.

4. **How are the results of these evaluations used for individual and program improvement?**

They assist in criteria for rehiring and offering professional advice to teachers for their improvement as pedagogues. Evaluations flag possible program improvements related to course contents and requirements, also to viable changes in scheduling.

5. **How do faculty seek and make effective use of available funding for conference attendance, equipment and technical support, etc?**

When funds are available, faculty requests for travel and registration fees are evaluated by the Program Director and approved according to funding availability. Monies for said purposes are now extremely limited, but in the past, requests for travel and equipment have been granted.

6. **How are the activities of faculty reviewed and recognized by faculty peers?**

Faculty members support their colleague efforts through direct collaboration in their initiatives, attendance to lectures and exhibits, and peer referrals. It’s faculty, but it’s family... (With all it implies!) To the point that students and faculty alike refer to the building that houses the program as “La Casita”.

7. **How do faculty participate in university and professional service, student advising and other activities that enhance the effectiveness of the program?**

One faculty member acts a Pro Bono Advisor to the President on Campus Planning. Faculty participation in the activities of other university departments is ample: they assist in project juries at the schools of Architecture, Management, and Geomatic Sciences. Professors participate at general institutional recruitment events such as graduate and undergraduate Open Houses. Acting as mentors as well as promoters, faculty members eagerly
assist students in choosing courses, and/or participate in TV and radio programming. With more administrative personnel in the future, coordination with university programs will be furthered.

C. Faculty Retention

1. Are faculty salaries, academic and professional recognition evaluated to promote faculty retention and productivity?

The university discontinued the tenure-track system and has recently established a mechanism for awarding multi-year contracts. The Program is in the process of developing guidelines to include peer participation from faculty in the evaluation process that should precede any long-term engagement. As the Program approaches its fifth year of existence, formalizing contracting procedures becomes an imminent priority.

2. What is the rate of faculty turnover?

Throughout its initial years, the school has managed to keep a consistent faculty core, now consolidated as a team of collaborators. Out of 22 faculty personnel hired over the last 5 years, only three are no longer with the School. One was not rehired, one went back to school, and one relocated in the continental United States.
OUTREACH TO THE INSTITUTION, COMMUNITIES, ALUMNI & PRACTITIONERS

STANDARD 6: The program shall have a record or plan of achievement for interacting with the professional community, its alumni, the institution, community, and the public.

A. Interaction with the Institution, and Public

1. How are service-learning activities incorporated into the curriculum?

Although not detailed as such in the course syllabi, many studio projects customarily address institutional and community needs. As an example, for the remaining, closely-knit district in a former sugar company town (previously referred to in this report) students prepared and debated publicly a master plan for development. They also groomed a green infrastructure plan for a community that has been forced for decades to mature next to a polluted stream. In addition, when public uproar questioned the Office of the Governor’s decision to level trees in a five-centuries old garden, students were kindled to contribute in-kind services to contest – through historical research - the old age falsely attributed to the plant material. On diverse instances, students have contributed with the university for the redesign of two interior courtyards in campus.

Students have also been very active in outreach events. Two have been mentioned before: Parking Day, and the advocacy project for opening a system of water canals for public leisure and enjoyment. For History of Landscape Architecture, LA 6210, students served as interpreters for children in Puerto Rico’s Museum of Art. Their task was to explain landscape concepts as expressed in painting to girl scouts. Out of their own initiative, students have proven to be also dependable as helping hands for events like Landscape Architecture Week.

2. How are service activities documented on a regular basis?

Student participation is recorded photographically, and all printed references are kept on file. As of January 2010, the university’s public relations office is in charge of digitizing all media citations.

3. How does the program interact with the institution and the public, aside from service learning?

For a young program as this one, commitment to public and institutional
projection stretches far, as illustrated by numerous examples mentioned previously along this report. Aside from participation in special events (open houses, installations, campus displays, professional exhibits, charrettes...) other venues of a more recurrent nature grant continuity to our efforts at program interaction.

At administrative level, the program director and faculty members participate in official and ad hoc institutional committees and task forces. At the academic level – to nurture disciplinary linkages, all final design juries are held in the jury areas of the School of Architecture to expose our students’ work to the architecture students and faculty. Regarding student affairs, the recurrent installments of Parking Day have institutionalized it as a key medium for interaction with the community at large.

3. How does the program assess its effectiveness in interacting with the institution and the public?

Awareness of the Program’s public impact is supported by direct feedback from groups and entities served, from participants of events, and colleagues from other academic institutions and departments. Student polling, and assessment comments requested at events constitute more formal tools. Invitations to speak on radio and TV, and requests to submit newspaper articles on diverse subjects constitute an added “thermometer”.

B. Interaction with the Profession, Alumni and Practitioners

1. How does the program recognize professional organizations, alumni, and practitioners as resources?

Professional organizations, alumni, and practitioners – as explained in preceding examples of the School’s modus operandi – figure prominently in the program’s definition of its public projection, but also in its self-assessment processes.

Office holders from professional groups are consistently invited to participate in juries and other school events, being requested to comment and, subsequently, offer feedback in said capacity. Collaborative design charrettes are endorsed as opportunities for students to become familiar with the advantages of affiliation. The School makes a point of annually inviting members of the Education and Professional Practice commissions of the local architects and landscape architects association to orient students about
licensure and membership issues. All events sponsored by local associations are promoted amongst students and faculty.

Regarding alumni, program graduates are regularly invited to return and present thesis work, to lecture and act as juries, as well as for purposes of recruitment and promotion. They have proven helpful in this self-assessment process, having been required to answer questionnaires, assemble for deliberation, evaluate the curriculum, attend related meetings, and review the SER document. For special events like Parking Day and university open houses, graduates are called in to contribute and assist, becoming valuable role models to students.

Given the limited number of local landscape architects holding a masters degree in Puerto Rico, early on it was deemed essential to incorporate the practitioners' know-how and historical perspective to the experience within the classroom. As a way to reel them in, the lecture series Inside the Landscape Designer's Studio was instituted in collaboration with aLAs, the student-led organization.

2. Does the program maintain a current registry of alumni that includes information pertaining to current employment, professional activity, postgraduate study, and significant professional accomplishments?

Yes. See Appendix #9: Alumni Registry and Profile.

3. Does the program use the alumni registry to interact with alumni?

Yes, via e-mail and telephone communication. (So far, they're just eleven...)

4. How does the program engage alumni, practitioners, allied professionals and friends in activities such as a formal advisory board, student career advising, potential employment, curriculum review and development, fund raising, continuing education, etc?

Ample representation of these interest groups has been considered in defining the Program's Advisory Board, to be designated before long. (See Appendix #1: School of Landscape Architecture, STRATEGIC PLAN 2010-2015, short-range goals.) Out of their own will, practitioners, alumni, and allied professionals have informally advised students on career paths and possibilities. Some of them have also participated in curricular evaluation. In the face of current economic predicaments, fundraising amongst professionals and alumni is at a halt. Continuing education – beyond the scope of the program for now – is being offered through the Colegio, and students' and faculty participation is notable.
5. How does the program assess its effectiveness in engaging alumni and practitioners?

Through attendance lists, increased attendance records, request forms for feedback after-the-fact, and person to person communication. Public reaction at the joint exhibits (of student and professional work), also increased participation and attendance.

A series of formal meetings with the Instituto de Arquitectos Paisajistas to request input about the School’s performance in preparing students’ for entry into the profession, resulted in a request from officers to be incorporated in all future thesis juries. Many have attended them.

On several occasions, the Landscape Architects’ Institute has requested the School to provide informative material for public and press dissemination.
7. FACILITIES, EQUIPMENT & TECHNOLOGY

STANDARD 7: Faculty, students and staff shall have access to facilities, equipment, library and other technologies necessary for achieving the program’s mission and objectives.

INTENT: The program should occupy space in designated, code-compliant facilities that support the achievement of program mission and objectives. Students, faculty, and staff should have the required tools and facilities to enable achievement of the program mission and objectives.

A. Facilities

1. How are faculty, staff, and administration provided with appropriate office space?

The two Full-Time Faculty members and the Program Administrator have private offices; Adjunct Faculty use the department’s conference room or any available space to meet privately with students or other professionals.

2. How are students assigned permanent studio workstations adequate to meet the program needs?

Because most of our students hold full time jobs, many students work at home. The School houses two studio areas for Design, where three Design courses meet per trimester, in alternate days. These courses require use of the computer; most students own a laptop, and all have access to two computer labs at nearby locations on campus. These laboratories are described in Section B ahead.

Other facilities to which students have access to work include: a tools and materials shop at the School of Architecture, and videoconferencing facilities administered by the Engineering School.

3. How are facilities maintained to meet the needs of the program?

Facilities’ maintenance is attended on an as-needed basis; yearly budgets have consistently included an allocation of $1,000 for said purposes.

4. Are facilities in compliance with ADA, life-safety, and applicable building codes?

Code compliant entrance ramp and restroom facilities are part of the School’s appurtenances. Students and faculty are made aware regularly of institutional risk-management policies and procedures.
5. If known deficiencies exist, what steps is the institution taking to correct the situation? (Provide documentation on reasonable accommodation from the institution’s ADA compliance office and/or facilities or risk management office.)

Revision of two emergency exits is underway to provide an additional means of egress from the School.

B. Information Systems and Technical Equipment

1. How does the program ensure that students and faculty have sufficient access to computer equipment and software?

The two Full Time Faculty and the Program Administrator each have their own computer; a laptop and digital projectors are available upon request to all faculty.

Limited space precludes the program from physically establishing a computer lab. Graduate program students in the Landscape Architecture program can use the Center for Educational Technology and the Architecture Department’s computer laboratories. In addition, the Geographic Information Systems’ Laboratory (an appendix to the Geomatic Sciences Department) is also of use to our students. These resources are itemized below.

Beginning in the 2nd year, program students are required to own a laptop computer in order to complete design work, thus expediting the timeframe between critique and hands on work. A plotter is available for students at the School.

The university’s Center for Educational Technology (CTE) includes 136 Desktop Computers (DELL T5500); 5 printers; and 2 plotters. Available software includes:

- National Instruments CVI
- National Instruments Lab View 2009 SP1
- National Instruments Vision Assistant 2009
- National Vision Builder AI 2009 SP1
- Autodesk (Autodesk DWF Viewer, AutoCAD 2007
- Lab View Basic 1
- Lab View Basic 2
- MathCAD 14
- MathLAB 2010
- Microsoft Office Professional 2010
- Microsoft Silverlight
- Microsoft SQL Server 2005
Microsoft Visual Studio 2008
Microsoft Windows SDK V60A
National Instruments
Peachtree 2009
Pspice Students
PTC (Pro Engineer)
Statgraphics Plus 5.0

Computer facilities at the Architecture Department also serve the Landscape Architecture students, even if these have yet to profit more from both equipment, and software. Operation hours are as follows: Monday to Thursday from 9:00 AM to 11:00 PM, Fridays and Weekends from 9:00 am to 5:00 PM.

A main laboratory is used as a classroom, where computer-related courses (CAD I, CAD II, Photoshop and Digital Imaging, and 3D Studio) are taught. Another laboratory is open on a limited schedule to students, serving as a support facility for all other Architecture courses; Internet access and plotters are available in this room, along with 15 general workstations and 1 scanning station. A third complementary facility is the Media Lab, housing the image library and acting as classroom for digital visualization and web page design. With the Architecture Department about to rehabilitate fully its building – including the computer labs – a more tangible incorporation of Landscape Architecture students to the use of these facilities is expected.

All three areas have access to the same software packages. Except where noted, all software used are site licenses: Autodesk University License, Autocad, Revit, 3D Studio et al; (5) Adobe Creative Suite 2 (45 lic.); (8) Archicad R12; Artlantis Studio 2 (99 lic); SketchUp Pro (45 lic); Maya 7 (30 lic); Adobe Premiere Elements (15 lic); Microsoft Office Suite. Equipment includes: 16 Dell Optiplex Pentium 4 3.2 Ghz, 1Gb Ram and 17” LCD’s; 3 Large Format Printers 42” wide (HP 500); 2 BackUp Large Format Printers 42” wide (HP 500 + HP 800 ps); 2 Large Format Printers 42” wide for final year students; 1 Tabloid Color Laser Printer; 1 Tabloid Black and White Printer.

In spite of a campus-wide WiFi system, service improvements are a must as, to this day, its range proves ineffective for the Landscape Architecture School’s specific location in relationship to campus.

Landscape Architecture Students also use the Geographic Information Systems’ (GIS) Laboratory upon having enrolled in courses of the Geomatic Sciences Department, favored as elective choices. Laboratory hours are scheduled from 9:30AM to 7:30 PM Monday through Thursday, 8:00Am to 3:00PM on Fridays and
Saturdays, between 8:00AM and 12:00M. This lab is used primarily for GIS and Cartography practice. It includes 16 Dell Precision T5500 and Precision model T5400 workstations, including a plotter. It has programs for GIS development and geospatial analysis, such as ArcGIS 9.3.1, IDRISI and Manifold. Open source software is also used for educational purposes. This alternative allows the student to practice at home. It also has general application software such as Microsoft Office and Open Office.

2. What are the program’s policies on the maintenance, updating, and replacement of computer hardware and software?

Maintenance, updates and replacement of hardware and software is requested on a need basis; however, a fiscal allowance is separated on a yearly basis for purposes of updates and maintenance. The CTE staff provides maintenance and updates to computer hardware and software.

3. What are the hours that the computer lab (if applicable) and studios are open to students / faculty?

Studio space and a plotter are available to students Monday to Friday, 7:00 am - 11:00 pm, and Saturdays, 8:00 am - 3:00 pm. During Mid Term and Final Sessions, School hours are expanded to a 24 hour service.

4. How does the program determine if these times are sufficient to serve the needs of the program?

Both students and Faculty request the program administrator additional time frames based on needs.

5. How does the program assess the adequacy of equipment needed to achieve its mission and objectives?

According to students and faculty requests; survey to students; student assemblies. Students’ main complaint regards wireless service at the School, which has been requested and the institution is currently updating the infrastructure required to enhance wireless service to campus facilities extended on campus fringes.

C. Library Resources

1. What library resources are available to students, faculty, and staff?
2. How does the program determine if the library collections are adequate?
3. How do instructional courses integrate the library and other resources?
4. What are the hours that library is open to students and faculty?
5. How does the program determine if these hours are convenient and adequate to serve the needs of faculty and students?
6. How does the program assess its library resources?
The Polytechnic University Library is a three-story building located at the center of the University campus and has an approximate area of 40,000 square feet with a seating capacity of 761. It serves all departments and programs including Landscape Architecture Graduate School. It provides services and resources for students, faculty and everyone at the academic community as well as the general public.

The Library holds over 140,000 volumes and is subscribed to over 25,000 periodicals. The collection’s strengths lie primarily in its bilingual, diverse and interdisciplinary resources focusing on Engineering, Geomatic Sciences, Business Administration, Architecture and Landscape Architecture. A variety of resources prove adequate to support the School of Landscape Architecture and other specified areas of concentration. (See Appendix #10: Library Resources)

Information resources include printed and electronic books, printed and electronic periodicals, audiovisuals, databases, rare books, Internet page and library created items like pathfinders, periodical indexes and our Blog. Students, professors and researchers can benefit from an Interlibrary Loan Program to obtain resources not available in the Library. Statistics show 90 Interlibrary Loans in the past 5 years for students and faculty of the Landscape Architecture Graduate School.

The Library Collection Development Librarian frequently receives recommendations for resources’ acquisition from Faculty and Director of the School of Landscape Architecture, who reviews bibliographies in the courses syllabus. A budget is assigned yearly for Landscape Architecture acquisitions.

The Library has a convenient schedule. It is open Monday to Thursday from 7:00 AM to 12:00 midnight, Fridays and Saturdays from 7:30 AM to 4:00 PM, and Sundays from 11:00 AM to 4:00 PM. This schedule responds to the use of students and faculty, who can visit the Library online to search catalog and databases, access online resources and consult with the librarians by email from the Library’s Internet site and the Blog.

The Library has an Information Literacy Program and, twice a year, coordinates workshops and orientations for students and faculty to integrate the Landscape Architecture Program and the Library. (See Appendix #11: Information Literacy Workshops)
**Final thoughts**

The School of Landscape of Architecture at Polytechnic University of Puerto Rico is committed to the identification, definition and interpretation of land as legacy and resource. Addressing the territory’s present and future potential, we hope our vision translates into an inheritance for future generations.

Ours is not a school to train 30+ students, but to serve a whole country. The establishment of the first-ever local program in Landscape Architecture represents the empowerment of Puerto Ricans who deserve the right to be trained locally.

With their help, we trust to stimulate a discourse tradition within landscape architecture in Puerto Rico: granting protagonism to the profession; encouraging introspection about what has been achieved so far, and raising awareness about the discipline’s vital role in the construction industry today.

Ours is an advocacy effort for everybody’s professional advancement.
**ADDENDA**

<table>
<thead>
<tr>
<th>A. Program Details</th>
<th>page</th>
<th>86</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Curriculum</td>
<td></td>
<td>88</td>
</tr>
<tr>
<td>C. Student Information</td>
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<td>92</td>
</tr>
<tr>
<td>D. Alumni Information</td>
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<td>94</td>
</tr>
<tr>
<td>E. Faculty Information</td>
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<td>95</td>
</tr>
<tr>
<td>F. Facilities Information</td>
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A. PROGRAM DETAILS

Faculty Resources

1. Budgeted Faculty Resources: TOTAL

<table>
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<tr>
<td></td>
<td>Current Year</td>
<td>Last year</td>
<td>2 Years Ago</td>
<td>3 Years Ago</td>
<td>4 Years Ago</td>
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<td>Professors/Adjunct</td>
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<td>$22,019</td>
<td>$10,689</td>
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<tr>
<td>Associates</td>
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<td>$42,000</td>
<td>$42,000</td>
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<td>-</td>
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<td>$90,626</td>
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2. Budgeted Faculty Resources: MALE

<table>
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<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Current Year</td>
<td>Last year</td>
<td>2 Years Ago</td>
<td>3 Years Ago</td>
<td>4 Years Ago</td>
</tr>
<tr>
<td>Professors</td>
<td>$5,665</td>
<td>-</td>
<td>$22,019</td>
<td>$10,689</td>
<td>$2,512</td>
</tr>
<tr>
<td>Associates</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Assistants</td>
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### 4. Budgeted Faculty Resources: FEMALE

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<tr>
<th></th>
<th>Undergrad degree in landscape architecture (BLA or BSLA)</th>
<th>MLA</th>
<th>Doctorate</th>
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<tbody>
<tr>
<td>Professors</td>
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<tr>
<td>Associates</td>
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<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Adjunct</td>
<td>-</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Instructors/lecturers</td>
<td>-</td>
<td>0</td>
<td>-</td>
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</table>

### 5. Number of Faculty Members With Undergraduate / MLA / Doctorate Degrees

<table>
<thead>
<tr>
<th></th>
<th>2010 Current Year</th>
<th>2009 Last Year</th>
<th>2008 2 Years Ago</th>
<th>2007 3 Years Ago</th>
<th>2006 4 Years Ago</th>
<th>5 Years Ago</th>
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<tbody>
<tr>
<td>Professors</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>n/a</td>
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<tr>
<td>Associates</td>
<td>$42,000</td>
<td>$42,000</td>
<td>$42,000</td>
<td>-</td>
<td>-</td>
<td>n/a</td>
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<tr>
<td>Assistants</td>
<td>$48,512</td>
<td>$48,512</td>
<td>$51,664</td>
<td>$53,330</td>
<td>$56,354</td>
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<tr>
<td>Graduate research assistantships (sponsored by your institution).</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>n/a</td>
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</table>
B. CURRICULUM

1. Required / Elective Courses
Credit Hours required to graduate: 69
Credit Hours required to graduate: 9

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>Landscape Architecture</td>
<td>39</td>
</tr>
<tr>
<td>Architecture</td>
<td>0</td>
</tr>
<tr>
<td>City &amp; Regional Planning</td>
<td>0</td>
</tr>
<tr>
<td>Natural Sciences/Technology</td>
<td>9</td>
</tr>
<tr>
<td>Horticulture</td>
<td>6</td>
</tr>
<tr>
<td>Engineering</td>
<td>6</td>
</tr>
<tr>
<td>Art or Design</td>
<td>3</td>
</tr>
<tr>
<td>Computer Applications/Technology</td>
<td>0</td>
</tr>
<tr>
<td>Other – LA 6220 - Historiography</td>
<td>3</td>
</tr>
<tr>
<td>Other – LA 6510 – Professional Practice &amp; Ethics</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group or Controlled Elective Choices</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Sciences</td>
<td>-</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>-</td>
</tr>
<tr>
<td>English, Speech, Writing</td>
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<tr>
<td>Other – Program Elective (SER – pages 40 – 41)</td>
<td>6</td>
</tr>
<tr>
<td>Free Electives – Open Graduate Elective</td>
<td>3</td>
</tr>
</tbody>
</table>

2. Typical Program of Study

Most courses respond to three-credit hour units, resulting in a one – four hour meeting per week, and five-credit hour courses meeting twice per week, for three and a half-hours. The MLA degree requires students to complete six (6) credit-hours in Program Electives, which encompass areas of representation, theory, sculpture and history. These courses were developed initially to address students’ needs. As the program evolves topics incorporated reflect both faculty and students additional interests. Program Electives are detailed in the SER’s, pages 43 - 44.

One three-credit hour open graduate elective is required of all landscape architecture students. Thus far they have chosen courses in GIS, management in sustainable issues, and water quality management. Students are encouraged to pursue topics of their interests in other departments within the institution. A list of potential classes has been developed by the School as a point of departure for our alumnus to seek other alternatives. Appendix #5, lists non-departmental course offerings.
<table>
<thead>
<tr>
<th>First Year</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA 6210: History of Landscape Architecture (3)</td>
<td>LA 6320: Soils (3)</td>
<td>LA 6600: [Elective] (3)</td>
</tr>
<tr>
<td>LA 6310: Plant Material &amp; Establishment (3)</td>
<td>LA 6710: Representation: Tools &amp; Techniques (3)</td>
<td></td>
</tr>
<tr>
<td>Second Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LA 6410: Environmental Resources (3)</td>
<td>LA 6140: Design: The Rural Studio (5)</td>
<td>LA 6150: Design: The Regional Studio (5)</td>
</tr>
<tr>
<td>LA 6220: Historiography (3)</td>
<td>LA 6420: Site Engineering (3)</td>
<td>LA 6330: Adv. Plant Material &amp; Establishment (3)</td>
</tr>
<tr>
<td>Third Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LA 6230: Theory/Research of Landscape Architecture (5)</td>
<td>LA 6510: Professional Practice &amp; Ethics (3)</td>
<td>LA 6600: [Open Graduate Elective] (3)</td>
</tr>
<tr>
<td>LA 6440: Ecology &amp; Technology (3)</td>
<td>LA 6600: [Open Graduate Elective] (3)</td>
<td>LA 6600: [Elective] (3)</td>
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</table>
### 3. Landscape Architectural Courses Offered During Past Academic Year

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Course Number</th>
<th>Instructor</th>
<th>Credit Hours</th>
<th>Contact Hours / Week</th>
<th># of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FALL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design: Foundations &amp; Drawings</td>
<td>LA 6110</td>
<td>Angueira Andraca, Olga</td>
<td>5</td>
<td>8</td>
<td>10</td>
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<tr>
<td>History of Landscape Architecture</td>
<td>LA 6210</td>
<td>Angueira Andraca, Olga</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Plant Material and Establishment</td>
<td>LA 6310</td>
<td>Areces Mallea, Alberto</td>
<td>3</td>
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<td>10</td>
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<tr>
<td>Ecology and Technology</td>
<td>LA 6440</td>
<td>González, Edgardo</td>
<td>3</td>
<td>4</td>
<td>10</td>
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<tr>
<td>Theory &amp; Research of Landscape Architecture</td>
<td>LA 6230</td>
<td>Lorenzo Torres, José</td>
<td>5</td>
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<td>7</td>
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<tr>
<td>Environmental Resources</td>
<td>LA 6410</td>
<td>Terrasa Soler, José Juan</td>
<td>3</td>
<td>4</td>
<td>7</td>
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<td>Ecology and Technology</td>
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<td>Torres Abreu, Alejandro</td>
<td>3</td>
<td>4</td>
<td>10</td>
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<tr>
<td><strong>WINTER</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design: The Rural Studio</td>
<td>LA 6140</td>
<td>Angueira Andraca, Olga</td>
<td>5</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Professional Practice &amp; Ethics</td>
<td>LA 6510</td>
<td>Angueira Andraca, Olga</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Representation Tools and Techniques</td>
<td>LA 6710</td>
<td>Aparicio Pagán, Luis</td>
<td>3</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Site Engineering</td>
<td>LA 6420</td>
<td>Colón Arizmendi, Edmundo</td>
<td>3</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Thesis Extension</td>
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<td>Rodríguez Toledo, Marisabel</td>
<td>0</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Design: The Garden Studio</td>
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<td>Terrasa Soler, José Juan</td>
<td>5</td>
<td>8</td>
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<tr>
<td><strong>SPRING</strong></td>
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<tr>
<td>Design: The Urban Studio</td>
<td>LA 6130</td>
<td>Suárez Toro, Jaime</td>
<td>5</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Design: The Regional Studio</td>
<td>LA 6150</td>
<td>Terrasa Soler, José Juan</td>
<td>5</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Advanced Plant Material &amp; Establishment</td>
<td>LA 6330</td>
<td>Areces Mallea, Alberto</td>
<td>3</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
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<td>Course Code</td>
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<td></td>
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</tr>
<tr>
<td>Site Construction</td>
<td>LA 6430</td>
<td>Colón Izquierdo, Edmundo</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design Thesis</td>
<td>LA 6800</td>
<td>Lorenzo Torres, José</td>
<td>5</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Colón Izquierdo, Edmundo</td>
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<tr>
<td>Thesis Extension</td>
<td>LA 6801</td>
<td>Rodríguez Toledo, Marisabel</td>
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**PROGRAM ELECTIVES**

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Course Code</th>
<th>Instructor</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Modes of Representation</td>
<td>LA 6610</td>
<td>Velázquez Figueroa, Juan C.</td>
<td>3</td>
</tr>
<tr>
<td>Garden Types, typologies and design approaches</td>
<td>LA 6650</td>
<td>Angueira Andraca, Olga</td>
<td>3</td>
</tr>
<tr>
<td>Contemporary Issues in Landscape Architecture</td>
<td>LA 6240</td>
<td>Guerit Martinez, Mercedes</td>
<td>3</td>
</tr>
<tr>
<td>Computer Representation for Landscape Architects</td>
<td>LA 6611</td>
<td>Aparicio Pagán, Luis</td>
<td>3</td>
</tr>
<tr>
<td>Sculptural Landscape</td>
<td>LA 6640</td>
<td>Velázquez Figueroa, Juan</td>
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</table>
### C. STUDENT INFORMATION

#### 1. Overview

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>In-State Male</th>
<th>In-State Female</th>
<th>Out-of-State Male</th>
<th>Out-of-State Female</th>
<th>Foreign Male</th>
<th>Foreign Female</th>
<th>TOTAL Male</th>
<th>TOTAL Female</th>
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<tbody>
<tr>
<td>Current Year</td>
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<td>16</td>
<td></td>
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<td>1</td>
<td>13</td>
<td>17</td>
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</tr>
<tr>
<td>1 Year Ago</td>
<td>20</td>
<td>16</td>
<td></td>
<td></td>
<td>1</td>
<td>20</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>2 Years Ago</td>
<td>23</td>
<td>22</td>
<td></td>
<td></td>
<td>23</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Years Ago</td>
<td>30</td>
<td>26</td>
<td></td>
<td></td>
<td>30</td>
<td>26</td>
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<td>4 Years Ago</td>
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<td></td>
<td>16</td>
<td>18</td>
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</tbody>
</table>

#### 2. Ethnic Group/Diversity

Include only full-time current landscape architecture students.

- 97% Hispanic/Puerto Rican
- 0% Caucasian
- 3% Other

#### 3. Applications

<table>
<thead>
<tr>
<th></th>
<th>Current Year</th>
<th>Last year</th>
<th>2 Years Ago</th>
<th>3 Years Ago</th>
<th>4 Years Ago</th>
<th>5 Years Ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of</td>
<td>10</td>
<td>10</td>
<td>18</td>
<td>33</td>
<td>42</td>
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<tr>
<td>Applications from</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>16</td>
<td>20</td>
<td>n/a</td>
</tr>
<tr>
<td>males</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applications from</td>
<td>6</td>
<td>5</td>
<td>13</td>
<td>17</td>
<td>22</td>
<td>n/a</td>
</tr>
<tr>
<td>females</td>
<td></td>
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</table>
4. Enrollments

<table>
<thead>
<tr>
<th></th>
<th>Current Year</th>
<th>Last Year</th>
<th>2 Years Ago</th>
<th>3 Years Ago</th>
<th>4 Years Ago</th>
<th>5 Years Ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total enrollment</td>
<td>30</td>
<td>27</td>
<td>55</td>
<td>56</td>
<td>34</td>
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<td>Females</td>
<td>17</td>
<td>17</td>
<td>22</td>
<td>26</td>
<td>18</td>
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5. Student Ethnic Backgrounds

<table>
<thead>
<tr>
<th></th>
<th>Caucasian</th>
<th>African-American</th>
<th>African Descent</th>
<th>Asian/Pacific</th>
<th>Puerto Rican</th>
<th>Native American</th>
<th>*Other</th>
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<tbody>
<tr>
<td>Total</td>
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<td></td>
<td></td>
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<td>2</td>
<td></td>
<td></td>
<td>Females</td>
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</table>

*Nationalities - Guatemala, Dominican Republic
D. ALUMNI INFORMATION

1. Degrees Awarded
Tabulate the number of degrees awarded in the present year (estimated) and for the years since the last SER.

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Males</th>
<th>Females</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Year</td>
<td>6</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>1 Year Ago</td>
<td>2</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>*2 Years Ago</td>
<td>2</td>
<td>2</td>
<td>4</td>
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</table>

*NOTE: First graduating class - Class 2009

2. Record of Advanced Study
Tabulate for the years since the last SER all alumni who were or are engaged in advanced study in any field. (Include alumni who are in the process of earning an advanced degree.)

<table>
<thead>
<tr>
<th>Institution</th>
<th>Degree</th>
<th>Number of Students</th>
<th>Year LA degree awarded</th>
<th>Year advanced degree awarded</th>
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</thead>
<tbody>
<tr>
<td>Domus Academy, Milan, Italy</td>
<td>Master's</td>
<td>1</td>
<td>2009</td>
<td>Starting Fall 2011</td>
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</tbody>
</table>

3. Current Employment
Tabulate the present employment of those having the degree conferred by the program since the last SER.

<table>
<thead>
<tr>
<th>Present Occupation</th>
<th>Males</th>
<th>Females</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td>Advanced Study and Research</td>
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<td>Teaching</td>
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<td>Private Practice</td>
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<td>0</td>
</tr>
<tr>
<td>Landscape Hort./Design Build</td>
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<td>1</td>
<td>2</td>
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<tr>
<td>Volunteer Service (Specify)</td>
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<td>Other (Specify) / Sales for urban furnishings &amp; playground equipment</td>
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<td>Unknown</td>
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### 1. Previous and Present Faculty

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<th>Rank/Title</th>
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<tbody>
<tr>
<td>Professor/LA</td>
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<td>Associate Professor/LA</td>
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<tr>
<td>Assistant Professor/LA</td>
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<td>1</td>
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<tr>
<td>Instructor/Architecture</td>
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<td>Asst. Professor/Arch.</td>
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<tr>
<td>Visiting Lecturer/ Adjunct</td>
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<tr>
<td>TOTAL</td>
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### 2. Instructional Assignments

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<thead>
<tr>
<th>Faculty member</th>
<th>Degree</th>
<th>Teaching %</th>
<th>Research %</th>
<th>Admin / other %</th>
<th>TOTAL %</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Land. Arch. Curriculum</td>
<td>Other programs</td>
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<tr>
<td>Marisabel Rodríguez</td>
<td>MLA</td>
<td>45%</td>
<td>0%</td>
<td>0%</td>
<td>55%</td>
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<tr>
<td>Olga Angueira</td>
<td>MLA</td>
<td>80%</td>
<td>0%</td>
<td>0%</td>
<td>20%</td>
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<tr>
<td>Jorge Rigau</td>
<td>MHistory</td>
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<td>Jaime Suárez</td>
<td>MA Design</td>
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<tr>
<td>Juan C. Velázquez</td>
<td>MFA</td>
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<tr>
<td>José J. Terrasa</td>
<td>MLA</td>
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<tr>
<td>Edmundo Colón, Jr.</td>
<td>MLA</td>
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<td>Ramón Irizarry</td>
<td>MLA</td>
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<td>José Lorenzo</td>
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<td>Edmundo Colón, Sr.</td>
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<tr>
<td>Alberto Areces</td>
<td>PhD</td>
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<tr>
<td>Luis Olivieri</td>
<td>PhD candidate</td>
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<tr>
<td>Mercedes Guerric</td>
<td>MArch</td>
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<tr>
<td>Luis Aparicio</td>
<td>MArch</td>
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<td>Alejandro Torres</td>
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<td>Edgardo González</td>
<td>PhD candidate</td>
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<tr>
<td>Fernando Payán</td>
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<td>Viviana Cora</td>
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<td>Jamille Victorio</td>
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<tr>
<td>Ismael García</td>
<td>MPA</td>
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</table>
3. Courses Taught by Individual Faculty Members

**Academic Year 2009 - 2010**

<table>
<thead>
<tr>
<th>Faculty: Olga Angueira Andraca</th>
<th>Course Taught</th>
<th>Course Number</th>
<th>Term</th>
<th>Credit Hours</th>
<th>Contact Hrs / Week</th>
<th>Number Of Students</th>
<th>FTE Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design: The Urban Studio</td>
<td>LA 6130</td>
<td>SP-09</td>
<td>5</td>
<td>7</td>
<td>3</td>
<td>1.25</td>
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<tr>
<td>Gardens: Types, typologies and design approaches</td>
<td>LA 6650</td>
<td>SP-09</td>
<td>3</td>
<td>4</td>
<td>6</td>
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<td>History of Landscape Architecture</td>
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<td>FA-09</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>1.75</td>
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<tr>
<td>Design: Foundations &amp; Representation</td>
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<td>Design: The Rural Studio</td>
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<td>7</td>
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<td>2.92</td>
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<tr>
<td>Professional Practice &amp; Ethics</td>
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<td>WI-09</td>
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<table>
<thead>
<tr>
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<th>Term</th>
<th>Credit Hours</th>
<th>Contact Hrs / Week</th>
<th>Number Of Students</th>
<th>FTE Students</th>
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</thead>
<tbody>
<tr>
<td>Representation Tools and Techniques</td>
<td>LA 6710</td>
<td>WI-09</td>
<td>3</td>
<td>4</td>
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<td>2</td>
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<tr>
<td>Computer Representation for Land. Architects</td>
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<td>WI-09</td>
<td>3</td>
<td>4</td>
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<table>
<thead>
<tr>
<th>Faculty: Alberto Areces Mallea</th>
<th>Course Taught</th>
<th>Course Number</th>
<th>Term</th>
<th>Credit Hours</th>
<th>Contact Hrs / Week</th>
<th>Number Of Students</th>
<th>FTE Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Material and Establishment</td>
<td>LA 6310</td>
<td>FA-09</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>2</td>
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<tr>
<td>Advanced Plant Material &amp; Establishment</td>
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<td>SP-09</td>
<td>3</td>
<td>4</td>
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### Faculty: Edmundo Colón Arizmendi, (Sr.)

<table>
<thead>
<tr>
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<th>Course Number</th>
<th>Term</th>
<th>Credit Hours</th>
<th>Contact Hrs / Week</th>
<th>Number Of Students</th>
<th>FTE Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Engineering</td>
<td>LA 6420</td>
<td>WI-09</td>
<td>3</td>
<td>4</td>
<td>9</td>
<td>2.25</td>
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### Faculty: Edmundo Colón Izquierdo

<table>
<thead>
<tr>
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<th>Course Number</th>
<th>Term</th>
<th>Credit Hours</th>
<th>Contact Hrs / Week</th>
<th>Number Of Students</th>
<th>FTE Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Construction</td>
<td>LA 6430</td>
<td>SP-09</td>
<td>3</td>
<td>4</td>
<td>17</td>
<td>4.25</td>
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</table>

### Faculty: Ismael García Ortega

<table>
<thead>
<tr>
<th>Course Taught</th>
<th>Course Number</th>
<th>Term</th>
<th>Credit Hours</th>
<th>Contact Hrs / Week</th>
<th>Number Of Students</th>
<th>FTE Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecology &amp; Technology</td>
<td>LA 6440</td>
<td>FA-09</td>
<td>3</td>
<td>4</td>
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### Faculty: Mercedes Guenic Martínez

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<th>Term</th>
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<th>Contact Hrs / Week</th>
<th>Number Of Students</th>
<th>FTE Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historiography</td>
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<td>FA-09</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Contemporary Landscape Issues</td>
<td>LA 6240</td>
<td>FA-09</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>1.25</td>
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### Faculty: José Lorenzo Torres

<table>
<thead>
<tr>
<th>Course Taught</th>
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<th>Term</th>
<th>Credit Hours</th>
<th>Contact Hrs / Week</th>
<th>Number Of Students</th>
<th>FTE Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design: The Regional Studio</td>
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<td>7</td>
<td>14</td>
<td>5.83</td>
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<td>Design: The Garden Studio</td>
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<td>3.75</td>
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</table>
## Faculty: Marisabel Rodríguez Toledo

<table>
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<th>Course Taught</th>
<th>Course Number</th>
<th>Term</th>
<th>Credit Hours</th>
<th>Contact Hrs / Week</th>
<th>Number Of Students</th>
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<tbody>
<tr>
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<td>3.75</td>
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<td>WI-09</td>
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## Faculty: José Juan Terrasa Soler

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## Faculty: Juan C. Velázquez Figueroa

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<td>Modes of Representation</td>
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### 4. Visiting Lecturers/Critics

<table>
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<tr>
<th>Name</th>
<th>Field/Specialty</th>
<th>Date(s)</th>
<th>Contribution</th>
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<tbody>
<tr>
<td>Virginia Pennock</td>
<td>Landscape Architecture</td>
<td>March 2009</td>
<td>Lecturer - Inside the Landscape Designer Studio Series</td>
</tr>
<tr>
<td>Beatriz del Cueto</td>
<td>Architectural Preservation</td>
<td>2009</td>
<td>Lecturer – conservation technologies</td>
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<tr>
<td>Vilma P. Blanco</td>
<td>Landscape Architecture</td>
<td>2009</td>
<td>Guided Project Tour – Punto Verde Park; Lecturer - Inside the Landscape Designer Studio Series</td>
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<tr>
<td>Dr. Ariel Lugo</td>
<td>Dasonomist</td>
<td>2008, 2009</td>
<td>Lecture</td>
</tr>
<tr>
<td>Magdiel Rodriguez</td>
<td>Architecture</td>
<td>May 2010</td>
<td>Juror – Final Thesis presentation</td>
</tr>
<tr>
<td>Linda Barfield</td>
<td>Landscape Architecture</td>
<td>May 2010</td>
<td>Juror – Final Thesis presentation; Lecturer - Inside the Landscape Designer Studio Series</td>
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<tr>
<td>Santiago Gala</td>
<td>Architecture</td>
<td>February 2010</td>
<td>Juror – first year design studio</td>
</tr>
<tr>
<td>Darwin Rivera</td>
<td>Architecture</td>
<td>February 2010</td>
<td>Juror – first year design studio</td>
</tr>
<tr>
<td>Daniel Velez (Alum)</td>
<td>Landscape Architecture</td>
<td>February 2010</td>
<td>Juror – first year design studio</td>
</tr>
<tr>
<td>Juan A. Díaz</td>
<td>Landscape Architecture</td>
<td>March 2009</td>
<td>Lecturer - Inside the Landscape Designer Studio Series</td>
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<tr>
<td>Gabriel Berriz</td>
<td>Landscape Designer</td>
<td>August 2009</td>
<td>Lecturer - Inside the Landscape Designer Studio Series</td>
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5. Individual Teacher's Record

**Name:**  Olga E. Angueira Andraca  
**Rank:**  Associate Professor  
**Department or unit:**  School of Landscape Architecture

### Education:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Number of Years Attended</th>
<th>Degree/Date Granted</th>
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<tbody>
<tr>
<td>Graduate School of Design, Harvard University, MA</td>
<td>2</td>
<td>MLA/ June, 2004</td>
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<tr>
<td>School of Architecture, University of Miami, FL</td>
<td>4</td>
<td>Arch. / May, 2001</td>
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### Teaching Experience:

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<tr>
<th>Institution</th>
<th>Years Taught</th>
<th>Subjects</th>
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<tbody>
<tr>
<td>Polytechnic University of PR Graduate School of Landscape Architecture</td>
<td>5</td>
<td>Design Foundations and Drawing Design: Garden Studio</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Design: Urban Studio</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Design: Rural Studio</td>
</tr>
<tr>
<td></td>
<td></td>
<td>History of Landscape Arch. Ethics and Professional Practice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Garden Types, Typologies &amp; Design Approaches</td>
</tr>
<tr>
<td>Polytechnic University of PR School of Architecture</td>
<td>2</td>
<td>History of Architecture - TA (Professor Jorge Rigau)</td>
</tr>
<tr>
<td>Harvard University Graduate School of Design</td>
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<td>Landscape Technology - TA (Professor Niall Kirkwood)</td>
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### Practice Experience:

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<tr>
<th>Firm or Agency</th>
<th>Number of Years</th>
<th>Responsibilities</th>
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</thead>
<tbody>
<tr>
<td>Soltero Muñoz &amp; Associates</td>
<td>2.5 years</td>
<td>Project coordinator Site assessment Site design and analysis Permitting procedures</td>
</tr>
<tr>
<td>Evelio Pina &amp; Associates</td>
<td>1.5 years</td>
<td>Preliminary design stages for a Resort Master Plan</td>
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</table>
Professional Registration:  
Associate ASLA #1115753, Florida Chapter  
Member of Colegio de Arquitectos y Arquitectos Paisajistas de Puerto Rico (CAAPPR):  
- Architect in Training (AII) #19282  
- Landscape Architect in Training (LAIT) #36

Professional & Academic Activities:  
- Inventory and Historic Documentation of the Gardens of Casa Blanca, class project presentation for the Office of the First Lady. May 18, 2010. Students involved: Rita Aristy, Marcel Airando and Juan Mojica.  
- Board Member of Colegio de Arquitectos y Arquitectos Paisajistas de PR (CAAPPR) 2009-2010.  
- Past President of the Institute of Landscape Architects of Puerto Rico (IAPPR) 2009-2010.  
- Organized the Landscape Architecture Week of 2010.  
- Sustainable Sites Initiatives Informational lecture, April 16, 2010  
- Vice President of the IAPPR 2008-2009.  
- 2009 Orden en el Caos- participated in photo exhibition during Landscape Architecture Week.  
- First Landscape Architects Project Exhibition held on April 27, 2006 at the CAAPPR.

Publications.  
- “Jardines renacentistas”, Sección POR DENTRO, El Nuevo Día, May 26, 2007  
- “Un pulmón en tu azotea”, Sección POR DENTRO, El Nuevo Día, August 2, 2007  
- “Abrazo tropical”, Sección Magazín, El Nuevo Día, April 26, 2009  
- “Cultura, Historia y Paisaje”, Foro de Diseño y Construcción, Primera Hora, November 8, 2010  
- “El paisaje abraza la arquitectura”, Sección A Tu Manera, Primera Hora, April 15, 2010

Contributions.  Through the School and the Institute of Landscape Architects of Puerto Rico I have participated and offered a series of orientations about the profession to several high schools. My active participation and involvement in the preparation of the Landscape Architecture week since 2007 has proved to be an instrumental part of promoting and explaining to the community and other professionals involved with design and construction what Landscape Architecture is all about. I have also taken part in advising the State Licensing Board about the adequate procedures for examination and pushing for the Board to administer the Graphic Exams in Puerto Rico.
Name: Luis E. Aparicio Pagán
Rank: Adjunct Professor
Department or unit: School of Landscape Architecture

<table>
<thead>
<tr>
<th>Education:</th>
<th>Number of Years Attended</th>
<th>Degree/Date Granted</th>
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<tbody>
<tr>
<td>University of Puerto Rico</td>
<td>4</td>
<td>B. Environmental Design/1992</td>
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<table>
<thead>
<tr>
<th>Teaching Experience:</th>
<th>Years Taught</th>
<th>Subjects</th>
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<tbody>
<tr>
<td>School of Fine Arts of Puerto Rico</td>
<td>1</td>
<td>Industrial Design: Introduction to Digital Design</td>
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<tr>
<td>Polytechnic University of Puerto Rico</td>
<td>8</td>
<td>School of Architecture: Basic CAD, Advanced CAD, Photoshop and Digital Imaging, 3DStudio, 2nd yr. Design Studio</td>
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<tr>
<td></td>
<td></td>
<td>Landscape Architecture: Representation- Tools &amp; Techniques, Computer Representation for Landscape Architects</td>
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<tr>
<td>University of Puerto Rico</td>
<td>2</td>
<td>Teaching Assistant: 2nd, 3rd, 4th year Design Studios</td>
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<tr>
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<tbody>
<tr>
<td>Firm or Agency</td>
<td></td>
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<tr>
<td>Aybar-Imbert, Rivera &amp; Assoc.</td>
<td>7</td>
<td>Project Architect</td>
</tr>
<tr>
<td>URS Corp. team</td>
<td>1</td>
<td>Construction Management supervisor, Project Architect</td>
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<tr>
<td>Underwood Architects</td>
<td>1</td>
<td>Project Architect</td>
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<tr>
<td>Aybar-Imbert, Rivera, Cardona Architect</td>
<td>3</td>
<td>Intern Architect, Project</td>
</tr>
<tr>
<td>Code Consultant- Freelance</td>
<td>8</td>
<td>Building Code, accessibility, life-safety consultant</td>
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Architectural Illustrator 21 Traditional and digital media

**Professional Registration:** In progress.

**Contributions:**

Regularly invited as juror to Design Studio Reviews at all levels as well as several Thesis Committees, emphasizing on design concepts application, spatial sequences and experiences, representation and presentation, both graphic and verbal.
Name: Alberto Areces-Mallea

Rank: Associate Professor

Department or unit: School of Landscape Architecture

Education:

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<td>University of Havana, Cuba</td>
<td>3</td>
<td>Geology</td>
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<tr>
<td>University of Louvain, Belgium</td>
<td>2</td>
<td>Master in Palynology</td>
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<tr>
<td>University of Salsburg, Austria</td>
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<td>Master in Alpine Flora</td>
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<tr>
<td>University of New York City, USA</td>
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<td>Master in Biology</td>
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<tr>
<td>University of New York City, USA</td>
<td>5</td>
<td>PhD in Biology-Botany</td>
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Teaching Experience:

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<tr>
<td>University of Havana, Cuba</td>
<td>1969-1980</td>
<td>Systematic Botany, Palynology, Plant Biology, Biogeography, West Indian Flora, Paleontology, Ecology of Ornamental Trees</td>
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<tr>
<td>University of New York City</td>
<td>1995-2000</td>
<td>Plant Ecology and Morphology, Plant Material Ornamental-Plants</td>
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<tr>
<td>Polytechnic University, PR</td>
<td>2006-2010</td>
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Practice Experience: (included in resume)

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Professional Registration:

See CV

Professional & Academic Activities:

See CV

Publications:

See CV

Contributions:

Landscape of Parque Dona Ines, San Juan Puerto Rico
Landscape of Guaynabo Arboretum, La Marquesa Park, Guaynabo Puerto Rico
Name: Edmundo Colón Arizmendi
Rank: Adjunct Professor
Department or unit: School of Landscape Architecture

Education
Institution: University of Puerto Rico, Mayagüez Campus
Number of Years Attended: 5
Degree/Date Granted: BSC E

Teaching Experience:
Institution: Polytechnic University of Puerto Rico
Years Taught: 12
Subjects: ARTE 3010 – Site Planning
Institution: Polytechnic University of Puerto Rico
Years Taught: 4
Subjects: Landscape Architecture, LA 6420 Site Engineering

Practice Experience:
Firm or Agency: A.R.P.E.
Number of Years: 4
Responsibilities: Regulations and Permit Administration
Firm or Agency: Colón-Díaz-Quiñones, Inc.
Number of Years: 26
Responsibilities: President
Firm or Agency: Eco
Number of Years: 4
Responsibilities: Principal

CDQ, Eng., PSC is a private consulting firm dedicated to the land development, planning and design for residential, commercial, institutional, tourism, recreational and industrial projects and the planning and design of infrastructure projects of water supply systems, sewers and wastewater treatment plants, hydrologic-hydraulic studies and design of flood control projects and highways, and the preparation of environmental impact statements.

ECO is involved in the planning and design of land development, architecture, landscape architecture and civil engineering projects.

Professional Registration:
- Junta Examinadora de Ingenieros y Agrimensores Departamento de Estado de Puerto Rico Lic. No. 7812
- Colegio de Ingenieros y Agrimensores de Puerto Rico
Professional Recognition:

- CIAPR – 1982
  Distinguish Professional

- JAYCEES – 1982
  1 of 10 Distinguish Young Professional

Public Service:

- 1980-1984
  Regulations & Permit Administrator
  Government of P.R.
Name: Edmundo R. Colón Izquierdo

Rank: Adjunct Professor

Department or unit: School of Landscape Architecture

Education:

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<th>Institution</th>
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<td>Harvard University</td>
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<td>Master in Landscape Architecture/2006</td>
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Teaching Experience:

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<th>Subjects</th>
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<tbody>
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<td>Boston Architectural Center</td>
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<td>Design, Representation, Technologies</td>
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Practice Experience:

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<tr>
<td>EC0</td>
<td>6</td>
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<td>CDQ &amp; Assoc</td>
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<td>Part-Time Designer</td>
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<tr>
<td>Jorge Rigau, FAIA</td>
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<td>Part-Time Designer</td>
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Professional Registration: CAAPPR - Lic. 19992 - AIT

Professional & Academic Activities

As partner at EC0, I have been involved in international competitions and projects in both Europe and the Middle East. I have partnered with firms abroad for four competitions in Europe and one project (built) in Qatar. Currently our office is involved in a major green roof project, as designers of a 24,000 ft² roof on a landmark historic building. We also are Civil and Landscape consultants for various architecture firms and residential developers.
**Publications**

2010  Gulf Times

*PIA raises QR1mn for ASD playground* - Citation

Qatar Tribune

*ASD inaugurates new elementary school playground* - Citation

2007  Entorno #6 – Entre la arquitectura paisajista y el paisajismo

“*Martha Schwartz - Mesa Arts Center y Grand Canal Square*”

- Essay

2006  *Londonderry and Derry*

Martha Schwartz, Virginie Lefebvre - Citation

**Contributions**

**Community Service**  *Tyler Elementary - Outdoor Classroom*, Washington, DC (Pro-Bono Design Work) Built 2008
Name: Viviana Cora Bonet  
Rank: Adjunct Professor  
Department or unit: School of Landscape Architecture  

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<td>Polytechnic University of Puerto Rico</td>
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<tr>
<td>Puerto Rico Infraestructure Financing Authority</td>
</tr>
<tr>
<td>Emilio Martínez Arquitecto</td>
</tr>
<tr>
<td>Directroría de Urbanismo Departamento de Transportación y Obras Públicas</td>
</tr>
<tr>
<td>Instituto de Cultura Puertorriqueña</td>
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Professional Registration:
Architect in Training, Puerto Rico / #19921.

Professional & Academic Activities.

- Member of the Committee of Continued Education from the Colegio de Arquitectos y Arquitectos Paisajistas de Puerto Rico (2008-2010)

Contributions.

As professor I provide my experience in planning projects in real case studies in Puerto Rico and participate as assessor in student research thesis.
**Name:** Edgardo González González  
**Rank:** Adjunct Professor  
**Department or unit:** School of Landscape Architecture

### Education:

<table>
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<tbody>
<tr>
<td>YALE UNIVERSITY</td>
<td>4</td>
<td>Doctoral candidate / 2004</td>
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<tr>
<td>School of Forestry and Environmental Studies New Haven, Connecticut</td>
<td></td>
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<tr>
<td>YALE UNIVERSITY</td>
<td>2</td>
<td>Master in Forestry / 1986</td>
</tr>
<tr>
<td>School of Forestry and Environmental Studies New Haven, Connecticut</td>
<td></td>
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</tr>
<tr>
<td>UNIVERSIDAD DE PUERTO RICO</td>
<td>4</td>
<td>Bachelor in Science / 1983</td>
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<tr>
<td>Rio Piedras, Puerto Rico</td>
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### Teaching Experience:

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Universidad Metropolitana</td>
<td>10</td>
<td>Forest Management and Silviculture</td>
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<tr>
<td>Sistema Universitario</td>
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<tr>
<td>Ana G. Mendez</td>
<td></td>
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<tr>
<td>Rio Piedras, Puerto Rico</td>
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<tr>
<td>Universidad de Puerto Rico</td>
<td>3</td>
<td>Geography</td>
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### Practice Experience:

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<th>Number of Years</th>
<th>Responsibilities</th>
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<tbody>
<tr>
<td>Centro para la Conservación del Paisaje Inc.</td>
<td>1 ½</td>
<td>Coordinate activities, programs and projects of the Non-Profit Organization.</td>
</tr>
<tr>
<td>Department of Natural and Environmental Resources</td>
<td>23</td>
<td>DIRECTOR, FOREST SERVICE BUREAU Supervise the work of three divisions and two hundred fifty five employees. DIRECTOR, FOREST RESEARCH DIVISION DIRECTOR, FOREST MANAGEMENT DIVISION</td>
</tr>
</tbody>
</table>
Name: Mercedes M. Guerric

Rank: Adjunct Professor

Department or unit: School of Landscape Architecture

Education:

<table>
<thead>
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<th>Degree/Date Granted</th>
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<tbody>
<tr>
<td>University of Texas at San Antonio (UTSA)</td>
<td>3½</td>
<td>Master Arch. /1999</td>
</tr>
<tr>
<td>Catholic University of America, Washington, D.C.</td>
<td>5</td>
<td>B. Arch. /1968</td>
</tr>
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</table>

Teaching Experience:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Years Taught</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polytechnic University of Puerto Rico</td>
<td>7</td>
<td>New School of Architecture) 1st and 3rd year Design Studio; Electives: Advanced History and Theory; (Graduate Program in Landscape Architecture) Historiography and Contemporary Issues.</td>
</tr>
</tbody>
</table>

Practice Experience:

<table>
<thead>
<tr>
<th>Firm or Agency</th>
<th>Number of Years</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walter Kidde Constructors, Inc., New York, NY</td>
<td>1</td>
<td>Junior Designer: Interior design and layouts; choice of materials; design of campus master plan, annex and dormitory units; coordination with structural engineers; renderings; model building.</td>
</tr>
<tr>
<td>Department of Social Services of New York City</td>
<td>1</td>
<td>Junior Architect: Overseeing and approval of projects submitted to the Department; design of day-care centers for the City.</td>
</tr>
</tbody>
</table>

Professional Registration: Not registered.

Professional & Academic Activities.

- Director, Visual Resources Center, The New School of Architecture, PUPR (2002-2006)
Juror, Graduate and Undergraduate project review (2002-2011)

Thesis Committee Member, Master of Landscape Architecture (2009-present)

Award Winner, Public Art Project of the Commonwealth Government of Puerto Rico


**Contributions.**

As an architect and conservationist, I exhort the students to explore the meaning of place in its various dimensions and manifestations: historical, cultural, social, phenomenological and ecological. I insist on their social responsibility and participatory role toward shaping the environment and on bringing about relevant changes through an interdisciplinary approach. Through my own commitment, I underline the importance of dialogue, accessibility and passion in the pursuit of one’s own endeavors.
Name: Ramón Irizarry  
Rank: Adjunct Professor  
Department or unit: School of Landscape Architecture

**Education:**

<table>
<thead>
<tr>
<th>Institution</th>
<th>Years Attended</th>
<th>Degree/Date Granted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louisiana State University</td>
<td>4</td>
<td>Master Landscape Architecture/2003</td>
</tr>
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</table>

**Teaching Experience:**

<table>
<thead>
<tr>
<th>Institution</th>
<th>Years Taught</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polytechnic University of Puerto Rico</td>
<td>1</td>
<td>Garden Studio [Site Design]</td>
</tr>
</tbody>
</table>

**Practice Experience:**

<table>
<thead>
<tr>
<th>Firm or Agency</th>
<th>Number of Years</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIA Landscape Architects</td>
<td>5</td>
<td>Design &amp; Project Management</td>
</tr>
<tr>
<td>Pennock Growers, Inc.</td>
<td>4</td>
<td>Design &amp; Project Management</td>
</tr>
<tr>
<td>JMCP Landscape Architects Engineers</td>
<td>1</td>
<td>Data collection, analysis &amp; design</td>
</tr>
</tbody>
</table>

**Professional Registration:**

In process – Puerto Rico

**Professional & Academic Activities:**

- President, Puerto Rico Institute of Landscape Architects 2010-Present
- Vice President Puerto Rico Institute of Landscape Architects 2008-2010
- **CHARRETE INFRAESTRUCTURA VERDE** (green infrastructure) April 2007

Directed a team of students from diverse backgrounds including planning, engineering, architecture, and landscape architecture. As team leader coordinated the development of a design proposal which comprehended a series of routes that allowed the public to experience the uniqueness of the Puerto Rico’s Southwest regions natural resources. The projects extended from the municipality of Cabo Rojo to Guánica along the coast.
Publications

- Thesis: Restructuring the Spaces under Elevated Expressways: A Case Study of the Spaces below the Interstate-10 Overpass at Perkins Road in Baton Rouge, Louisiana

Contributions

- As member of the Institute of Landscape Architects of Puerto Rico collaborated on the development and revision of Laws governing the profession in the island.
Name: José Lorenzo-Torres  
Rank: Adjunct Professor  
Department: School of Landscape Architecture  

<table>
<thead>
<tr>
<th>Education:</th>
<th>Institution</th>
<th>Number of Years Attended</th>
<th>Degree/Date Granted</th>
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<tbody>
<tr>
<td>Harvard University, Cambridge, MA</td>
<td>3</td>
<td>Master of Architecture in Urban Design/2005</td>
<td></td>
</tr>
<tr>
<td>Polytechnic University of Puerto Rico</td>
<td>6</td>
<td>Bachelor of Architecture/2001</td>
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<table>
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<tr>
<th>Teaching Experience:</th>
<th>Institution</th>
<th>Years Taught</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polytechnic University of Puerto Rico, Landscape Architecture</td>
<td>5</td>
<td>Design (Regional, Garden) Representation, Thesis Research &amp; Design</td>
<td></td>
</tr>
<tr>
<td>Polytechnic University of Puerto Rico, School of Architecture</td>
<td>11</td>
<td>Design (Urban)/Architecture Conservation, Representation/Foundation</td>
<td></td>
</tr>
<tr>
<td>Instituto Superior de Arquitectura y Diseño, Chihuahua, México</td>
<td>4</td>
<td>Architecture</td>
<td></td>
</tr>
<tr>
<td>Pedro Henríquez Ureña University, Santo Domingo, D.R.</td>
<td>1</td>
<td>Architecture/2002</td>
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<table>
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<tr>
<th>Practice Experience:</th>
<th>Firm or Agency</th>
<th>Number of Years</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jorge Rigau, FAIA - Architects</td>
<td>11</td>
<td>Design Development</td>
</tr>
<tr>
<td></td>
<td>Rigau &amp; Penabad, Architects</td>
<td>6</td>
<td>Architectural Draftsman</td>
</tr>
</tbody>
</table>

Professional Registration:  
Associate AIA, 2010-Present
Professional & Academic Activities:

- Member of the advocacy committee for opening Puerto Rico’s Irrigation System for eco-tourism.

- Member of the preservation committee for San Martín de Porres temple Center for Urban Studies, School of Architecture.

- Polytechnic University of Puerto Rico, Founding director, 2005-2007; DOCOMOMO_PR, 2005-Present.

Contributions:

Professor of the first school of Landscape Architecture in Puerto Rico where I have had the opportunity to develop curricula and exercises relating to issues of architecture, urbanism and landscape urbanism.

In addition, I have incorporated into the pedagogy of the courses in architecture and architectural conservation, consciousness criteria of the discipline of landscape architecture.
Name: Luis J. Olivieri

Rank: Adjunct Professor

Department or unit: School of Landscape Architecture

Education:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Number of Years Attended</th>
<th>Degree/Date Granted</th>
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</thead>
<tbody>
<tr>
<td>University of Puerto Rico</td>
<td>2</td>
<td>BS / June, 1985</td>
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Teaching Experience:

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<thead>
<tr>
<th>Institution</th>
<th>Years Taught</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic Cape Community College</td>
<td>1</td>
<td>Geographic Information Systems (GIS)</td>
</tr>
<tr>
<td>Polytechnic University of Puerto Rico</td>
<td>3</td>
<td>Soils</td>
</tr>
<tr>
<td>Inter American University of Puerto Rico</td>
<td>3</td>
<td>GIS</td>
</tr>
<tr>
<td>University of Puerto Rico</td>
<td>10</td>
<td>Agriculture/ GIS/ Remote Sensing</td>
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Practice Experience:

<table>
<thead>
<tr>
<th>Firm or Agency</th>
<th>Number of Years</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geodec Consulting Services</td>
<td>9</td>
<td>Sole proprietor/consultant</td>
</tr>
<tr>
<td>University of Puerto Rico</td>
<td>5</td>
<td>Researcher/Professor</td>
</tr>
<tr>
<td>Ohio Department of Natural Resources</td>
<td>4</td>
<td>Program Coordinator</td>
</tr>
<tr>
<td>The Ohio State University</td>
<td>4</td>
<td>Research Assistant</td>
</tr>
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</table>

Professional Registration:

Urban & Regional Information Systems Association
Professional & Academic Activities.

- Member, Mid-Atlantic Urban and Regional Information Systems Association. 2009 - present
- Member of the Scientific Advisory Committee: 1997-2009. Jobos Bay National Estuarine Research Reserve, Salinas, PR. Part of the NOAA-NERR Program
- Member of the Accreditation Committee: 2005. Puerto Rico Council on Higher Education

Publications.


Name: Fernando Payán Aparicio

Rank: Adjunct Professor

Department or unit: School of Landscape Architecture

Education:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Years Attended</th>
<th>Degree/Date Granted</th>
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</thead>
<tbody>
<tr>
<td>University of Puerto Rico, Mayagüez Campus</td>
<td>5</td>
<td>M.Sc. Horticulure</td>
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Teaching Experience:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Years Taught</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>National University of Colombia</td>
<td>5</td>
<td>Genetics &amp; Vegetable Phisiology</td>
</tr>
<tr>
<td>Interamerican University of Puerto Rico</td>
<td>31</td>
<td>Botany, Genetics, Microbiology.</td>
</tr>
<tr>
<td>Polytechnic University of Puerto Rico</td>
<td>2</td>
<td>Botany</td>
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Practice Experience:

<table>
<thead>
<tr>
<th>Firm or Agency</th>
<th>Number of Years</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interamerican University</td>
<td>31</td>
<td>Biology, Botany, Microbiology, Genetics, Genetics, Industrial Microbiology, Virology</td>
</tr>
<tr>
<td>Guayama &amp; Barranquitas campuses</td>
<td></td>
<td>Director Department of Natural &amp; Applied Sciences</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Development of curricular proposals: Associate Degree in Landscape Architecture; G.A. in Installation and Repair of Computer Systems, Bachelor in Biotecnology, Federal Grants (MSEIP), Title V.</td>
</tr>
</tbody>
</table>

Professional Registration:

Colegio de Agrónomos de Puerto Rico
Profesional de Siembra y Forestación
Contributions.

Development of residential gardens for private homeowners and commercial lots (Popeye’s, Walgreen’s, Viejo San Juan, Capitol building, etc).

Reforestation efforts along roadways.
Name: Jorge Rigau Pérez
Rank: Professor
Department: School of Architecture; School of Landscape Architecture

Education:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Number of Years Attended</th>
<th>Degree/Date Granted</th>
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<tbody>
<tr>
<td>University of Puerto Rico</td>
<td>3</td>
<td>Master Degree in History/1991</td>
</tr>
<tr>
<td>Cornell University</td>
<td>4</td>
<td>Professional Bachelor’s Degree in Architecture/1975</td>
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Teaching Experience:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Years Taught</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate School of Landscape Architecture,</td>
<td>6</td>
<td>History of Landscape</td>
</tr>
<tr>
<td>Polytechnic University of Puerto Rico</td>
<td></td>
<td>Architecture/Historiography/Regional Studio</td>
</tr>
<tr>
<td>School of Architecture, Polytechnic University of Puerto Rico</td>
<td>16</td>
<td>History of Architecture/Historiography/Conservation/Midcareer Research/Architectural Design</td>
</tr>
<tr>
<td>Interamerican University, San Germán, Puerto Rico</td>
<td>3</td>
<td>History of Architecture/Architectural Design</td>
</tr>
<tr>
<td>School of Architecture, University of Puerto Rico</td>
<td>8</td>
<td>Architectural Design</td>
</tr>
</tbody>
</table>

Practice Experience:

<table>
<thead>
<tr>
<th>Firm or Agency</th>
<th>Number of Years</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jorge Rigau, Arquitectos</td>
<td>24</td>
<td>Private practice.</td>
</tr>
</tbody>
</table>

Professional Registration:

Puerto Rico Association of Architects and Landscape Architects, License 7650
Fellow of the American Institute of Architects, Member No. 30038578
Member, Puerto Rico’s History Academy
Professional & Academic Activities:

Campus Planning Advisor, President’s Office, Polytechnic University of PR, 2005-present
Henry Klumb Award, bestowed to an architect’s trajectory in Puerto Rico, 2006
AIA Fellowship, 2000
Two National Awards (1991, 2003), Puerto Rico Architecture Biennale

Publications:

“La legislación de la precaución en Ponce: Fábrica y fuego en la trama urbana de ciudades del suroeste de Puerto Rico” Patrimonio, OECH, V.1 2010

“La vereda metropolitana”, INforma, University of Puerto Rico, 2010

Puerto Rico Then & Now, Thames Publishing, 2009

Indice Anotado, Editorial Revés, State Historic Preservation Office, 2009

Micro, Editorial Revés, 2006

Contributions:

President, Casa del Libro, a rare-book collection and museum, 2011-2014

Pro Bono Architectural Conservation Work for San Martín Church, 2010-present

Member, Puerto Rico Chapter of DoCoMoMo, since 2006

Co-Founder, School of Landscape Architecture, Polytechnic University of Puerto Rico

Founding Dean, School of Architecture, Polytechnic University of Puerto Rico
**Name:** Marisabel Rodríguez  

**Rank:** Assistant Professor  

**Department or unit:** School of Landscape Architecture  

### Education:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Number of Years Attended</th>
<th>Degree/Date Granted</th>
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<tbody>
<tr>
<td>Cornell University, Ithaca, New York</td>
<td>3.5</td>
<td>Master of Landscape Architecture, May 1998</td>
</tr>
<tr>
<td>University of Puerto Rico, Río Piedras campus</td>
<td>4</td>
<td>Bachelor of Arts, Education, May 1992</td>
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### Teaching Experience:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Years Taught</th>
<th>Subjects</th>
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<tbody>
<tr>
<td>School of Architecture</td>
<td>4</td>
<td>Advanced Theory in Architecture, Design Conservation, History of Architecture (Teaching assistant)</td>
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### Practice Experience:

<table>
<thead>
<tr>
<th>Firm or Agency</th>
<th>Number of Years</th>
<th>Responsibilities</th>
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<tbody>
<tr>
<td>Rodríguez, Landscape Architects</td>
<td>1</td>
<td>Principal – responsible for the design and implementation of landscape architectural projects.</td>
</tr>
<tr>
<td>Polytechnic University of Puerto Rico</td>
<td>8.5</td>
<td>Direct, design, develop and implement Landscape Architecture Program and curricula.</td>
</tr>
<tr>
<td>The Trust for Public Land, Minneapolis, Minnesota</td>
<td>3</td>
<td>Collaborator in the preparation of a Wisconsin state funding proposal; a study regarding the city’s need for public space conducted for the Mayor of the city of Indianapolis, and charrettes held with the office of Calthorpe and Associates, for the city of Chaska, Minnesota.</td>
</tr>
</tbody>
</table>
Kenwood Area Association  
Minneapolis, Minnesota  
2

Develop community plans in accordance with the city of Minneapolis’ Neighborhood Revitalization Program (NRP) guidelines and funding. Assist neighborhood’s board in project implementation.

Arlington County Government  
Arlington, Virginia  
4

Design, initiate, coordinate and implement capital improvement plans. Review and revise neighborhood initiated conservation plans.

Professional Registration:
Registered Landscape Architect, #25, Puerto Rico

Professional & Academic Activities
American Society of Landscape Architects  
1999 - present

Colegio De Arquitectos & Arquitectos Paisajistas de Puerto Rico (CAAPPR)  
2000 - present

Member, Institute of Landscape Architects (IAPR), CAAPPR  
2000 – present

Delegate, International Federation of Landscape Architects (IFLA)  
2006 – present

Liaison between IFLA and the CAAPPR

Member, Public Practitioners Advisory Committee, ASLA  
2009 – present

Professional Practice
Director, Urbanism Committee, DoCoMoMo Puerto Rico  
2008 - 2010

Vice President, Institute of Landscape Architects (IAPR), CAAPPR  
2006 - 2007

Member, Education Committee, CAAPPR  

Exhibitor at IAPR LA Week, CAAPPR  
2009, 2010

Co-founder & Exhibitor at IAPR LA Week, CAAPPR  
2006
Publications

Every Tree Tells a Story, Landslide 2010, The Cultural Landscape Foundation, Garden Design & American Photo Magazines, October 27, 2010

Policy Shaper: José Ortega, LAND Online, May 20, 2010

“Logros y Reconocimientos de la Escuela de Arquitectura Paisajista de la Universidad Politécnica”, Foro de Diseño y Construcción, Primera Hora, November 8th, 2010

“Tras el rastro de Paul Schumm”, El Nuevo Día, September 15, 2007

“Mal obnubilador sería”, Suplemento, El Nuevo Día, September 27, 2006

“La Arquitectura Paisajista”, Revista Habitat, El Vocero, Abril 8, 2006

“Relevancia de la Arquitectura Paisajista”, El Nuevo Día, November 17, 2005

Lectures

“Conservación y Paisaje”, Serie - Preservation 101 Series, Architecture Foundation, October 21, 2010

“Tradición de la Arquitectura Paisajista en Puerto Rico”, April 22nd, 2010

“Paisajismo y urbanismo”, Architecture Foundation, November 5th, 2009

“Historical evolution of the profession in Puerto Rico”, CAAPPR, 2008

“Arquitectura Paisajista en el Siglo XXI”, San Juan, Puerto Rico, December 7, 2006

“Paisaje por Escamondarse”, ACUP, San Juan, Puerto Rico, October 20, 2006

“Introducción a la Arquitectura Paisajista”, Botanical Garden, Río Piedras, Puerto Rico, February 2006

Contributions

Licensure
Depositions and correspondence in support of professional efforts to clarify boundaries among design and related construction professions, April 2011

Research
SHPO Grantee, The Landscape Legacy of the Modern Movement in Puerto Rico, 2010 - present
<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Juror</td>
<td>Advisor to Final Project for Architecture students, 2010</td>
</tr>
<tr>
<td>Profession’s Exposure</td>
<td>“Cultural landscapes”, Arquitectura HOY, Radio Interview, November 28th, 2010</td>
</tr>
<tr>
<td>Exhibitor</td>
<td>Participant with student Thesis work at the 6th Biennial Architecture and Landscape, Barcelona, 30 September - 15 October, 2010</td>
</tr>
<tr>
<td>Profession’s Exposure</td>
<td>“Arquitectura Paisajista”, Arquitectura HOY, Radio Interview, April 18, 2010, Interview with a senior professional, Mrs. Virginia Pennock, RLA, Olga Angueira, LAIT, and Marisabel Rodríguez, RLA</td>
</tr>
<tr>
<td>Community Outreach</td>
<td>Team leader, Charrette BosqueEscuela La Olimpia, Casa Pueblo, Adjuntas, March 5 - 7, 2010, Students: Rey Caraballo, Laura Lugo Caro, Ricardo Sánchez</td>
</tr>
<tr>
<td>Community Outreach</td>
<td>Sponsorship of Park(ing) Day, for the first time in the island and recurrent, 2009 &amp; 2010</td>
</tr>
<tr>
<td>Profession’s Exposure</td>
<td>“La profesión de la Arquitectura Paisajista”, Arquitectura HOY, Radio Interview, December 20, 2009</td>
</tr>
<tr>
<td>Outreach</td>
<td>Park(ing) Day video interview for Popular Bank, September 23, 2009</td>
</tr>
<tr>
<td>Licensure</td>
<td>Deposition to the State Examining Board regarding proposed regulatory revisions, September 1, 2009</td>
</tr>
<tr>
<td>Exhibitor</td>
<td>Participant at the Photographic exposition “Orden en el caos”, held during Landscape Architecture week, CAPPR, April 17, 2009</td>
</tr>
<tr>
<td>Community Outreach</td>
<td>Orientation regarding the landscape architecture profession for Baldwin High School’s, Environment Student Committee, April 3, 2009</td>
</tr>
<tr>
<td>Community Outreach</td>
<td>Participant, Isabela Irrigation Channels System, Isabela, 2008</td>
</tr>
<tr>
<td>Outreach</td>
<td>Orientations about Landscape architecture at Zingiber Society of Puerto Rico, 2006 - 2008</td>
</tr>
<tr>
<td>International Letter</td>
<td>submitted to Anita Berrizbeitia and DoCoMoMo International, in support of conservation efforts for Roberto Burle Marx’s Parque del Este in Caracas, Venezuela, October 7 - 8, 2008</td>
</tr>
</tbody>
</table>
Name: Jaime Suárez
Rank: Professor
Department or unit: School of Architecture; School of Landscape Architecture

Education:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Number of Years Attended</th>
<th>Degree/Date Granted</th>
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<tbody>
<tr>
<td>Columbia, University, NY</td>
<td>1</td>
<td>MA Design/1970</td>
</tr>
<tr>
<td>Catholic University of America,</td>
<td>5</td>
<td>BA Architecture/1969</td>
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<tr>
<td>Washington, DC</td>
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Teaching Experience:

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<thead>
<tr>
<th>Institution</th>
<th>Years Taught</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polytechnic University of Puerto Rico</td>
<td>16</td>
<td>Undergraduate Design (various levels)</td>
</tr>
<tr>
<td>New School of Architecture</td>
<td></td>
<td>Electives in Ceramics and Set Design</td>
</tr>
<tr>
<td>Polytechnic University of PR</td>
<td>5</td>
<td>Graduate Design: Garden Studio, Urban Studio</td>
</tr>
<tr>
<td>Graduate School of Landscape Architecture</td>
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<td></td>
</tr>
<tr>
<td>University of PR, Rio Piedras Campus</td>
<td>3</td>
<td>Undergraduate Design</td>
</tr>
<tr>
<td>School of Architecture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casa Candina, Inc., San Juan, PR.</td>
<td>10</td>
<td>Ceramics, Design</td>
</tr>
<tr>
<td>Liga de Estudiantes de Artes, San Juan, Puerto Rico</td>
<td>4</td>
<td>Ceramics</td>
</tr>
</tbody>
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Practice Experience:

<table>
<thead>
<tr>
<th>Firm or Agency</th>
<th>Number of Years</th>
<th>Responsibilities</th>
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<tbody>
<tr>
<td>New School of Architecture</td>
<td>7</td>
<td>Director Academic Affairs</td>
</tr>
<tr>
<td>Polytechnic University of PR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casa Candina, Inc., San Juan, P.R.</td>
<td>10</td>
<td>Co-Director</td>
</tr>
<tr>
<td>Jaime Suarez Diseño, San Juan, P.R.</td>
<td>39</td>
<td>Ceramic Artist, Exhibition, Set and Costume Designer</td>
</tr>
</tbody>
</table>
Partner Suárez & Suárez Diseño 4 Architect
San Juan, P.R.

Toro & Ferrer Architects 3 Urban Designer
San Juan, P.R.

Corporación de Renovación Urbana y Vivienda (Federal Housing Program) 1 Architect
San Juan, P.R.

The Real Great Society 1 Architect
Advocacy Urban Planning Studio
New York, N.Y.

Professional & Academic Activities:

Offices Held in Committees & Boards.
- Secretary, Board of Directors School of Visual Arts, San Juan, P.R.
- President, Ballets de San Juan Trust, San Juan, P.R.
- Member, Board of Directors Casa Candina, Inc.
- Director of Academic Affairs, School of Architecture, Polytechnic University
- Member, Steering Committee Alianza Arte Santurce, San Juan, P.R.
- Member, Curriculum & Faculty Committees; School of Architecture and School of Landscape Architecture PUPR, San Juan, P.R.
- Member, Advisory Board, Museum and Center for Humanistic Studies, Turabo University, Gurabo, P.R.
- Founding Member of Mano a Mano por Haití, fundraising arm of the International Feminist Camp, established in Haiti by F.I.R.E. (Feminist International Radio Enterprise).

Exhibitions
- Galería de las Tierras, Museo de Arte de Puerto Rico (Individual Exhibition), 2008
- Group Exhibition, Martínez Gallery, Troy, N.Y. 2007
- Stratified Landscapes, Gandía Arts, San Juan, P.R. 2006
**Professional Registration:**

- Member of Colegio de Arquitectos y Arquitectos Paisajistas de Puerto Rico (CAAPPR): Registered Architect # 6408
- Member of International Academy of Ceramics, Geneva, Switzerland.

**Publications/Citations.**


**Public Commissions**

- Relieve, Cancer Research Center, San Juan, P.R. 2009
- De los muros demuidos, UPR Cayey Campus 2007
- Jardín de vestigios, Sculpture Garden, Caguas, P.R. 2007
- De los muros demuidos: pórtico, UPR Bayamón Campus 2006

**Contributions.**

- Participation in establishment of the graduate Landscape Program at Polytechnic University, and continuous participation in its promotion.
- Promotion of the re-activation and improvement of public spaces through participation in the Arte Santurce Cultural District.
- Promoter and Co-Curator of Exterior Contemporary Ceramic Collection, Parque de la Laguna Jaime Benítez, Condado, P.R.
Name: José Juan Terrasa-Soler  
Rank: Adjunct Professor  
Department or unit: School of Landscape Architecture

Education:  

<table>
<thead>
<tr>
<th>Institution</th>
<th>Number of Years Attended</th>
<th>Degree/Date Granted</th>
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<tbody>
<tr>
<td>Harvard University</td>
<td>3</td>
<td>Master in Landscape Architecture, 7 June 2007</td>
</tr>
<tr>
<td>Cambridge, MA</td>
<td></td>
<td></td>
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<tr>
<td>Yale University</td>
<td>2</td>
<td>Master of Environmental Studies, 7 June 1997</td>
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<tr>
<td>New Haven, CT</td>
<td></td>
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<tr>
<td>Loyola University Chicago</td>
<td>1</td>
<td>Graduate School '94-95</td>
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<tr>
<td>Chicago, IL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The University of Michigan</td>
<td>2</td>
<td>Master of Science, 1 May 1992</td>
</tr>
<tr>
<td>Ann Arbor, MI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mount Saint Mary’s College</td>
<td>4</td>
<td>Bachelor of Science, 20 May 1990</td>
</tr>
<tr>
<td>Emmitsburg, MD</td>
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Teaching Experience:  

<table>
<thead>
<tr>
<th>Institution</th>
<th>Years Taught</th>
<th>Subjects</th>
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<tbody>
<tr>
<td>Polytechnic University of Puerto</td>
<td>4</td>
<td>Landscape Architecture design and theory; environmental systems</td>
</tr>
<tr>
<td>Rico – graduate</td>
<td></td>
<td></td>
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<tr>
<td>University of Puerto Rico</td>
<td>1</td>
<td>Fluvial Systems</td>
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<tr>
<td>Río Piedras, PR - undergraduate</td>
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Practice Experience:  

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<th>Firm or Agency</th>
<th>Number of Years</th>
<th>Responsibilities</th>
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<tr>
<td>Puerto Rico Tourism Company</td>
<td>2</td>
<td>Deputy Executive Director, Planning &amp; Development</td>
</tr>
<tr>
<td>EnviroDesign Studio/ Microtectura</td>
<td>2</td>
<td>Designer</td>
</tr>
<tr>
<td>CSA Architects &amp; Engineers</td>
<td>7</td>
<td>Management Environmental Unit (30 persons)</td>
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</table>
Professional Registration:

Landscape Architect in Training, Puerto Rico, 2007

Professional & Academic Activities:

Memberships/Offices held

- Ex officio Member, Board of Directors, Puerto Rico National Parks Company, 2009-present
- Member, Advisory Council on Urban Renewal and Urbanism, Center for Puerto Rico (Governor Sila María Calderón Foundation), San Juan, PR, 2011-present
- Professional College of Architects and Landscape Architects of Puerto Rico
  - Member, Editorial Board, professional-cultural journal "Entomo", 2007-2009
  - Member, Environmental Affairs and Sustainability Commission, 2009
- Institute of Landscape Architects of Puerto Rico
  - Member, Board of Directors, 2007-2009
  - President, Environmental Affairs Committee, 2007-2009
- Institute of Professional Environmental Practice
- Sigma Xi – The Scientific Research Society

Funding

- Penny White Award (Research Grant), Harvard University, 2006
- National Oceanic and Atmospheric Administration Research Grant, La Parguera Green Infrastructure Plan, 2010 (with the Center for Watershed Protection, Maryland)

Exhibitions (selection)


Interviews

- El Día de Toledo [newspaper, Toledo, Spain], 17 July 2006 (front page, p. 6-7), Urbanism in Toledo (Spain)
- Caribbean Business [weekly newspaper, Puerto Rico], 30 April 2009 (Construction, p. S10), "Landscape architect is Tourism's Director of Planning & Development"
- Arquitectura Hoy [weekly radio show by the Colegio de Arquitectos y Arquitectos Paisajistas de Puerto Rico, WKAQ Radio 580 AM].
  - 7 March 2010 – The architect in the public sector
  - 20 June 2010 – Architecture and Tourism
Publications:


Coalition of Caribbean Urbanists. 2010. Workshop on the Reconstruction of Port-au-Prince, Haiti. San Juan, Puerto Rico. July 2010. 50 p. [J. J. Terrasa-Soler is a member of the Coalition that produced this Report on an urban vision for the city to the year 2030. He led the group that worked on Open Space, Parks, Urban Agriculture, and Landscape Architecture. The Report may be viewed at: www.urbanistsplanportauprince.com].

Contributions:

Since graduation from Harvard (M. L. A., 2007), I have been deeply involved in advancing landscape architecture in Puerto Rico. I have been continuously involved since 2007 in teaching at the Polytechnic University of Puerto Rico; publishing in academic periodicals, newspapers, and other media; and serving on various capacities in the Colegio de Arquitectos y Arquitectos Paisajistas de Puerto Rico, our professional institution. Since 2009, I am one of the very few architects or landscape architects serving in executive positions within the Government of Puerto Rico.
Name: Dr. Alejandro Torres-Abreu

Rank: Adjunct Professor

Department or unit: School of Landscape Architecture

### Education:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Number of Years Attended</th>
<th>Degree/Date Granted</th>
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<tbody>
<tr>
<td>Lancaster University, UK</td>
<td>6</td>
<td>Ph.D. Environment and Society</td>
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<tr>
<td>Free University of Brussels, Belgium</td>
<td>2</td>
<td>M.Sc. Human Ecology</td>
</tr>
<tr>
<td>University of Puerto Rico, Río Piedras</td>
<td>5</td>
<td>B.A. Interdisciplinary Studies</td>
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### Teaching Experience:

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<tr>
<th>Institution</th>
<th>Years Taught</th>
<th>Subjects</th>
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<tbody>
<tr>
<td>University of Puerto Rico, Cayey</td>
<td>6</td>
<td>Environment, Democracy and Citizenship, Environment and Health in Puerto Rico, Introduction to Western Cultures I and II</td>
</tr>
<tr>
<td>Polytechnic University of Puerto Rico</td>
<td>1</td>
<td>Ecology and Technology</td>
</tr>
<tr>
<td>University of Puerto Rico, Río Piedras</td>
<td>1</td>
<td>Introduction to Sociology</td>
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### Practice Experience:

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<tr>
<th>Firm or Agency</th>
<th>Number of Years</th>
<th>Responsibilities</th>
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<tbody>
<tr>
<td>Institute for Interdisciplinary Research</td>
<td>4</td>
<td>P.I. research initiatives on water and forest conservation</td>
</tr>
<tr>
<td>Planning Department, Municipality of Carolina</td>
<td>2</td>
<td>Consultant conservation strategies, Land use change analysis</td>
</tr>
<tr>
<td>Conservation Trust of Puerto Rico</td>
<td>2</td>
<td>Coordination reforestation program, Environmental interpretation guide</td>
</tr>
</tbody>
</table>

### Professional & Academic Activities:

Selected presentations

- Forest Management and Public Participation in Puerto Rico Conference Series: Globalization, Peace and Sustainability Luis Muñoz Marín Foundation
- Lessons from the Super-pipe: Water Infrastructures and Consumption Dynamics in
Modern Puerto Rico
First World Congress of Environmental History
Copenhagen, Denmark, August 4-9

Industry, Academia and the Biotechnology Project: A Critical Perspective about Puerto Rico’s Experience
Co-authors: Dr. Concepción and Prof. Fontánez
X International Congress on Thought and Education
Cartagena de Indias, Colombia, May 13-15

Memberships: Waterlat and Society for Applied Anthropology

Publications.


Contributions.

Promoting an interdisciplinary perspective in landscape architecture projects aimed at enhancing quality of life among the general public (i.e. Infrastructures for environmental interpretation)

Strengthening student’s research skills on the social aspects of landscape architecture through the design of class projects that encourage community consultation and engagement in project design and implementation
Name: Juan Carlos Velázquez Figueroa

Rank: Adjunct Professor

Department or unit: School of Architecture

<table>
<thead>
<tr>
<th>Education</th>
<th>Number of Years Attended</th>
<th>Degree/Date Granted</th>
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<tbody>
<tr>
<td>Facultad de Bellas Artes, Universidad Complutense de Madrid</td>
<td>3</td>
<td>Licenciatura (MFA) July, 1988 (Sculpture department scholar)</td>
</tr>
<tr>
<td>Escuela de Artes Plásticas de Puerto Rico</td>
<td>4</td>
<td>Bachelor degree (BFA) May, 1985 (Magna Cum Laude)</td>
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<table>
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<th>Subjects</th>
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<tr>
<td>Escuela Graduada de Arquitectura Paisajista, Universidad Politécnica de Puerto Rico</td>
<td>4</td>
<td>Representation, Sculpture</td>
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<tr>
<td>Escuela de Arquitectura, Universidad Politécnica de Puerto Rico</td>
<td>14</td>
<td>Linear Perspective, Drawing, Introduction to 2D and 3D Design</td>
</tr>
<tr>
<td>Universidad Metropolitana de Puerto Rico, Sistema Universitario Ana G. Méndez</td>
<td>2</td>
<td>Art Appreciation, Humanities</td>
</tr>
<tr>
<td>Escuela de Artes Plásticas de Puerto Rico</td>
<td>4</td>
<td>Sculpture</td>
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<th>Practice Experience</th>
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<th>Responsibilities</th>
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<tbody>
<tr>
<td>Escuela de Arquitectura, Universidad Politécnica</td>
<td>2</td>
<td>Coordinator, Architectural Drawing courses</td>
</tr>
<tr>
<td>Escuela de Arquitectura, Universidad Politécnica</td>
<td>11</td>
<td>Academic Mentor</td>
</tr>
<tr>
<td>Escuela de Arquitectura, Universidad Politécnica</td>
<td>3</td>
<td>Member, Outcomes' Assessment Committee</td>
</tr>
<tr>
<td>Colegio San Antonio</td>
<td>18</td>
<td>Director, Fine Arts</td>
</tr>
<tr>
<td>Department and professor</td>
<td>Program de Puerto Rico</td>
<td>Program de Puerto Rico</td>
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<td>----------------------------------------------</td>
<td>------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Escuela de Artes Plásticas de Puerto Rico</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Academic Senator</td>
<td>Director, Extension</td>
<td>Director, Rehabilitation Program for Young People, Gypsum and plaster conservation, and mold construction workshop.</td>
</tr>
<tr>
<td></td>
<td>Assistant Professor</td>
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</tr>
</tbody>
</table>

### Professional & Academic Activities

- **Sculpture studio and workshop**, Toa Alta, Puerto Rico. 1990 – present
- **Sculpture consultation, Glass mosaic conservation and reconstruction,** Arch. Jorge Rigau, “Casa de España” Building, San Juan, Puerto Rico. 2004
- **Sculpture consultation, Damage report of the altarpiece at the “Santuario de Nuestra Señora de la Monserate”, Homigueros, Puerto Rico**
- **Sculpture consultation, Gypsum and Plaster conservation, Arch. Francisco Ojeda and Assoc. “Senate Building”, San Juan, Puerto Rico. 1991**
- **Conservation workshop, Gypsum and Plaster conservation and mold construction, “Teatro La Perla”, Ponce, Puerto Rico. 1990**
- **Conservation workshop, Gypsum and Plaster conservation and mold construction, “Casa de las Cariátides” Head office of the “Instituto de Cultura Puertorriqueña”, Ponce, Puerto Rico. 1990**
- **Conservation workshop, Glass mosaic conservation and reconstruction, Old market “Plaza los Perros”, Ponce, Puerto Rico. 1990**
- **Conservation workshop, Gypsum and Plaster conservation and mold construction, “Café Plaza” Building, Ponce, Puerto Rico. 1990**
- **Conservation workshop, Gypsum and Plaster conservation and mold construction, “Casa Monasillos” Building, Río Piedras, Puerto Rico. 1990**
- **Conservation workshop, Gypsum and Plaster restoration, Scale model “Universidad Complutense de Madrid in 1946”, Contemporary Art Museum, Madrid, Spain. 1988**
- **Conservation workshop, Gypsum and Plaster restoration, Scale model “Universidad Complutense de Madrid after Civil War, 1939”, Contemporary Art Museum, Madrid, Spain. 1988**

Publications.

Graphic Designer, Literary Anthology “Géneros”, San Antonio H.S., Río Piedras, Puerto Rico. 1997 – present
Name: Jammile A. Victorio Sánchez, AIT
Rank: Assistant Professor
Department or unit: School of Landscape Architecture

<table>
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<tr>
<th>Education:</th>
<th>Number of Years Attended</th>
<th>Degree/Date Granted</th>
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<tbody>
<tr>
<td>University of Puerto Rico</td>
<td>2006 - today</td>
<td>Master in Planning - Thesis in progress</td>
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<tr>
<td>University of Puerto Rico</td>
<td>1999 - 2005</td>
<td>Master in Architecture</td>
</tr>
<tr>
<td>University of Puerto Rico</td>
<td>1995 - 1999</td>
<td>Bachelor in Environmental Design</td>
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Teaching Experience: Undergraduate and Graduate levels

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<tr>
<th>Institution</th>
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<tbody>
<tr>
<td>Polytechnic University of PR</td>
<td>2008</td>
<td>Design: Regional Studio, LA 6150</td>
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<tr>
<td>University of Puerto Rico</td>
<td>1999 - 2001</td>
<td>Teaching Assistant for structures class</td>
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Practice Experience:

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<th>Number of Years</th>
<th>Responsibilities</th>
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<tbody>
<tr>
<td>Professional Association of Architects and Landscape Architects</td>
<td>2010 - present</td>
<td>Audit construction project files to verify if they are in compliance with payments to professional associations and to the state revenue of construction cost. Designing and implementing urban renewal policies and programs oriented towards traditional urban centers in cities and towns in the island. Promoting state programs and working closely with private investors preparing schematic design of public works.</td>
</tr>
<tr>
<td>Puerto Rico Highway and Transportation Authority, Office of Strategic Planning</td>
<td>2003 - 2006</td>
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Professional Registration:
Professional Association of Architects and Landscape Architects of Puerto Rico, 2006 - present.
FACILITIES INFORMATION

Program Facilities

Commonly referred to – by students and faculty alike, as “la Casita” – the small house, the School of Landscape Architecture occupies a two story building. All School activities take place in this compressed locale, housing approximately 50 individuals at various points in time. Facilities are devoted strictly to the MLA students.

<table>
<thead>
<tr>
<th>Room #</th>
<th>Size (SF)</th>
<th>Max. Capacity Normal Max. Users</th>
<th>Type of Space (studio, office, storage, etc.)</th>
<th>Exclusive Use</th>
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<tbody>
<tr>
<td>Hortus ludis</td>
<td>312</td>
<td>15</td>
<td>Classroom, studio</td>
<td>E</td>
</tr>
<tr>
<td>Hortus contemplationis</td>
<td>200</td>
<td>12</td>
<td>Conference, classroom</td>
<td>E</td>
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<tr>
<td>Hortus conclusus</td>
<td>456</td>
<td>33</td>
<td>Classroom</td>
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<tr>
<td>(frigidarium)</td>
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<tr>
<td>Hortus catalogi</td>
<td>552</td>
<td>12</td>
<td>Studio</td>
<td>E</td>
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<tr>
<td>Hortus “Zen” (2 rooms of the same size)</td>
<td>56</td>
<td>3</td>
<td>Individual work space</td>
<td>E</td>
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<tr>
<td>Hortus clerestorium</td>
<td>120</td>
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<tr>
<td>(2 rooms of the same size)</td>
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</table>
LIST OF APPENDIXES:

Appendix #1:
School of Landscape Architecture, STRATEGIC PLAN 2010-2015

Appendix #2:
Polytechnic University of Puerto Rico’s Graduate School Course Catalogue

Appendix #3:
MLA Program Brochure

Appendix #4:
Faculty Recruitment Advertisement in ASLA Online/May 14, 2008
www.asla.org/joblink

Appendix #5:
Non-departmental elective courses (Open Elective requirement)

Appendix #6:
Sample Course Syllabus – LA 6220 - Historiography

Appendix #7:
Internal Evaluation Form for Course Assessment

Appendix #8:
MLA Program Course Matrix

Appendix #9:
Alumni Registry and Profile

Appendix #10:
Library Resources

Appendix #11:
Information Literacy Workshops
Appendix #1: School of Landscape Architecture
STRATEGIC PLAN 2010-2015

This plan was developed in accordance with the six (6) planning goals identified as such in Polytechnic University’s Institutional Strategic Plan 2010-2015:

1. Increase the recruitment of talented and underrepresented students.
2. Increase the retention, persistence, and graduation rates of students.
3. Improve integration with society.
4. Develop organizational structures, processes, and infrastructure to support high quality education.
5. Recruit, retain, promote and compensate faculty members who significantly contribute to the institutional development.
6. Encourage and develop graduate and undergraduate research with emphasis on energy and the environment.

The School of Landscape Architecture’s Strategic Plan was formalized after meetings with the President of the University, the Vice President for Academic Affairs (Provost), and the Dean of Polytechnic’s Graduate School. Objectives are listed below, explaining simultaneously how they will be met.

Short Range Objectives

1. Increase Enrollment to ensure the school’s fiscal and academic health.

Promotional efforts will be further expanded through press exposure, radio programming, and informative sessions at undergraduate institutions. Orientations at high school level will help to spread interest on the subject early on. Every opportunity (conferences, discussion panels, debates) to educate publicly about Landscape Architecture will be capitalized upon. Those students, who -in spite of having completed a significant number of credits - have not returned to the program, will be contacted and encouraged to complete their course requirements.

2. Implement Curriculum Review to execute decisions regarding content changes, additions, and overlaps, taking into account credit requirements, while maintaining long standing academic quality standards.

Comparative data from university officials and other departments sharing similar processes will be evaluated in terms of their administrative impact.
Contents concerns are to be addressed in a threefold manner: reviewing other institutions’ curricular structure; coordinating ad hoc faculty sessions; and delegating in academic subcommittees. Topics for revising curricular contents include: representation skills, design development of construction details of relative complexity; grading proficiency; soils as a concern pertinent to construction, and awareness of sustainability as a multifaceted issue. A revised curriculum should be in place for the class entering in Fall 2011. Follow up evaluation meetings will be held each trimester.

3. **Recruit a third Full-Time Faculty Member** to promote diversity and program stability, as well as insure students’ exposure to different approaches regarding landscape architecture.

4. **Institutionalize an Advisory Board.**

The board will warrant diversity, but also stability and continuity of its initiatives by incorporating key officers from related, high profile entities in the Island:

- Past President  
  *Landscape Architecture Institute of Puerto Rico*

- Director of Education Commission  
  *Puerto Rico Architects’ and Landscape Architects’ Association*

- President  
  *Puerto Rico Chapter of the International Society of Arborists*

- Vice President  
  *Puerto Rico Planning Society*

An alumnus and two representatives from industry and public relations will complete the group, for a total of seven (7) members. The Advisory Board will meet three (3) times per year; the Landscape Architecture School will provide facilities and administrative support for its operation and record keeping.

The Board should start operating before Academic Year 2011-2012, with a first assessment of its performance scheduled for Summer 2012.

5. **Identify Alternate Funding Venues** to subsidize lecturers, visiting critics, school events, awards, and student and faculty initiatives.
Direct and in-kind support from key industry representatives and local organizations will be pursued, first targeting those entities with which the members of the Advisory Board have contacts. Identification of applicable grant programs will be carried out with assistance of the institution’s Research and Development Office. Practicing landscape architects will be asked to contribute to the establishment of a scholarship fund.

6. Articulate and formalize Career Advising Services as catalyst for employment support in a fiscally challenged job environment, identifying follow up strategies to ascertain performance.

A mentorship program will be established for upperclassmen, entrusting faculty members trained in landscape architecture to orient candidates for graduation about the job panorama in and outside Puerto Rico. Selected professors will be required to attend a training seminar to that effect. They will evaluate and report on the program’s effectiveness. Advertisements that are now posted at school and/or informed verbally, and emailed to advanced students and alumni will be complemented with the support of the University’s COOP Office, responsible for identifying practice opportunities and allocating students accordingly.

Current dissemination efforts to inform alumni about job positions shall incorporate orientations regarding Web searches on various sites like Land 8 Lounge, ASLA, AECOM and other similar ones.

7. Design a Multi-year Contract Award System for Faculty.

A more “stable” system of faculty recruitment might make teaching positions more attractive to prospective candidates.

8. Further coordination with other university programs.

Given Polytechnic’s University extended offerings regarding the construction industry, our Program has yet to identify many more possible venues of collaboration, profiting from teaching and learning resources at our disposal.

9. Strengthen ties with ASLA to stimulate faculty and student participation in ASLA-sponsored events and competitions.

ASLA’s membership benefits will be divulged further, particularly as the program grows and students grow familiar with the association’s achievements and services.
10. **Incorporate LAAB 2011 Recommendations** to tackle program needs and areas of action underlined in the first evaluation visit scheduled for Spring 2011.

Based on the exit interviews and the Findings Report, recommendations will be reviewed with university administrators, faculty (including academic subcommittees), students, and the Advisory Board. The School’s Strategic Plan may be amended accordingly to act upon it.

**Long Range Objectives**

The Landscape Architecture Program has identified these long-range objectives in preliminary manner, in anticipation of an updated version of Polytechnic University’s Institutional Strategic Plan 2010-2015, as well as LAAB’s 2011 Evaluation Visit results. Based on the university’s revisions to the plan, all units will be required to restructure their individual strategic plans.

1. **Pursue** expanded and improved facilities and resources.

   *Escalating funds will be allocated yearly to enable development.*

2. **Attract** more students and faculty from the Caribbean Region.

   *Formalizing networking efforts already initiated with Dominican Republic, Colombia, and Costa Rica.*

3. **Expand** the School’s fiscal base.

   *Increasing tuition income and, as a complement, institutionalizing continued education courses and grant-generating initiatives.*

4. **Partner** with industry and the entrepreneurial world.

   *Linking the School’s research and design efforts with business, management, and market concerns.*

5. **Consider** the future establishment of an undergraduate degree in Landscape Architecture.
Weighing in the potential of a BLA program at Polytechnic University to attract students, engage more full-time faculty and, simultaneously, feed the Masters Degree Program.

This Strategic Plan will be evaluated on a yearly basis and revised then, if required. Amendments submitted by the School’s Advisory Board, faculty and students during the Fall trimester will be considered by the Program Administrator during the Winter trimester, prior to the definition of budget allocations pertaining to the following academic year. This calendar coincides with any revisions that may be incorporated after LAAB’s Evaluation Visit to take place in Spring 2011.

Marisabel Rodríguez, ASLA
Program Director

Date Adopted – August 2010
## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
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<tbody>
<tr>
<td><strong>I. CAMPUS MAP</strong></td>
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<tr>
<td><strong>II. LOCATION MAP</strong></td>
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</table>
I. CAMPUS MAP

1. Main Building, University Administration
2. Engineering Laboratories Building
3. Library
4. Amphitheater
5. Multi-Purpose Building: (School of Architecture, Basketball Court, Cafeteria, Student Center, Science Art Deanship, Security Office)
6. Fifth Centennial Plaza
7. Student's Parking
8. Pavilion: (School of Management, Geomatic Sciences Department)
9. Parking for Faculty, Administration and Visitors
10. School of Landscape Architecture
11. Graduate School
12. Medical Services
13. General Services
14. Main University Entrance
15. Alhambra Street
16. Ponce de León Ave.
17. José Martí Street

II. LOCATION MAP

III. ACADEMIC CALENDAR

Academic Year 2007-08 to 2010-2012

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<td>SU/13</td>
<td>June 10, 2013</td>
<td>July 20, 2013</td>
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</table>
ACTIVITIES ON THE ACADEMIC CALENDAR

1) **Admissions Deadline:**
   Two weeks before the beginning of the academic term. Deadlines for submission of materials may vary by program. Submission of Late applications require the authorization of the Graduate Affairs Office Supervisor.

2) **Orientation and Pre-Registration of New Graduate Students:**
   Saturday prior to the beginning of the regular registration period.

3) **Regular Registration Period:**
   One week prior to the beginning of the term.

4) **Beginning of the Term (Monday):**
   Classes begin on the Monday after the week of registration. Three credit-hour graduate courses meet once a week with a duration of 4 hours per session for a twelve week period, equivalent to three semester credit-hours.

Courses during the summer term meet twice a week with a duration of 4 hours per session for a six week period.

5) **Deadline for Late Registration and Course Changes:**
   Friday of the first week of each term.

6) **Deadline for Completing Pending Projects and to Remove Incomplete Grades:**
   Eleven (11) weeks after the end of the preceding term are allowed for this purpose (tenth week of the current term).

7) **Deadline for the First Partial Examination:**
   The fourth week of each term (first third of the term).

8) **Deadline for the Second Partial Examination:**
   The eighth week of each term (second third of the term).

9) **Deadline for Partial or Total Withdrawal:**
   Students may withdraw totally or partially until the tenth week of the current term, and receive a grade of "W".

10) **Period of Early Registration:**
    Eleventh week of the current term.

11) **Regular Registration Period:**
    The registration period will be held in the recess period between terms. Active students will be notified in advance of their registration day.

IV. BOARD OF TRUSTEES

René Di Cristina, B.S.C.E, P.E., Chairman
Ricardo Jaen Presmo, M.D., Vice Chairman
Luis Carreras Acevedo, B.A., Treasurer
Edna Vázquez Bonnet, M.B.A., Secretary

Luís Fullana, B.S.
Genaro Negrón, B.S., M.G. S.,
María Magdalena Díaz Vilá, B.S.C.E.
Irving A. Jiménez Juarbe, B.A., M.S.W., Esq.,
Ernesto Vázquez Barquet, B.B.A., M.B.A.

V. INFORMATION DIRECTORY

Mailing Address:    P.O. Box 192017
                   San Juan, Puerto Rico 00919-2011
Street Address:     377 Ponce de León Avenue
                   San Juan, Puerto Rico 00918
University Switchboard: (787) 754-8000 / (787) 622-8000
Fax (787) 763-8919 - Office of the President
Fax (787) 281-8342 - School of Engineering
Fax (787) 767-0607 - School of Architecture
Fax (787) 754-5931 - Dean of Arts and Science
Fax (787) 756-8647 - Department of Science and Math.
Fax (787) 767-2921 - Department of Scientific Research
Fax (787) 758-1334 - Vice President – Enrollment
                     Management and Student Services
Fax (787) 766-1163 - Financial Aid Office
Fax (787) 763-3028 - Library
Fax (787) 763-8275 - Collector’s Office
Fax (787) 753-4465 - Accounting
Fax (787) 274-8562 - COOP Program
Fax (787) 753-6569 - Human Resources
Fax (787) 764-1902 - Registrar’s Office
Fax (787) 754-8268 - Planning and Development
Fax (787) 758-3383 - Student Integrated Service Center
Fax (787) 756-7274 - School of Management
Fax (787) 758-7933 - Graduate School
Fax (787) 763-6867 - Security
Fax (787) 771-0013 - Geomatic Sciences
Fax (787) 773-0098 - Civil Engineering
Fax (787) 765-9207 - Industrial Engineering
Fax (787) 771-0011 - Mechanical Engineering
Fax (787) 771-0010 - Chemical Engineering
Fax (787) 281-8342 - Electrical Engineering
Fax (787) 758-3522 - Alumni
Fax (787) 753-1675 - Informatics
Fax (787) 754-8520 - Educational Services
Fax (787) 751-0545 - General Services
Fax (787) 766-4925 - Physician
Fax (787) 250-8131 - UPADI
Fax (787) 756-8647 - Socio-Humanistic
Fax (787) 625-0415 - Retention Management
Fax (787) 625-0414 - Distance Learning
Fax (787) 294-1816 - Continuing Education Center
Fax (787) 771-0012 - Compliance: Heath Safety and Environmental
Fax (787) 625-0414 - Dean for Academic Support
Fax (787) 754-8821 - Purchasing
Fax (305) 418-4325 - Miami Campus
Fax (407) 677-5082 - Orlando Campus
Internet Home Page: http://www.pupr.edu
Graduate School Home Page: http://www.pupr.edu/gs

Graduate Catalog 2010-11 to 2011-12

Update Winter 2010
VI. ADMINISTRATIVE OFFICIALS

President
Ernesto Vázquez Barquet, BA, MBA

Vice President for Academic Affairs
Miguel A. Riestra, BA, MA, Ph.D.

Vice President for Administration and Finance
Ernesto Vázquez Martínez, BSIE, MBA

Vice President for Enrollment Management and Student Services
Carlos Pérez, BA, MBA

Associate Vice President for Enrollment Management and Student Services
Elsa Zayas, BA, MA

Associate Vice President for Federal and State Grant Funds Administration
Olga C. de Torres, BBA

Dean of Graduate School
Miriam Pabón, BSIE, MEM, Ph.D., PE

Dean of School of Engineering and Geomatic Sciences
Carlos González Miranda, BSIE, MSIE, Ph.D.

Dean of School of Management
José Orlando Rivera; BSIE, MSEM, Ph.D. (Candidate)

Dean of School of Architecture
Carlos Betancourt Llamvías, BArch., MArch.

Dean of Arts and Sciences
Catalina Vicéns, BA, MA, Ph.D.

Associate Dean of Engineering and Geomatic Science
Cuauhtemoc Godoy, D.E., PE

Director, Plasma Laboratory
Angel González, BSEE, MEE, Ph.D.

Civil and Environmental Engineering Department Head
José Borrageros, BSCE, MSCE, PE

Electrical and Computer Engineering and Computer Science Department Head
Fernando Pérez Bracetti, BSEE, MSNE, PE

Industrial Engineering Department Head (Acting)
Cuauhtemoc Godoy, D.E., PE

Mechanical Engineering Department Head
Carlos Alvarado, BSME, MSME, Ph.D., PE

Chemical Engineering Department Head
Elba Herrera, BScChE, MSChE

Geomatic Sciences Department Head (Acting)
Marisol Rodríguez, BS, NIS

Mathematics and Sciences Department Head
Horacio García Correa, BSEE, MEM

Socio-Humanistic Department
Virginia Dessus, BA, MA, Ph.D.

Graduate Program Coordinator
Héctor Cruzado, BSCE, MSCE, Ph.D., PE

Graduate Program Coordinator
Alfredo Cruz, BA, Ph.D.

Graduate Program Coordinator
Luis Vicente, Ing. Telecom., MSEE, Ph.D.

Graduate Program Coordinator
Rafael Nieves, BS, MS, Pharm. D.

Graduate Program Coordinator
Carlos Alvarado, BS, MS, Ph.D.

Landscape Architecture Graduate School Director
Marisabel Rodríguez, BA, MLA

Business Administration Department Head
Sonia Mojica, BA, MBA

Library
Mirta Colón, BA, MLS

Registrar
Mayra López, BA, MA

Financial Aid Office Administrator
Sergio Villoldo

Sponsored Research Office
Angel González, BSEE, MSEE, Ph.D.

Cooperative Education Program
Angie Escalante, BA

Office of Graduate Affairs
Melina Mercado, BA, MBA

Institutional Advancement
Ana María Dapena, BA, MA

Outcomes Assessment
Gilberto A. Vélez, BSME, MSNuE, PE

Student Activities and Sport and Recreation
Roberto Medina

Planning and Institutional Research
Miguel A. Riestra, BA, MA, Ph.D.

Human Resources
Ana E. Castellano, BBA, MBA

Information Technology
Pedro Pérez, MIS

Director Guidance and Counseling
Legal Counselor
Irving A. Jiménez Juarbe, BA, MSW, Esq.

Security Office
Miguel Albarrán

Director Center for Distance Education
Heyda Delgado, BA, MA.Ed.

VII. GENERAL INFORMATION

A BRIEF HISTORY

Polytechnic University of Puerto Rico (P.U.P.R.) is a private, non-profit, coeducational, nonsectarian institution founded in 1966. At present it is the largest private Engineering School and the only one in, San Juan, Capital of Puerto Rico. It is also the largest private Hispanic Serving Engineering School in the United States and its territories. PUPR offers the following programs at the graduate level, listed in the order they were created.

A. The Council of Higher Education of Puerto Rico (CHE-PR)

B. Licensing and Accreditation

MASTER PROGRAMS

- Master in Engineering Management (1992)
- MBA in International Enterprises (1997)
• MBA in Management of Technology (1997) postponed (2001)
• MBA (General Interdisciplinary) (1997)
• MBA in Computer Information Systems (E-Commerce & Data Base) (1997)
• Master in Environmental Management (1988)
• Master of Science in Manufacturing Engineering (1988)
• Master of Science in Manufacturing Competitiveness (1988)
• Master of Science in Civil Engineering (1998)
• Master in Manufacturing Competitiveness (1998)
• Master of Engineering in Civil Engineering (1998)
• Master of Science in Electrical Engineering (2002)
• Master of Engineering in Electrical Engineering (2002)
• Master of Science in Computer Engineering (2004)
• Master of Engineering in Computer Engineering (2004)
• Master of Science in Computer Science (2005)
• Master in Landscape Architecture (2006)
• MS in Civil Engineering with Specialization in Structures (Sept. 2009)
• MS in Civil Engineering with Specialization in Geotechnology (Sept. 2009)
• MS in Civil Engineering with Specialization in Water Resources (Sept. 2009)
• Master of Engineering in Civil Engineering in Structures (Sept. 2009)
• Master of Engineering in Civil Engineering in Geotechnology (Sept. 2009)
• Master of Engineering in Civil Engineering in Water Resources (Sept. 2009)
• Master of Engineering in Civil Engineering in Water Treatment (Sept. 2009)
• MS in Computer Engineering with Specialization in Internet Engineering (Sept. 2009)
• MS in Computer Engineering with Specialization in Software Engineering (Sept. 2009)
• MS in Computer Engineering with Specialization in Digital Signal Processing (Sept. 2009)
• Master of Engineering in Computer Engineering with Specialization in Software Engineering (Sept. 2009)
• Master of Engineering in Computer Engineering with Specialization in Internet Engineering
• Master of Engineering in Computer Engineering with Specialization in Digital Signal Processing (Sept. 2009)
• MS in Computer Science with Specialization in IT Management and Information Assurance (Sept. 2009)
• MS in Computer Science with Specialization in Knowledge Discovery and Data Mining (Sept. 2009)
• MS in computer Science with Specialization in Computer Graphics and Game Technology (Sept. 2009)
• Master in Computer Science with Specialization in IT Management and Information Assurance (Sept. 2009)
• Master in Computer Science with Specialization in Knowledge Discovery and Data Mining (Sept. 2009)
• Master in Computer Science with Specialization in Computer Graphics and Game Technology (Sept. 2009)
• MS in Electrical Engineering in Communication Systems (Sept. 2009)
• MS in Electrical Engineering in Digital Signal Processing (Sept. 2009)
• Master of Engineering in Electrical Engineering in Communication Systems (Sept. 2009)
• Master of Engineering in Electrical Engineering in Digital Signal Processing (Sept. 2009)
• MS in Manufacturing Engineering with Specialization in Industrial Automation (Sept. 2009)
• MS in Manufacturing Engineering with Specialization in Pharmaceutical Processes (Sept. 2009)
• MS in Manufacturing Engineering with Specialization in Quality Management (Sept. 2009)
• Master of Engineering in Manufacturing Engineering with Specialization in Industrial Automation (Sept. 2009)
• Master Engineering in Manufacturing Engineering with Specialization in Pharmaceutical Processes (Sept. 2009)
• Master of Engineering in Manufacturing Engineering with Specialization in Quality Management (Sept. 2009)
• Master in Manufacturing Engineering with Specialization in Industrial Automation (Sept. 2009)
• Master Engineering in Manufacturing Engineering with Specialization in Pharmaceutical Processes (Sept. 2009)
• Master of Engineering in Manufacturing Engineering with Specialization in Quality Management (Sept. 2009)
• Master in Manufacturing Competitiveness with Specialization in Pharmaceutical Processes (Sept. 2009)
• Master in Manufacturing Competitiveness with Specialization in Quality Management (Sept. 2009)
• Master of Engineering in Mechanical Engineering with Specialization in Aerospace (2009)

ONLINE PROGRAMS
• Master of Engineering Management Sept., 2002
• MS in Manufacturing Engineering Sept., 2002
• MS in Manufacturing Competitiveness Sept., 2002
• Master of Engineering in Manufacturing Engineering Sept., 2002
• Master in Manufacturing Competitiveness Sept., 2002
• MBA in Computer Information System Sept., 2002

Most Recent Date of License Renewal

• MBA in Computer Information Systems Sept. 2009 (E-Commerce & Data Base)
• MBA (General and Interdisciplinary) Sept. 2009
• MBA (International Enterprises) Sept. 2009
• MBA Management of Technology (postponed) Dec. 2001
• Master in Computer Science Sept. 2009
• Master in Engineering Management Sept. 2009
• Master in Environmental Management Feb. 1998
• Master in Landscape Architecture Sept. 2009
• Master in Manufacturing Competitiveness June, 2001
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<td>Master of Engineering in Civil Engineering in Structures</td>
<td>Sept. 2009</td>
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<tr>
<td>Master of Engineering in Civil Engineering in Geotechnology</td>
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<tr>
<td>Master of Engineering in Civil Engineering in Water Resources</td>
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<tr>
<td>Master of Engineering in Civil Engineering in Water Treatment</td>
<td>Sept. 2009</td>
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<tr>
<td>MS in Computer Engineering with Specialization in Internet Engineering</td>
<td>Sept. 2009</td>
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<tr>
<td>MS in Computer Engineering with Specialization in Software Engineering</td>
<td>Sept. 2009</td>
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<tr>
<td>MS in Computer Engineering with Specialization in Digital Signal Processing</td>
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<tr>
<td>Master of Engineering in Computer Engineering with Specialization in Internet Engineering</td>
<td>Sept. 2009</td>
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<tr>
<td>MS in Computer Science with Specialization in IT Management and Information Assurance</td>
<td>Sept. 2009</td>
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<tr>
<td>MS in Computer Science with Specialization in Knowledge Discovery and Data Mining</td>
<td>Sept. 2009</td>
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<tr>
<td>MS in Computer Science with Specialization in Computer Graphics and Game Technology</td>
<td>Sept. 2009</td>
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<tr>
<td>Master in Computer Science with Specialization in Computer Graphics and Game Technology</td>
<td>Sept. 2009</td>
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<tr>
<td>MS in Electrical Engineering in Digital Signal Processing</td>
<td>Sept. 2009</td>
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<tr>
<td>MS in Manufacturing Engineering with Specialization in Industrial Automation</td>
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<tr>
<td>Master Engineering in Manufacturing Engineering with Specialization in Pharmaceutical Processes</td>
<td>Sept. 2009</td>
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<tr>
<td>Master in Manufacturing Engineering with Specialization in Quality Management</td>
<td>Sept. 2009</td>
</tr>
<tr>
<td>Master in Manufacturing Competitiveness with Specialization in Pharmaceutical Processes</td>
<td>Sept. 2009</td>
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<tr>
<td>Master in Manufacturing Competitiveness with Specialization in Quality Management</td>
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</tbody>
</table>

**ONLINE PROGRAMS**

<table>
<thead>
<tr>
<th>Program</th>
<th>Start Date</th>
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<tbody>
<tr>
<td>Master of Engineering Management</td>
<td>Sept., 2009</td>
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<tr>
<td>MS in Manufacturing Engineering</td>
<td>Sept. 2009</td>
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<tr>
<td>MS in Manufacturing Competitiveness</td>
<td>Sept. 2009</td>
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<tr>
<td>Master of Engineering in Manufacturing Engineering</td>
<td>Sept. 2009</td>
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<tr>
<td>Master in Manufacturing Competitiveness</td>
<td>Sept. 2009</td>
</tr>
<tr>
<td>MBA in Computer Information Systems</td>
<td>Sept. 2009</td>
</tr>
</tbody>
</table>

**B. Middle States Association of Colleges and Schools (MSACS)**

3624 Market St.
Philadelphia, PA 19104-2680
In 2005, the Commission on Higher Education of MSACS extended the accreditation to the institution.

C. Accreditation Board for Engineering and Technology (ABET)

The following Bachelor of Science programs are accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202 - telephone: (410) 347-7700:

- Civil Engineering
- Industrial Engineering
- Electrical Engineering
- Mechanical Engineering
- Environmental Engineering
- Chemical Engineering
- Computer Engineering

D. The following program was accredited by the Applied Science Accreditation Commission of ABET, 111 Market Place Suite 1050, Baltimore, MD 21202 - telephone: (404) 347-7700

- Land Surveying and Mapping (BS)

E. National Architectural Accrediting Board (NAAB)

1735 New York Avenue, NW,
Washington, DC 20006
(202) 783-2007
(202) 783-2822
info@naab.org

In year 2009, NAAB extended accreditation to the School of Architecture.

F. International Assembly for Collegiate Business Education (IACBE)

PO Box 3960
Olathe, KS 66063 USA

In April, 2006 IACBE accredited the School of Management.

Academic Alliances

Currently, PUPR has academic alliances with the following universities:

a. Instituto Nacional Tecnológico de Santo Domingo (INTEC)
   Ave. Los Próceres, Calle Gala,
   Postal 342-9 y 249-2, Santo Domingo

b. Fundación Ciudad del Saber
   Clayton, Ancón
   Ciudad de Panamá

MISSION, VISION AND GOALS

Mission

As an institution of higher education, Polytechnic University of Puerto Rico provides opportunities for individuals from diverse backgrounds in different locations using multiple methods of delivery to cultivate their potential for leadership, productivity and competitiveness with the purpose of providing greater social responsibility toward their communities, through exposure to intellectual, humanistic and technological advancement.

Vision

To be recognized as the leading Hispanic Serving Institution in multiple fields of study, meeting societal and industrial standards in general, in association with public and private enterprise; characterized by an emphatic relationship between faculty and students, and with a culture of client-oriented quality service, empowerment and teamwork. Polytechnic University of Puerto Rico reflects the meeting of the two pervasive cultures of the Americas, thus it is well positioned to interact with the Hispanic and the Anglo worlds inside and outside its geographical borders by providing a cultural and linguistic intermediary link.

Goals

- To contribute to the socio-economic development of Puerto Rico through the formation of well rounded and educated engineers, architects, surveyors, and business managers.
- To provide access to higher education to additional segments of our population other than traditional high school graduates.
- To provide students with the capability to continue graduate education.
- To foster the linkage between PUPR and industry, government, commerce and professional associations.
- To utilize the latest technology to provide, facilitate and manage PUPR's educational offerings.
- To develop in students a profound ethical commitment and a sense of professional competence and social responsibility.
- To promote the linkage among the university and its communities.
- To foster and promote an applied research culture.
- To develop critical thinking and a scientific approach in the analysis and solutions of professional and social problems.
- To promote the dissemination of knowledge through the teaching-learning process and publications.
- To achieve long-term sustainable growth in financial resources.
- To enhance cultural diversity outside PUPR's geographical border.
GRADUATE SCHOOL MISSION STATEMENT

The mission of the Graduate School (GS) is to promote and encourage excellence in graduate education for the students. To accomplish this mission, the GS values integrity, collaboration, efficiency, innovation, and inclusiveness in all that it does. These values are central to the GS’s role in encouraging a creative environment for scholarship and research, teaching and learning. The GS develops new concepts and best practices for graduate education, and supports other schools within the Institution in their graduate initiatives and emerging programs. It aims to guarantee that all graduate students regardless of ethnicity, gender, or other individual characteristics are afforded the opportunity to achieve their full potential as professionals.

The Graduate Dean, in collaboration with academic and administrative units of the University, exercises overall review and supervision of graduate programs conducted in the several colleges and provides guidance in the development of new programs as well as the maintenance of standards for existing programs. Each college of the University has developed its graduate programs in accordance with the Council of Graduate Schools national professional standards and the standards of their respective fields.

RECOGNITIONS

BOARD OF EXAMINERS OF ENGINEERS, AND SURVEYORS OF PUERTO RICO – Graduates of Civil Engineering, Industrial Engineering, Electrical Engineering, Mechanical Engineering, Environmental Engineering, Chemical Engineering, and Land Surveying and Mapping curricula qualify to take the examinations required for a professional license.

BOARD OF EXAMINERS OF ARCHITECTS AND LANDSCAPE ARCHITECTS – Graduates of Architecture qualify to take the examinations required for a professional license.

BOARD OF EXAMINERS OF CERTIFIED PUBLIC ACCOUNTANTS – Graduates of BBA in Accounting curriculum are admitted to take their qualifying examinations for the professional license.

VETERANS ADMINISTRATION – Veterans and qualified dependents are permitted to study under the provisions of the G.I. Bill of Rights.

BUREAU OF IMMIGRATION AND CITIZENSHIP SERVICES (FORMERLY INS). Foreign students are permitted to study under BCIS/ Department of Homeland Security.

DEPARTMENT OF SOCIAL SERVICES OF PUERTO RICO – Recipients and beneficiaries of Vocational Rehabilitation are permitted to study under the provisions of the corresponding federal legislation.


VIII. GENERAL SERVICES AND FACILITIES

PHYSICAL FACILITIES

The Main Campus of Polytechnic University of Puerto Rico is located in the Metropolitan Area of San Juan at 377 Ponce de León Avenue, near the financial and economic center of Puerto Rico. The campus consists of nine acres and six buildings housing classrooms, laboratories, academic offices, library, administrative offices, student center, medical services, athletic and other recreational facilities, and a parking building.

PUPR opened branch campuses at the following cities:

a. Polytechnic University of Puerto Rico, Miami
   8180 NW 36 St.; Suite 401,
   Miami, Florida, USA 33166

b. Polytechnic University of Puerto Rico, Orlando
   4800 Howell Branch Rd. Winter Park,
   Orlando, Florida, USA, 32792

LIBRARY

The Library is an academic unit with the mission to offer the university community the information services needed to achieve academic excellence and develop leaders with the knowledge and skills that will help them become professional, responsible and successful citizens. This statement is consonant with the university’s mission and all library services are directed towards achieving it.

The Library occupies over 40,000 square feet in a three-story building. The collection is specialized in Engineering, Geomatic Sciences, Architecture, Business Administration, and Landscape Architecture to support the academic programs. The collection also includes nearly 100,000 books and serial volumes which are catalogued and searchable through our online catalog. The print resources are organized in open stacks according to the Library of Congress Classification System. In order to deliver the best possible combination of traditional and virtual library services, the library has subscribed to thousands of on-line resources including full text electronic books and periodicals. There are wireless access points throughout the library providing laptop access to electronic and online research resources. In addition, remote access is available through the library’s website.

Librarians and library staff offer users specialized information assistance and services such as inter-library loans, information literacy, and bibliographic search, among others. There are also scanning, printing and photocopy services. Carrels and rooms for individual or group studying are distributed throughout the three levels of the building. Library hours include weekends and holidays totaling ninety-three hours weekly. In addition, the library sponsors cultural activities and expositions during the year.


**CENTER FOR DISTANCE EDUCATION**

The Center for Distance Education at the Polytechnic University of Puerto Rico supports through its human and technological resources the academic programs and online courses offered. This enable the professors, as well as the students to choose at their convenience the way in which they conduct the teaching – learning process, opening a new door of educational opportunities.

The Center for Distance Education, known in Spanish as Centro de Educación a Distancia (CEDUP); was established in 2001. Its facilities are located in the 3rd floor of the Library Building. Blackboard (Bb) is the educational platform in use. A Distance Learning Education Policy is in effect.

Courses developed through the educational platform have been incrementing since 2001-2002, when 14 online courses were offered during that academic year; today over 400 courses are taught in one of three ways: web enhance, hybrid or totally online.

**INFORMATION LITERACY PROGRAM**

Information Literacy is a set of abilities or skills requiring individuals to “recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information.”

In order to help students develop these skills the program teach them the processes of finding, organizing, using, producing, and distributing information in print, electronically, and in other formats. Students learn about the flow of information in a variety of disciplines, how to be effective at the research process, how to access information in a variety of formats, and how to formulate effective searches on electronic databases and the Internet. Students become familiarized with practical, social, and ethical issues relating to information.

The Information Literacy program is also located in the third floor of Library Building.

**EDUCATIONAL TECHNOLOGY CENTER**

The Educational Technology Center (ETC) constitutes the academic computing center. It offers the following services:

1. Provides computer services to the student body and faculty to assist them in the performance of their academic endeavors and projects.
2. Provides training to the Faculty and administrative personnel on computer use.
3. Offers seminars to students about specific software.
4. Offers computer services to the different academic departments as requested.

The ETC is organized in six areas

1. Engineering Graphics Laboratory for computer assisted design.
2. AutoCAD Laboratory for multiple purposes and the use of the latest versions of AutoCAD.
3. Main Computer Area - Laboratory for all the latest Engineering Applications.
4. Computer Classrooms for the different engineering courses.
5. Classroom for the training of students, Faculty and administration.
6. Internet Room- Continuous access to Internet by students. All computers are connected through Ethernet wire scheme using Novell NetWare. The Center provides the latest technology in the industry today.

**CONTINUING EDUCATION**

The Continuing Education is oriented towards serving the needs of all the Alumni, specially the professional engineers and surveyors. Given the reality of our industrialized society and rapid technological advances, this program provides the resources necessary for renewal of licenses for working professionals. It offers short term non credit seminars, conferences, symposiums, workshops and courses of a technological nature.

**COOPERATIVE EDUCATION PROGRAM AND PLACEMENT OFFICE**

The Placement Office has the mission to help our students to obtain a professional experience (Temporary or Regular Contract) related to their academic area.

The participants should meet the following requirements:

1. Active students of Polytechnic University of Puerto Rico (third, fourth or fifth year student) or Ex – Alumni.
2. Fill Program Application Form
3. Add the resume to the Application Form (English).
4. Present US citizenship or Visa documentations.
5. Participate in employer’s interviews.

**IX. STUDENT INFORMATION AND SERVICES**

The Graduate School Deanship coordinates a major portion of the services that Polytechnic University of Puerto Rico offers to its graduate students.

**OFFICE OF GRADUATE AFFAIRS**

The Office of Graduate Affairs offers admission, registration, collection and student financial aid guidance services.

This office is an administrative unit within the Graduate School Deanship. The Deanship is responsible for the facilitation of graduate studies at the Polytechnic University of Puerto Rico. It is the responsibility of the Graduate Affairs Office to see that all pertinent administrative regulations are followed and that proper guidance relative to this topic is
provided to all the academic units that offer graduate programs.

For easy access, the Office is located in Alhambra Street #51. Office hours are: Mondays through Thursdays from 8:00am to 8:00pm, Fridays from 8:00am to 12:00 noon and from 1:00pm to 3:00pm, and Saturdays from 8:00am to 12:00 noon. These office hours satisfy the needs of our evening, and Saturday students.

**STUDENT ACTIVITIES OFFICE**

The Student Activities Office offers the opportunity to participate in organized recreational and sports activities.

The Students Center offers the opportunity to engage in leisure activities such as billiards, dominoes, chess, table tennis, TV Room Area with Cable TV video system and others.

In the sports area, PUPR has an indoor basketball and volleyball court. The institution participates in the Inter-University Sports Organization, the interuniversity league. PUPR participates in several sports such as: Softball (female), Baseball (male), Basketball, Volleyball, Beach Volleyball, Weight Lifting, Taekwondo, Track and Field and Cross Country. There are male and female teams participating in all these sports. In addition PUPR has a male Indoor Soccer team.

In the Intramural Program students, faculty and administration have the opportunity to share in recreational activities and organized sports tournaments such as: Basketball, Volleyball, Dominoes, Billiard and Tennis, Table Tennis, Chess, Softball, and many others.

**HEALTH SERVICES**

The University requires that all students be covered by some type of health service program. Upon registration, the student must show that he/she is subscribed to a health plan. Students who can not prove that they are subscribed to a health plan, must register in the health services plan sponsored by the Institution. To register for and receive the services sponsored by the institution, the student must pay the corresponding fee for health services stipulated in the Tuition and Fees section of the Catalog.

The Health Services plan sponsored by the Institution is an individually contracted service plan. The service is not a Health Insurance Plan and as such does not include radiology or laboratory services, or medicines. The health services sponsored by the institution are offered by a physician in his private Office located at José Martí Street adjacent to the University campus. Medical services are rendered Monday through Thursday, 8:00 am to 9:00 pm; and Saturday from 8:00 am to 12 noon.

**SECURITY OFFICE**

Pursuant to Public Law 101-542 “Student Right to Know and Campus Security Act of 1990, PUPR created the Office of Security. This office is responsible of creating, promoting and maintaining academic and working conditions at the campus free of criminal acts. Pacific coexistence among all the university components is essential to achieve a teaching and learning environment free from all kinds of violence. Such atmosphere will benefit students, faculty members, visitors, suppliers and officials from diverse agencies who participate in our operations.

This kind of environment will be monitored on a continuous basis, without interruption, by a closed circuit television network. Cameras are installed in all the common area corridors of all buildings, entrances, exits, all computer rooms, library, laboratory rooms and campus entrances.

All Students, faculty members and employees are provided with an identification card which is required to gain access to the campus and services.

**Services that the Security Offices Provides to the University**

- Installation and operation of a 24 hours a day, 7 days a week monitoring system
- Implementation of the vehicle access system to the University Campus
- Implementation of the identification card system for employees and students
- Seminars to the students, employees and visitors about the campus security system
- Coordination of diverse activities with the different offices
- Availability of a Security Handbook or manual
- Publication of the annual Statistical Report about Security Information in the campus
- Providing assistance to the student with his vehicle malfunctioning in the campus
- Providing escorts to students if required

**IDENTIFICATION CARD**

An identification card is issued to students during the registration period. Students are required to present their identification card to gain access to Polytechnic University of Puerto Rico facilities and services.

**X. ADMISSIONS**

For admission to graduate studies, a student must have obtained a bachelor’s degree prior to enrollment. Degree-seeking applicants may sometimes be admitted conditionally. Admission and/or continued enrollment depends on the satisfactory fulfillment of these conditions.

PUPR admits qualified students without regard to gender, sexual orientation, age, race, color, religion, national or ethnic origin, marital status, veteran status or disability.
Active Status

Active Status requires the student to be registered as a Part-Time or Full-Time student. Student can loose this status due to poor academic performance, failure to register for two terms or failure to complete their degree within established time limits.

GRADUATE STUDENT CLASSIFICATION

Full-Time Degree-Seeking Status – The student who intends to complete a graduate degree on a full-time basis must enroll on a minimum of 6 credit-hours per term. To register for more than six credit-hours the student must seek the approval of the Graduate Program Coordinator or the Dean of Graduate School.

Part-time Degree-Seeking Status – The student who intends to complete a graduate degree on part-time basis is enrolled in less than 6 credit-hours per term.

GENERAL ADMISSION REQUIREMENTS AND PROCEDURES

For application forms and program information, write to:

Polytechnic University of Puerto Rico, Graduate Affairs Office, PO Box 192017, San Juan, Puerto Rico 00919-2017.

Prospective applicants should indicate their preferred academic area when they inquire about admission. Candidates may apply for admission in any academic term.

All applicants must comply with the following requirements:

1. Fill the Application for Admission.
2. Pay a $50.00 Admission Fee (non-refundable).
3. Submit an official academic transcript directly from the university where the applicant obtained his/her bachelor’s degree, and a Graduation Certificate that includes the graduation general grade point average to the Graduate Affairs Office.
4. Submit three (3) letters of recommendation from persons who can attest to the applicant’s preparation and ability to perform at a graduate level.
5. Aliens must submit a copy of immigration status.

Applicants who are denied admission may request reconsideration by a committee. The Reconsideration committee is composed by the Graduate Program Coordinator, Dean of Graduate School and the Vice President for Academic Affairs. The procedures and criteria for reconsideration are established by the Committee taking into account the applicant’s job experience, professional licensing and other alternate admission criteria such as results from TOEFL and GMAT among others.

Individual programs may have additional requirements. Applicants are encouraged to consult the catalog’s section that describes the graduate program of interest.

An active undergraduate student can only register in graduate courses if he/she has been admitted to the Combined Bachelor’s Master’s Degree Program. (Refer to Bachelor’s Master’s Degree Program section of this Catalog).

Upon proper completion of all admission requirements the applicant will, if admitted, be eligible to register. When registration is completed, and all fees are paid, the student will be officially enrolled at the University. The dates for registration are included in the Academic Calendar.

INTERNATIONAL STUDENTS

Applicants who are not United States of America citizens or permanent residents must petition Polytechnic University of Puerto Rico to issue official forms required by the Bureau of Immigration and Citizenship Services (BICS). Upon completion of these forms and acceptance, these applicants will be classified as international students.

An applicant desiring to enroll as an international student must submit the following documents:

International Applicants with Form I-20

1. Fill the Application for Admission.
2. Make payment of Two Hundred Fifty dollars ($250.00) application fee. The application fee is non refundable and will not be applicable toward the student’s registration charges.
3. Submit an official transcript certified by the educational institution and validated by the Ministry of Education of the applicant’s home country as well as a USA academic equivalence certification for that degree certified by an accredited evaluation firm (World Education Services, Inc.; Educational Evaluation, Inc. etc.). The academic equivalence certification must include the equivalent U.S.A. degree with a detailed evaluation, course by course, of an official transcript from the educational institution in the candidate’s home country. The document must be sent directly from the institution to the Graduate Office, Polytechnic University of Puerto Rico.
4. Submit three (3) letters of recommendation from persons who can attest to the applicant’s preparation and ability to perform at a graduate level.
5. Demonstrate financial capacity to complete the required program, if personally by means of a funds availability certificate from the candidate’s banking institution or:
   a. Submit a sworn statement by the person that will cover the costs of the studies, indicating the annual amount assigned for this purpose and
   b. Submit a copy of the Income Tax return of the person, residing in U.S. territory that will cover the cost of the studies or, if self financed, submit a letter from the applicant’s banking institution, certifying availability of funds to cover the studies.
6. Applicants may be required to take the Test of English as a Foreign Language (TOEFL).

The International Student Adviser offers information, counseling, and assistance on Federal Regulations related to maintaining the student status. The adviser is located at the Registrar’s Office.

Instructions for the letters of recommendation

The Office of Graduate Affairs will provide the recommendation letters form. These forms must be filled with a typewriter or in block letters by each of the three persons to whom the applicant requests a recommendation. The letters must accompany the application for admission at the time of submission.

NON-DEGREE SEEKING ADMISSION

A non-degree student status is a candidate who would like to take graduate course work for professional development, personal enrichment, or familiarize with the curriculum of a graduate program. Visiting Students, those students that visit PUPR for a term and then transfer the course credit-hours to their degree-granting institution, could also apply as a non-degree student. Students who are required some prerequisites courses for a graduate program could take these courses as a non-degree student before being granted full admission to the Graduate School.

A maximum of 12 credit-hours may be completed in the student’s graduate program before program admission. Non-degree seeking student must have permission and the signature of the Graduate Program Coordinator and Graduate School Dean to register for graduate courses.

Permission to attend PUPR as a non-degree student does not guarantee admission at the undergraduate or graduate level, nor does it guarantee admission into a continuous education program.

The amount of credit-hours taken as a non-degree student will be limited to 12 credit-hours of graduate course work.

If the non-degree student decides to apply for a graduate program (change his/her status as a degree-seeking student) and admission is granted, full credit could be given for courses completed with a grade of at least “B”, while having the non-degree student status.

Application Requirements

To apply for admission as a non-degree student, the candidate will be required to provide proof of undergraduate degree by means of an official academic transcript. A one-time non-refundable application fee will be required for the non-degree applicants, and the fee will cover all terms attended as a non-degree student. If later the non-degree student decides to apply for a graduate program, the corresponding non-refundable graduate admission application fee will be waived.

Registration Requirements

A non-degree student must receive permission from both, the Graduate Program Coordinator and the Graduate School Dean before registering.

Upon completion or registration of the 12 credit-hours the student may contact the Office of Graduate Affairs for advice on admission into a graduate program.

Restrictions

The following restrictions apply to the non-degree student status:

- A student who is already admitted to PUPR may not register for a non-degree status.
- Financial aid is not available for non-degree students.
- All student, degree and non-degree alike, must meet the requirements as stated in the current PUPR Graduate Catalog. Failure to meet these requirements will subject students to probation or dismissal.

READMISSION POLICY AND PROCEDURES

Students who have been inactive at Polytechnic University of Puerto Rico for two or more regular terms, or who have been suspended academically and wish to be readmitted, must apply for readmission.

Regular students who have discontinued their studies for one year or more will be readmitted under the procedures in effect. The applicable curriculum will be the one outlined in the Catalog in effect at the time of readmission.

The student will receive and submit the readmission application form from the Office of Graduate Affairs and will submit it to the same office. Readmission applications must be submitted at least a month prior to the next registration period. If the student does not register during the period requested, the application will remain active for one (1) additional term.

A student whose readmission application has been denied may appeal to the Readmissions Committee through the Graduate School Deanship. The student will receive instructions regarding the procedure to follow in order to request reconsideration by the committee.

An applicant who is delinquent with the Finance Office may be readmitted conditioned to the full payment of all financial and other debts due to Polytechnic University of Puerto Rico prior to registration.

Validation of courses from other institutions taken before the five-year period prior to readmission may be canceled. A readmitted student may be asked to take such, or other equivalent courses, by his/her Graduate Program Coordinator or Dean of Graduate School.

All courses having more than five calendar years of approval at PUPR or elsewhere are considered to be expired. Nevertheless, during the readmission process the Dean of
Graduate School will pass judgment of every expired course and determine which ones shall be retaken and which others are waived in writing, if any.

**GRADUATE SCHOOL TRANSFER OF CREDIT HOURS**

A maximum of 6 credit-hours of graduate-level course work may be transferred from another institution to apply towards a Master’s Degree. Acceptance of transfer credit-hours toward program requirements is at the discretion of the program. The student must file a formal petition at the Graduate Affairs Office accompanied with descriptive material such as transcripts, catalog descriptions and listings of textbooks used, among others.

Transfer of credit-hours will be favorably considered if courses were completed with a B or higher grade. Also the courses must be equivalent to those offered in the curriculum of the chosen Graduate Program and they must have been completed within the last five years. No expired courses will be transferred unless there is a waiver in writing by the Dean of Graduate School.

**Pre-requisite for a graduate program taken outside PUPR**

Students may take undergraduate pre-requisite courses required as part of the Graduate Program Curriculum at Institutions different than PUPR as long as: ① Institution is adequately licensed, ② course content is equivalent to the course required at PUPR, and ③ a minimum grade of “C” is obtained in the course.

**XI. FINANCIAL INFORMATION AND SERVICES**

**TUITION AND FEES FOR GRADUATE PROGRAMS**

The following schedule of tuition and fees applies to all graduate students of the Polytechnic University of Puerto Rico.

**Tuition per credit-hour: (Graduate Programs)**

- Tuition per graduate credit-hour: $200.00
- Tuition per graduate credit-hour for Landscape Architecture: $225.00

**Registration fees**

- Graduate Registration Fee: $50.00
- Graduate Library Fee: $60.00
- Student Activity Graduate Fee: $25.00
- Computer Technology Center Fee: $75.00

**General fees**

- Application for Graduate Admission: $50.00 (non refundable)
- Application for International Graduate Admission: $60.00 (non refundable)
- Application for Non-Degree Seeking Admission: $75.00 (non refundable)
- Application for Graduate Certificate: $75.00 (non refundable)
- Readmission: $25.00
- Deferred Payment: $25.00
- Student Health Service (if applicable): $25.00
- Late Registration: $60.00
- Drop/Withdrawal Fee Per Course: $15.00
- Record Analysis: $10.00
- Change of academic program: $15.00
- Transcript: $6.00
- ID-Card: $15.00
- Duplicate ID-Card: $16.00
- Access to Parking: $50.00
- Graduation Fee: $135.00
- Late Graduation Fee: $20.00
- Certification: $4.00
- Copy of the Registration Report: $2.00
- Returned Check Processing: $50.00
- Collection Fee: $20.00
- Seminar Fee (SEMI 5500): $400.00
- Graduate Lab Fee: $175.00
- Thesis Fee: $225.00
- Project Fee: $190.00
- Thesis Extension Fee: $225.00
- Project Extension Fee: $190.00
- Late Charge on pending balances: 1.5 % monthly

Note: Tuition and Fees are Subject to Change without notice

**PAYMENT OF TUITION AND FEES**

Tuition and fees are payable in full during the registration period, and prior to the first day of classes. Students that decide to pay in full during the registration process will receive a 2% discount from the remaining balance that is not covered by financial aid or other sponsorships. Students may opt to defer payment for thirty (30) days at a cost of $25.00 (deferred payment fee), after paying 50% of total cost. The deferred payment will allow the student a grace period after the first day of classes to pay the remaining balance without paying late charges. The registration process is not completed until all fees have been paid or proper arrangement for deferred payment has been made.

In case the student cannot fully satisfy his debt prior to registration, the University's collection policy is as follows:

- a. Tuition and fees due from previous terms of study must be paid in full, prior to the student registering for the new term.
- b. Any balance remaining after 30 days will be subject to a 1.5% monthly surcharge.
- c. Balances remaining unpaid after 180 days will be subject to a collection fee of $20 (see (b) above).
Students who request loans or veteran benefits must consult either the Director of Student Financial Aid or the Institution’s Veterans Representative in the Registrar’s Office, before their registration can be completed.

Payment of fees can be made either in money order, personal check, a bank manager’s check, a certified check, Automatic Teller (ATM), Visa, MasterCard or American Express. Failure to pay any University fees when due may result in administrative withdrawal or withholding copies of student’s academic records or other documents by the appropriate University officials. Students with pending balances on their accounts are not permitted to enroll in subsequent terms.

**VETERANS’ BENEFITS**

Students eligible for Veterans benefits are required to make their financial arrangements in line with the policies of the University for all students.

**REFUND POLICY**

The Finance Office is responsible for complying with the refund policy established by the Institution. The procedure to apply for a refund must be submitted in writing, and in accordance with the academic term calendar.

**INSTITUTIONAL REFUND POLICY**

<table>
<thead>
<tr>
<th>Period of Registration</th>
<th>Percentage of Refund</th>
</tr>
</thead>
<tbody>
<tr>
<td>During week of regular registration</td>
<td>100 %</td>
</tr>
<tr>
<td>During first week of classes in each term</td>
<td>100 %</td>
</tr>
<tr>
<td>During second week of classes in each term</td>
<td>33% Tuition and Laboratory Fees</td>
</tr>
<tr>
<td>During third week of classes thru the last date to withdraw form a course</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

Registration fees are non refundable.

**FINANCIAL DELINQUENCY**

Students failing to pay their debt to the University on or before the day payment is due may be excluded from graduation. The University may also withhold grades, the issuance of transcripts, degrees, diplomas, and the granting of certificates of good standing to any student whose account is in arrears. Inactive students with debts will have the opportunity to pay the pending balances. Their payment plan agreement with Polytechnic University of Puerto Rico is held in association with the United Credit Bureau Service. If the students fail to comply with the payment plan, they are referred to a collection agency. Students referred to an agency for collection will be charged an additional $20.00 fee.

**STUDENT CONSUMER INFORMATION**

The University conforms to the Student Consumer Information Requirements established by the United States Department of Education, and hereby serves notice that the Director of Student Financial Aid and office staff are the persons designated under those requirements to assist the student or prospective student in obtaining information regarding student financial assistance.

**FINANCIAL AID**

The University participates in the Federal Stafford Loan Program and State Grant (Programa de Asistencia Económica para Estudiantes Graduados Fondo Especial de Oportunidades Educativas). This program has the following requirements:

1. Be enrolled at least half-time in an eligible program.
2. Be a U.S.A. citizen or eligible alien.
3. Make satisfactory academic progress.
4. Have financial needs.
5. Sign a statement of Educational Purpose and Certification on refunds and default, also sign an Anti-Drugs Abuse Act Certification, a statement of update information and Selective Service registration status.
6. Have a valid social security number.
7. Not in default.

The student who requires a financial aid loan must file the U.S. Department of Education Federal Student Aid Application Form used to determine the family contribution (FC), and the financial needs of the student. Also, the student has to file an application for the loan and bring it to the Financial Aid Office with the required documentation. The application will be processed by the office and sent to the lender if the student is eligible.

For more information or additional Financial Aid opportunities, students should visit the Financial Aid Office of PUPR, located on the first floor of the Administration Building.

**XII. ACADEMIC INFORMATION AND SERVICES**

The student should be thoroughly familiar with: (1) this section of the Catalog, (2) the section containing the academic requirements for the degree he/she plans to earn, (3) the offerings of his/her major program of study, and (4) any changes published after the publication of this Catalog. A degree will be awarded only to a student who has satisfied all the academic and administrative requirements of Polytechnic University of Puerto Rico.

**GRADUATE ACADEMIC SCHEDULE**

Registration for all students is held prior to the beginning of each term on designated days as specified in the Academic Calendar. Completion of registration for each term is a prerequisite of class attendance. The academic year consists of three terms, and one summer session. Fall, Winter, and
Spring classes are scheduled from Monday through Thursday from 6:30 pm to 10:30 pm; Saturday from 8:00 am to 5:00 pm or through On-line courses. On-line courses may have on-campus requirements. Depending upon the term, students may be required to make-up class contact hours lost due to days observed as holidays.

**CHANGES IN CLASS SCHEDULE**

During the first week of classes a student may add, or drop from, courses by completing a Change of Program Form at the Graduate Affairs Office.

Add Policy: A student may add a course during the official Add/Drop period; a class which has been dropped will not appear in his/her permanent record. Some academic programs may require approval of the Program Coordinator before any course change is made. For withdrawal after the Add/Drop period, consult the Withdrawal Policy.

**ACADEMIC LOAD**

The regular or normal load per term is six (6) credit-hours. Additional credit-hours require the approval of the Graduate Program Coordinator or the Graduate School Dean. Credit-hours will not be awarded for courses in which the student is not properly registered.

**DEFINITION OF CREDIT-HOUR**

One credit-hour corresponds to 15 contact hours per term for a lecture course, and 30 to 45 contact hours per term for a laboratory course.

**RESIDENCE REQUIREMENTS**

Residence requirements are not mandatory for the Master's degrees offered at Polytechnic University of Puerto Rico.

**WITHDRAWAL FROM COURSES**

The Polytechnic University of Puerto Rico does not encourage withdrawal from courses. The withdrawal form must be approved by the Graduate Affairs Officer and Finance Officer by the stated deadline. Students may withdraw from courses two weeks before ending a term, or on the date specified in the academic calendar.

**TOTAL WITHDRAWAL**

Students needing to withdraw from the University for personal reasons, must secure a Withdrawal Form from the Graduate Affairs Office. This type of withdrawal must be signed by the Graduate Affairs Officer. The application shall be submitted by the stated deadline.

**GRADING SYSTEM**

The Polytechnic University of Puerto Rico utilizes an alphabetic grading system. The grades that must appear in the midterm and final reports are as follows:

- A: Excellent (4 honor points per credit-hour)
- B: Good (3 honor points per credit-hour)
- C: Satisfactory (2 honor points per credit-hour)
- D: Deficient (1 honor point per credit-hour)
- F: Failure (0 honor points per credit-hour)
- I-Grade: Incomplete
- WF: Non Authorized Withdrawal

**GRADE POINT AVERAGE OR GRADE INDEX**

A student's grade point average is the measure of academic achievement and computed as follows:

a. The total number of credit-hours corresponding to all courses taken, counted once, and having a grade of A,B,C,D, or F, is obtained (T).
b. The credit-hours of each course is multiplied by 4,3,2,1 or 0 according to grades of A,B,C,D or F, respectively.
c. These products are added (S); and identified as honor points.
d. S is divided by T to obtain the grade-point average.

In computing the grade point average or grade-index, the highest grade obtained in a repeated course will be used whenever it is higher than the original grade. If the grade obtained in the repeated course is lower than the original grade, the original grade will prevail.

**SYMBOLS**

- T: Transferred
- AU: Audit (class audited only)
- R: Repeated course
- W: (Withdrawal) Indicates that the student was permitted to withdraw from a course without penalty. It indicates that authorization of the officers previously mentioned was obtained
- P: Pass, only for specified courses
- NP: Not passed, only for specified courses
- E: Expired course (course no longer offered)
- S: Satisfactory, only for specified courses
- NS: Not satisfactory, only for specified courses
- CE: Course Exception

**NORMS AND PROCEDURES FOR THE EVALUATION OF STUDENT ACADEMIC PROGRESS AT THE GRADUATE LEVEL**

**Purpose**

This document includes the norms and procedures of student academic progress at the graduate level. The purpose of these norms and procedures is to define the parameters to be used in the retention, probation, suspension, and academic dismissal of students. They establish the mechanisms to be followed in the evaluation of student academic progress. These norms and procedures apply to every student admitted or readmitted to pursue graduate studies.
Norms and Procedures

The PUPR requires that all graduate students demonstrate academic progress through the number of approved credit-hours and general average.

A. Definitions

1. Attempted credit-hours - all credit-hours in which the student enrolls at the graduate level at the Polytechnic University of Puerto Rico, for which a grade of I, A, B, C, D, F, W, NS, NP, or P is given, including all the number of times the student has enrolled in the same course.

2. Transfer credit-hours - graduate credit-hours approved with a grade of "A", "B" or its equivalent at an accredited institution of higher learning, and are accepted by the Graduate School in accordance with the prevailing norms at the PUPR. Transfer credit-hours will not be taken into consideration in qualitative evaluation. These credit-hours will be considered to determine the level or year of study of the student at the graduate level. A maximum of six (6) credits will be accepted in transfer from other accredited institutions of higher learning.

3. Approved credit-hours – credit-hours attempted at the PUPR by students admitted to the Graduate School and approved with a grade of "A", "B", "C", "S" or "P".

4. General average - measure used to evaluate the academic performance of the graduate student. This measure is computed by dividing the total number of credit-hours accumulated by the total number of credit-hours in which the student has received final grades, including "F's" that have not been removed. Courses in which grades of "S", "NS", "P" or "NP" will not be included for computing the measure.

5. Repetition of courses - practice under which the graduate student is allowed to repeat only one course in which he (she) obtained a grade of "C", "D", "F", "NS", or "NP". In accordance with this practice, only the highest grade will be considered to determine the general average.

6. Probation - temporary condition of the graduate student at the PUPR because of academic reasons, in which both the quantitative and qualitative elements are taken into consideration.

7. Suspension because of academic deficiency - dismissal of the graduate student at PUPR for academic reasons, in which the qualitative element, as well as the time on probation, are considered.

8. Academic year - three academic educational periods that makeup the academic year which begins with the autumn term.

9. Educational period - typical academic period during which the regular courses are offered, several periods of which three make up the academic year.

10. Probation to receive Financial Aid – student will be in probation status for one academic year because he/she did not fulfill deficiency shown in Table A and/or B from section 3.

11. Suspension of Financial Aid – student that at the end of his/her probation period does not surpass the deficiency shown in table A and/or B from section 3.

B. Norms of Academic Progress to be followed by the Registrar's Office for the evaluation of students

1. Academic index

Students are required a 3.00 or more general index for graduation and that they are not on probation or have-not dismissed.

2. Total number of credit-hours approved

The student should pass 50% of all credit-hours attempted at the Institution.

Probation and suspension

All graduate students, whose academic progress does not comply with the retention indexes shown in Table A or with the conditions included in Table B, will begin an "On Probation" period for no more than a year. If the "On Probation" period is not overcome, the student will be suspended (dismissed) from the Institution.

Table A

<table>
<thead>
<tr>
<th>Transfer Credit-hours (1)</th>
<th>Credit-hours Passed at PUPR (2)</th>
<th>Total Credit-hours Accumulated at PUPR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Minimum Grade Point Average</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0-9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19 or more</td>
</tr>
</tbody>
</table>

Table B

Reasons for a Probation Status

<table>
<thead>
<tr>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade of &quot;C&quot; in more than two courses</td>
</tr>
<tr>
<td>Grade of &quot;D&quot; in one course</td>
</tr>
<tr>
<td>Grade of &quot;F&quot; in one course</td>
</tr>
<tr>
<td>Grade of &quot;NS&quot; in thesis or project during a term</td>
</tr>
<tr>
<td>Failure once in the comprehensive exam or in the defense of the thesis or design project</td>
</tr>
</tbody>
</table>

3. Incompletes

If the course instructor has given an "Incomplete" in a course, the graduate student must complete the course requirements within the date stated in the next educational period. If the student does not comply with what is hereby stated last day to remove grades of "Incomplete" the provisional grade given will be turned into the final grade in the course(s). Grades of

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1 Apply only to students who have scholarship or loan.
“Incomplete” will be included to determine the general average using the provisional grade.

C. Procedures for evaluating academic progress of the graduate level students

The academic progress of all graduate level students will be measured in the following way:

1. The general Grade Point average will be verified every trimester.
2. Probation will be granted for one year educational period.
3. If at the end of the year on probation, the student does not meet all the conditions established and does not overcome the academic deficiencies, he (she) will be permanently suspended from the Institution.

D. Appeals

The student may appeal a decision under the following conditions:

1. Every student is entitled to ask for, in writing, to the Academic Achievement Committee, a reconsideration of the afore mentioned decision within the ten work days following the date in which the decision was notified.
2. The application for reconsideration should show the decision referred to, include a brief statement of facts, expose and justify the basics or foundation that support the appeal and indicate the change or remedy asked for.
3. All reconsideration applications should be filed in the Graduate School Deanship.
4. Exposition of the case by the student before the Academic Achievement Committee is acceptable, and if he (she) so wishes, can be accompanied by persons who are not members of the Committee.
5. The Academic Achievement Committee will inform the student in writing, of the decision taken in regard to the particular case appealed. If the case appealed is approved by the Committee, the student will be rejoined to his/her program on a probation status and will be responsible of the total registration cost.

Effective Date

These rules and regulations are in effect since the beginning of the 2007-2008 academic year. Any student affected by norms and procedures eliminated by these new rules and regulations may apply for reconsideration of his (her) case.

APPLICATION FOR GRADUATION

An official academic evaluation is required prior to applying for graduation. The graduation application must be completed and a graduation fee paid no later than the date specified in the academic calendar. Academic and Graduation applications are obtained at the Graduate Affairs Office. The graduation application should be returned to this Office after clearance by Library, Financial Aid and Finance Offices confirming non existence of debts and payment of the non-refundable graduation fee. Any alleged error in the analysis of an academic record should be reported to the attention of the Academic Evaluator, Graduate Affairs Office within a week after it has been received by the student.

GENERAL GRADUATION REQUIREMENTS

The Polytechnic University of Puerto Rico reserves the right to make changes in the different curricula and degree requirements at its discretion. As a rule, a student is entitled to graduate under the curriculum requirements in force at the time of admission to the Institution. However, students who fail to fulfill the graduation requirements within the regular period of time assigned to their corresponding curricula, and students who re-enroll after a period of one year of absence or more, are governed by the existing curricular requirements at the time of graduation.

To receive a graduation diploma from the Polytechnic University of Puerto Rico, candidates must meet the following conditions or requirements:

1. Apply for graduation after the completion of about 80% of the credit-hours required by filing an application form at the Graduate Affairs Office on the day the student registers in the fall term of the last year of studies.
2. Pay the graduation fee and satisfy all other financial obligations to the University no later than the date specified in the academic calendar.
3. Students must have been recommended for the degree by the Dean of Graduate School to the President of PUPR and to the Board of Trustees.
4. Students completing requirements during any one of the different three academic terms are invited to do their best and participate in the summer commencement exercises.
5. Students should have taken the final credit-hours for the degree at the PUPR with the understanding that these credit-hours correspond to at least the total credit-hours of the last year of the program as specified and described in the Catalog.
6. The student must attain a minimum cumulative grade point average of 3.00.
7. From the term of first registration, graduate students have five years to complete their degree. The time limit for completing a graduate degree can be extended from the term of first registration up to seven years via: a formal petition issued by the graduate student to the Graduate School Dean and the corresponding approval by the Dean.

Note: Time limit extensions are subjected to verification of caducity of certain courses.
8. The student must satisfy all credit-hours specified for the degree within a period equivalent to five years. After the expiration of said period, all expired courses must be repeated, unless otherwise authorized by the Graduate School Dean.
9. The University celebrates Commencement Exercises once every academic year during the Summer term, at which time all degrees and certificates are awarded.

CURRICULAR CHANGES
When the curriculum of a graduate program is revised, this curriculum will apply to (1) new students admitted to the program and (2) inactive students who have been out of the Institution for at least one academic year.

Active students who would like to adopt the curriculum change in his/her program must complete the specific form at the Graduate Affairs Office.

VETERANS’ SERVICES
Polytechnic University of Puerto Rico offers recruiting, guidance, and referral services to veterans who wish to study at the institution. The guidance and counseling officer at the Registrar’s Office assists veterans in the solution of their individual problems and serves as liaison with other offices, as needed. Veteran’s academic records are under the custody of the Registrar’s Office and are available for student’s review.

CERTIFICATIONS AND TRANSCRIPTS
Whenever a student files an application with the Registrar’s Office for a certification of his program of study, transcripts or any other official statement, the same will usually be issued by the Registrar within two weeks after filing of the request. However, when a request is made at the beginning of the or the end of a term, a longer period of time for issuance may be required. To transfer credit-hours to other colleges and universities and to supply information to certifying agencies and prospective employers, official transcripts are issued in a confidential manner. These are mailed directly to the addresses designated by the students and are never given to the student or any other individual. Students may also obtain an official copy of the transcript of credits marked Student Copy. Any alleged errors in the transcript should be reported to the Registrar within ten days of receiving it. A transcript and certification fee is charged for each transcript. All services are denied to debtor students.

DIPLOMAS
Diplomas must be claimed by graduates at the Registrar’s office no earlier than three weeks following the graduation ceremony.

CHANGE OF ADDRESS
When a student submits an application for admission, he/she is required to submit a mailing address. After admission, changes of address should be reported immediately to the Graduate Affairs Office. If change of the address is not indicated, the University will not be responsible for correspondence it sends which is not received by the student. Any notice, official or otherwise, mailed to a student’s address as it appears on the records shall be deemed sufficient notice.

CHANGE IN GRADUATE PROGRAM
A student that would like to change from his/her current graduate program to a new program must: ① complete the change in graduate program form and pay the required fees, ② be in good standing, ③ have approved at least 3 credit-hours and ④ comply with the specific graduate program requirements.

CHANGE IN SPECIALIZATION
Student must complete the change in specialization form available at the Graduate Affairs Office.

CLASS ATTENDANCE
The fact that classes are scheduled is evidence that attendance is important. Students should maintain regular attendance if they are to attain maximum success in the pursuit of their studies. Students who have not attended any classes during the first two weeks of the academic term, are automatically disqualified to charge tuition fees to federal funds and are responsible for their payment. The instructor, after receiving the class lists, will submit, in writing, the names of all such students to the Office of the Registrar.

It is recognized that the record of class attendance may vary according to the student, the instructor, or the course. On occasions, it may be necessary for the student to be absent from scheduled classes or laboratories. The student is responsible for contacting the instructor and for all work, completed or assigned. Instructors in charge of courses in all programs of study are required to include in their mid term and final grade reports the total number of absences of all students. The Registrar will not accept reports if this condition is not met by the instructor.

APPOINTMENT OF GRADUATE SCHOOL RESEARCH ASSISTANTSHIPS (RAS) AND TEACHING ASSISTANTSHIPS (TAS)
Graduate School publicizes assistantships, screens applications and submits recommendations to the Graduate Council for its final approval regarding RAS and TAS.

General guidelines and applications for RAS on TAS can be obtained at the Graduate School Deanship or Graduate School Website, www.pupr.edu/gs.

XIII. GENERAL GRADUATE ACADEMIC INFORMATION

DEGREES OFFERED

Master Degrees in Engineering
Master of Science in Civil Engineering
Master of Science in Computer Engineering
Master of Science in Computer Science
Master of Science in Electrical Engineering
Master of Science in Manufacturing Competitiveness
Master of Science in Manufacturing Engineering
Master of Engineering in Civil Engineering
Master of Engineering in Computer Engineering
Master of Engineering in Electrical Engineering
Master of Engineering in Manufacturing Engineering
Master in Computer Science
Master in Manufacturing Competitiveness
Master in Mechanical Engineering

**Master Degree in Landscape Architecture**
Master of Landscape Architecture

**Master Degrees in Management**
Master of Business Administration
Master in Engineering Management
Master in Environmental Management

**PHILOSOPHY AND OBJECTIVES**

Polytechnic University of Puerto Rico, being deeply committed to serve the private sector, as well as the government and engineering profession, proclaims that graduate studies is one of the most effective ways to satisfy one and all of these constituents. The economic growth strategy promoted by the Government of Puerto Rico depends heavily on product design and development, as part of an ambitious science and technology initiative.

Graduate Programs at Polytechnic of University of Puerto Rico provide excellent opportunities and academic resources for the continuing development of advanced studies and research in Engineering, Management and Landscape Architecture. The most important objective of these programs is that the graduate student develops a mastering knowledge of his/her field of study and of the resources and techniques that will enable him/her to carry out independent professional work or research. The second most important objective is to contribute to the development of an environment capable of nourishing the science and technology initiative of the Government of Puerto Rico. These two objectives, will contribute in many ways to the development of the student, the University, and the community at large.

While the provisions of this Catalog will ordinarily be applied as stated, PUPR reserves the right to change, without previous notice to individual students, any provisions listed in it, including, but not limited to, academic regulations and requirements. Every effort will be made to keep students advised on any changes. Information on changes will be available at the Graduate School. Notification of changes will be posted on PUPR’s Web Page. It is especially important to note that it is the responsibility of the student to keep abreast of current graduation requirements for a particular degree program. A student is normally required to satisfy the degree requirements of the Catalog in effect at the time of his/her initial registration.

A degree will be awarded only to a student who has satisfied all the academic and administrative requirements of PUPR.

**ORGANIZATION OF GRADUATE STUDIES**

Polytechnic University of Puerto Rico offers Graduate Programs in Engineering, Management, and Landscape Architecture. Graduate studies at PUPR are organized around the Graduate School and the academic departments. The student is normally admitted to study the master's degree in the field in which his or her undergraduate degree was conferred when the student record indicates ability to do advanced work in the field. When the student decides to do graduate work in a different field, however, the department may require him/her to establish additional background by taking certain undergraduate courses.

**GRADUATE COURSES NUMBERING SYSTEM**

All graduate courses in Engineering are codified by a number between 6000 and 7999. Some graduate programs in Engineering allow the graduate student to take undergraduate advanced courses, codified by the level 5000. All graduate courses in Management are codified by a number between 5500 and 7999. All graduate courses in Landscape Architecture are codified by a number between 6000 and 7999. 5000 level courses will only be counted as graduate course credit-hours if the graduate program curriculum provides for it.

**GRADUATE PROGRAM COORDINATORS**

The Graduate Program Coordinators are faculty members who verify that administrative and academic requirements are met by all graduate students. Also these faculty members are responsible of establishing more detailed academic requirements for their programs.

The functions and responsibilities of the Graduate Program Coordinators include, among others: curriculum advising, general academic advising, consideration of proposed changes on the student's plan of graduate work, thesis/design project general advising, and the preparation of qualifying examinations (when applicable).

**GRADUATE SCHOOL DEADLINES**

Specific deadlines are published by the Graduate School each term to inform the graduate student regarding due dates related to the specific master’s programs.

**PLAN OF STUDY**

A Plan of Study could be required by an academic program. In such cases, the student must submit the Plan of Study to the Graduate Program Coordinator for his/her approval.
XIV. REQUIREMENTS FOR THE MASTER’S DEGREE

There are several academic options to complete a Master’s degree. The applicant should seek information on the program of interest to determine which options are available in that program.

Option I. Thesis Requirement

In addition to all other graduation requirements, the student shall:

1. Pass all required credit-hours.
2. Present a Thesis proposal of the research that the student will carry out, to his/her Graduate Committee. The student must comply with his/her Graduate Program research requirements.
4. Prepare and present to his/her Graduate Committee a defense of the Thesis research.

Students must enroll for one thesis course and at least one thesis extension to comply with the thesis option graduation requirement. Additional thesis extensions are optional to complete his/her academic work. However, students pursuing the Thesis option can only register in the extension course for up to five consecutive regular trimesters. If the student has not completed the thesis work by the fifth extension course, he/she will have to register the thesis course again. Registering the thesis course again will allow him/her to continue the thesis work.

In the event that the student fails the defense, he/she will have the opportunity to present his/her work for a second time in the following term. The result of the second defense shall be final.

Research topics that change from a Thesis to a Design Project level

Students whose research topics changed, by recommendation and approval of their Graduate Committee, from a Thesis level to a design project level must register at least the Design Project course and comply with the Design Project requirements to complete his/her academic work.

Option II. Design Project Requirement

In addition to all other graduation requirements, the student shall:

1. Pass all required credit-hours.
2. Prepare a Project document following the Graduate School Guidelines for the Design Project Article.
3. Present the Project work and outcomes at the Graduate School Project Design Expo.

Students must enroll for one design project course to comply with the design project option graduation requirement.

Design Project Extension is optional to complete his/her academic work. However, students pursuing the Design Project option can only register in the extension course for up to two consecutive regular trimesters. If the student has not completed the Design Project work by the second extension course, he/she will have to register the Design Project course again. Registering the Design Project course again will allow him/her to continue the thesis work.

In the event that the student fails the defense, he/she will have the opportunity to present his/her work for a second time in the following term. The result of the second presentation shall be final.

Research topics that change from a Design Project to a Thesis level

Students whose research topics are develop, by recommendation and approval of their Graduate Committee, from a design project level to a thesis level (innovation) must register at least the Thesis course and comply with the Thesis requirements to complete his/her academic work.

Option III. Comprehensive Exam Requirement

In addition to the general requirements, the student shall:

1. Pass all required credit-hours.
2. Prepare and present to his/her Graduate Committee a Thesis proposal of the research that the student will carry out, to his/her Graduate Committee. The student must comply with his/her Graduate Program research requirements.
3. Pass all required credit-hours.
5. Prepare and present to his/her Graduate Committee a defense of the Thesis research.

In the event that the student fails the defense, he/she may take a second exam in the next term. The result of the second exam shall be final.

Option IV. Without Thesis, Project or Comprehensive Exam Requirement

In addition to the general requirements, the student shall:

1. Pass all required credit-hours.

CONTINUOUS ENROLLMENT

Continuous Enrollment is only required when a student is pursuing academic work/research necessary to complete a degree. Continuous Enrollment applies to students who have started the research phase of their graduate degree by either enrolling the thesis or design project course. Continuous Enrollment allows students to maintain active status with his/her advisor by registering extension courses. It is the responsibility of the student to maintain Continuous Enrollment status. In the event that the student does not comply with the Continuous Enrollment policy, he/she will have to register the thesis or design project course; the Graduate School will not permit extension courses without the thesis or design project course.

MULTIPLE MASTER’S DEGREES

Completion of an Additional Degree

Students that would like to complete an additional graduate degree (i.e., Graduate School alumni) must: 1) complete the admission procedure for the desired additional graduate
Completion of an Additional Specialization

Students could complete an additional specialization in the same graduate program where they are enrolled by completing the number of credit-hours required in the new desired specialization. Courses already approved in the specialization will not be considered towards the required number of credit-hours of the new specialization.

RULES FOR THE PREPARATION OF THESIS DOCUMENT AND PROJECT ARTICLE

Student must refer to the Graduate School Publications entitled Thesis Writing Procedures or Guidelines for the Design Project Article when writing either the thesis document or the project article. These documents contain specific information regarding the sections of the thesis or project article documents. Compliance with the rules described in those guidelines is mandatory to all graduate students submitting thesis or project article documents to the Graduate School.

The Graduate School offers support services regarding the writing procedures for the thesis or project article through the Graduate School Deanship personnel.

XV. PROGRAMS OF STUDY

MASTER IN CIVIL ENGINEERING

The Graduate Program of Civil Engineering offers two degrees: Master of Science in Civil Engineering (MSCE) and Master of Engineering in Civil Engineering (MECE). Currently, students can select one of the four major areas of interest offered for these degrees: Structural Engineering, Geotechnical Engineering, Water Resources & Water Treatment, and Construction Engineering. By choosing appropriate courses at the graduate level, the student can tailor the program to his/her specific interests or research focus. The Civil Engineering Graduate Program Coordinator will work closely with the student to carefully choose the elective courses that fulfill the student’s professional expectations in breadth as well as in depth.

PROGRAM PHILOSOPHY

Experience and professional practice are essential elements in the formation of an engineer, but an in-depth knowledge of the foundations of the different Civil Engineering (CE) areas, and the development of strong analytical skills based on state of the art knowledge, methodologies, and techniques are also necessary. The professional experience would complement and strengthen the study through applications, but they cannot substitute the experience acquired through an academic graduate level degree.

The CE graduate program seeks to promote advanced studies and research at the Polytechnic University of Puerto Rico. Moreover, it seeks to involve graduate students in this process and to instill in them an intense desire for knowledge.

Civil Engineers are responsible for providing the world’s infrastructure facilities, which are basic to the existence of modern society. These facilities can be large and complex, thus requiring the civil engineers to be broadly trained and able to deal with the latest technologies. The goals of the Graduate Program in Civil Engineering at PUPR are to provide comprehensive training in the Civil Engineering area chosen by the students, to offer instruction in the methods of independent investigation, and to foster the spirit of research scholarship.

The Graduate Program in Civil Engineering has the following objectives:

1. Adequately prepare Civil Engineers in the most advanced technological and scientific aspects of their chosen area of interest.
2. Convey into students the skills and knowledge that will enable them to occupy positions in industry, academia, the public or private sector, or in their own enterprises.
3. Offer Civil Engineers the opportunity to grow professionally in the essential aspects of design and research of their chosen area of interest.
4. Prepare Civil Engineers capable of:
   a. Employing the latest technology to analyze and design safe structures. (Specific to the Structural Engineering area.)
   b. Using their best judgment to analyze data and predict soil properties. (Specific to the Geotechnical Engineering area.)
   c. Applying hydrologic and hydraulic models to the analysis and design of water systems. (Specific to the Water Resources area.)
   d. Assessing and give recommendations to improve the quality of water. (Specific to the Water Treatment area.)
   e. Managing and inspecting the construction of infrastructural projects. (Specific to the Construction Engineering area.)

GRADUATE PROFILE AND OUTCOMES

CE graduates should be able to keep abreast of the latest developments in their chosen area of interest (Structural Engineering, Geotechnical Engineering, Water Resources, Water Treatment and Construction Engineering) by being capable of doing the following:

1. Read and analyze journal papers from their chosen area of interest.
2. Conduct independent research in their chosen area of interest (Thesis Option).
3. Develop engineering solutions of the common problems in their chosen area of interest.
4. Be able to find solutions to comprehensive situations in their chosen area of interest.
5. Write papers or technical reports.
6. Conduct technical and scientific presentations within a conference environment.
7. Use mainstream engineering software applications related to their area of interest.

Graduates in the area of Structural Engineering will be able to:

1. Analyze and design statically indeterminate structures.
2. Analyze and design of structural systems.
3. Use advanced computer tools to analyze the behavior of structural systems.
4. Apply the finite element method to structural systems, plates and shells, plane frame elements and elastic foundations.
5. Understand the behavior of structures under time-dependent loads, vibration analysis, and design for earthquake and impact loadings.
6. Apply advanced concepts to design more economical structures.
7. Apply fundamental concepts within the theory of elasticity and plasticity.
8. Perform analysis to predict and prevent the buckling of trusses, frame elements, shell structures and beams.
9. Apply the principles of soil mechanics to the design of foundations for complex situations.
10. Analyze and design concrete and steel bridges.

Graduates in the area of Geotechnical Engineering will be able to:

1. Fully understand soil shear strength behavior and its application to the engineering practice.
2. Use computer programs to evaluate the properties of soils.
3. Determine the appropriate type of soil shear strength to be used for analysis and design of geotechnical structures.
4. Be able to select the most suitable type of foundation for a specific site.
5. Estimate and control the distribution of consolidation settlement with time.
6. Understand the behavior of soils under dynamic load.
7. Understand the mechanisms of earthquakes and measurement of strong ground motions.
8. Perform back analysis of slope failures and stabilization techniques.
9. Apply the analytical and experimental approach to the design of earthworks involving seepage and seepage control measures.
10. Recognize potential applications for retention structures used in civil engineering applications.

Graduates in the area of Water Resources & Water Treatment will be able to:

1. Select and apply appropriate hydrologic and hydraulic models for analysis and design.
2. Apply probability and statistics principles in the solution of hydrologic problems.
3. Analyze statistical procedures for the evaluation of hydrologic events.
4. Apply groundwater concepts in the solution of hydrologic and water supply problems.
5. Apply tools for the analysis and management of fluvial systems.
6. Design urban drainage systems.
7. Become a productive member of a team involved in the design or management of dams and reservoirs.
8. Assess water quality for any case related to treatment and distribution of potable water, and collection, treatment and disposal of runoff and wastewater.
9. Perform physical-chemical, biological and bench-scale testing of untreated water, potable water, and wastewater samples.
10. Identify and account for the change in contaminant characteristics during each treatment process.
11. Evaluate the efficiency of the different processes in the water and wastewater treatment.
13. Identify the best treatment alternative for each contaminant in subsurface environments.

GRADUATE PROFILE AND OUTCOMES

Graduates from the MEM program will be able to:

- Apply economic analysis to engineering projects to take sound budgetary decisions, effectively controlling costs and expenditures.
- Perform management planning and organization of tasks in order to accomplish corporate goals.
- Manage efficiently engineering resources.
- Establish and maintain successful engineering business ventures.
- Determine cost estimates and appraisals of engineering projects.

**CAREER OPPORTUNITIES**

CE Graduates could primarily work in engineering consulting firms, in construction companies and in government agencies that deal with public infrastructure. They could work in the design of civil engineering works or in the inspection and supervision of construction projects. Graduates of this master program can also teach at the undergraduate or technical level, or can pursue a doctoral degree.

**PROGRAM REQUIREMENTS**

**Admission Requirements**

Students with undergraduate preparation in Civil or Environmental Engineering programs are encouraged to apply for admission. Applicants must have completed a bachelor's degree at an accredited university with a minimum Grade Point Average (GPA) of 2.75/4.00. Applicants not meeting these requirements may request reconsideration by a committee.

**Graduation Requirements**

Students may pursue their master degree according to three program alternatives. One conducts to the Master of Science in Civil Engineering degree and the other two lead to the Master of Engineering in Civil Engineering degree. Following are the requirements for each of the three alternatives. All alternatives require a minimum GPA of 3.00/4.00.

**Alternative 1: Master of Science Degree - Thesis Requirement**

- Approve a minimum of 24 credit-hours in graduate courses (Level 6000) in the major area. Two of the courses must be CE 6900 - Introduction to Research in Civil Engineering and a mathematical oriented course as required by the major area of interest selected by the student.
- Approve a minimum of 6 credit-hours in graduate courses (Level 6000) out of the major area. These courses may be replaced major area courses.
- A maximum of 6 credit-hours advanced under-graduate courses (Level 5000) can be used to replace graduate courses (Level 6000) as recommended by the Civil Engineering Graduate Program Coordinator.
- Carry out a research program as specified in his/her program of study and prepare a thesis. The thesis consists of 6 credit-hours. Pass an oral exam (defense) on the thesis subject.

**Alternative 2: Master of Engineering Degree - Master Project Requirement**

- Approve a minimum of 27 credit-hours, in graduate courses (Level 6000) in the major area. One of the courses must be a mathematical oriented course as required by the major area of interest selected by the student.
- Approve a minimum of 6 credit-hours in graduate courses (Level 6000) out of the major area. These courses may be replaced major area courses.
- A maximum of 6 credit-hours advanced under-graduate courses (Level 5000) can be used to replace graduate courses (Level 6000) as recommended by the Civil Engineering Graduate Program Coordinator.

**Alternative 3: Master of Engineering Degree - Comprehensive Exam Requirement**

- Approve a minimum of 30 credit-hours, in graduate courses (Level 6000) in the major area. One of the courses must be a mathematical oriented course as required by the major area of interest selected by the student.
- Approve a minimum of 9 credit-hours in graduate courses (Level 6000) out of the major area. These courses may be replaced major area courses.
- A maximum of 6 credit-hours advanced under-graduate courses (Level 5000) can be used to replace graduate courses (Level 6000) as recommended by the Civil Engineering Graduate Program Coordinator.
- Pass an oral and written comprehensive exams on the topics covered in the major area.

**Thesis, Master Project and Comprehensive Exam Requirements**

The thesis or project required in the Civil Engineering Graduate Program is intended to test the ability of the Master's candidate to engage in original research or complex projects, and to organize and evaluate themselves creatively in the area of Civil Engineering.

**Thesis**

The student must prepare a research proposal, after completion of a minimum of twelve (12) credit-hours. The proposal has to be approved by the student advisor and the graduate committee. The graduate committee will be constituted by a minimum of three professors, including the chairperson. The student must conduct the research under the direct supervision of the chairperson and with the mentoring of the rest of the graduate committee. The final report must include original contributions to the specific area of knowledge.

At completion of the thesis project, an oral examination will be administered to test the candidate not only on his/her research topic, but also in the Civil Engineering areas and related fields that are relevant for the thesis development. This examination (defense) is administrated by the graduate.
committee, under the supervision of the chairperson and with the presence of the Civil Engineering Graduate Program Coordinator.

A copy of the final version of the thesis report with the signature approval of the graduate committee must be delivered to both, the Civil Engineering Graduate Program Coordinator and the Graduate School.

Master Project
In the Master Project alternative, the student must prepare a project proposal. The proposal has to be approved by the project advisor. The project advisor is a faculty member. The project has to be a challenging case-study that may include the evaluation, analysis and/or design of a specific situation within the student’s area of interest.

At completion, the project will be presented at the Graduate School Design Project Expo. As a final requirement of the Graduate School, the student must submit a technical article of the Master Project.

Comprehensive Exam
The comprehensive examination will be designed to test the candidate in the Civil Engineering areas and related fields covered in his/her program of study. This examination is administered by the graduate committee, under the supervision of the student advisor, after the completion of a minimum of 33 credit-hours.

DEGREES OFFERED
The Department of Civil and Environmental Engineering offers graduate instruction leading to the degrees of Master of Science in Civil Engineering (MSCE) and Master of Engineering in Civil Engineering (MECE). Students must select a major area of interest from the following:

- Structural Engineering
- Geotechnical Engineering
- Water Resources & Water Treatment
- Construction Engineering

CURRICULAR STRUCTURE AND SEQUENCE

Required Course for MSCE (3 credit-hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 6900</td>
<td>Introduction to Research in Civil Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>

Major Area
Students must select one of the four available Major Areas: (1) Structural Engineering, (2) Geotechnical Engineering, (3) Water Resources & Water Treatment, and (4) Construction Engineering. The total number of credits in Major Area courses varies depending on the degree and option selected. For the Master of Science degree, student must take a minimum of 18 credit-hours in their Major Area. For the Master of Engineering degree with the Project Option, student must take a minimum of 24 credit-hours in their Major Area. For the Master of Engineering degree with the Comprehensive Exam Option, students must take a minimum of 27 credit-hours in their Major Area.

Structural Engineering Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 6370</td>
<td>Finite Element Methods in Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>

Other Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 6300</td>
<td>Structural Engineering Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CE 6305</td>
<td>Simulation Engineering Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CE 6315</td>
<td>Analysis of Plates and Shells</td>
<td>3</td>
</tr>
<tr>
<td>CE 6320</td>
<td>Advanced Strength of Materials</td>
<td>3</td>
</tr>
<tr>
<td>CE 6323</td>
<td>Design of Composite Materials</td>
<td>3</td>
</tr>
<tr>
<td>CE 6325</td>
<td>Principles of Structural Stability</td>
<td>3</td>
</tr>
<tr>
<td>CE 6330</td>
<td>Advanced Topics in Structural Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CE 6335</td>
<td>Advanced Foundations</td>
<td>3</td>
</tr>
<tr>
<td>CE 6340</td>
<td>Advanced Bridge Design</td>
<td>3</td>
</tr>
<tr>
<td>CE 6345</td>
<td>Design of Reinforced Masonry Structures</td>
<td>3</td>
</tr>
<tr>
<td>CE 6350</td>
<td>Dynamics of Structures</td>
<td>3</td>
</tr>
<tr>
<td>CE 6355</td>
<td>Advanced Earthquake Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CE 6357</td>
<td>Wind Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CE 6360</td>
<td>Bridge Inspection, Rehabilitation, Repair, and Management</td>
<td>3</td>
</tr>
<tr>
<td>CE 6375</td>
<td>Advanced Finite Element Methods in Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CE 6378</td>
<td>Advanced Reinforced Concrete Design</td>
<td>3</td>
</tr>
<tr>
<td>CE 6380</td>
<td>Nonlinear Behavior of Concrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>CE 6385</td>
<td>Advanced Steel Design</td>
<td>3</td>
</tr>
<tr>
<td>CE 6390</td>
<td>Lateral Load Distribution in Multistory Buildings</td>
<td>3</td>
</tr>
<tr>
<td>CE 6395</td>
<td>Nonlinear Analysis of Soil-Structure Interaction</td>
<td>3</td>
</tr>
</tbody>
</table>

Geotechnical Engineering Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 6174</td>
<td>Finite Element Methods for Geotechnical Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>

Other Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 6100</td>
<td>Soil Shear Strength</td>
<td>3</td>
</tr>
<tr>
<td>CE 6105</td>
<td>Advanced Geotechnical Engineering Applications</td>
<td>3</td>
</tr>
<tr>
<td>CE 6110</td>
<td>Earth Retaining Structures</td>
<td>3</td>
</tr>
<tr>
<td>CE 6114</td>
<td>Shallow Foundations</td>
<td>3</td>
</tr>
<tr>
<td>CE 6116</td>
<td>Consolidation Theory and Applications</td>
<td>3</td>
</tr>
<tr>
<td>CE 6120</td>
<td>Deep Foundations</td>
<td>3</td>
</tr>
</tbody>
</table>
Graduate Catalog 2010-11 to 2011-12

Out-of-Major Area

An Out-of-Major Area course is any CE course not listed in the student’s Major Area. In addition, students in the Water Resources and Water Treatment major area of interest may take as Out-of-Major Area elective any course labeled as MEM 69XX and EPM 6XXX, while students in the Construction Engineering major area of interest may take as Out-of-Major Area elective any course labeled as MGM 5XXX, MEM and EPM 6XXX. The total number of credits in out-of-major area courses varies depending on the degree and option selected. For the Master of Science degree and the Master of Engineering with the Project option, students could take a maximum of 6 credit-hours in elective courses. For the Master of Science degree the Comprehensive Exam option the maximum is 9 credit-hours in elective courses. Students are allowed to replace Out-of-Major Area courses with Major Area courses.

Thesis, Project and Comprehensive Exam courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 6901</td>
<td>Master’s Thesis Dissertation</td>
<td>6</td>
</tr>
<tr>
<td>CE 6902</td>
<td>Extension of Master’s Thesis Dissertation</td>
<td>0</td>
</tr>
<tr>
<td>CE 6905</td>
<td>Master Project, “Final Project”</td>
<td>3</td>
</tr>
<tr>
<td>CE 6906</td>
<td>Extension of Master Project, “Final Project”</td>
<td>0</td>
</tr>
<tr>
<td>CE 6910</td>
<td>Comprehensive Examination</td>
<td>3</td>
</tr>
</tbody>
</table>

LABORATORIES

The Civil and Environmental Engineering Department has the following laboratory facilities on campus: Structural Engineering Laboratory, Construction Materials Laboratory, Mechanics of Materials Laboratory, Geotechnical Engineering Laboratory, Environmental Engineering Laboratory, Transportation Laboratory, and Civil Engineering Simulations Laboratory. These laboratories have been designed to perform a wide range of experiments in each of the areas.

Structures and Mechanics of Materials Laboratory – This laboratory is prepared to support undergraduate and graduate courses of Civil Engineering, as well as some extracurricular activities of the students, such as a competitions sponsored by the student chapters of professional societies. Among the major equipment of the laboratory are a test frame with two hydraulic jacks with capacity of 50 KN (11.5 kips) each; small-scaled structures to support the theory of structural lectures with experiments; a plate for analysis of a two-way slab; models of a gable and flat frame; data acquisition system to obtain the data electronically.

Construction Materials Laboratory – This laboratory can be used to develop an understanding of the physical and mechanical properties of construction materials as well as the loads that each construction material can withstand. The laboratory has several equipment to test aggregates, concrete, wood, reinforcing steel and asphalt.

Geotechnical Engineering Laboratory – This laboratory has multiple sets of equipment meeting or exceeding industry
standards and used to measure the engineering properties of soils with an acceptable rate of accuracy. The laboratory facilities provide enough space for four fully equipped workstations.

**Environmental Engineering Laboratory** – In this laboratory, students can conduct tests to determine the main physical, chemical and biological characteristics of water and wastewater, to monitor the quality of water and wastewater, and to conduct measurements for air contaminants, solid waste physical properties, metals and dissolved components in wastewater, pH of soil suspensions in water, and adsorption of organic chemicals to activated carbon.

**Highway and Transportation Laboratory** – This laboratory is focused in data collection techniques and use of equipment and computer software associated with different types of transportation studies in which application of statistics and probability to analyze, interpret, manage and present transportation data is required.

**Civil and Environmental Engineering Simulations Laboratory** - This laboratory is equipped with 30 computers. It is commonly used as a classroom for professors to teach essential Civil Engineering software and as a computer center for civil and environmental engineering for students to use for their class projects.

**CIVIL ENGINEERING COURSE DESCRIPTIONS**

**CE 6100 - Soil Shear Strength**

*Three credit-hours. Prerequisite: None. One four hours session per week.*


**CE 6105 - Advanced Geotechnical Engineering Applications**

*Three credit-hours. Prerequisite: None. One four hours session per week.*


**CE 6110 - Earth Retaining Structures**

*Three credit-hours. Prerequisite: None. One four hours session per week.*


**CE 6114 - Shallow Foundations**

*Three credit-hours. Prerequisite: None. One four hours session per week.*


**CE 6116 - Consolidation Theory and Applications**

*Three credit-hours. Prerequisite: None. One four hours session per week.*


**CE 6120 - Deep Foundations**

*Three credit-hours. Prerequisite: None. One four hours session per week.*


**CE 6125 - Soil Dynamics**

*Three credit-hours. Prerequisite: None. One four hours session per week.*


**CE 6130 - Geotechnical Earthquake Engineering**

*Three credit-hours. Prerequisite: None. One four hours session per week.*

The principles, theories and methods of Geotechnical earthquake engineering. Principles of wave propagation and their applications for the development of local site effects, liquefaction and slope stability under seismic conditions.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Prerequisite</th>
<th>Session per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 6140</td>
<td>Slope Stability</td>
<td>Three</td>
<td>None</td>
<td>One four</td>
</tr>
<tr>
<td></td>
<td></td>
<td>credit-hours</td>
<td></td>
<td>hours</td>
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<tr>
<td></td>
<td>Subsoil exploration and sampling for slope stability.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Shear strength for slope stability analysis.</td>
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<tr>
<td></td>
<td>Procedures for computations, Ordinary, Bishop, Jambu and</td>
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<tr>
<td></td>
<td>Spencer methods.  Water pressures and unit weight.</td>
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<tr>
<td></td>
<td>Short and long-term conditions.  Pseudo-static analysis.</td>
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<tr>
<td></td>
<td>Common problems in computer analysis.  Back analysis of slope failures.</td>
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<tr>
<td></td>
<td>Computer applications.  Slope stabilization and monitoring program.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>CE 6150</td>
<td>Seepage and Drainage</td>
<td>Three</td>
<td>None</td>
<td>One four</td>
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<tr>
<td></td>
<td></td>
<td>credit-hours</td>
<td></td>
<td>hours</td>
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<tr>
<td></td>
<td>Filter and drain design.  Geosynthetics applications.</td>
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<td></td>
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<tr>
<td>CE 6174</td>
<td>Finite Element Methods for Geotechnical Engineering</td>
<td>Three</td>
<td>None</td>
<td>One four</td>
</tr>
<tr>
<td></td>
<td></td>
<td>credit-hours</td>
<td></td>
<td>hours</td>
</tr>
<tr>
<td></td>
<td>Displacement approximation.  Shape functions and generalized coordinates approach.</td>
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<tr>
<td></td>
<td>Bar elements applied to pile analysis.  Plane strain elements applied to slope and earth gravity dam analysis.  Plate elements applied to analysis of mats on elastic foundations.  Commercial packages. Advanced topics in geotechnical computational mechanics.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>CE 6210</td>
<td>Probability and Statistics in Water Engineering</td>
<td>Three</td>
<td>None</td>
<td>One four</td>
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<tr>
<td></td>
<td></td>
<td>credit-hours</td>
<td></td>
<td>hours</td>
</tr>
<tr>
<td></td>
<td>Probability and statistical principles applied to the solution of hydrologic problems.</td>
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<td></td>
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<tr>
<td></td>
<td>Application of probability distributions to the rainfall and runoff process.  Field analysis using random distributions and functions.  Determination of confidence intervals and hypothesis.  Analysis of annual and partial hydrologic time series.</td>
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<td></td>
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<tr>
<td>CE 6220</td>
<td>Meteorology</td>
<td>Three</td>
<td>None</td>
<td>One four</td>
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<tr>
<td></td>
<td></td>
<td>credit-hours</td>
<td></td>
<td>hours</td>
</tr>
<tr>
<td></td>
<td>Composition of the atmosphere.  Temperature and air mass.</td>
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<td></td>
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<tr>
<td>CE 6230</td>
<td>Groundwater Hydrology</td>
<td>Three</td>
<td>None</td>
<td>One four</td>
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<tr>
<td></td>
<td></td>
<td>credit-hours</td>
<td></td>
<td>hours</td>
</tr>
<tr>
<td>CE 6240</td>
<td>Urban Drainage</td>
<td>Three</td>
<td>None</td>
<td>One four</td>
</tr>
<tr>
<td></td>
<td></td>
<td>credit-hours</td>
<td></td>
<td>hours</td>
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<tr>
<td></td>
<td>Studies of storm water management in urban areas emphasizing storm drainage systems associated with transportation facilities and urbanized watersheds.  Basic topics: a) Surface drainage systems design parameters and regulations, b) Flow in gutters, c) Drainage inlet and median channels analysis, d) Detention and retention storage facilities analysis.</td>
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<tr>
<td>CE 6250</td>
<td>Advanced Hydrologic and Hydraulic Modeling</td>
<td>Three</td>
<td>None</td>
<td>One four</td>
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<tr>
<td></td>
<td></td>
<td>credit-hours</td>
<td></td>
<td>hours</td>
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<tr>
<td></td>
<td>Methods of modeling hydrologic and hydraulic systems are examined.  Basic topics: a) Particular models, b) Model selection, c) Model calibration procedures, d) Model application to real cases.</td>
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<td></td>
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</tr>
<tr>
<td>CE 6260</td>
<td>Analysis and Restoration of Fluvial Systems</td>
<td>Three</td>
<td>None</td>
<td>One four</td>
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<tr>
<td></td>
<td></td>
<td>credit-hours</td>
<td></td>
<td>hours</td>
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<tr>
<td></td>
<td>This is a practical course, which describes the characteristics, management and restoration of fluvial systems and their associated estuary and wetland habitats.  It provides an integrated overview of the morphology, ecology, hydrology, hydraulics and sediment dynamics of both artificial and natural channels and their associated floodplains.  Tools are presented to observe, sample, and interpret basic problems that affect fluvial systems, and to define and analyze restoration alternatives.</td>
<td></td>
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<tr>
<td>CE 6270</td>
<td>Sedimentation Engineering</td>
<td>Three</td>
<td>None</td>
<td>One four</td>
</tr>
<tr>
<td></td>
<td></td>
<td>credit-hours</td>
<td></td>
<td>hours</td>
</tr>
<tr>
<td></td>
<td>Sediment transport Analysis and management in the fluvial environment.  A practical course on the characteristics and management of fluvial sediments including: sediment characteristics, origin and transport of sediments, sampling and measurements of both coarse and fine sediment, initiation of motion, channel hydraulics and stability, numerical and physical modeling concepts, design of fixed and live bed channels.  Includes practical applications in the area of reservoir design and management, bridge scour, intake design, and streambank erosion and design of naturalized channels.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Name</td>
<td>Credit Hours</td>
<td>Prerequisite</td>
<td>Session Per Week</td>
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<tr>
<td>CE 6280</td>
<td>Reservoir Analysis and Design</td>
<td>Three</td>
<td>None. One four hours</td>
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<td>credit-hours</td>
<td>. Prerequisite: None. One four hours</td>
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<td></td>
<td>Physical characteristics of reservoirs:</td>
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<td></td>
<td>yield, capacity, reliability,</td>
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<td></td>
<td>sedimentation. Types of reservoirs. Forces on</td>
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<td></td>
<td>dams, gravity dams, arch dams, earth</td>
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<td></td>
<td>dams. Safety and rehabilitation of dams.</td>
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<td></td>
<td>Spillways, gates and outlet structures.</td>
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<tr>
<td>CE 6300</td>
<td>Structural Engineering Laboratory</td>
<td>Three</td>
<td>None. One four hours</td>
<td>Three</td>
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<td>credit-hours</td>
<td>. Prerequisite: None. One four hours</td>
<td>per week.</td>
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<td></td>
<td>Experimental determination, and correlation</td>
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<td></td>
<td>with theoretical predictions of behavior of</td>
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<td></td>
<td>basic structures under static and dynamic</td>
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<td>loading conditions. Tests include tension,</td>
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<td>compression, fatigue, and strain gauge</td>
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<td></td>
<td>measurements.</td>
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<tr>
<td>CE 6305</td>
<td>Simulation Engineering Laboratory</td>
<td>Three</td>
<td>None. One four hours</td>
<td>Three</td>
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<td></td>
<td>credit-hours</td>
<td>. Prerequisite: None. One four hours</td>
<td>per week.</td>
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<td></td>
<td>The development of numerical structural system</td>
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<td></td>
<td>models. Applications of software system to</td>
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<td>design and analysis. Interactive design</td>
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<td>techniques of optimal design and structural</td>
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<td>element configuration. Experimental stress</td>
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<td></td>
<td>analysis using computer tools.</td>
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<tr>
<td>CE 6315</td>
<td>Analysis of Plates and Shells</td>
<td>Three</td>
<td>None. One four hours</td>
<td>Three</td>
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<td></td>
<td>credit-hours</td>
<td>. Prerequisite: None. One four hours</td>
<td>per week.</td>
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<td></td>
<td>Bending of flat plates. General theory. Folded</td>
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<td></td>
<td>plates. Slab action and beam behavior. Shear</td>
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<td></td>
<td>flow at plate intersections. Membrane stresses</td>
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<td>and displacement of shells of revolution.</td>
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<td>Bending stresses in circular domes. Synclastic</td>
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<td></td>
<td>surfaces. Hyperbolic paraboloid shells. Edge</td>
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<td>geometry and support conditions. Prestressing</td>
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<td>in plates and shells.</td>
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<tr>
<td>CE 6320</td>
<td>Advanced Strength of Materials</td>
<td>Three</td>
<td>None. One four hours</td>
<td>Three</td>
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<td>credit-hours</td>
<td>. Prerequisite: None. One four hours</td>
<td>per week.</td>
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<td>Theories of stress and strain, linear</td>
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<td></td>
<td>stress-strain. Temperature relations,</td>
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<td>inelastic material behavior, nonsymmetrical</td>
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<td>bending of straight beams, torsion, beams oil</td>
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<td>elastic foundations. Applications to</td>
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<td>cylindrical shells. Two-dimensional theory of</td>
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<td>elasticity. Matrix formulation.</td>
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<td>CE 6325</td>
<td>Principles of Structural Stability</td>
<td>Three</td>
<td>None. One four hours</td>
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<td>credit-hours</td>
<td>. Prerequisite: None. One four hours</td>
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<td>Integration of the neutral equilibrium</td>
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<td>differential equation in columns. Energy</td>
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<td>method. Principle of stationary total</td>
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<td>potential energy. Second order strains. Stress</td>
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<td>stiffness matrix in flexural members. Eigenvalue</td>
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<td></td>
<td>problem. Buckling of trusses and frames.</td>
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<td>Computer program. Torsional and torsional-</td>
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<td>flexural buckling of beams. Stress stiffness</td>
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<td>matrix plate elements. Local buckling. Inelastic</td>
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<td>effects.</td>
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<td>CE 6330</td>
<td>Advanced Topics in Structural Engineering</td>
<td>Three</td>
<td>None. One four hours</td>
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<td>credit-hours</td>
<td>. Prerequisite: None. One four hours</td>
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<td></td>
<td>Advanced matrix analysis methods. Applications</td>
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<td>to bar-element structures, with particular</td>
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<td>emphasis on the stiffness method application,</td>
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<td>computer implementation, and the usage of</td>
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<td>spreadsheets and analysis packages.</td>
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<td>CE 6335</td>
<td>Advanced Foundations</td>
<td>Three</td>
<td>None. One four hours</td>
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<td>credit-hours</td>
<td>. Prerequisite: None. One four hours</td>
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<td>The applications of the principles of soil</td>
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<td>mechanics to the design of foundations.</td>
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<td>Subsurface investigation. Design of footings,</td>
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<td>retaining walls, pile foundations, flexible</td>
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<td>retaining structures, anchor tie-backs, bridge</td>
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<td>piers, abutments, dewatering system, and</td>
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<td>underpinning. Case studies.</td>
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<td>CE 6340</td>
<td>Advanced Bridge Design</td>
<td>Three</td>
<td>None. One four hours</td>
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<td>credit-hours</td>
<td>. Prerequisite: None. One four hours</td>
<td>per week.</td>
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<td></td>
<td>Introduction to modern highway bridges. Design</td>
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<td>of concrete, steel and timber superstructures.</td>
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<td>Design of bridge substructure, including: piers,</td>
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<td>abutments and bearings. Bridge seismic analyses.</td>
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<td>Introduction to bridge inspection and</td>
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<td>maintenance.</td>
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<td>CE 6345</td>
<td>Design of Reinforced Masonry Structures</td>
<td>Three</td>
<td>None. One four hours</td>
<td>Three</td>
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<td>credit-hours</td>
<td>. Prerequisite: None. One four hours</td>
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<td>Design of Masonry building structures using</td>
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<td>working stress and ultimate strength. Design</td>
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<td>methods. Lateral load distribution to shear</td>
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<td>walls. Design of shear and bearing masonry</td>
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<td>walls subjected to lateral and gravity load</td>
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<td>conditions. Quality control and construction of</td>
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<td></td>
<td>masonry structures. Reinforced masonry, system</td>
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<td>behavior state analysis.</td>
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<td>CE 6350</td>
<td>Dynamics of Structures</td>
<td>Three</td>
<td>None. One four hours</td>
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<td>credit-hours</td>
<td>. Prerequisite: None. One four hours</td>
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<td>Analysis and design of structures under</td>
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<td>time-dependent loads. Response of elastic</td>
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<td>damped and undamped structural systems.</td>
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<td>Vibration analysis for single and multiple</td>
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<td>lumped mass.</td>
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systems and continuous systems. Lagrange's equation. Design for earthquake and impact loadings.

**CE 6355 - Advanced Earthquake Engineering**

**Three credit-hours. Prerequisite: None. One four hours session per week.**


**CE 6357 - Wind Engineering**

**Three credit-hours. Prerequisite: None. One four hours session per week.**


**CE 6360 - Bridge Inspection, Rehabilitation, Repair and Management**

**Three credit-hours. Prerequisite: None. One four hours session per week.**

Overview of the bridge engineering process: from the origins of bridge project through its design and the eventual maintenance and rehabilitation of a structure.

**CE 6370 - Finite Element Methods in Engineering**

**Three credit-hours. Prerequisite: None. One four hours session per week.**


**CE 6375 - Advanced Finite Element Methods in Engineering**

**Three credit-hours. Prerequisite: None. One four hours session per week.**

Semi-analytical finite element processes. Use of orthogonal functions and “finite strip” methods. Non-linear plasticity, creep, viscoplasticity. Non linear geometrically covering the large displacement and structural instability.

**CE 6378 - Advanced Reinforced Concrete Design**

**Three credit-hours. Prerequisite: None. One four hours session per week.**


**CE 6380 - Non Linear Behavior of Concrete Structures**

**Three credit-hours. Prerequisite: None. One four hours session per week.**


**CE 6385 - Advanced Steel Design**

**Three credit-hours. Prerequisite: None. One four hours session per week.**

Behavior of elements subjected to tensile, bending, and compression forces. Design of connections. Design of plate-girders.

**CE 6390 - Lateral Load Distribution in Multistory Buildings**

**Three credit-hours. Prerequisite: None. One four hours session per week.**


**CE 6395 - Nonlinear Analysis of Soil-Structure Interaction**

**Three credit-hours. Prerequisite: None. One four hours session per week.**

Nonlinear stress-displacement relationship at soil-structure interface. Discussion of differences between granular and cohesive soils. Refined beam-column with five (5) degrees of freedom to allow distributed load between nodes. Element stiffness matrix and geometric non-linearity expressed by corresponding stability matrix. Analytical procedure to take into account the non-linear soil response by means of a corrective force vector. Discussion of computer software for calculation of ultimate pile lateral load capacity considering non-linear soil behavior and second order effects. Studies of bridge pile bent subjected to large lateral forces caused by extreme ground motion during earthquakes.
CE 6410 - Water And Wastewater Treatment Applications
Three credit-hours. Prerequisite: None. One four hours session per week.

Development of sampling programs and experimental procedures to evaluate untreated water sources, and the treatment performance of potable water and wastewater unit processes. The results can be used to improve the operation and maintenance of existing facilities and the design of new facilities with confidence based on field data.

CE 6420 - Fate and Transport of Contaminants in Soils
Three credit-hours. Prerequisite: None. One four hours session per week.

Engineering principles applied to the study of contamination and remediation of soils. Basic topics: a) Characteristics of soils, b) Origin and nature of soil contamination, c) Fate and Transport of contaminants in the subsoil, d) Remediation of soil contamination.

CE 6430 - Remediation in Contaminated Subsurface Environments
Three credit-hours. Prerequisite: None. One four hours session per week.

Remediation engineering: design and applications to emphasize the engineering aspects of using remediation process for the treatment of contaminated soils, sludge, and groundwater.

CE 6440 - Physical and Chemical Treatment Processes of Water and Wastewater
Three credit-hours. Prerequisite: None. One four hours session per week.

Physical and chemical characteristics of water and wastewater. Analysis of the theory and applications of physical and chemical processes to the treatment of water and wastewater: screening, sedimentation, thickening, dissolved air flotation, coagulation, chemical precipitation, mixing, flocculation, filtration, electrodialysis and pressure membranes, adsorption, aeration, absorption and stripping, water softening, water stabilization, ion exchange, and disinfection. Design criteria and evaluation techniques for these processes. Chemical requirements and sludge production calculations.

CE 6450 - Biological Wastewater Treatment Processes
Three credit-hours. Prerequisite: None. One four hours session per week.


CE 6460 - Water Quality Control and Management
Three credit-hours. Prerequisite: None. One four hours session per week.


CE 6512 - Value Engineering
Three credit-hours. Prerequisite: None. One four hours session per week.


CE 6520 - Construction Contracting and Procurement
Three credit-hours. Prerequisite: None. One four hours session per week.


CE 6530 - Schedule Impact Analysis
Three credit-hours. Prerequisite: None. One four hours session per week.


CE 6532 - Construction Cost Control
Three credit-hours. Prerequisite: None. One four hours session per week.


CE 6534 - Construction Productivity Improvement
Three credit-hours. Prerequisite: None. One four hours session per week.

Construction Supervisor Skills. Productivity impact factors. Lost productivity quantification. Sub-contractors management. Record keeping, control, changes and defect analysis. Use of new technology to increase productivity.
CE 6540 - Construction Equipment Administration
Three credit-hours. Prerequisite: None. One four hours session per week.


CE 6542 - Construction Material Management
Three credit-hours. Prerequisite: None. One four hours session per week.


CE 6544 - Hazardous Material Management
Three credit-hours. Prerequisite: None. One four hours session per week.

This course covers the safety, health and transportation regulations of hazardous materials according to Federal and Local Agencies Regulations, such as: Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), and Department of Transportation (DOT).

CE 6550 - Construction Inspections
Three credit-hours. Prerequisite: None. One four hours session per week.


CE 6560 - Construction Safety Planning & Regulations
Three credit-hours. Prerequisite: None. One four hours session per week.


CE 6580 - Temporary Structures in Construction
Three credit-hours. Prerequisite: None. One four hours session per week.


CE 6900 - Introduction to Research in Civil Engineering
Three credit-hours. Prerequisite: None. One four hours session per week.

This course introduces students to the different stages of a formal research process in engineering sciences. Emphasis is given to the first steps of the process, that lead to the development of a thesis (project) proposal: topic selection, formulation of preliminary objectives, development of a comprehensive literature review, and definition of the research project objectives, scope, methodology, and schedule of activities.

CE 6901 - Master's Thesis Dissertation
Six credit-hours. Prerequisite: Graduate Program Coordinator Approval. One four hours session per week.

Experimental and/or theoretical research to be presented in thesis for degree requirements.

CE 6902 - Extension of Master's Thesis Dissertation
Zero credit-hours. Prerequisite: Graduate Program Coordinator Approval. One four hours session per week.

Extension to complete the experimental and/or theoretical research to be presented in thesis for degree requirements.

CE 6905 - Master Project, "Final Project"
Three credit-hours. Prerequisite: Graduate Program Coordinator Approval. One four hours session per week.

Development of a design project covering all relevant aspects and using advanced analysis and design techniques.

CE 6906 - Extension of Master Project, "Final Project"
Zero credit-hours. Prerequisite: Graduate Program Coordinator Approval. One four hours session per week.

Extension to complete the development of a design project covering all relevant aspects, and using advanced structural analysis and design techniques.

CE 6910 - Comprehensive Examination
Zero credit-hours. Prerequisite: Graduate Program Coordinator Approval. One four hours session per week.

Written and oral comprehensive exams on the major field of study.

CE 6999 - Special Topics in Civil Engineering
Three credit-hours. Prerequisite: Graduate Program Coordinator Approval. One four hours session per week.

Special topics in any areas of civil engineering.
PROGRAM FACULTY

Alsaadi, Balhan Altayeb – Professor, Ph.D. in Civil Engineering, Polytechnic University of Madrid, Spain, 1988; M.S.C.E., B.S.C.E., Trian Vuia Polytechnic Institute, Timisoara, Romania, 1984.

Coll Borgo, Manuel – Lecturer II, Ph.D. in Civil Engineering, University of Puerto Rico, Mayagüez Campus, 2001; B.S.C.E., University of Puerto Rico, Mayagüez Campus; 1994; P.E.

Collazos Ordóñez, Omaira – Professor, Ph.D. in Civil Engineering, University of Puerto Rico, Mayagüez Campus, 1993; B.S.C.E., University of Cauca, Colombia, 1989.

Cruzado Vélez, Héctor J. – Professor, Ph.D. in Wind Science and Engineering, Texas Tech University, 2007; M.S.C.E., Massachusetts Institute of Technology, 1998; B.S.C.E., University of Puerto Rico, Mayagüez Campus, 1996; P.E.

Deschapelles Duque, Bernardo – Professor, Ph.D. in Civil Engineering, California Western University, 1983; M.S.C.E., California Western University, 1981; B.S.C.E., University of Havana, Cuba, 1954; P.E.

González Miranda, Carlos J. – Professor, Ph.D. in Industrial Engineering, North Carolina State University, 1995; M.M.S.E., North Carolina State University, 1990; B.S.I.E., University of Puerto Rico, Mayagüez Campus, 1987; E.I.T.

Guzmán De La Cruz, Alberto – Associate Professor, Ph.D. in Civil Engineering, University of Puerto Rico, Mayagüez Campus, 1998; M.S.C.E., University of Puerto Rico, Mayagüez Campus, 1994; B.S.C.E., Institute of Technology of Santo Domingo, Dominican Republic, 1990; P.E.

Malaver Muñoz, Roger – Associate Professor, Ph.D. in Chemical Engineering, University of Sherbrooke, Canada, 1999; M.S.Ch.E., University of Puerto Rico, Mayagüez Campus, 1993; B.S.Ch.E., National University of San Marcos, Perú, 1990; B.S. in Food Technology Engineering, Villareal University, Perú, 1987.

Mueses Pérez, Auristela – Professor, Ph.D. in Civil Engineering, University of Florida; M.S.C.E., University of Puerto Rico, Mayagüez Campus, 1992; B.S.C.E., Technological Institute of Santo Domingo, Dominican Republic, 1987; P.E.

Pacheco-Crosetti, Gustavo – Professor, Ph.D. in Civil Engineering, University of Puerto Rico, Mayagüez Campus, 2007; M.S. in Finite Element Method, UNED, Spain, 1996; M.S.C.E., University of Puerto Rico, Mayagüez Campus, 1993; B.S.C.E. and M.S.C.E., National University of Córdoba, Argentina, 1988; P.E.

Pimenta De Oliveira, Aluisio – Associate Professor, Ph.D. in Environmental Engineering, Rensselaer Polytechnic Institute, New York, 2001; M.S.Ch.E., University of Maryland, 1983; B.S.Ch.E., University of Maryland, 1976.

Villalta Calderón, Christian A. – Assistant Professor, Ph.D. in Civil Engineering, University of Puerto Rico, Mayagüez Campus, 2009; M.S.C.E., University of Puerto Rico, Mayagüez Campus, 2004; B.S.C.E. University of Costa Rica, 2001.

MASTER PROGRAM IN COMPUTER ENGINEERING

The Electrical and Computer Engineering and Computer Science Department at the Polytechnic University of Puerto Rico offers graduate programs in Computer Engineering, in Computer Science, and in Electrical Engineering. For the Master in Computer Engineering, the Thesis option leads to a Master of Science in Computer Engineering (M.S.C.E) degree and the non-Thesis option leads to a Master of Engineering in Computer Engineering (M.Eng.Cp.E) degree. Currently, there are three areas of specialization for the M.S.C.E or the M.Eng.Cp.E: Software Engineering, Internet Engineering, and Digital Signal Processing. By choosing appropriate elective courses at the graduate level the student can tailor the program to his/her specific interests or research focus. An advisor will work closely with the student to carefully choose the elective courses that fulfill the student’s professional expectations in breadth as well as in depth.

PROGRAM PHILOSOPHY

Our program is flexible enough to be tailored to the student interests while providing sufficient breadth and depth to accommodate the rapid changes taking place in the field. This program aims to enable graduates to pursue further studies at the doctoral level, enter the industrial workforce, create technological new ventures, be self-employed, or work in a research and development environment. This graduate program offers engineers, or scientists with appropriate background, a unique opportunity to become more productive by acquiring knowledge of advanced technologies in the Computer Engineering field. This also includes the exploration of projects with a technical venture, or entrepreneurial focus.

GRADUATE PROFILE AND OUTCOMES

Our graduates should be able to keep abreast of the latest developments in their areas, read and analyze journal papers from their field, conduct independent research in their areas of interest (Thesis Option), write papers or technical reports, conduct technical and scientific presentations within a conference environment, and explore technological venture opportunities with an entrepreneurial mind-set.

We also promote in our students awareness of the need to actively pursue continuing education and professional development in order to remain actualized in the computer engineering field.

CAREER OPPORTUNITIES

The computer industry in Puerto Rico and the United States should be a primary source of employment for engineers and scientists holding Masters in Computer Engineering. The
federal and local government, as well as the high technology companies in the U.S. and Puerto Rico offer additional opportunities for engineers and scientists holding master degrees. Graduates of this master program can also teach at the undergraduate or technical level, or can pursue a doctoral degree.

PROGRAM REQUIREMENTS

Admission Requirements

Applicants must meet the general requirements for admission to the graduate program outlined by the Graduate School. In addition applicants are expected to have a Bachelor of Science in Computer Engineering, preferably from an ABET-accredited institution, or a Bachelor of Science in Computer Science, and a minimum general GPA of 2.8, and a GPA of 3.00 in the computer related courses. After a revision of the student’s credit transcript the department may require him/her to take certain developmental or pre-requisite courses.

The student is normally admitted to the master’s degree program in the field in which his or her undergraduate degree was conferred. When the student decides to do graduate work but his background is from a different field, the department, at its discretion, may require him/her to establish additional background by taking a number of undergraduate courses. These requirements must be fulfilled as early as possible in the student’s program. Courses taken to remedy deficiencies can not be used to fulfill course requirements for the master’s degree.

Graduation Requirements

A candidate for a master’s degree in Computer Engineering must:

- Complete the plan of study with at least the minimum number of credit-hours specified by the M.S.Cp.E. (15 credits of core courses, 6 credit-hours of thesis and 12 credit-hours of elective courses) or the M. Eng. Cp.E. (15 credit-hours of core courses, 21 credit-hours of elective courses, and 3 credit-hours for a project), with a minimum GPA of 3.00 (no more than six credit-hours are accepted in transfer courses and no more than six credit-hours of advanced undergraduate courses are allowed).
- Present and defend an independently written, single author, thesis (for students enrolled in the thesis option).
- Pursue a plan of study that will lead to the completion of all requirements, including those of the department, within a maximum number of years established by the Graduate School.
- Satisfy all other institutional requirements for graduation.

DEGREES OFFERED

The Thesis option leads to a Master of Science in Computer Engineering (M.S.Cp.E.) degree and the non-Thesis option leads to a Master of Engineering in Computer Engineering (M.Eng.Cp.E.) degree.

Thesis Option:

This option provides a significant element of independent research through the completion of a thesis. This option is recommended, but not limited, to the student either seeking to pursue a doctoral degree or planning to work in a research and development environment. It consists of 15 credit-hours of core courses, 6 credit-hours of Thesis work and 12 credit-hours of elective courses for a total of 33 credit-hours. Students enrolled in this track will receive a Master of Science in Computer Engineering (M.S.Cp.E.).

The thesis research shall be directed by a member of the faculty, which also acts as the student's advisor and graduate committee chairperson. The purpose of the thesis is to expose the student to a reasonably independent research experience that enhances his/her academic development. The student should prepare, carry out and report a structured and methodical study of importance. Publication of this work in journals, conference proceedings, and/or poster presentations is strongly encouraged.

Thesis Requirements:

1. Thesis Topic: The thesis topic must be approved in writing by the student graduate committee. The topic should be of sufficient relevance to illustrate the student’s ability to conduct independent research to the extent described above.
2. Thesis Exam (Defense): The student will make an oral presentation followed by a session of question and answers. Students must approve an oral thesis examination before his/her graduate committee.
3. Continuous Enrollment: Once the graduate committee has accepted the student's topic the student can receive authorization to enroll in the Thesis course. It is recommended that the student maintains continuous enrollment through the Thesis Extension course.
4. Thesis Copies: The student will be required to submit copies of the thesis in a format approved by the Graduate School. After approval and correction, a final version of the copies will be maintained in the library.

Non-Thesis Option:

The non-thesis option also provides for some degree of exposure to independent research through class projects, literature search and paper reviews. Because of the additional course load required by this alternative the student can select to specialize further in his/her area or to add more breadth to his program. This option is recommended, but not limited, to students who are not interested in seeking a higher degree (Ph.D.), but rather have an entrepreneurial bent. Its completion requires 15 credit-hours of core courses, 21 credit-hours of elective courses, and a 3 credit Project course, for 39 credit-hours. Students enrolled in this option will receive a Master of Engineering in Computer Engineering (M.Eng.Cp.E.).
This option does not require a comprehensive examination but requires a final project which the program encourages to be the exploration of an opportunity for an entrepreneurial technological venture through the development of a prototype for the proposed new product or service, the hardware aspects and environment for the project should be discussed.

**CURRICULAR STRUCTURE AND SEQUENCE**

The Master of Science program is a flexible program that can be tailored to the student’s interest while providing solid grounding through 15 credit-hours of core courses on some of the key concepts and tools related to the Computer Engineering field. For each area of interest the required undergraduate courses are defined as the minimum background or prerequisites necessary to enter the field. The students will have to enroll in these courses if they did not take them as part of their undergraduate studies.

Further remedial courses could be determined, at the discretion of the department, on an individual student basis depending on the student’s background and chosen field of study. If further remedial courses are prescribed they will not counted towards the degree, and must be approved with the minimum specified grade.

**Software Engineering Area**

This area seeks to develop professionals with a strong background in the development of large software systems. Upon graduation the student should be able to go into industry, government, or academia, or pursue doctoral studies. A variety of courses are offered such as: Object Oriented Design, Software Engineering I and II, Data Communication Networks, Computer Security, Advanced Database System, Data Mining and Data Warehousing, Special Topics in Software Engineering, and the Software Engineering Project course. New courses are added periodically. In addition to the courses that focus on Digital Signal Processing, emphasis is also placed on opportunity identification with a view toward the establishing of new technological ventures in this area, the Technology-Based Startups course, and the Project Course support this aim.

**Internet Engineering Area**

The purpose of this area of specialization is to prepare professionals that can lead their enterprises in leveraging the Internet and in developing new uses for the information search, dissemination, social and networking collaboration potential of this global infrastructure. Graduates may also pursue further graduate studies leading to a doctoral degree. A diversity of courses are offered such as: Data Communication Networks, Internet Engineering I and II, e-Commerce and Web Information Systems, Computer Security, Object Oriented Design, Human Computer Interfacing, Advanced Database Systems, Data Mining and Data Warehousing, Special Topics in Internet Engineering, and the Internet Engineering Project course. These cover current and future architectural, human accessibility, and technological aspects of the Internet, providing adequate breadth and depth in the field. In addition to the courses that focus on Internet Engineering, additional emphasis is also placed on opportunity identification with a view toward the establishing of new technological ventures in this area, the Technology-Based Startups course, and the Project Course support this aim.

**Digital Signal Processing Area**

This area seeks to prepare professionals with a strong background in Digital Signal Processing and its applications. Graduates of this area can be employed by industry, government, academia, or pursue doctoral studies. A variety of courses cover the theory and the application of Digital Signal Processing concepts, including: Linear Systems, Digital Signal Processing, Stochastic Processes, Advanced Mathematics for Signal Processing, Speech Processing, and Image Processing, among others. In addition to the courses that focus on Digital Signal Processing, emphasis is also placed on opportunity identification with a view toward the establishing of new technological ventures in this area, the Technology-Based Startups course, and the Project Course support this aim.

**Prerequisite Courses or Equivalents**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CECS 3210</td>
<td>Object Oriented Programming</td>
<td>3</td>
</tr>
<tr>
<td>CECS 3212</td>
<td>Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>MATH 2310</td>
<td>One year of Calculus</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>and 2320</td>
<td></td>
</tr>
<tr>
<td>ENGI 2210</td>
<td>Probability and Statics</td>
<td>3</td>
</tr>
<tr>
<td>COE 3310</td>
<td>Logic Circuits</td>
<td>3</td>
</tr>
</tbody>
</table>

**Core Courses**

The student program must include 15 credit-hours of core courses for each area as specified below.

**Digital Signal Processing Core (15 credit-hours)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 5720</td>
<td>Digital Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>EE 6010</td>
<td>Mathematical Methods for Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>EE 6020</td>
<td>Stochastic Processes</td>
<td>3</td>
</tr>
<tr>
<td>EE 6030</td>
<td>Linear Systems</td>
<td>3</td>
</tr>
<tr>
<td>EE 6120</td>
<td>Computer Architecture</td>
<td>3</td>
</tr>
</tbody>
</table>

**Software Engineering Core (15 credit-hours)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 6120</td>
<td>Computer Architecture</td>
<td>3</td>
</tr>
<tr>
<td>EE 6130</td>
<td>Data Communication Networks</td>
<td>3</td>
</tr>
<tr>
<td>EE 6150</td>
<td>Object Oriented Design</td>
<td>3</td>
</tr>
<tr>
<td>EE 6510</td>
<td>Software Engineering I</td>
<td>3</td>
</tr>
<tr>
<td>CECS 6605</td>
<td>Advanced Database Systems</td>
<td>3</td>
</tr>
</tbody>
</table>
Elective Courses

Elective Courses are loosely classified into three sections only for organizational purposes but students from each area are free to choose from the whole pool of electives as long as they comply with pre-requisites. The three sections of electives are: Digital Signal Processing-oriented electives, Software Engineering-oriented electives and Internet Engineering-oriented electives.

The area-oriented electives give support, as deemed necessary by the student and his counselor, to the student’s chosen field of work.

Each area features a Special Topics Course, a Project Course and/or a Thesis.

The appropriate mix of electives will depend on the chosen field of study and will be carefully decided by the student, working closely with his advisor, in order to fulfill his professional interest in depth as well as in breadth.

Elective courses at the graduate level

(The student may complete the remaining number of required credit-hours by selecting, in agreement with his advisor, courses from this list).

### Digital Signal Processing Oriented Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CECS 6240</td>
<td>Technology-Based Start-Up</td>
<td>3</td>
</tr>
<tr>
<td>EE 7712</td>
<td>Image Processing</td>
<td>3</td>
</tr>
<tr>
<td>EE 7740</td>
<td>Algorithms for Digital Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>EE 7780</td>
<td>Special Topics in Signal Processing</td>
<td>3</td>
</tr>
</tbody>
</table>

### Software Engineering Oriented Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CECS 6750</td>
<td>Software Testing</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7510</td>
<td>Software Engineering II</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7802</td>
<td>Special Topics in Software Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>

### Internet Engineering Oriented Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CECS 7230</td>
<td>Network Security</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7560</td>
<td>Internet Engineering II</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7804</td>
<td>Special Topics in Internet Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>

Electives Related to more than one Area of Studies

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CECS 6240</td>
<td>Technology-Based Start-Up</td>
<td>3</td>
</tr>
<tr>
<td>CECS 6430</td>
<td>Advanced Software Architectures</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7010</td>
<td>Computer Graphics</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7020</td>
<td>Advanced Computer Graphics</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7130</td>
<td>Advanced Computer Networks</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7520</td>
<td>Human Computer Interaction</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7530</td>
<td>Data Mining and Data Warehousing</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7550</td>
<td>Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7570</td>
<td>Computer Security</td>
<td>3</td>
</tr>
<tr>
<td>EE 6720</td>
<td>Pattern Recognition</td>
<td>3</td>
</tr>
<tr>
<td>CIS 6715</td>
<td>E-Commerce and Web Information Systems</td>
<td>3</td>
</tr>
</tbody>
</table>

Thesis and Project Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CECS 7971</td>
<td>Thesis</td>
<td>6</td>
</tr>
<tr>
<td>CECS 7972</td>
<td>Thesis Extension</td>
<td>0</td>
</tr>
<tr>
<td>CECS 7900</td>
<td>Project for Master in Computer Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7901</td>
<td>Project Extension for Master in Computer Engineering</td>
<td>0</td>
</tr>
</tbody>
</table>

MASTERS IN COMPUTER SCIENCE

The Computer Science Program of the Electrical and Computer Engineering and Computer Science Department at the Polytechnic University of Puerto Rico offers a Master Degree in Computer Science. There are two options: the Thesis option and the non-Thesis option. The Thesis option (33 credit-hours) leads to a Master in Science in Computer Science (MS CS) degree. The non-Thesis option (39 credit-hours) leads to a Master in Computer Science (MCS) Degree. The three main areas of interest to be offered in this program are: IT Management and Information Assurance (ITMIA), Knowledge Discovery and Data Mining (KDDM), and Computer Graphics and Game Technology (CGGT). Combining core courses with recommended electives provides students with an opportunity for advancement throughout the program that can be tailored to their personal needs, research focus, and time limitation.

PROGRAM PHILOSOPHY AND OBJECTIVES

Computer Science is a dynamic field where the fast pace of innovation leads to a need for continuous actualization of knowledge. The emphasis on standard practices, tools and methodologies will provide graduates with empirical knowledge. The program seeks to develop skills in decision-making, leadership, and collaboration. Graduates will possess in-depth engineering and technological knowledge that will allow them to further develop these skills while performing successfully at strategic levels. This know-how is obtained through the development of technical, analytical, and project management/leadership skills and initiatives, acquired throughout the program. The program also prepares
GRADUATE PROFILE AND OUTCOMES

Students completing the Master in Computer Science degrees will be professionally prepared and qualified to apply knowledge of mathematics and computer science to identify, formulate and solve scientific problems, manage capital and intellectual property assets, implement computer security, understand ethical and legal aspects of computing, participate as a team member/leader or project manager. Additionally, provide technical direction in the development of high-level architectural specifications, understand human factors that impact human computer interaction, analyze and interpret data for decision-making, integrate computer systems from components that perform a wide range of tasks and meet user needs, perform as entrepreneurs and consultants, understand the impact of scientific solutions in a global/societal context, and recognize the need to engage in life-long learning.

CAREER OPPORTUNITIES

The federal and local governments, as well as high-technology companies in PR and the US, represent the main employers of engineers and scientists holding master degrees. The most common categories of occupations that need to have a background in Computer Science are: system software engineers, application software engineers, network/database/system administrators, information security managers, computer system analysts, computer scientists, computer support specialists, game developers, database administrators, specialists in data mining, software publishers, project leaders, Web developers, Internet and Intranet developers, computer science teachers, information managers and others. Graduates may be employed in the computer industry to lead team projects related to hardware and software system design and/or research. Opportunities for employment increase greatly with a Masters Degree in Computer Science.

Advancement leads towards management and administrative positions: Project Manager (PM), Manager of Information Systems (MIS), Chief Information Officer (CIO), Chief Information Security Officer (CISO), Knowledge Engineer (KE), Chief Knowledge Officers (CKO), Database Administrator (DBA), Network Administrator (NA), among others. Some of these may require experience, which also leads to lucrative opportunities as system designers, independent consultants or computer consulting firm owners. The service industry is growing steadily, and is recognized as one of the most promising occupational groups for computer scientists for the next decade.

PROGRAM REQUIREMENTS

Admission Requirements

Applicants must meet the general requirements for admission to the graduate program outlined by the Graduate School. In addition, applicants are expected to have a Bachelor of Science in Computer Science, a minimum general GPA of 2.8.

The student is normally admitted to the master’s degree program in the field in which his or her undergraduate degree was conferred. When the student decides to do graduate work but his background is from a different field, the department, at his discretion, may require him/her to establish additional background by taking a number of undergraduate courses. The student has to earn a grade of C or better in his undergraduate work. These requirements must be fulfilled as early as possible in the student’s program. Courses taken to remedy deficiencies can not be used to fulfill course requirements for the master’s degree. The program adopts the Polytechnic University guidelines for Combined Bachelor’s Master’s Degree Program by allowing students who have accumulated a minimum of 85% from their total credit-hours towards the Bachelor degree to begin taking graduate courses from the Master in Computer Science (MSCS/MCS) programs.

Graduation Requirements

A candidate for the Master Degree in Computer Science (MCS) or the Master in Science in Computer Science (MS CS) is required to complete a plan of study with a minimum number of credit-hours specified by the selected option:

M.C.S. (Non-Thesis Option)

Core: 15 credit-hours; Electives: 21 credit-hours; Project Course: 3 credit-hours; Total: 39 credit-hours.

M.S.C.S. (Thesis Option)

Core: 15 credit-hours; Electives: 12 credit-hours; Thesis: 6 credit-hours; Total: 33 credit-hours.

Students should present and defend an independently written, single author thesis (for thesis option), pursue a plan of study that will lead to the completion of all requirements including those of the department and satisfy other institutional requirements for graduation.

CURRICULAR STRUCTURE AND SEQUENCE

Areas of Interest

The three main areas to be offered in this program are: IT Management and Information Assurance (ITMIA), Knowledge Discovery and Data Mining (KDDM), and Computer Graphics and Game Technology (CGGT).
IT Management and Information Assurance (ITMIA) Area of Interest

The ITMIA specializes in training graduates to become leaders in IT groups in the financial industry, including knowledge in security, operations, off-shoring and financial terminology. There is a shortage of skilled computer security professionals capable of reducing vulnerabilities in computing systems.

Knowledge Discovery and Data Mining (KDDM) Area of Interest

The KDDM are relevant in various industries such as finance or pharmaceutical where there are vast amount of data to be analyzed and leveraged for new business ideas. Graduates will be knowledgeable in applying algorithms and building systems to work with real-world data.

Computer Graphics and Game Technology (CGGT) Area of Interest

The CGGT addresses the gaming industry by focusing on technology needed to be successful in that growing industry. Graduates will be knowledgeable in applying advanced AI techniques for commercial computer games, the use of commercial game technology for training and education, product development methodologies, and entrepreneurship.

Thesis Option Degree Requirements (for a total of 33 credit-hours)

The thesis option requires a minimum GPA of 2.8 from baccalaureate studies in Computer Science or related fields. Degree requirements for this option include the completion of twenty-seven (27) credit-hours of coursework and six (6) credit-hours of approved thesis work. Fifteen (15) credit-hours of core courses at the 6000-6900 level are required for the degree. Twelve (12) credit-hours of 6000-7900 level elective courses must be approved. Six (6) additional credit-hours must be completed through the development of a thesis in a subject related to the MS in Comp. Science program. The thesis subject matter is to be approved by the student’s graduate advisor and the thesis committee. The total of thirty-three (33) credit-hours is required for the thesis option.

Non-Thesis Option Degree Requirements (for a total of 39 credit-hours)

The non-thesis option requires a minimum GPA of 2.8 from baccalaureate studies in Computer Science or related fields. Degree requirements for this option total thirty-nine (39) credit-hours that include thirty-six (36) credit-hours of coursework and three (3) credit-hours of project courses. Fifteen (15) credit-hours of core courses at the 6000-6900 level are required for the degree. Twenty (21) credit-hours of 6000-7900 level elective courses must be approved and three (3) credit-hours of project courses. The project subject matter is to be approved by the student’s graduate advisor. The program encourages, promotes and will give preference to projects with an entrepreneurial scope. The entrepreneurial focus derives from the desire to meet the goals advanced by the Puerto Rico Industrial Development Corporation (PRIDCO) who funded the startup of this program.

Rational for Business Electives

Regardless of industry sector, business application development requires know-how of the application domain. The ability to communicate effectively with the business side is essential to contain development costs and meet the business needs. Furthermore, economics are an increasingly important aspect of strategic technical decisions. As computer scientists with advanced skills graduate into leadership positions in the industry, need to round up their technical skills with relevant business electives.

Prerequisite Course or Equivalents

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CECS 3210</td>
<td>Object Oriented Programming</td>
<td>3</td>
</tr>
<tr>
<td>CECS 3212</td>
<td>Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>MATH 2310 and 2320</td>
<td>One Year of Calculus</td>
<td>6</td>
</tr>
<tr>
<td>CECS 2004</td>
<td>Discrete Mathematics</td>
<td>3</td>
</tr>
</tbody>
</table>

Core Courses

(6000-6900 Level Courses)

(3 credit each) (15 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CECS 6010</td>
<td>Advanced Design and Analysis of Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CECS 6030</td>
<td>Computational Theory</td>
<td>3</td>
</tr>
<tr>
<td>CECS 6230</td>
<td>IT Operations</td>
<td>3</td>
</tr>
<tr>
<td>CECS 6430</td>
<td>Advanced Software Architecture</td>
<td>3</td>
</tr>
<tr>
<td>CECS 6750</td>
<td>Software Testing</td>
<td>3</td>
</tr>
</tbody>
</table>

IT Management and Information Assurance (ITMIA)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CECS 7230</td>
<td>Network Security</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7235</td>
<td>Computer Forensics</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7570</td>
<td>Computer Security</td>
<td>3</td>
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Knowledge Discovery and Data Mining (KDDM)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CECS 6605</td>
<td>Advanced Database System</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7530</td>
<td>Data Mining and Data Warehousing</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7550</td>
<td>Artificial Intelligence</td>
<td>3</td>
</tr>
</tbody>
</table>

Computer Graphics and Game Technology (CGGT)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CECS 7010</td>
<td>Computer Graphics</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7020</td>
<td>Advanced Computer Graphics</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7550</td>
<td>Artificial Intelligence</td>
<td>3</td>
</tr>
</tbody>
</table>
Additional Elective Courses

Student must complete the remaining number of required credit-hours by selecting courses from this list of electives or those strongly recommended for another area of interest:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CECS 6005</td>
<td>Principles of Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>CECS 6015</td>
<td>IT Auditing and Secure Operations</td>
<td>3</td>
</tr>
<tr>
<td>CECS 6035</td>
<td>Contingency Planning</td>
<td>3</td>
</tr>
<tr>
<td>CECS 6045</td>
<td>Law, Investigation and Ethics</td>
<td>3</td>
</tr>
<tr>
<td>CECS 6240</td>
<td>Technology-Based Start-Up</td>
<td>3</td>
</tr>
<tr>
<td>CECS 6760</td>
<td>Internet Engineering I</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7130</td>
<td>Advanced Computer Networks</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7240</td>
<td>Database Security</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7410</td>
<td>Parallel and Distributed Processing</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7420</td>
<td>Modeling and Simulation</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7510</td>
<td>Software Engineering II</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7520</td>
<td>Human-Computer Interaction (HCI)</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7760</td>
<td>Internet Engineering II</td>
<td>3</td>
</tr>
<tr>
<td>CIS 6715</td>
<td>E-Commerce and Web Inf. Systems</td>
<td>3</td>
</tr>
<tr>
<td>EE 6120</td>
<td>Computer Architecture</td>
<td>3</td>
</tr>
<tr>
<td>EE 6130</td>
<td>Data Communication Networks</td>
<td>3</td>
</tr>
<tr>
<td>EE 6150</td>
<td>Object Oriented Design (OOD)</td>
<td>3</td>
</tr>
<tr>
<td>EE 6510</td>
<td>Software Engineering I</td>
<td>3</td>
</tr>
</tbody>
</table>

Additional Elective Courses

Student must complete the remaining number of required credit-hours by selecting courses from this list of electives. Thesis option should choose one (1) course; Non-thesis option should choose four (4) courses.

- KDMM or CGGT Courses can be electives for the ITMIA Area.
- ITMIA or CGGT Courses can be electives for the KDDM Area.
- KDDM or ITMIA Courses can be Electives for the CGGT Area.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 6120</td>
<td>Computer Architecture</td>
<td>3</td>
</tr>
<tr>
<td>EE 6150</td>
<td>Object Oriented Design (OOD)</td>
<td>3</td>
</tr>
</tbody>
</table>

Requirements for the Thesis and Non-thesis options

Thesis or Project

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CECS 7980</td>
<td>Thesis</td>
<td>6</td>
</tr>
<tr>
<td>CECS 7990</td>
<td>Thesis Extension</td>
<td>0</td>
</tr>
<tr>
<td>CECS 7950</td>
<td>Project for Master in Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>CECS 7951</td>
<td>Project Extension for Master in Computer Science</td>
<td>0</td>
</tr>
</tbody>
</table>

MASTER IN ELECTRICAL ENGINEERING

The Master Degree in Electrical Engineering offers two options. The Thesis option leads to a Master of Science in Electrical Engineering (M.S.E.E) degree and the non-Thesis option leads to a Master of Engineering in Electrical Engineering (M.Eng.E.E.) degree. Currently there are two areas of interest for the M.S.E.E or the M.Eng.E.E: Digital Signal Processing and Communication Systems. By choosing appropriate elective courses at the graduate level the student can tailor the program to his/her specific interests. A counselor will work closely with the student in order to carefully choose the elective courses that fulfill the student’s professional expectations in breadth as well as in depth.

PROGRAM PHILOSOPHY

Our program is flexible enough to be tailored to the student interest while providing sufficient breadth and depth to accommodate the rapid changes taking place in the field.

This program aims to enable graduates to pursue further studies at the doctoral level, enter the industry workforce or work in a research and development environment.

This program intends to offer electrical engineers an opportunity to become more productive by acquiring knowledge of advanced technologies in the Electrical Engineering field. This includes exposing the student to state of the art engineering application software.

The program also seeks to stimulate students to actively pursue continuing education and professional development options in order to stay on the cutting-edge of Electrical Engineering Science and technology.

GRADUATE PROFILE AND OUTCOMES

Graduates should be able to keep abreast of the latest developments in their areas, read and analyze journal papers from their field, conduct independent research in their areas of interest (Thesis Option), write papers or technical reports, conduct technical and scientific presentations within a conference environment, and use mainstream engineering software applications.

CAREER OPPORTUNITIES

The telecommunication industry in Puerto Rico and the United States should be a primary source of employment for engineers holding Masters of Engineering with coursework in Communications Systems and Digital Signal Processing. The federal and local government, as well as the high technology companies in the U.S. and Puerto Rico offer additional opportunities for engineers holding master degrees. Master of Engineering graduates can also teach at the undergraduate or technical level and can pursue a doctoral degree.
PROGRAM REQUIREMENTS

Admission Requirements

Applicants must meet the general requirements for admission to the graduate program outlined by the Graduate School. In addition, applicants are expected to have a Bachelor of Science in Electrical Engineering, preferably from an ABET-accredited institution, a minimum general GPA of 2.8, and a GPA of 3.00 in the electrical engineering courses. After a revision of the student’s credit transcript the department may require him/her to take certain remedial courses.

The student is normally admitted to the master's degree program in the field in which his or her undergraduate degree was conferred. When the student decides to do graduate work in a different field, the department, at its discretion, may require him/her to establish additional background by taking a number of undergraduate courses. The student has to earn a grade of C or better in his undergraduate work. These requirements must be fulfilled as early as possible in the student’s program. Courses taken to remedy deficiencies can not be used to fulfill course requirements for the master's degree.

Graduation Requirements

A candidate for a master's degree in Electrical Engineering must:

- Complete the plan of study with at least the minimum number of credit hours specified by the M.S.E.E. (9 credit-hours of core courses, 6 credit-hours of thesis and 15 credit-hours in elective courses) or M.Eng.E.E. (9 credit-hours of core courses and 30 credit-hours of elective courses), with a minimum GPA of 3.0 points (no more than six credit-hours are accepted in transfer courses and no more than six credit-hours of advanced undergraduate courses are allowed).
- Present and defend an independently written, single author thesis (for students enrolled in the thesis option).
- Pursue a plan of study that will lead to the completion of all Graduate School requirements, including those of the department, within a maximum of five years.
- Satisfy all other institutional requirements for graduation.

DEGREES OFFERED

The Thesis option leads to a Master of Science in Electrical Engineering (M.S.E.E) degree and the non-Thesis option leads to a Master of Engineering in Electrical Engineering (M.Eng.E.E) degree.

Thesis Option:

This option provides a significant element of independent research through the completion of a thesis. This option is recommended, but not limited, to the student either seeking to pursue a doctoral degree or planning to work in a research and development environment. It consists of 9 credit-hours of core courses, 6 credit-hours of Thesis work and 15 credit-hours of elective courses for a total of 30 credit-hours. Students enrolled in this track will receive a Master of Science in Electrical Engineering (M.S.E.E).

The thesis research shall be directed by a member of the faculty, which also acts as the student's graduate committee chairperson. The purpose of the thesis is to expose the student to a reasonable independent research experience that enhances his/her academic development. The student should prepare, carry out and report a structured and methodical study of importance. Publication of this work in journals, conference proceedings, and/or poster presentations is strongly encouraged.

Thesis Requirements:

1. Thesis Topic: The thesis topic must be approved in writing by the student graduate committee. The topic should be of sufficient relevance to illustrate the student’s ability to conduct independent research to the extent described above.
2. Thesis Exam (Defense): Students must approve an oral thesis examination before his graduate committee. The student will make an oral presentation followed by a session of questions and answers.
3. Continuous Enrollment: Once the graduate committee has accepted the student's topic it is mandatory that the student maintains continuous enrollment with the thesis extension course until graduation.
4. Thesis Copies: The student will be required to submit copies of the thesis in a format approved by the Graduate School. After approval and correction, a final version will be maintained in the library.

Non-Thesis Option:

The non-thesis option also provides for some degree of exposure to independent research through class projects, literature search and paper reviews. Because of the additional course load required by this alternative the student can select to specialize further in his/her area or to add more breadth to his program. This option is recommended, but not limited, to students who are not interested in seeking a higher degree (Ph.D.). Its completion requires 9 credit-hours of core courses and 30 credit-hours of elective courses for 39 credit-hours. Students enrolled in this option will receive a Master of Engineering in Electrical Engineering (M.Eng.E.E). This option does not require a comprehensive examination or final project. If a student desires to tackle a specific project, it can do so under the “Design Project for Master in Electrical Engineering” course.

CURRICULAR STRUCTURE AND SEQUENCE

The Master of Science program is a flexible program that can be tailored to the student’s interest while providing solid grounding, through 9 credit-hours of core courses, on some of the key concepts and tools related to the electrical engineering field. For each area of interest required undergraduate
courses are defined as the minimum background or prerequisite necessary to enter the field. The students will have to enroll in these courses if they did not take them as part of their undergraduate studies. Background courses are advanced undergraduate courses and count (up to 6 credit-hours) toward the degree.

Further remedial courses could be determined, at the discretion of the department, on a one to one basis depending on the student’s background and chosen field of study. If further remedial courses are prescribed they will not count toward the degree and will have to be approved with a grade of C or better.

**Communication Systems**

The purpose of this area is to prepare professionals with a strong background in Communication Systems. Upon graduation the engineer should be able to enter the telecommunication industry or pursue doctoral studies. Besides Digital, Satellite and Wireless Communications Systems, there are several courses in Antenna and Electromagnetism so that the interested student can specialize further in those areas. A variety of courses are offered such as Digital Communication, Wireless Communication, Satellite Communication Systems, Data Communication and Computer Networks, Digital Signal Processing, Stochastic Processes, Antenna Theory, RF Design, and Engineering Electromagnetic Field Theory.

**Digital Signal Processing**

The purpose of this area is to prepare engineers that can either enter into the DSP industry or that can pursue further graduate studies leading to a Doctoral degree. A diversity of courses such as Digital Signal Processing, Image Processing, Stochastic Processes, Pattern Recognition, Speech Processing, Algorithms for Signal Processing, Satellite Remote Sensing of the Oceans, Digital Communication and Neural Networks cover coding, compression and information extraction providing adequate breadth and depth in the field.

### CURRICULAR STRUCTURE

These courses should be completed during undergraduate studies, or should be taken at the beginning of the graduate studies, prior to (or at the same time than) the core courses.

#### Digital Signal Processing Area

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 5720</td>
<td>Digital Signal Processing</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Communication Systems Area

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 5714</td>
<td>Digital Communication Systems</td>
<td>3</td>
</tr>
<tr>
<td>EE 5720</td>
<td>Digital Signal Processing</td>
<td>3</td>
</tr>
</tbody>
</table>

### Core Courses

The student program must include 9 credit-hours of core courses as specified below.

#### Digital Signal Processing Core

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 6010</td>
<td>Mathematical Methods for Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>EE 6020</td>
<td>Stochastic Processing</td>
<td>3</td>
</tr>
<tr>
<td>EE 6030</td>
<td>Linear Systems</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Communication Systems Core

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 6010</td>
<td>Mathematical Methods for Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>EE 6020</td>
<td>Stochastic Processes</td>
<td>3</td>
</tr>
<tr>
<td>EE 6760</td>
<td>Digital Communications</td>
<td>3</td>
</tr>
</tbody>
</table>

### Elective Courses

Even though areas of interest have overlapping topics, the courses are loosely classified in three sections for organizational purposes: Digital Signal Processing oriented electives, Communication Systems oriented electives and Computer Engineering oriented electives.

The Computer Engineering oriented electives give support, as deemed necessary by the student and his counselor, to the student’s chosen field of work.

The appropriate mix of electives will depend on the chosen field of study and will be carefully decided by the student, working closely with his advisor, in order to fulfill his professional interest in depth as well as in breadth.

#### Elective courses at the advanced undergraduate level

(The student may include up to 6 credit-hours selected from this list).

#### Communication Systems Oriented Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 5730</td>
<td>Radio Frequency Circuit Design</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Elective courses at the graduate level

(The student may complete the remaining number of required credit-hours by selecting, in agreement with his advisor, courses from this list).

#### Digital Signal Processing Oriented Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 6632</td>
<td>Non-Linear Control</td>
<td>3</td>
</tr>
<tr>
<td>EE 6660</td>
<td>Advanced Robotic Manipulators</td>
<td>3</td>
</tr>
<tr>
<td>EE 6720</td>
<td>Pattern Recognition</td>
<td>3</td>
</tr>
<tr>
<td>EE 6740</td>
<td>Intelligent Control</td>
<td>3</td>
</tr>
</tbody>
</table>
### Configurable Hardware Laboratory
- This laboratory has 15 ML-5001 Evaluation Platform boards for Xilinx Virtex-5 reconfigurable gate arrays. These are connected to PC workstations that are configured with the Xilinx Integrated Software Environment, which allows the creation of VHDL models for hardware-implemented functionality of substantial complexity. These models and other intellectual property modules are then compiled, simulated, debugged, synthesized and downloaded into the Evaluation Platform boards, where they can be embedded into the application environment.

### Communication Systems Oriented Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 7712</td>
<td>Image Processing</td>
<td>3</td>
</tr>
<tr>
<td>EE 7714</td>
<td>Satellite Remote Sensing</td>
<td>3</td>
</tr>
<tr>
<td>EE 7716</td>
<td>Computer Vision</td>
<td>3</td>
</tr>
<tr>
<td>EE 7730</td>
<td>Speech Processing</td>
<td>3</td>
</tr>
<tr>
<td>EE 7740</td>
<td>Algorithms for Digital Signal Processing</td>
<td>3</td>
</tr>
</tbody>
</table>

### Learning Objects Research Collaborative Atelier (LORCA)
- eLearning Research Laboratory - This laboratory provides space, laptop computers, and several servers to support the development of eLearning and educational support tools. This laboratory is available to students conducting work on eLearning as part of their undergraduate research course, capstone course, graduate thesis course, or graduate project course.

### High Performance Computing Center
- This laboratory provides high performance, loosely coupled, parallel computing facilities that were established with a grant provided by the Air Force Office of Research of the Department of Defense in 2004 for $101,089. This lab has two Beowulf PC Clusters, with 64 processors each, and one SGI PC Cluster with 256 processors from a grant from the NSF for $160,000. It also houses an Altix 350 supercomputer with four processors from a grant by PRIDCO. All are used to support scientific and engineering research for graduate and undergraduate students.

### Turing Laboratory for Graduate Studies
- This laboratory provides faculty members and graduate students state-of-the-art equipment to support their research. The PUPR recently awarded a grant from PRIDCO for the establishment of the Master in Computer Science (first in Puerto Rico) of $450,000 and for the acquisition, installation, and maintenance of the PCs and workstations housed in the Turing lab. It includes 24 state-of-the-art Dell PCs, 10 SGI power workstations, 4 Apple G5 and 4 50” Plasma Monitors.

### Window to the Caribbean Laboratory
- This laboratory creates a virtual environment that connects Puerto Rico to the rest of the world. Its main function will be to participate in collaborative academic and research projects with students, professors, industries and others entities from around the globe. The lab was funded by a grant from the Air Force Office of Research Science of the Department of Defense (AFORS DoD) in 2005 for $181,000.

### Virtual Wireless Lab for Information Security
- In September 2007 the Army Research Office of the Department of Defense (ARO DoD) awarded a grant for $193,800 for a virtual wireless lab for information security.

### Signal Processing Laboratory
- This laboratory is equipped with high performance Workstations with 1 GByte of RAM, flat panel monitors and a heavy duty HP Color Laser Printer. All

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If the required courses are not part of the student background, then these courses should be taken prior to admission to the program or during the first two terms of the program.

**COMPUTER AND ELECTRICAL ENGINEERING, AND COMPUTER SCIENCE LABORATORIES**

**Networking Laboratory** - This laboratory is equipped with a broad variety of networking appliances including repeaters, switches, routers, firewalls, and servers, plus wireless access points, and wired interconnection panels housed in various cabinets and racks. There are also twenty (20) dual-processor hyper-threading workstations, where the student can configure a variety of protocol stacks and network management software.
workstations have a research license of MATLAB and Internet access.

COURSE DESCRIPTIONS

Computer Engineering, Computer Science, and Electrical Engineering

CECS 6005 - Principles of Information Security

Three credit-hours. Prerequisites: Graduate Program Coordinator approval. One four hours session per week.

This course is an introduction to the various technical aspects of information security and assurance to understand computer, data, and communications security issues. It provides the foundation for understanding the key issues associated with protecting information assets, determining the levels of protection and response to security incidents, and designing a consistent, reasonable information security system, with appropriate intrusion detection and reporting features.

CECS 6101 - Advanced Design and Analysis of Algorithms

Three credit-hours. Prerequisites: Data Structure. One four hours session per week.

This course emphasizes the computational complexity of a problem, the efficiency of an algorithm for solving a problem, technique for designing algorithms, and the inherent intractability of certain problems. Problems in a number of applications are covered.

CECS 6150 - IT Auditing and Secure Operations

Three credit-hours. Prerequisites: Graduate Program Coordinator approval. One four hours session per week.

The course will give students the know-how they need to implement an effective Information Technology (IT) audit. The course covers principles and practice related to the evaluation of secure operations in existing and new information technologies. Core concepts related to security auditing and accountability will be discussed using the standard IT audit approach and contemporary information system auditing concepts. Internet and e-commerce security auditing issues will also be addressed.

CECS 6030 - Computational Theory

Three credit-hours. Prerequisites: Calculus II, Discrete Structure. One four hours session per week.

This course provides an introduction to formal languages. Regular languages: regular expressions, finite automata, minimization, closure properties, decision algorithms, and non-regular parsing theory, and no context-free languages. Computable languages: Turing machines, recursive functions, Church’s thesis, un-decidability and halting problem.

CECS 6035 - Contingency Planning

Three credit-hours. Prerequisites: Graduate Program Coordinator approval required. One four hours session per week.

This course addresses the managerial issues associated with planning for, and reacting to events, incidents, disasters and crises. It covers organizational awareness, incident response, contingency strategies, disaster recovery, business continuity operations planning, and crisis management. Students will learn the skills to secure current information systems and networks, recognizing and planning for threats and vulnerabilities present in the existing systems.

CECS 6045 - Law, Investigation, and Ethics

Three credit-hours. Prerequisites: Graduate Program Coordinator approval required. One four hours session per week.

This course is intended for students of computer science and other related fields of study who are interested in the IT social and ethical issues that arise from computationally intense environments in the workplace and in society. It addresses computer crime laws and regulations, the measures and technologies used to investigate computer crime incidents and the ethics involved in the use of computers, information systems and technology. Controversies and alternate points of view are addressed on social, legal, philosophical, political, constitutional and economic issues related to computers.

CECS 6230 - IT Operations

Three credit-hours. Prerequisites: None. One four hours session per week.

The course covers all relevant tasks for the day to day life of an IT Manager. It will cover user support as well as change management and strategic planning in a heterogeneous environment. The goal is to give an upcoming IT manager all relevant skills in order to successfully run an IT Department for medium and large companies.

CECS 6240 - Technology-Based Start-Up

Three credit-hours. Prerequisites: None. One four hours session per week.

This course provides an introduction to the concepts and activities applicable to launching and managing technology-based ventures. Course readings, case studies and discussion will highlight key issues and concepts. Throughout the course of the semester, students will create a technology-based enterprise with all the essential elements concerning technology viability, competitive positioning, sales channel analysis, business plan, and investor pitch. Students will work in teams to launch companies, working through issues as they arise. Successful team-building for a technology-based start-up and product life-cycle planning are addressed as part of the strategic considerations for creating companies that can quickly define and dominate a new sector or die easily.
CECS 6430 - Advanced Software Architecture
Three credit-hours. Prerequisites: Object Oriented Programming. One four hours session per week.

The course introduces Pattern Languages of program design, which represent a recently defined major abstraction level after Object Oriented Programming. Then follows up with an introduction to the two major component architectures in use today: Sun's Java Beans (EJB), and Microsoft's COM and .NET architectures in their several incarnations. The course then explores Web Services and several proposals for the assembly of applications from network-accessible, centrally published, and publicly discoverable services. Finally we end up with a close look at more recent developments in Model Driven Architectures, including their potential for platform independent application models, and for back annotation of implementation level customizations.

CECS 6605 - Advanced Database System Design
Three credit-hours. Prerequisites: None. One four hours session per week.

Methodologies and principles of database systems are covered: database architectures, logical modeling, the relational model, data normalization, database design process and techniques, relational algebra, relational calculus, integrity constraints, views, and SQL language. Advanced topics include: non-first normal-form databases, database security, query optimization, indexes generation, security issues, distributed databases, object-relational and object-oriented databases, internet databases, parallel databases and XML databases. Projects on theoretical aspects of databases and on application development will be required.

CECS 6750 - Software Testing
Three credit-hours. Prerequisites: Object Oriented Programming. One four hours session per week.

This course covers topics of software testing methodologies for development and maintenance for object-oriented, component-based business and web applications. Approaches to automatic testing and supporting tools are covered. Topics include structural and functional techniques, code inspection, peer review, test verification and validation, statistical testing methods, regression tests, preventing of errors, metrics, plans, formal models and software quality. Students who finished this course will be able to analyze a given software life cycle for improvements as well as design and implement testing strategies within their companies.

CECS 6760 - Internet Engineering I
Three credit-hours. Prerequisites: EE 6130. One four hours session per week.

This course presents current and emerging technologies for the World Wide Web. The emphasis is on understanding the operation of the World Wide Web at many different architectural levels, including its protocols, programming languages, history and future.

CECS 6824A - Special Topics in CS (ITMIA)
Three credit-hours. Prerequisites: Graduate Program Coordinator approval required. One four hours session per week.

This course is designed to offer the students additional insight on topics related to the Information Technology Management (ITMIA) and Information Assurance (IT) area of interest. Topics discussed include the fundamental tools and techniques for IT management, computer security and information assurance. General models of computer security and intrusion detection techniques are also discussed.

CECS 6824B - Special Topics in CS (KDDM)
Three credit-hours. Prerequisites: Graduate Program Coordinator approval required. One four hours session per week.

This course is designed to offer the students additional insight on topics related to the Knowledge Discovery and Data Mining (KDDM) area of interest. The course discusses special topics related to Data Warehousing as one of the main mechanisms for practical storage of historical data derived from the enterprise operational databases. Several models for organizing and re-factoring databases along various dimensions, as used in Data Warehouses, are discussed, and justified. Data Mining and Data Warehousing tasks, techniques and different tools for implementation are discussed. The most representative commercial tools for data mining incorporating these techniques will be reviewed.

CECS 6824C - Special Topics in CS (CGGT)
Three credit-hours. Prerequisites: Graduate Program Coordinator approval required. One four hours session per week.

This course is designed to offer the students additional insight on topics related to the Computer Graphics and Game Technology. This course is intended for graduate students who are interested in special topics on modeling systems with sculptured curve and surface geometry. Methods of geometric modeling for integral and rational curves and surfaces and their application to computer aided design problems will be studied.

CECS 7010 - Computer Graphics
Three credit-hours. Prerequisites: Calculus II. One four hours session per week.

This course is an introduction to computer graphics for students who wish to learn the basic principles and techniques of the field and who in addition want to write substantial graphics applications themselves.
CECS 7020 - Advanced Computer Graphics
Three credit-hours. Prerequisites: CECS 7010. One four hours session per week.
This course is intended for graduate students who are interested in modeling an engineering system with sculptured curve and surface geometry. Methods of geometric modeling for integral and rational curves and surfaces and their application to computer aided design problems will be studied.

CECS 7130 - Advanced Computer Networks
Three credit-hours. Prerequisite: EE 6130. One four hours session per week.
The course covers the latest trends in computer networking and the related applications that depend on those advances. Study of wireless networks, value added networks (van), virtual private networks (vpn), satellite networks, cable, fiber, and other wide-area networking technologies. The impact of new networking technologies and the new business modalities that they facilitate is covered. The course emphasizes on the integration of networking concepts and protocols into comprehensive solutions for the enterprise or business. Discussion of performance, reliability, expandability, relevance, and the economic aspects of planning and implementing practical computer networks is also covered. Analysis of the trade-offs between equipment costs, performance, reliability, long-term expandability, and operational and human management costs. Analysis of tariff and legal constraints that bear on the adoption of particular technologies are considered.

CECS 7230 - Network Security
Three credit-hours. Prerequisite: Graduate Program Coordinator approval required. One four hours session per week.
The fundamental tools and techniques for network security are discussed in the context of the pervasive role and impact that the internet has over the individual, the enterprise and on society-at-large. Major topics covered are symmetric encryption (DES and AES), public key encryption (RSA and Diffie-Hellman), message authentication and hash functions. A general introduction to number theory, prime numbers and discrete logarithms is provided as mathematical background. The course concludes by illustrating these techniques in network security applications including electronic mail, IP security and web security.

CECS 7235 – Computer Forensics
Three credit-hours. Prerequisite: Graduate Program Coordinator approval required. One four session per week.
This course is an introduction to digital forensics in the context of the microsoft windows operating system. Overview of evidence collection and archiving (rfc 3227), order of volatility and Locards Exchange Principle. Preservation of volatile and non-volatile data. Analysis of data including windows memory and registry analysis, log file and executable file analysis. The course will use case studies and open source tools.

CECS 7240 - Database Security
Three credit-hours. Prerequisite: Graduate Program Coordinator approval required. One four session per week.
This course will focus on issues related to the design and implementation of secure data stores. Emphasis will be placed on access control, multilevel security in systems, covert channels, inference problem and security measures for relational and object-oriented database systems. Also, secure distributed and heterogeneous databases systems as well as data mining for security applications are addressed.

CECS 7410 - Parallel and Distributed Processing
Three credit-hours. Prerequisite: None. One four hours session per week.
This course provides a graduate-level introduction to parallel and distributed systems programming. The foundations of the creation of systems on distributed environments will be discussed. The main characteristics of a distributed and parallel system will be presented emphasizing how they can be used to outline new applications.

CECS 7420 - Modeling and Simulation
Three credit-hours. Prerequisite: None. One four hours session per week.
Computer simulation is the discipline of designing a model of an actual or theoretical system, executing the model on a computer and analyzing the results. This course explores systems model design methods and their execution for computer simulation.

CECS 7510 - Software Engineering II
Three credit-hours. Prerequisites: EE 6510. One four hours session per week.
The course discusses recent trends in Software Engineering theory and practice. Explores new paradigms in the conceptualization of software such as Pattern Languages and Aspect Oriented Programming and their impact in the creation of re-usable and evolvable software. Covers increasingly important software topics such as Software Testing, Software System Validation, Software Reliability, and Software Security. Choosing from the techniques learned in Software Engineering I, we can now fully concentrate on going through several development cycles and improving techniques and know-how of tools. We will discuss limitations and advantages of using metrics, creating artifacts and how to maintain planning, deliverables and documentation in synch.
CECS 7520 - Human Computer Interaction

Three credit-hours. Prerequisite: Object Oriented Programming. One four hours session per week.

The course presents issues on effective human-computer interaction. The role of software engineering and the human factors is considered in the design, implementation and evaluation of software. User interface and software design principles, guidelines, methodologies and strategies are explored. Specific topics covered include: basic elements, procedures, tools, development environments, user experience levels, interaction styles and collaborative systems technology. Additional topics on multidisciplinary dynamics of human-computer interaction as a field of study, current developments in HCI research and usability engineering are covered. The course reviews principles and guidelines so as to move on to advanced subjects on rapid development and application in computer engineering.

CECS 7530 - Data Mining and Data Warehousing

Three credit-hours. Prerequisite: CECS 6605. One four hours session per week.

The first part of the course discusses Data Warehousing as one of the main mechanisms for practical storage of historical data derived from the enterprise operational databases. Several models for organizing and re-factoring databases along various dimensions, as used in Data Warehouses, are discussed, and justified. Data warehouses represent just one, but perhaps the most readily available source of data within an enterprise, for performing data mining. Additional data sources for mining are discussed, including governmental and commercial sources. The second and third parts of the course discuss data mining tasks, techniques and the tools that implement these. Major data mining tasks include classification, clustering and diagramming. These generic tasks are supported through a set of techniques that include decision trees, self-organizing maps, neural networks, and other visual representation techniques. The most representative commercial tools for data mining incorporating these techniques will be used by students to mine some publicly available data sets and report their findings.

CECS 7550 - Artificial Intelligence (AI)

Three credit-hours. Prerequisite: Data Structure. One four hours session per week.

This course offers a broad overview in the field of artificial intelligence and Knowledge Based Expert Systems (KBES). A basic background in computer science and programming in structured languages is assumed. The course surveys the major topics in Artificial Intelligence (AI). It begins with an overview of what constitutes AI and an introduction to intelligent agents. This is followed by a series of traditional AI topics such as logic, predicate calculus, knowledge representation, reasoning, planning, inference, heuristic and adversary search, artificial neural networks, machine learning, genetic algorithms, fuzzy logic and logic programming.

CECS 7560 - Internet Engineering II

Three credit-hours. Prerequisites: CECS 6770. One four hours session per week.

The students will learn advanced Internet technologies and how to use them to design the overall structure of secure systems and e-commerce sites. Techniques for integrating legacy back-end systems and additional software components will be discussed. The use of W3C standards such as XML and other emergent technologies will be emphasized.

CECS 7570 - Computer Security

Three credit-hours. Prerequisites: EE 6130. One four hours session per week.

The fundamental tools and techniques for computer security are discussed in the context of the pervasive role and impact that computer technology has over the individual, the enterprise and on society-at-large. Mathematical cryptography fundamentals are covered followed by a set of services built on these techniques, which are then used to provide security at the system and network levels. General models of computer security and intrusion detection techniques are also covered.

CECS 7802 - Special Topics in Software Engineering

Three credit-hours. Prerequisites: Graduate Program Coordinator approval required. One four hours session per week.

This course seeks to allow the inclusion into the curriculum of newly developing trends and special areas of interest or research. The format of the course will vary, including student and lecturer presentations, and discussion and reporting on recent research results.

CECS 7804 - Special Topics in Internet Engineering

Three credit-hours. Prerequisites: Graduate Program Coordinator approval required. One four hours session per week.

This course seeks to allow the inclusion into the curriculum of newly developing trends and special areas of interest or research. The format of the course will vary, including student and lecturer presentations, and discussion and reporting on recent research results.

CECS 7900 – Project for Master in Computer Engineering

Three credit-hours. Prerequisites: Graduate Program Coordinator approval required. One four hours session per week.

Two project alternatives are offered in the student's area of specialization: a research study or development of a software application. The project topic needs to be approved by the course instructor. The research study requires a thorough review of literature relevant to a current problem in the student's specialization area. The research project should present a solution to the problem in the form of a research paper of publishable quality. For the software application
development alternative a real-life problem amenable to a solution that leverages the computer engineering methodologies should be selected.

Preference will be given to the development of tools. The analysis and design phases should be applied to the problem using appropriate modeling techniques to describe the system before and after the proposed solution. Conceptual and physical model design and documentation should be done using computer engineering tools.

This course seeks to develop the research and/or application development skills of students at a graduate level scope. Both alternatives for the project will help students acquire leading edge knowledge.

**CECS 7901 – Project Extension for Master in Computer Engineering**

**Zero credit-hours. Prerequisites: Graduate Program Coordinator approval required. One four hours session per week.**

This is an extension of the Computer Engineering project. The project offers two alternatives: a research study or a software application development. The research study requires a thorough review of literature relevant to a current problem in a field relevant to the specialization area chosen by the student. The project should present a solution to the problem in the form of a research paper of publishable quality. For the software application development, a real-like problem amenable to a solution the leverages the Internet environment should be selected. The applications, programs and laboratories used during the academic sessions will be available to the student.

This course seeks to develop the research and/or application development skills to students at a graduate level scope. Both alternatives for the project will help students acquire leading edge knowledge.

**CECS 7950 - Project for Master in Computer Science**

**Three credit-hours. Prerequisites: Graduate Program Coordinator approval required. One four hours session per week.**

The project alternative offers the student the opportunity to develop a software application and the planning of its launching as a product using an entrepreneurial focus. The project topic needs to be approved by the course instructor. The software application development involves a solution to a real-life problem that leverages the computer science knowledge gained through the program. Preference will be given to the development of leading edge applications in areas such as IT Management and Information Assurance, Knowledge Discovery and Data Mining, and Computer Graphics and Game Technology, among other related topics.

**CECS 7951 – Project Extension for Master in Computer Science**

**No credit-hours. Prerequisite: Graduate Program Coordinator approval required.**

This is an extension to complete the development of a final project for the Master in Computer Engineering. The project offers two alternatives: (1) a research study or (2) the development of a software application and the planning of its launching as a product using an entrepreneurial focus. Preference will be given to the development of leading edge applications in areas such as IT Management and Information Assurance, Knowledge Discovery and Data Mining, and Computer Graphic and Game Technology, among other related topics.

This course in an extension for students to continue the development of the research project and/or application development. The project will help students demonstrate their domain of the Computer Science discipline.

**CECS 7971 - Thesis MSCPE**

**Six credit-hours. Prerequisites: Graduate Program Coordinator approval required. One four hours session per week.**

The purpose of the thesis is to expose the student to a reasonable independent research experience that enhances his/her academic development. The student should prepare, carry out and report a structured and methodical study of importance. The student graduate committee must approve the thesis topic in writing. The topic should be of sufficient relevance to illustrate the student's ability to conduct independent research. Students must approve an oral thesis examination before assigned graduate committee. The student will make an oral presentation followed by a session of question and answers. Once the graduate committee has accepted the student's topic the student must maintain continuous enrollment in thesis hours. Publication of this work in journals, conference proceedings, and /or poster presentations is strongly encouraged.

**CECS 7972 - Thesis Extension**

**Zero credit-hour. Prerequisite: CECS 7971 and Graduate Program Coordinator approval required. One four hours session per week.**

This course provides the student the opportunity to continue the development of his/her experimental and/or theoretical research.

**CECS 7980 - Thesis MSCS**

**Six credit-hours. Prerequisites: Graduate Program Coordinator approval required. One four hours session per week.**

The purpose of the thesis is to expose the student to a reasonable independent research experience that enhances
his/her academic development. Preference will be given to research topics in areas such as IT Management and Information Assurance, Knowledge Discovery and Data Mining, and Computer Graphics and Game Technology, among other related topics. The topic should be of sufficient relevance to illustrate the student’s ability to conduct independent research. The student should follow the guidelines established by the Graduate School for the required format for writing the Thesis work.

CECS 7990 - Thesis Extension

No credit-hours. Prerequisite: CECS 7980 and Graduate Program Coordinator approval required. One four hours session per week.

This extension gives the students the opportunity to continue with the Thesis (CECS 7980) in which they were previously enrolled.

EE 5714 - Digital Communication Systems

Three credit-hours. Prerequisites: EE 4704. Co-requisite: EE 4710. One four hours session per week.

This course provides a review of Random Processes. Topics include the sampling theorem, pulse modulation including PAM, PPM, PWM and PCM; Base-band and pass-band transmission of digital signals including FSK, PSK, and QAM; M-ary modulation techniques; Introduction to spread spectrum systems; Behavior of digital communication systems in the presence of noise; Optimal threshold detection; Optimum Receivers.

EE 5720 - Digital Signal Processing

Three credit-hours. Prerequisites: Undergraduate Signal and Systems and Probability and Statistics. One four hours session per week.

Topics include LSI systems, DTFT, DFT, FFT, sampling, linear and cyclic convolution, the Z-transform and filter structures. Introduction to FIR and IIR digital filter design. Several DSP applications are discussed and demonstrated. A design project is required.

EE 5730 - Radio Frequency Circuit Design

Three credit-hours. Prerequisites: EE 3030, EE 3520, EE 4702. One four hours session per week.

This course is an introduction to high-frequency analog circuit design. It provides a solid background for continued studies in RF design as applied to different areas such as wireless communications and RF circuit design. Topics include RF concepts, lumped component models, transmission line fundamentals, the Smith Chart and its applications, resonant circuits and filters, and small signal amplifiers with s-parameters.

EE 6010 - Mathematical Methods for Signal Processing

Three credit-hours. Prerequisites: Undergraduate Calculus and Diff. Equations. One four hours session per week.

This course provides part of the extensive mathematical background needed for contemporary signal processing, practice and research. It emphasizes several linear algebra topics. Some of the topics covered are: Vector Spaces and Linear Algebra including Linear Operators, Inverse Matrices, Matrix Factorizations, Eigenvalues and Eigenvectors, Singular Value Decomposition, Some Special Matrices and their Application, Kronecker Products. The connection of these topics with signal processing is emphasized.

EE 6012 - Advanced Engineering Mathematics

Three credit-hours. Prerequisites: Undergraduate Calculus and Undergraduate Diff. Equations. One four hours session per week.

This course is an in-depth review of various mathematical concepts which are fundamental tools in the study of electromagnetic and antenna theory. Topics include Vector Calculus, Fourier Analysis, Partial Differential Equations and Boundary Value problems with applications.

EE 6020 - Stochastic Processes

Three credit-hours. Prerequisites: Undergraduate Probability and Statistics or Undergraduate Random Processes. One four hours session per week.


EE 6030 - Linear Systems

Three credit-hours. Corequisite: EE 6010. One four hours session per week.

Review of linear algebra; vector spaces and operators. Mathematical descriptions of linear systems; controllability and observability, irreducible realization of rational transfer-function matrices; canonical forms, state feedback, and state estimators; stability.

EE 6120 - Computer Architecture

Three credit-hours. Prerequisites: Undergraduate Computer Courses. One four hours session per week.

Fundamental concepts of the architectural structure and organization of computers are reviewed: fundamental execution cycle, central processing unit, input/output unit, and memory management unit are covered. Course reviews key
abstractions supported at the architectural level such as virtual memory, micro-architecture, I/O controllers and processors. A historical analysis of the evolution of the major architectures from complex instruction set computers (CISC) to reduced instruction set computers (RISC) is carried out. Additional topics include performance evaluation, multiprocessing and parallel architectures, and tightly and loosely coupled distributed architectures. The architectural layer is considered in the context of compilation processes, operating systems, as well as high level programming concepts.

EE 6130 - Data Communication Networks
Three credit-hours. Prerequisites: Undergraduate Computer Courses. One four hours session per week.

The course covers the fundamentals of data communication networks, including architecture, principles of operations, and performance analyses. It provides a rationale from the engineering standpoint that justifies the way networks are currently structured, and facilitate understanding the issues and tradeoffs faced by designers of future networks. Strong emphasis is provided to understanding algorithms used in networking and their performance impact. An engineering mathematics background including probability is assumed. Some of the topics included are: multilayered network architecture, data link layer protocols, high-speed packet switching, queuing theory, LANs, and WANs issues.

EE 6150 - Object Oriented Design
Three credit-hours. Prerequisites: Undergraduate Object Oriented Programming. One four hours session per week.

The object oriented paradigm is covered including all its fundamental concepts. Students write programs at increasing levels of complexity that illustrates the principles of encapsulation, inheritance, polymorphism, overloading, overriding and constructors. The course assumes familiarity with structured programming techniques, compilation and debugging tools.

EE 6510 - Software Engineering I
Three credit-hours. Prerequisites: Undergraduate Computer Courses. One four hours session per week.

The course covers basic concepts of software requirements generation and analysis, software design, implementation, maintenance, structured design methodologies, object-oriented design methodologies, and data flow design. Project development and team software, budgets and computer ethics issues are also discussed. Students practice the analysis and design phases for a system and the required testing techniques. Various system development models are presented.

EE 6632 - Non Linear Control
Three credit-hours. Prerequisites: Undergraduate Linear Systems. One four hours session per week.

To study the essentials of nonlinear control systems. Topics covered are those techniques which have already been found effective. Several new techniques which are potentially useful to control applications and one detailed case study will also be discussed. Concepts will be re-enforced using computer-aided engineering tools such as MATLAB®, SIMULINK or similar.

EE 6660 - Advanced Robotic Manipulators
Three credit-hours. Prerequisites: Undergraduate Control. One four hours session per week.


EE 6720 - Pattern Recognition
Three credit-hours. Prerequisites: EE 6010, EE 6020. One four hours session per week.

The course presents a description of the general pattern recognition problem and the general methods employed for basic pattern recognition applications. Bayes theory is presented as the building block for statistical pattern recognition methods along with the different approaches used for solving real world problems. The techniques presented include both supervised and unsupervised methods and feature selection and reduction techniques.

EE 6740 - Intelligent Control
Three credit-hours. Prerequisites: Undergraduate Linear System. One four hours session per week.

To study the fundamentals of neural networks and fuzzy set theory with emphasis on their applications in control systems. Concepts will be re-enforced using computer-aided engineering tools such as MATLAB®, SIMULINK or similar.

EE 6750 - Engineering Electromagnetic Field Theory
Three credit-hours. Prerequisites: EE 6012 or equivalent. One four hours session per week.

Review of static fields, fundamental concepts, wave equation and its solutions, wave propagation, reflection and transmission; potential theory; construction of solutions; electromagnetic theorems: concepts of source, duality, uniqueness, equivalence, induction and reciprocity theorems.

EE 6760 - Digital Communications
Three credit-hours. Prerequisites: EE 5714. One four hours session per week.

A review of the behavior of digital communication systems in the presence of noise, optimal threshold detection and optimum receivers. Topics include optimum receivers for general M-ary signaling in the presence of AWGN, geometrical representation of signals, determination of an orthogonal basis.
set, MAP detectors, decision regions and error probability, equivalent signal sets, minimum energy signal set, colored channel noise, generalized Bayes Receiver, and Maximum Likelihood Receiver. Other topics are: Introduction to information theory, Huffman Code, Channel Capacity. Mutual Information, capacity of a band-limited AWGN channel, and Error Correcting Codes.

**EE 6770 - Satellite Communication Systems**

**Three credit-hours. Prerequisites: EE 6760 or EE 5714. One four hours session per week.**

Analysis and design of satellite communication systems and links including the study of propagation, satellite transponders, earth stations and satellite networks. Analog and digital modulation schemes, as well as antennas and microwave components are studied at a block system level. This course also introduces the economics, regulatory law, and business characteristics of the satellite communications field. A final project or report is required.

**EE 7712 - Image Processing**

**Three credit-hours. Prerequisites: EE 6010 or EE 6020. One four hours session per week.**

The purpose of the course is to give the student an approach to image processing, image fundamentals, image enhancement in the spatial and frequency domains, restoration, color image processing, wavelets, image compression, morphology, segmentation, image description, and the fundamentals of object recognition. It focuses on material that is fundamental and has a broad scope of application.

**EE 7716 - Computer Vision**

**Three credit-hours. Prerequisites: EE 7712. One four hours session per week.**

The aim of this course is to introduce the principles, models and applications of computer vision. The course will cover: image structure and encoding; edge and feature detection; interpretation of surfaces; texture, color, stereo, and motion; wavelet methods in vision; parameterizations for solids and shapes; visual inference; and strategies for automatic face recognition. The course requires an extensive use of MATLAB and other mainstream software packages for computer implementation. The course requires a research report and paper reviews.

**EE 7730 – Speech Processing**

**Three credit-hours. Prerequisites: EE 6010, EE 6020. One four hours session per week.**

This course presents an overview of the area of speech processing using computers. The course includes topics such as the speech production process and the necessary mathematical background to study the major applications of the area. The applications presented in the course include speech coding, speech synthesis, speech recognition, and speaker and language identification.

**EE 7740 - Algorithms for Digital Signal Processing**

**Three credit-hours. Prerequisites: EE 6010, EE 6030. One four hours session per week.**

This course provides an introduction to the field of advanced digital signal processing algorithms, in particular to Fast Algorithms for Discrete Fourier Transforms, Discrete Linear and Cyclic Convolutions. Transforms such as the Discrete Cosine Transform, the Hartley Transform, the Walsh-Hadamard Transform and others are also reviewed. The course does extensive use of MATLAB and other mainstream software packages for computer implementation and as an aid to understand the structure of the different algorithms. The course requires a research project, research report or paper reviews.

**EE 7772 - Wireless Communications**

**Three credit-hours. Corequisite: EE 5414. One four hours session per week.**

This course will cover advanced topics in wireless communications for voice, data, and multimedia. We begin with a brief overview of current wireless systems and standards. We then characterize the wireless channel, including path loss for different environments, random lognormal shadowing due to signal attenuation, and the flat and frequency-selective properties of multipath. The course requires an extensive use of MATLAB and other mainstream software packages for computer simulation and implementation. The course requires a research project and paper reviews. The final project will generally be a literature survey, analysis, and/or simulation related to one of the topics.

**EE 7770 - Special Topics in Signal Processing**

**Three credit-hours. Prerequisites: Approval Required. One four hours session per week.**

This course seeks to allow the inclusion into the curriculum of newly developing trends and other special areas of interest or research. The format of the course will vary, including student and lecturer presentations, and discussion and reporting on recent research results.

**EE 7790 - Project for Master in Electrical Engineering**

**Three credit-hours. Prerequisites: Approval Required. One four hours session per week.**

The specialization area project is composed of two alternatives: a research study on a current topic related to the student's specialization area (DSP or Communication Systems), or a related problem that has a solution through the development or enhancement of a digital signal processing or communication system, or component. The specialization area subject needs to be approved by the graduate project student counselor. For the development project the analysis and design phases should be applied to the problem with related modeling techniques to describe the system before and after the proposed solution. Conceptual and physical model design should be done with tools.
that have been used in the classroom during the student’s pursuit of his program of study.

Students who choose to complete the non-thesis option with a specialization area project obtain additional hands-on skills that are required to excel as electrical or computer engineering professionals. Students in the thesis option can also benefit from this course. Both alternatives for the project will help students develop new skills and/or acquire additional technical knowledge.

EE 7791 - Project Extension for Master in Electrical Engineering

Zero credit-hours. Prerequisites: Graduate Program Coordinator approval. One four hours session per week.

Extension to complete the Design Project. The design project is composed of two alternatives: a research study on a current topic related to the student’s area of interest (DSP or Communication Systems), or a related problem that has a solution through the development or enhancement of a digital signal processing or communication system, or component. The project subject needs to be approved by the graduate student counselor.

EE 7800 - Thesis

Six credit-hours. Prerequisites: Approval Required. One four hours session per week.

The purpose of the thesis is to expose the student to a reasonable independent research experience that enhances his/her academic development. The student should prepare, carry out and report a structured and methodical study of importance. The student graduate committee must approve the thesis topic in writing. The topic should be of sufficient relevance to illustrate the student’s ability to conduct independent research. Students must approve an oral thesis examination before assigned graduate committee. The student will make an oral presentation followed by a session of question and answers. Once the graduate committee has accepted the student’s topic the student must maintain continuous enrollment in thesis hours. Publication of this work in journals, conference proceedings, and /or poster presentations is strongly encouraged.

EE 7801 - Thesis Extension

Zero credit-hour. Prerequisites: EE 7800. Approval Required. One four hours session per week.

This course provides the student the opportunity to continue the development of his/her experimental and/or theoretical research.

ELECTRICAL AND COMPUTER ENGINEERING AND COMPUTER SCIENCE DEPARTMENT PROGRAM FACULTY


Sobrino, Eduardo – Adjunt Professor, Ph.D., University of Michigan, School of Architecture, concentration on Information Sciences and Decision Support Systems., 1988; Master on Architecture, Applied Acoustics, University of Puerto Rico School of Architecture, 1981; B.A.Arch. University of Puerto Rico. Research and Development interests: business-oriented information systems, software development project management, database management systems, call center software systems, networking including wireless systems,
business intelligence software, data warehousing, data mining, medical informatics, e-Government.


MASTER IN MANUFACTURING COMPETITIVENESS

The Master Program in Manufacturing Competitiveness seeks to prepare professional engineers, scientists and business administrators for managerial positions and responsibilities in manufacturing organizations. The program offers the opportunity to specialize in the major manufacturing sectors of Puerto Rico, such as the pharmaceutical, quality management, and high tech sectors.

The program of study allows graduates to gain a deep knowledge in current and new manufacturing technologies, regulatory issues affecting manufacturing, decision making tools, as well as a thorough knowledge in key aspects regarding the operation and management of a high tech industry. Such knowledge will prepare them to assume important positions within manufacturing companies either in Puerto Rico, the U.S. or abroad. Professionals graduating from the Master Program in Manufacturing Competitiveness include engineers from the traditional disciplines such as industrial, electrical, mechanical and chemical engineering among other disciplines. It also includes professionals from careers in the natural science fields such as chemistry, pharmacy and biology among others. Finally, it includes professionals from the business administration and related fields such as accountants, business administrators, financial analysts, etc.

CAREER OPPORTUNITIES

The graduate from this program will be amply qualified to occupy diverse managerial positions in manufacturing organizations, including but not limited to the pharmaceutical, and high tech manufacturing companies.

PROGRAM REQUIREMENTS

Admission Requirements

Students with undergraduate preparation in engineering, natural sciences or business administration are encouraged to apply for admission. Admission to the Master's program is based on total academic and professional achievement. Applicants must have completed his/her Bachelor's degree at an accredited university with a minimum general Grade Point Average (GPA) of 2.75/4.00.

All entering students should have: a) completed a one-term course in Probability and Statistics; b) completed a one-term course in Calculus with Analytical Geometry; c) demonstrated proficiency to work with computer application programs such as electronic spreadsheets, presentation programs, and word processing.

Students with deficiencies in these prerequisites are required to take courses in these areas and earn a grade of C or better. These requirements must be fulfilled as early as possible in the student’s program. Courses taken to remedy deficiencies cannot be used to fulfill course requirements for the Master’s degree.

Graduation Requirements

The minimum graduation requirements for each of the degrees offered are as follows:

Master of Science in Manufacturing Competitiveness Degree (Thesis Option)

The program of study leading to a Master of Science in Manufacturing Competitiveness degree with a Thesis requires passing a minimum of 36 credit-hours including the following:

1. Fifteen (15) credit-hours in core courses.
2. Satisfactory completion of a Seminar on Business Writing and Presentation Skills (0 credit-hours).
3. A minimum of 12 credit-hours (four courses) in the area of specialization chosen by the student.
4. An additional minimum of 3 credit-hours in elective courses to be chosen from the Manufacturing Graduate Program offerings.
5. The student must conduct research and prepare a thesis. The thesis consists of 6 credit-hours.

Master in Manufacturing Competitiveness Degree (Design Project Option)

The program of study leading to a Master in Manufacturing Competitiveness degree with a Design Project requires passing a minimum of 36 credit-hours including the following:

1. Fifteen (15) credit-hours in core courses.
2. Satisfactory completion of a Seminar on Business Writing and Presentation Skills (0 credit-hours).
3. A minimum of 12 credit-hours (four courses) in the area of specialization chosen by the student.
4. An additional minimum of 6 credit-hours in elective courses to be chosen from the Manufacturing Graduate Program offerings.
5. The student must conduct a design project and prepare a final report. The design project consists of 3 credit-hours. The student must present the research at the Design Project Expo.

DEGREES OFFERED

Students enrolled in the Graduate Program in Manufacturing Competitiveness may pursue their Master’s degree according to two alternatives. The first one leads to the Master of Science (MMSf.Comp.) degree. Through this alternative students are required to complete a thesis. The second alternative leads to the Master (MMfg.Comp.) degree. In this alternative students must prepare a design project.

CURRICULAR STRUCTURE AND SEQUENCE

The structure and sequence of the curriculum include blocks of courses classified as Core, Area of Specialization, Elective and Thesis/Design Project.

Core Courses

This block of courses provides the fundamental knowledge in current and new manufacturing technologies, decision making tools, as well as a thorough knowledge in all the aspects regarding the operation and management of high-tech manufacturing industries. The core courses total 15 credit-hours, distributed among 5 courses, 3 credit-hours each. As part of the core courses, all students must take the Business Writing and Presentation Skills Seminar. This is a 0 credit-hours seminar whose major purpose is to develop student’s skills in preparing technical reports and making presentations using modern technology.

Areas of Specialization

Students may select from two areas of specialization: Pharmaceutical Products or Quality Management. Through these courses, students may gain fundamental knowledge in current and innovative manufacturing technologies, all pertinent regulatory aspects, as well as the profile and managerial insights of the industry in their field of area of specialization.

Elective Courses

The total number of credit-hours in elective courses varies depending on the degree and option selected. For the Master of Science degree, students must take a minimum of 3 credit-hours in elective courses. For the Master Degree with the Design Project option the minimum is 6 credit-hours in elective courses.

Thesis/Design Project

Students must select one of two options: preparing a thesis based on an applied research topic; or preparing a design project in a topic intimately related to their area of studies.

MANUFACTURING COMPETITIVENESS CURRICULUM STRUCTURE

Core Courses

(Pharmaceutical Products Specialized Courses - 15 credit-hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMP 6000</td>
<td>Advanced Statistics and Quality Improvement (1)</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6002</td>
<td>Operations Planning and Control (1)</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6006</td>
<td>Lean Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6050</td>
<td>Materials Flow and Logistics</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6052</td>
<td>Managerial Finances and Cost Accounting (2)</td>
<td>3</td>
</tr>
<tr>
<td>SEMI 5500</td>
<td>Business Writing and Presentation Skills Seminar</td>
<td>0</td>
</tr>
</tbody>
</table>

Pharmaceutical Products Area of Specialization Courses

(Must select 12 credit-hours from the following courses, including MMP 6132 which is required):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMP 6110</td>
<td>Industry Profile and Business Management for Health Care Products</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6132</td>
<td>Manufacture of Pharmaceutical Solid Dosage Forms</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6180</td>
<td>Material Handling Automation</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6224</td>
<td>Manufacture of Pharmaceutical Parenteral Dosage Forms</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6230</td>
<td>Manufacture of Pharmaceutical Semisolids Dosage Forms</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6234</td>
<td>GMP's and Regulatory Issues</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6236</td>
<td>Packaging Technology</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6564</td>
<td>Process Validation and Technology Transfer</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6180</td>
<td>Material Handling Automation</td>
<td>3</td>
</tr>
</tbody>
</table>

Core Courses

(Quality Management Area of Specialization - 15 credit-hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMP 6000</td>
<td>Advanced Statistics and Quality Improvement (1)</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6002</td>
<td>Operations Planning and Control (1)</td>
<td>3</td>
</tr>
</tbody>
</table>
The Master Program in Manufacturing Engineering distinguishes itself by its depth and focus in state of the art technology. It seeks to prepare engineers for managerial positions and responsibilities in manufacturing organizations. The program offers the opportunity to specialize in the pharmaceutical manufacturing sector. It also offers the opportunity to specialize in the field of Industrial Automation, and Quality Management to serve a wide range of manufacturing companies.

The program of study allows graduates to gain a deep knowledge in current and new manufacturing technologies, regulatory issues affecting manufacturing, decision making tools, as well as a broad knowledge in key aspects regarding the operation and management of a high technology industry. Such knowledge will prepare them to assume important positions within manufacturing companies either in Puerto Rico, the U.S. or abroad.

Professionals graduating from the Master Program in Manufacturing Engineering include engineers from the traditional disciplines such as industrial, electrical, mechanical, and chemical engineering among other disciplines.

CAREER OPPORTUNITIES

The graduate from this program will be amply qualified to occupy diverse managerial, supervisory, and technical positions in many manufacturing organizations including, but not limited to, pharmaceutical and high technology manufacturing plants.

PROGRAM REQUIREMENTS

Admission Requirements

Students with undergraduate preparation in industrial, electrical, mechanical, chemical, and other engineering programs are encouraged to apply for admission. Admission to the Master’s program is based on total academic and professional achievement. Applicants must have completed his/her Bachelor’s degree at an accredited university with a minimum general Grade Point Average (GPA) of 2.75/4.00.

All entering students should have: a) completed a one-term course in Probability and Statistics; b) demonstrated proficiency to work with computer application programs such as electronic spreadsheets, presentation programs, and word processing.

Students with deficiencies in these prerequisites are required to take courses in these areas and earn a grade of C or better. These requirements must be fulfilled as early as possible in the student’s program. Courses taken to remedy deficiencies cannot be used to fulfill course requirements for the Master’s degree.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMP 6006</td>
<td>Lean Manufacturing</td>
<td>3</td>
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<tr>
<td>MMP 6008</td>
<td>Foundations in Quality Learning and Assurance</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6052</td>
<td>Managerial Finances and Cost Accounting (2)</td>
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</tr>
<tr>
<td>SEMI 5500</td>
<td>Business Writing and Presentation Skills Seminar</td>
<td>0</td>
</tr>
</tbody>
</table>

Quality Management Specialized Courses
(Must select 12 credit-hours from the following courses, including MMP 6130 which is required):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>MMP 6130</td>
<td>Six Sigma</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6190</td>
<td>Measuring and Managing Customer Satisfaction and Loyalty</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6250</td>
<td>Audit Program Management</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6256</td>
<td>Assessment Tools to Improve Business Performance</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6558</td>
<td>Machine and Process Characterization</td>
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<tr>
<td>MMP 6570</td>
<td>Design and Implementation of Statistical Sampling Plans</td>
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Elective Courses (3)

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</thead>
<tbody>
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<td>MMP 6535</td>
<td>Research in Manufacturing</td>
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<td>MMP 6540</td>
<td>Management Techniques in the Manufacturing Environment</td>
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<td>MMP 6550</td>
<td>Ergonomics and Human Factors in the Workplace</td>
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<td>MMP 6552</td>
<td>Industrial Safety and OSHA Regulations</td>
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<tr>
<td>MMP 6560</td>
<td>Organizational Behavior</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6562</td>
<td>Environmental Requirements for Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6599</td>
<td>Special Topics in Manufacturing</td>
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</table>

Thesis and Design Project

<table>
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<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMP 6700</td>
<td>Design Project</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6701</td>
<td>Design Project Extension</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6800</td>
<td>Master’s Thesis</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6801</td>
<td>Master’s Thesis Extension</td>
<td>3</td>
</tr>
</tbody>
</table>

(1) Students with a Bachelor degree in Industrial Engineering must substitute this course with an elective course with MMP code.
(2) Students with a Bachelor degree in Business Administration must substitute this course with an elective course with MMP code.
(3) In addition of the current list of elective courses, the student could select as an elective course any course with MMP code that is not specified as a core or interest course component requirement (not including Industrial Automation courses).
Graduation Requirements

The minimum graduation requirements for each of the degrees offered are as follows:

**Master of Science in Manufacturing Engineering Degree (Thesis Option)**

The program of study leading to a Master of Science in Manufacturing Engineering Degree with a Thesis requires passing a minimum of 36 credit-hours including the following:

1. Twelve (12) credit-hours in core courses.
2. Satisfactory completion of a Seminar on Business Writing and Presentation Skills (0 credit-hours).
3. A minimum of 12 credit-hours (four courses) in the area of specialization chosen by the student.
4. An additional minimum of 6 credit-hours in elective courses to be chosen from the Manufacturing Graduate Program offerings.
5. The student must conduct research and prepare a thesis. The thesis consists of 6 credit-hours.

**Master of Engineering in Manufacturing Engineering Degree (Design Project Option)**

The program of study leading to a Master of Engineering in Manufacturing Engineering Degree with a Design Project requires passing a minimum of 36 credit-hours including the following:

1. Twelve (12) credit-hours in core courses.
2. Satisfactory completion of a Seminar on Business Writing and Presentation Skills (0 credit-hours).
3. A minimum of 12 credit-hours (four courses) in the area of specialization chosen by the student.
4. An additional minimum of 9 credit-hours in elective courses to be chosen from the Manufacturing Graduate Program offerings.
5. The student must conduct a design project and prepare a final report. The design project consists of 3 credit-hours. The student must present the research at the Design Project Expo.

**DEGREES OFFERED**

Students in the Graduate Program in Manufacturing Engineering may pursue their Master’s degree according to two alternatives. The first one leads to the Master of Science degree. Through this alternative students are required to complete a thesis. The second alternative leads to the Master of Engineering degree. In this alternative students must prepare a design project.

**CURRICULAR STRUCTURE AND SEQUENCE**

The structure and sequence of the curriculum include blocks of courses classified as Core, Area of Specialization, Elective and Thesis/Design Project.

**Core Courses**

This block of courses provides the fundamental knowledge in current and new manufacturing technologies, decision making tools, as well as a thorough knowledge in all the aspects regarding the operation and management of high-technology manufacturing industries. The core courses total 12 credit-hours, distributed among 4 courses, three credits each. As part of the core courses, all students must take the Business Writing and Presentation Skills Seminar. This is a 0 credit-hours seminar whose major purpose is to develop student’s skills in preparing technical reports and making presentations using modern technology.

**Area of Specialization**

All students may select from three areas of specialization: Pharmaceutical Processes, Industrial Automation, or Quality Management. Through these areas, students may gain fundamental knowledge in current and innovative manufacturing technologies of the industry in their specialized courses.

**Elective Courses**

Through this block of courses students may select courses of their interest with the purpose of rounding their graduate education in those areas of their concern. The total number of credit-hours in elective courses varies depending on the degree option selected. For the Master of Science degree, students must take a minimum of 6 credit-hours in elective courses. For the Master of Engineering degree the minimum is 9 credit-hours in elective courses. The total number of credit-hours is distributed among courses of 3 credit-hours each.

**Thesis /Design Project**

Students must select one of two options: preparing a thesis based on an applied research topic; or preparing a design project in a topic intimately related to their specialized courses.

The thesis or design project required in the Graduate Programs in Manufacturing is intended to test the ability of the Master’s candidate to engage in original research or complex design projects, and to organize and evaluate themselves creatively in the areas of Manufacturing Engineering or Manufacturing Competitiveness.

**Thesis**

In the Thesis alternative, the student must prepare a research proposal, after the completion of all the courses in the core and specialized courses components, including the seminar. The proposal has to be approved by the student advisor and the graduate committee. After that, the student must conduct the research under the direct supervision of the advisor, who is the chairperson of the graduate committee. The final report must include original contributions to a specific area of knowledge.
The thesis will be designed to test the candidate not only in his/her thesis research, but also in the Manufacturing Engineering or Manufacturing Competitiveness areas and related fields that are relevant for the thesis development. The graduate committee, chaired by the student advisor, conducts the examination (defense) after the completion of the written thesis report.

**Design Project**

In the Design Project alternative, the student must prepare a project proposal, after the completion of all the courses in the core and area of specialization courses components, including the seminar. The proposal has to be approved by the student advisor and the graduate program coordinator. After that, the student must conduct the design project under the direct supervision of the advisor, who is the chairperson. The project has to be a special design within the area of specialization.

**MANUFACTURING ENGINEERING CURRICULUM STRUCTURE AND SEQUENCE**

**Core Courses**
(Pharmaceutical Processes Specialized Courses - 12 credit-hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMP 6000</td>
<td>Advanced Statistics and Quality Improvement</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6002</td>
<td>Operations Planning and Control</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6005</td>
<td>Process Engineering</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6006</td>
<td>Lean Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>SEMI 5500</td>
<td>Business Writing and Presentation Skills Seminar</td>
<td>0</td>
</tr>
</tbody>
</table>

**Pharmaceutical Processes Specialized Courses**
(Must select 12 credit-hours from the following courses, including MMP 6132 which is required):

<table>
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<tr>
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<td>3</td>
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<td>Material Handling Automation</td>
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<td>MMP 6230</td>
<td>Manufacture of Pharmaceutical Semisolid Dosage Forms</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6234</td>
<td>GMP's and Regulatory Issues</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6236</td>
<td>Packaging Technology</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6564</td>
<td>Process Validation and Technology Transfer</td>
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</tbody>
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**Core Courses**
(Industrial Automation Specialized Courses (12 Credit-hours))

<table>
<thead>
<tr>
<th>Course</th>
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<th>Credit-Hours</th>
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<tbody>
<tr>
<td>MMP 6000</td>
<td>Advanced Statistics and Quality Improvement</td>
<td>3</td>
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<tr>
<td>MMP 6002</td>
<td>Operations Planning and Control</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6005</td>
<td>Process Engineering</td>
<td>3</td>
</tr>
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<td>MMP 6006</td>
<td>Lean Manufacturing</td>
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</tr>
<tr>
<td>SEMI 5500</td>
<td>Business Writing and Presentation Skills Seminar</td>
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</table>

**Industrial Automation Specialized Courses**
(Must select 12 credit-hours from the following courses, including MMP 6141, MMP 6143, and MMP 6246 which are required)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMP 6141</td>
<td>Industrial Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6143</td>
<td>Process Control</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6180</td>
<td>Material Handling Automation</td>
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<tr>
<td>MMP 6236</td>
<td>Packaging Technology</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6244</td>
<td>Process Measurement and Control Standards</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6246</td>
<td>Industrial Systems Automation</td>
<td>3</td>
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</table>

**Core Courses**
(Quality Management Specialized Courses - 12 credit-hours)

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
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<tr>
<td>MMP 6002</td>
<td>Operations Planning and Control</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6006</td>
<td>Lean Manufacturing</td>
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</tr>
<tr>
<td>MMP 6008</td>
<td>Foundations in Quality Learning and Assurance</td>
<td>3</td>
</tr>
<tr>
<td>SEMI 5500</td>
<td>Business Writing and Presentation Skills Seminar</td>
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</tr>
</tbody>
</table>

**Quality Management Specialized Courses**
(Must select 12 credit-hours from the following courses, including MMP 6130 which is required):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMP 6130</td>
<td>Six Sigma</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6190</td>
<td>Measuring and Managing Customer Satisfaction and Loyalty</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6250</td>
<td>Audit Program Management</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6256</td>
<td>Assessment Tools to Improve Business Performance</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6558</td>
<td>Machine and Process Characterization</td>
<td>3</td>
</tr>
<tr>
<td>MMP 6570</td>
<td>Design and Implementation of Statistical Sampling Plans</td>
<td>3</td>
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**Elective Courses**

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<tr>
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<td>MMP 6145</td>
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Thesis and Design Project

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<td>MMP 6701</td>
<td>Design Project Extension</td>
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<td>MMP 6800</td>
<td>Master’s Thesis</td>
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</tr>
<tr>
<td>MMP 6801</td>
<td>Master’s Thesis Extension</td>
<td>0</td>
</tr>
</tbody>
</table>

(1) Students with a Bachelor degree in Industrial Engineering must substitute this course with an elective course with MMP code.
(2) Students with a Bachelor degree in Chemical Engineering must substitute this course with an elective course with MMP code.
(3) In addition of the current list of elective courses, the student could select an elective course any course with MMP code that is not specified as a core or interest course component requirement.

LABORATORIES

The Industrial Engineering Department offers students the opportunity to receive hands on experience to practice the concepts and techniques learned in the classroom allowing them the best opportunity to acquire current knowledge and the expertise that industry demands. In order to fulfill this commitment, these laboratories have been designed to cover all major areas of Industrial Engineering. The Industrial Engineering Department has the following laboratory facilities on campus: Human Factors Laboratory, Methods Engineering and Work Measurement Laboratory, Operations Management Laboratory, and Software Instruction Laboratory. These laboratories have been designed to perform a wide range of experiments in each of the areas of interest.

Human Factors Laboratory - This laboratory was designed to provide students the opportunity to carry out practical experiments concerning anthropometry, noise and illumination, work-station design, manual material handling, biomechanics and other areas of human performance evaluation and machine-human interactions for the workstation design. The laboratory includes adjustable workstations, ergonomic equipment, soundproof cabins, sound level meters, light meters, goniometers and push/pull gauges.

Methods Engineering and Work Measurement Laboratory - This laboratory was designed to provide students the opportunity to carry out practical experiments concerning motion and time studies techniques (Stopwatch, Work Sampling and Predetermined Time), workstation design, method improvement, performance rating, allowance factor and learning curve. The laboratory includes Time Study equipment such as: Stopwatch, Random Reminder, MTM equipment and tables, assembly's parts and computer to download manufacturing assemblies and for the utilization of statistical software for time-study data analysis and design software for workstation improvements.

Operations Management Laboratory - This laboratory consists of a Windows 2000 network with twenty (20) Intel Pentium III personal computers for student use. This network offers the student the opportunity to access specialized software to tackle manufacturing problems. This laboratory has the equipment and software required to develop the system analysis, solutions development and decision-making skills in our students. The hardware available in this laboratory includes twenty personal computers, and a laser printer. The software in the network includes AutoCAD 2002, Statgraphics Plus for Windows, Witness Simulation software, FactoryCad and FactoryFlow, Microsoft Project, Power Point, Word, Excel, Microsoft Visio and other relevant software.

Software Instruction Laboratory - This laboratory is a state-of-the-art facility. It provides seating for 20 students and has been designed specially for teaching purposes. This room is also equipped with computer lab instruction software to provide one-on-one instruction. It consists of a Microsoft 2000 network with twenty Gateway Pentium IV personal computers and a LCD projector. This network offers the faculty the opportunity to teach software-related courses in order to solve manufacturing problems. The different software available in the network includes Statgraphics plus for windows, Witness and Arena simulation Software, Microsoft Project, MS Visio and other relevant software.

COURSE DESCRIPTIONS

MMP 6000 - Advanced Statistics and Quality Improvement
Three credit-hours. Prerequisite: MGM 5700 or undergraduate course in Probability and Statistics (Not required to graduates from an Industrial Engineering Program). One four hours session per week.

Practical applications of advanced statistical concepts, Quality improvement techniques and management philosophies. The use of statistical computer packages and their application to manufacturing problems will be emphasized.

MMP 6002 - Operations Planning and Control
Three credit-hours. Prerequisite: MGM 5700 or undergraduate course in Probability and Statistics (Not required to graduates from an Industrial Engineering Program). One four hours session per week.

This course focuses on solving managerial problems associated with planning and controlling operations. Major topics include inventory, capacity and demand management, aggregate planning, and activity control.

MP 6005 - Process Engineering
Three credit-hours. Prerequisite: None (Not required to graduates from a Chemical Engineering Program). One four hours session per week.

This course introduces non-chemical engineers to the field of process engineering. Starting with mass and energy balances and then introducing the main unit operations used in chemical processes.
### MMP 6006 - Lean Manufacturing

Three credit-hours. Prerequisite: MMP 6002 (Not required to graduates from an Industrial Engineering program offering a similar undergraduate course).

This course presents the Lean Manufacturing Theory. Discussion of the concepts and procedures related to Lean Thinking: how to simultaneously achieve high efficiency, flexibility, responsiveness, and cost reduction.

### MMP 6008 - Foundations in Quality Learning and Assurance

Three credit-hours. Prerequisite: None. One four hours session per week.

Understanding quality-oriented philosophies and theories such as quality leadership, strategy development and deployment, quality management tools, customer-focus organizations, supplier performance, training and introduction to a quality system development and the audit process using quality assurance systems such as the ISO 9000: 2000. Understand the importance of establishing goals and identify ongoing goals for certified partnerships.

### MMP 6050 - Materials Flow and Logistics

Three credit-hours. Prerequisite: None. One four hours session per week.

This course will introduce the components and analytical tools of logistics to support the operations of supply chain. Through the explanation of the logistic components like demand, procurement, customer service, warehousing, information systems, transportation, material flow and handling the ability of analytical tools will improve the supply chain application.

### MMP 6052 - Managerial Finances and Cost Accounting

Three credit-hours. Prerequisite: None (Not required to graduates from a Business Administration Program). One four hours session per week.

Financial analysis, including sources and uses of fund statement, cost control of business funds, working capital management, long term financing, capital business and financial structure. Study of the methods and procedures of accounting in the determination of the unit cost of a product.

### MMP 6110 - Industry Profile and Business Management for Health Care Products

Three credit-hours. Prerequisite: None. One four hours session per week.

Study of the Pharmaceutical and Medical Devices industries including industry configuration, types of drugs and devices, manufacturing technologies, product’s life cycle, global competition and trends. It also covers the macro perspective of the administration of a manufacturing business, emphasizing the pharmaceutical and medical devices industries.

### MMP 6130 - Six Sigma

Three credit-hours. Prerequisite: MMP 6000. One four hours session per week.

Understanding the strategic and statistical principles underlying the Six Sigma quality model; learn and apply tools and concepts such as voice of the customer, process yield, defects per opportunity and sigma calculation. Be able to apply the six sigma methodology to define a Sigma project: DMAIC from a green belt perspective.

### MMP 6132 - Manufacture of Pharmaceutical Solid Dosage Forms

Three credit-hours. Prerequisite: None. One four hours session per week. One four hours session per week.


### MMP 6141 - Industrial Instrumentation

Three credit-hours. Prerequisite: None. One four hours session per week.

Course in the field of process instrumentation. Includes the construction, functionality and mathematical representation of the various commercially available instrumentation components such as pressure, level, flow and temperature sensors. Also covers the final actuators and control valves, integral part of a closed control loop. Also the analysis and operation of industrial controllers is a part of this course.

### MMP 6143 - Process Control

Three credit-hours. Prerequisite: MMP 6005. One four hours session per week.

This course addresses the following aspects of Process Control: analysis of factors affecting process dynamics, instrumentation required for control system design, modes of control and feedback controllers, stability, design case studies, simulation of processes, cascade, ratio, override, and feedforward control. The course focuses on a practical approach through the application of basic concepts to the solution of process control problems.

### MMP 6145 - Lean Six Sigma

Three credit-hours. Prerequisites: MMP 6006 and MMP 6130. One four hours session per week.

Fundamental concepts of Lean Production and Six Sigma methodologies. Includes identifying the customer’s critical-to-quality issues and evaluating value streams in key processes and translating identified opportunities into cost, quality, capital and lead time improvement projects through a case-study learning environment. Statistical and visual software analysis criteria will be used throughout the whole course.
MMP 6162 - Medical Devices Technology I

Three credit-hours. Prerequisite: None. One four hours session per week.

Manufacturing Process Technology for Non Critical Devices. New Manufacturing Technologies. Product and process flow, use and market; product classification according to FDA; compliance program, systems and practices in place used in industry to assure compliance with FDA Regulations.

MMP 6180 - Material Handling Automation

Three credit-hours. Prerequisite: MMP 6002. One four hours session per week.

Evaluation, design, control, and implementation of material handling systems. Interrelationships between material handling and plant layout, industrial robots, production planning and control, and integrated manufacturing systems.

MMP 6190 - Measuring and Managing Customer Satisfaction and Loyalty

Three credit-hours. Prerequisite: MMP 6008. One four hours session per week.

Designing and implementing a customer satisfaction measurement program for capturing the voice of the customer. Link the voice of the customer with value and retention. Methods and models for creating a long-term customer value and improved business performance.

MMP 6224 - Manufacture of Pharmaceutical Parenterals Dosage Forms

Three credit-hours. Prerequisite: None. One four hours session per week.


MMP 6230 - Manufacture of Pharmaceutical Semisolid Dosage Forms

Three credit-hours. Prerequisite: None. One four hours session per week.

This course presents the most relevant and important principles and controls for the manufacturing processes and equipment for the manufacturing of semi-solid dosage forms.

MMP 6234 - GMP's and Regulatory Issues

Three credit-hours. Prerequisites: MMP 6132 or Master's in Manufacturing Coordinator Approval. One four hours session per week.

History, importance, law, regulation and regulatory mapping in quality as applied to health related industries. GMP's, 21CFR210 and other related regulations and documents.

MMP 6236 - Packaging Technology

Three credit-hours. Prerequisite: MMP 6132 or Master's in Manufacturing Coordinator Approval. One four hours session per week.

This course covers the most relevant and important concepts of packaging technologies. Discussion of current methods, materials, processes and equipment. It includes packages for tablets, capsules, ointments and liquids.

MMP 6244 - Process Measurement and Control Standards

Three credit-hours. Prerequisite: MMP 6141 or MMP 6142. One four hours session per week.

This course covers the most relevant and important elements Instrumentation and control standards. Discussion of commonly used standards in industry including Instrumentation symbols and identification, batch control, control center design, environmental conditions, electronic records and signatures, and safety instrumented systems among others.

MMP 6246 - Industrial Systems Automation

Three credit-hours. Prerequisite: MMP 6142 or MMP 6143. One four hours session per week.

This course presents the most important elements of many alternative technologies and systems available for the automation of production lines. It describes important topics in production automation such as industrial control systems, PLCs, Sensors and actuators, PC control, industrial robotics, bar code, and vision systems.

MMP 6250 - Audit Program Management

Three credit-hours. Prerequisite: MMP 6008. One four hours session per week.

Describes and explains in detail the audit process that provide the expertise for examining processes and systems and making data based decisions to improve work processes and systems.

MMP 6256 - Assessment Tools to Improve Business Performance

Three credit-hours. Prerequisite: MMP 6008. One four hours session per week.

Describes and explains in detail the Baldrige Quality Award and European Quality Award. Define relevant guidelines to develop organizations assessment criteria. Describes tools to designing organization scorecards and the approach for balance metrics. Explain the linked process between scorecards and the company improves performance.
MMP 6518 - Project Management
Three credit-hours. Prerequisite: MGM 5700 or undergraduate course in Probability and Statistics. One four hours session per week.

The aim of this course is to educate an individual to develop expertise to manage projects. The course will accomplish this aim by introducing the fundamental concepts of projects management to graduate students. The fundamental concepts revolve around the individual or project manager, the organizational processes and structures, and the project management tools. The students will learn how to balance conflicting demands to ensure successful project management.

MMP 6520 - Industrial Systems Simulation
Three credit-hours. Prerequisites: MMP 6000. One four hours session per week.

This course presents the most relevant concepts of systems simulation. It describes simulation as an analysis technique used to evaluate and improve dynamic systems of all types. The course contains a blend of theory and practice. It also covers the use of simulation in both manufacturing and service systems. It has a strong focus on the practical aspects of simulation. Emphasis is placed on the use of simulation in actual problem-solving situations.

MMP 6535 - Research in Manufacturing
Three credit-hours. Prerequisite: 24 Credits Approved. One four hours session per week.

This course provides students the tools required to conduct original research in the area of manufacturing, including the selection of a problem, development of a literature review, and determination of the research methodology.

MMP 6540 - Management Techniques in the Manufacturing Environment
Three credit-hours. Prerequisite: None. One four hours session per week.

A graduate course in engineering management designed to provide students without specialized business training, the framework of the management process. This framework is divided into the four managerial functions: planning, organizing, leading and controlling. The student will gain a perspective of the bases of these managerial functions.

MMP 6550 - Ergonomics and Human Factors in the Workplace
Three credit-hours. Prerequisite: None. One four hours session per week.

A graduate level in-depth exposure to the design and management of industrial workplaces with emphasis on people at work. Discussion of worker behavior and performance, industrial safety, standards and regulations, industrial ergonomics, manual material handling, and cumulative trauma disorders.

MMP 6552 - Industrial Safety and OSHA Regulations
Three credit-hours. Prerequisite: None. One four hours session per week.

The most relevant concepts of safety engineering, as applied to manufacturing environments. OSHA and other regulatory aspects are covered.

MMP 6558 - Machine and Process Characterization
Three credit-hours. Prerequisite: MMP 6000. One four hours session per week.

Statistical design of experiments for machine and process characterization and improvement. Discussion of experimentation strategy including factorial experiments, response surface experiments, and empirical model building.

MMP 6560 - Organizational Behavior
Three credit-hours. Prerequisite: None. One four hours session per week.

This course offers the most relevant concepts applicable to the study, understanding, and application of human behavior in organizations. Discussion of historical and behavioral science research methodology. Examines the interrelations of personality, perception, attitudes and job satisfaction. Focus is on the importance of motivation, group dynamics, conflicts and leadership, communication and modern organization designs.

MMP 6562 - Environmental Requirements for Manufacturing
Three credit-hours. Prerequisite: Master's in Manufacturing Coordinator Approval. One four hours session per week.

Study of the most important environmental aspects regarding control and treatment of industry waste. The student will learn the types of waste streams produced by typical manufacturing processes and the potential impacts to human health and the surrounding ecosystems. Alternatives for pollution prevention and protecting the environment from residual manufacturing pollution produced will be described. Pollution treatment and control strategies for reducing the environmental impact from manufacturing will be presented.

MMP 6564- Process Validation and Technology Transfer
Three credit-hours. Prerequisites: MMP 6132. One four hours session per week.

Study of the most relevant concepts and organization for effective validation of processes and equipment for pharmaceutical and medical devices industries. Technology transfer fundamentals.
MMP 6570 - Design and Implementation of Statistical Sampling Plans

Three credit-hours. Prerequisites: MMP 6000. One four hours session per week.

In depth analysis of the statistical sampling plans with emphasis in the design, performance and implementation of the plans. Also, includes the discussion of the quality metrics used for the evaluation, and selection of the sampling strategy. The course will be oriented to the correct and effective implementation of sampling plans in the Manufacturing Industry.

MMP 6599 - Special Topics in Manufacturing

Three credit-hours. Prerequisite: Graduate Program Coordinator approval. One four hours session per week.

Special topics in any of the areas of specialization in manufacturing.

MMP 6700 - Design Project

Three credit-hours. Prerequisites: All core and specialization courses and Graduate Program Coordinator approval. One four hours session per week.

This course consists on the development of an applied design project in an area of the specialization selected by the student. This course will guide the student to develop and test a model of some process, conduct experiments to test a hypothesis (manufacturing, ergonomics, etc.), develop a software package to solve some type of manufacturing, human factors, or operational problem, solve an actual industrial engineering problem using one or several quantitative, analytical, and/or qualitative methods.

MMP 6701 - Design Project Extension

Zero credit-hours. Prerequisites: MMP 6700 Graduate Program Coordinator approval. One four hours session per week.

This course provides the student the opportunity to continue the development of his/her applied design project.

MMP 6800 - Master’s Thesis

Six credit-hours. Prerequisites: All core and specialization courses and Graduate Program Coordinator approval. One four hours session per week.

This course consists on the development of experimental and/or theoretical research in an area of the specialization selected by the student to be presented in a thesis with merits for granting the degree. This course will guide the student to develop and test a model of some process, conduct experiments to test a hypothesis (manufacturing, ergonomics, etc.), develop a software package to solve some type of manufacturing, human factors, or operational problem, solve an actual industrial engineering problem using one or several quantitative, analytical, and/or qualitative methods.

MMP 6801 - Master’s Thesis Extension

Zero credit-hours. Prerequisites: MMP 6800 and Graduate Program Coordinator approval. One four hours session per week.

This course provides the student the opportunity to continue the development of his/her experimental and/or theoretical research.

SEMI 5500 - Business Writing and Presentation Skills Seminar

Zero credit hours. Prerequisite: None. One four hours session per week.

This course is designed to provide graduate students with the most relevant concepts governing effective business writing, oral, and nonverbal communication. It presents the steps required for developing an effective presentation and the different resources available for multimedia presentations. Students will strengthen their presentation skills through a series of presentations required as part of the course.

PROGRAM FACULTY

De Cárdenas, Lourdes – Lecturer III, Ph.D., Chemistry, Purdue University, 1986; B.S., Chemistry, University of Puerto Rico, Río Piedras, 1981.

Dávila Aponte, Edwin – Assistant Professor – Ph.D., Entrepreneurship Development, Interamerican University of Puerto Rico, Río Piedras Campus, 2006; MBA Accounting, Interamerican University of Puerto Rico, Río Piedras Campus, 1999; BBA, Accounting, Caribbean University, Bayamón, Puerto Rico, 1986.


González Lizardo, Angel – Associate Professor, Director Plasma Engineering Laboratory, Ph.D., Electrical Engineering, University of Dayton, OH, 2003; M.S., Electrical Engineering, University of Puerto Rico, Mayagüez, 1994; B.S., Electrical Engineering, Universidad del Zulia, Venezuela, 1984.

González, Clara – Lecturer III, Ph.D., Materials Science and Engineering, University of Illinois at Urbana-Champaign, 1997; M.S., Industrial Engineering, Texas A&M University, College Station, 1991; B.S., Chemical Engineering, University of Puerto Rico, Mayagüez, 1988.

The generation, conversion, transmission, and operation of mechanical and thermal energy systems. The program is suited for students with a keen interest in science and mathematics. The curriculum in Mechanical Engineering covers the fundamental aspects of the field, stresses on basic principles and educates students in the use of these principles to solve engineering problems. In the freshman and sophomore years, emphasis is on humanities, mathematics, physics, and computer aided drafting and design with an introduction to design, conventional manufacturing, automation and mechatronics. The junior and senior years are devoted to solid mechanics, applied mechanics, materials, thermodynamics, heat transfer, fluid mechanics, dynamic systems and controls, thermal and mechanical design, manufacturing, finite element analysis, computer aided engineering, and the application of the fundamentals to the solution of the vast variety of problems encountered in mechanical engineering. The curriculum stresses on laboratory work and design projects in a teamwork setting as well as on the acquisition of superior computer skills. It is designed to prepare students to face with success the new challenges of the industry and for the benefit of our society. It also includes free and mechanical engineering elective courses in order that the student best fits his/her interest in areas of specialization that includes the classical areas of air conditioning, power plants, turbo machinery, manufacturing, robotics, vibrations and new areas such as aerospace, biomedical, and plastics engineering. Mechanical Engineering students may decide to earn a concentration in aerospace engineering with emphasis in aeronautics including the areas of aerodynamics, flight dynamics, aircraft design, and airplane propulsion. Finally, a sequence of courses in management has been added to the curriculum to strengthen managerial skills and self-employment.

PROGRAM PHILOSOPHY AND OBJECTIVES

The main objective of the program is to prepare students for a professional career that broadly spans industrial, governmental and academic settings. The program is committed to impart to students the leadership and professional requirements needed in the mechanical engineering environment (in all sectors), enabling them to participate in the development and enhancement of composite systems and components. This know-how is obtained through the development of fundamental knowledge, technical, analytical, and project management, and leadership skills and initiatives, all acquired throughout the program.

The program aims to prepare graduates with a desire and capacity for life-long learning and self-development. Students will have the opportunity to take courses at different times; allowing the availability to a larger student population. Mechanical Engineering is a dynamic field where the fast pace of innovation leads to a need for continuous actualization of knowledge. The emphasis on standard practices, tools and methodologies will provide graduates with empirical knowledge. The program also prepares graduates for
academic careers that can fill the demand for professors in related areas of instruction. The programs also seek to develop skills in decision-making, leadership, and collaboration. Graduates will possess in-depth engineering and technological knowledge that will allow them to further develop these skills while performing successfully at strategic levels. The main objective of the programs is to fill the major market needs that have been identified with qualified, competent candidates, providing PUPR graduate mechanical engineering students with:

- Skills to use, evaluate, and apply mathematics, physics, mechanical engineering fundamentals, time-proven techniques and principles, and advanced topics towards the development of novel solutions.
- Communication, leadership, and group collaboration skills, which will enable students to work effectively on diverse projects within multidisciplinary and multicultural teams.
- The necessary knowledge for the application of physical principals such as heat, force, the conservation of mass and energy, and others, to design composite products such as vehicles (automobiles, aircraft, others), weapon systems, heating and cooling systems, industrial equipment and machinery, and household appliances.
- The necessary skills to work in a research and development environment and/or in industrial projects.
- The understanding needed to acquire a professional and ethical attitude, adhering to ethical standards on engineering and intellectual property which will help the student develop the necessary initiative, character and judgment that is required in the profession.
- An understanding of the fundamental trade-offs and constraints related to the economic aspects of mechanical engineering.
- Experiences that lead to strong analytical thinking and problem solving capacity.
- The awareness needed to seek life-long professional development, independent study, and creativity, in order to stay on the cutting-edge of technology.
- Use of modern engineering tools to assist in the analysis of complex systems.

**CAREER OPPORTUNITIES**

The demand for mechanical engineers is growing at a steady rate. Mechanical engineers apply physical principals such as heat, force, the conservation of mass and energy to design composite products such as vehicles (automobiles, aircraft, others), weapon systems, heating and cooling systems, industrial equipment and machinery, and household appliances. Mechanical engineers need to be well trained in the physical, mechanical, analytical, computational, and experimental practices used in this industry.

The aerospace and manufacturing sectors are considered the most in-demand areas of the industry for mechanical engineers, but emerging technologies such as biotechnology, materials science, and nanotechnology have also created job opportunities. Additional opportunities of employment outside of the discipline also arise for mechanical engineers because the skills and knowledge acquired through earning a degree can be applied to other engineering specialties.

Mechanical engineers research, design, develops, manufacture, and test tools, engines, machines, and other mechanical devices. They work on power-producing machines such as electric generators, internal combustion engines, and steam and gas turbines; and power-using machines such as refrigeration and air conditioning equipment, machine tools, material handling systems, elevators and escalators, industrial production equipment, and robotics used in manufacturing. They also design tools that other engineers use. They usually work in the manufacturing or agricultural production, maintenance, or technical sales. Many acquire the skills and knowledge to become managers or administrators.

A growing demand in the aerospace industry has opened a vast gamma of opportunities for graduate mechanical engineers that posses the technical and administrative skills to embrace state-of-the-art research and innovative technology projects in the most important enterprises located in the U.S., Puerto Rico, and the world. This industry is establishing itself in Puerto Rico and promises to grow at a significant rate in the next five to ten years. Many aerospace engineers have training in mechanical engineering. They design, develop, and test aircraft, spacecraft, and missiles. They supervise and manufacture these products. They develop the technologies for use in aviation, defense systems, and space exploration. Our specialization in aerospace will give students the skills and know-how needed to commence a career in aerospace engineering in Puerto Rico or the mainland.

Aerospace and mechanical engineers are expected to have a fourteen percent growth from 2006 to 2016. In 2006, twenty-two percent of the mechanical engineering specialties were concentrated in the architectural, engineering, and related services industries; fourteen percent were in the transportation equipment manufacturing industry. In that year forty-nine percent of the aerospace engineers were in the aerospace product and parts manufacturing industry. An increase in the number and scope of military aerospace projects and new technologies to be used in commercial aircraft should spur this demand for the present and next decade.

**PROGRAM REQUIREMENTS**

**Admission Requirements**

Students with Bachelor’s degree in Mechanical Engineering from an accredited institution can apply directly with the only requirement of a minimum general Grade Point Average (GPA) of 2.80/4.00. Students with a GPA lower than 2.8 can apply and the graduate committee reconsideration analyzes the case to determine if the student can be admitted.
Students with Bachelor’s degree from other engineering programs can apply for admission. Additional undergraduate pre-requisites may apply after the evaluation of the application by the program coordinator. The number of undergraduate credits must not exceed 12 credit hours, if it exceeds this amount the student must enroll as a special student in the bachelors program to be able to take the necessary pre-requisites. After the completion of these credit hours the student may apply to the master’s program.

**Graduation Requirements**

The minimum graduation requirements are as follows:

**Master of Engineering in Mechanical Engineering Degree (Design Project)**

Degree requirements for this program include thirty (30) credits of coursework and three (3) credits of a project course. This is a total of 33 credit hours of graduate level courses, which consists of:

1. Twelve credit hours (4 courses) of core courses.
2. A minimum 12 credit hours (4 courses) in the area of specialization.
3. A minimum of 6 credit hours (2 courses) in elective courses chosen by the student.
4. Three credit hours of a Design Project. The student must conduct a design project and prepare a final tech article. The project subject matter is to be approved by the Graduate Program Coordinator and the student’s advisor.

The program is intended to be flexible; students can petition the Coordinator the Program to substitute other courses dealing with practical applications in Mechanical Engineering Special Topics or in other Departments. The student is thus free to construct a program consisting of courses consistent with the program requirements.

**DEGREE OFFERED**

Students in the Graduate Program in Mechanical Engineering earn a Master of Engineering in Mechanical Engineering.

**CURRICULAR STRUCTURE AND SEQUENCE**

The structure and sequence of the curriculum include blocks of courses classified as Core, Area of Specialization, Elective and Thesis/Design Project.

**Core Courses**

This block of courses provides the fundamental knowledge in current and new manufacturing technologies, decision making tools, as well as a thorough knowledge in all the aspects regarding the operation and management of high-technology manufacturing industries. The core courses total 12 credit-hours, distributed among 4 courses, three credits each.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
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</thead>
<tbody>
<tr>
<td>ME 6000</td>
<td>Advanced Numerical Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ME 6012</td>
<td>Advanced Engineering Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>ME 6100</td>
<td>Advanced Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 6200</td>
<td>Advanced Solid and Fracture Mechanics</td>
<td>3</td>
</tr>
</tbody>
</table>

**Aerospace Area of Specialization**

The Aerospace (AE) area of specialization trains graduates to become leaders in the aerospace industries, including knowledge in design and analysis of structures, dynamic systems, compressible fluids, and controls related to aerospace research and industrial applications. In addition, it focuses on modern computational, analytical, and experimental techniques applied to the aerospace field. There is a shortage of skilled mechanical engineers specialized in aerospace technologies capable of making significant contributions to this industry in Puerto Rico and the U.S. Graduates will acquire knowledge in areas such as aerospace structures, mechanical and aerospace systems and controls, high speed aerodynamics, stability and vibration of systems, composite materials, computational fluid dynamics, and turbo machine theory, among others.

**Elective Courses**

Through this block of courses students may select courses of their interest with the purpose of rounding their graduate education in the areas of Energy/Thermal/Fluids and Design/Materials/Manufacturing. The total number of credit-hours in elective courses can be of up to six credit-hours.

**Design Project**

Students must prepare a design project in a topic that has been approved by faculty and the program coordinator. The project can be suggested by students or presented by the faculty members.

**CURRICULAR STRUCTURE AND SEQUENCE**

<table>
<thead>
<tr>
<th>Course</th>
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<th>Credit-Hours</th>
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</thead>
<tbody>
<tr>
<td>ME 6130</td>
<td>Gas Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 6140</td>
<td>High Speed Aerodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 6150</td>
<td>Theory of Turbomachines</td>
<td>3</td>
</tr>
<tr>
<td>ME 6160</td>
<td>Computational Fluid Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 6220</td>
<td>Fracture Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME 6260</td>
<td>Introduction to Composite Materials</td>
<td>3</td>
</tr>
<tr>
<td>ME 6330</td>
<td>Finite Element Methods</td>
<td>3</td>
</tr>
<tr>
<td>ME 6340</td>
<td>Stability and Vibrations of Systems</td>
<td>3</td>
</tr>
<tr>
<td>ME 6350</td>
<td>Mechanical and Aerospace Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>ME 6360</td>
<td>Optimization in Engineering Design</td>
<td>3</td>
</tr>
</tbody>
</table>
Elective Courses*
(Can select up to 6 credit-hours from the following courses):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 6110</td>
<td>Conduction and Radiation Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ME 6120</td>
<td>Advanced Convection, Heat Transfer, and Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME 6170</td>
<td>Alternative and Renewable Energy Technologies</td>
<td>3</td>
</tr>
<tr>
<td>ME 6210</td>
<td>Theory of Elasticity</td>
<td>3</td>
</tr>
<tr>
<td>ME 6240</td>
<td>Tool, Tooling, and Machine Design</td>
<td>3</td>
</tr>
<tr>
<td>ME 6250</td>
<td>Advanced Manufacturing Simulation</td>
<td>3</td>
</tr>
</tbody>
</table>

Design Project

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 6400</td>
<td>Design Project in Master of Engineering in Mechanical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ME 6401</td>
<td>Design Project in Master of Engineering in Mechanical Engineering Extension</td>
<td>3</td>
</tr>
</tbody>
</table>

Design Project Descriptions

The design project is required in the to test the ability of the Master’s candidate to engage in original research or complex design projects, and to organize and evaluate themselves creatively in the areas of Energy/Thermal/Fluids, or Design/Materials/Manufacturing, or Aerospace. The student must prepare a project proposal, after the completion of all the courses in the core and area of specialization courses components. The Proposal has to be approved by the student advisor and the graduate program coordinator. After that, the student must conduct the design project under the direct supervision of the advisor, who is the chairperson.

LABORATORIES

These are several laboratories in the Mechanical Engineering Department that can be used either for teaching or research purposes to support the master’s program:

Materials Engineering Laboratory - Students receive hands on experience in the use of equipments dedicated to the determination of material properties such as the stress-strain diagrams, hardness testing, and microstructure observation and material identification, and material treatment. Laboratory equipments include tension testing machines, brinell hardness machine, Vickers hardness machine, Rockwell hardness testing machine, microscopes, ovens, etching chemicals, polishing equipment, etc.

Thermology Laboratory - The students have the opportunity of applying knowledge of convection, radiation and conduction, laws of thermodynamics, and property relations to different thermal equipments.

The laboratory is provided along with a variety of equipment for teaching lab-based for thermal, fluid science courses and turbomachinery. The facility also includes features computer controlled heating and cooling systems that mimic the types of equipment found in industry. Equipments include a wind tunnel, compressible fluid flow, convective heat transfer, thermal radiation, air conditioning, steam boiler, cross flow heat exchanger, Tube and tube, shell and tube, and plate heat exchangers, series and parallel pumping systems, axial and centrifugal fans, hydraulics turbines, and centrifugal compressors.

Fluid Mechanics Laboratory - Hands on experiences on the fundamentals of fluid mechanics is provided in this lab. Students perform and conduct simple experiments for incompressible fluids. Besides, students develop the ability to measure, analyze and interpret data.

This lab is equipped with four work benches, set of different accessories and devices to measure flow, hydrostatic forces, stability of floating bodies, friction in pipes and forces of impact of jets. Other experiments included are ventury meters, weirs and orifices where students determine loss coefficient and learn some characteristics and application of them.

Mechatronics, Controls, and Measurements Laboratory- Hands on experience in Fluid Power and Hydraulic Motion Control Systems; Pneumatic Power and Pneumatic Motion Control Systems; equipment for Controls and Instrumentation for Automation and mechanical actuation systems is available.

This laboratory includes electronic data acquisition cards, PID Controllers, Programmable Logic Controllers (Allan-Bradley and DirectLogic), microprocessors, sensors, transducers, actuators, and power supplies. At the same time, it is provided with computer machine and the different necessary software to accomplish this task.

High Computing Performance Laboratory - This room is specifically reserved for mechanical engineering students of the graduate program where numerical experiments can be performed. The uses include design and analysis of thermal, fluid, and structural numerical experiments. Ten Sun Microsystem workstations and software licenses that include ProEngineering, Ansys, Fluent and VX are available.

Manufacturing and Product Realization Laboratory - This lab provides hands on experiences on a variety of techniques and process for the manufacturing of engineering components including, operation of machine tools and welding machines. Prototypes are designed and manufactured by teams by the guidance of the instructor. This lab is equipped with CNC lathes and millings, conventional lathes, milling machines, grinder surfaces, bandsaws, drills, cuttingsaw, welding machines, oxyacetylene, and tube bender.

In addition, reverse engineering equipment is available such as a Stratasys rapid prototyping machine and a 3-D scanner, and computer machine and software for the state-of-art manufacturing technology.
There are other centers available that were created from grants that our university has developed over the years that can be used in this effort. These centers are:

**Plasma Engineering Laboratory** - In this Plasma Laboratory it is possible to create plasmas with a very wide range of plasma densities and plasma temperatures, and consequently many different plasma applications can be performed in this Laboratory. The Plasma Engineering Laboratory provides an interdisciplinary research experience for graduate students interested in the development and modification of materials for aerospace applications via plasma treatments. The plasma treatments are performed using the ECRH device existing in the laboratory, which allows for performing Plasma Assisted Gas Deposition as well as Nitriding processes. The Plasma Engineering Laboratory is equipped with a set of tools for plasma diagnostics which allows the accurate measurement of the plasma parameters while the treatments are being performed, and is working in collaboration with University of Missouri-Columbia, who provides for the material analysis techniques that are not available at PUPR. The laboratory is also affiliate of NASA Puerto Rico Space Grant Consortium, which expose the graduate students to a number of initiatives and resources for their research work. This laboratory is funded by U.S. Department of Energy and NASA Puerto Rico Space Grant Consortium. The Plasma Engineering Laboratory has produced 18 publications in the recent past, 8 of them at international conferences.

**High Performance Computing Laboratory** - Supported by the Department of Defense (DoD), the High Performance Computing Laboratory is designed to provide for the needs of high computing power for multi-disciplinary research as required. The laboratory is equipped with three Beowulf PC Clusters (two 64 processor and one 256 processor) and an Altix 350 supercomputer. The laboratory also provides for the development of joint research projects and software development between university-industry partnerships to enable PUPR to assist in the scientific, technological, and economic transformation of Puerto Rico and in meeting national unmet needs in scientific high performance computing.

**COURSE DESCRIPTIONS**

**ME 6000 - Advanced Numerical Analysis**

Three credit-hours. Prerequisites: None.

The course presents numerical methods and modern algorithms for solving some technical problems: solving systems of linear and nonlinear equations; numerical solutions of ordinary differential equations; initial value problems, one-step and multi-step methods, and Taylor series method. Also includes automatization of input data, practical applications of boundary value problems, partial differential equations, and modern computing.

**ME 6012 - Advanced Engineering Mathematics**

Three credit-hours. Prerequisites: None.

The course covers advanced mathematical topics as they relate to practical problems. The material is arranged into independent parts: ODE; Linear Algebra, Vector Calculus; Fourier Analysis and Partial Differential Equations; and, Complex Analysis. The course will present the analytical solutions and numerical methods.

**ME 6100 - Advanced Engineering Thermodynamics**

Three credit-hours. Prerequisites: None.

Course covers advanced thermodynamics topics as they relate to practical problems. The material is arranged as follows: single-phase systems, exergy analysis, multiphase systems, chemically reactive systems, power generation, solar power, refrigeration, entropy-energy minimization, and irreversible thermodynamics.

**ME 6110 - Conduction and Radiation Heat Transfer**

Three credit-hours. Prerequisites: ME 6000.

This course is designed to be a graduate course in conduction and radiation heat transfer. It includes a review of the nature of thermal radiation; implications from electromagnetic theory; radiative characteristics of surfaces; enclosures; configuration factors; radiosity; specular and diffuse reflection; transfer in absorbing, emitting and scattering media; combined radiation conduction and convection; experimental methods. The first half of the course includes general heat conduction equation derivations, one and two dimensional steady and unsteady state heat conduction using closed and numerical approaches. The second half includes basic relations of radiation, radiation exchange between surfaces in a non-participant medium using the net exchange and Monte Carlo methods.

**ME 6120 - Advanced Convection Heat Transfer and Fluid Mechanics**

Three credit-hours. Prerequisites: ME 6100.

This course is an analytical study of convective heat transfer in laminar and turbulent flows; forced convection, natural convection, and mixed convection; combined heat and mass transfer; heat transfer with change of phase; instability of laminar flow; current topics in convection.

**ME 6130 – Gas Dynamics**

Three credit-hours. Prerequisites: ME 6100.

This course teaches the effects of compressibility occurring at high-speeds in internal and external flows with relevance to Aerospace applications. The primary focus of the course is on the teaching of inviscid compressible aerodynamics in nozzle, around wings, and around blunt bodies.
ME 6140 - High Speed Aerodynamics
Three credit-hours. Prerequisites: ME 6100.
This course introduces the branch of fluid mechanics which describes the flow of compressible flow; fluids which show appreciable variation in density as a result of the flow, mainly to variation in pressure and temperature. The conservation of mass, first and second law of thermodynamics and Newton's laws of motion of sonic and supersonic, bounded and unbounded are studied and analyzed.

ME 6150 - Theory of Turbomachines
Three credit-hours. Prerequisites: None.
This course covers rotor dynamics machines; dimensional analysis; energy transfer in rotating passages; flow through passages and over blades and vanes; centrifugal pumps, fans, and compressors; axial flow pumps; fans, and compressors; steam and gas turbines; hydraulic turbines; and wind turbines.

ME 6160 - Computational Fluid Dynamics
Three credit-hours. Prerequisites: None.
This a graduate course on modern computational fluid dynamics. Topics include theory, numerical techniques and the use of CFD software on the solution of complex fluid flow. Also includes finite difference and finite volume methods; Grid Generation; Explicit, implicit, and iterative techniques; solutions of elliptic, parabolic, and hyperbolic equations. Emphasis will be on applications and commercial software; validation and verification of solutions.

ME 6170 - Alternative and Renewable Energy Technologies
Three credit-hours. Prerequisites: None.
The course covers energy conversion, utilization and storage for renewable technologies such as wind, solar, biomass, fuel cells and hybrid systems. Thermodynamic concepts (including the first and second law) will form the basis for modeling the renewable energy systems. The course also touches upon the environmental consequences of energy conversion and how renewable energy can reduce air pollution and global climate change.

ME 6200 - Advanced Solid and Fracture Mechanics
Three credit-hours. Prerequisites: None.
Mechanics of materials is based on the simplified assumption related to the geometry of deformation. The load-stress relations are derived first and used to obtain load-deflection relations for the members under study. The course discusses stress and strain concepts, mechanical elastic and inelastic behavior of materials, energy methods, torsion, non symmetrical bending and shear center, curved beams, beams on elastic foundations, thick wall cylinder, elastic and inelastic stability of columns, and flat plates and contact stress.

ME 6210 - Theory of Elasticity
Three credit-hours. Prerequisites: None.
Elasticity is the basis for solid mechanics and the course intends to provide a background for tensor-based theory of elasticity. The main topics covered are: Vector and Cartesian Tensors; Indicial Notation; Review of the field equations of elasticity: Traction, Stress and Equilibrium; Deformations; Materials behavior; Formulation and uniqueness theorems; Elementary problems in one and two dimensions; Bending of thin plates; Energy principles.

ME 6220 - Fracture Mechanics
Three credit-hours. Prerequisites: None.

ME 6240 - Tools, Tooling, and Machine Tool Design
Three credit-hours. Prerequisites: None.
The fundamentals of proper selection of manufacturing processes, machinery, tool and tooling design are considered. Process selection depends on, in addition to technical requirements, factors such as the production quantity and production rate. Guideline and considerations for sequence in process planning and tool, tooling design are given.

ME 6250 - Advanced Manufacturing Simulation
Three credit-hours. Prerequisites: None.
This course will provide the basic understanding of the mechanics of manufacturing processes, their modeling and their simulation. Both simple analytical and computer simulation methods will be covered. Greater emphasis will be given in understanding the fundamentals of the process modeling and less on computational methods. Details and governing theory behind the construction of software will not be provided. However, the intelligent use of software in the solution of industrial problems will be the goal.

ME 6260 - Introduction to Composite Materials
Three credit-hours. Prerequisites: None.
The objective of this course is to present advanced analysis techniques used to support the advanced design of composite structures. The course covers those topics overlooked during preliminary design courses. On the other hand, refined computations of deflections, stress, strength, and buckling loads can only be done using finite element analysis. FEA of
composite structures includes many aspects that set it apart from standard FEA, thus requiring some attention as part of this course.

**ME 6270 - Fundamentals of Tribology and Surface Layer Technology**

Three credit-hours. Prerequisites: None.

Friction and wear are surface phenomena. This course considers friction and wear and their important effects in manufacturing and service of machine components. The three topics of friction; wear, lubrication, and interacting of surfaces in relative motion are grouped together in the term TRIBOLOGY. This consideration involves; types of wear, lubrication, surface integrity, surface technology-surface treatments, protection from wear and friction, fundamentals of tribology, and surface layer technology and their applications in engineering design. Surface integrity is an important consideration in manufacturing and design because it influences properties such as fatigue strength, corrosion, wear, and service life.

**ME 6330 - Finite Element Analysis**

Three credit-hours. Prerequisites: None.

This course is intended to cover numerical methods of Finite Element to solve problems in the areas of mechanics of material, heat transfer, and dynamics with the development of mathematical descriptions and programming.

**ME 6340 - Stability and Vibrations Systems**

Three credit-hours. Prerequisites: None.

Course covers free and forced vibration of single degree and multiple degrees of freedom; discrete and continuous systems; Eigen value and boundary value problems; exact solutions for classical continuous systems; and numerical methods for the analysis of nonlinear systems.

**ME 6350 - Mechanical and Aerospace Control Systems**

Three credit-hours. Prerequisites: None.

This course provides tools for the analysis of dynamical systems, as well as the mechanisms and techniques to enable their operation, and to improve their behavior.

**ME 6360 - Optimization in Engineering Design**

Three credit-hours. Prerequisites: None.

This course is intended as a first course on engineering design optimization for graduate students in all areas of engineering. The basic idea of the course is to introduce the design of engineering systems as a systematic and well-organized activity. Emphasis is on establishing a firm understanding of modern optimization. Many assignments are open-ended and subject to individual interpretation and creativity.

**ME 6400 - Design Project**

Three credit-hours. Prerequisites: Graduate Program Coordinator approval. One four hours session per week.

The specialization area project is composed of a research study on a current topic related to the energy/fluids/thermal, design/materials/manufacturing, or aerospace areas. The specialization area subject needs to be approved by the graduate project student counselor. For the development project the analysis and design phases should be applied to the problem and validated using simulations, modeling techniques, experimental tests, and/or prototype construction. Conceptual and physical model design should be done with tools that have been used in the classroom during the student’s pursuit of his program of study.

**ME 6401 – Design Project Extension**

Zero credit-hours. Prerequisites: MMP 6400. One four hours session per week.

This course provides the student the opportunity to continue the development of his/her applied design project.

**PROGRAM FACULTY**


**Napolitano, Marcello R.** - Adjunct Professor, Ph.D., Oklahoma State University, 1989; M.S., University of Naples, Italy, 1985.

**Noriega Motta, Julio A.** - Associate Professor, Ph.D., West Virginia University, 2006; M.S. Mechanical Engineering, University of Puerto Rico, Mayagüez, 1993; B.S. Mechanical Engineering, University of San Carlos, Ciudad de Guatemala, Guatemala, 1983.

**Pelaez Carpio, Hugo M.** - Assistant Professor, Ph.D., University of Puerto Rico, Mayagüez, 2001; M.S. Chemical Engineering, University of Puerto Rico, Mayagüez, 1995; B.S. Chemical Engineering, University of San Marcos, Lima-Perú, 1987.


**Skrzypinski Romanow, Antoni E.** - Professor, D.Sc. Mechanical Engineering, 1980, Ph.D. Mechanical Engineering,

**Solano Rodríguez, Jacinto** - Associate Professor, **Ph.D.**, West Virginia University, Mechanical Engineering, 2008, **M.S.** Mechanical Engineering, University of Puerto Rico, Mayagüez, 1996; **B.S.** Mechanical Engineering, University of Puerto Rico, Mayagüez, 1991.


**MASTER OF LANDSCAPE ARCHITECTURE**

The Landscape Architecture program at Polytechnic University of Puerto Rico offers two graduate curricula leading to the Master of Landscape Architecture (MLA), both of which require thesis work.

**PROGRAM PHILOSOPHY AND OBJECTIVES**

At Polytechnic University of Puerto Rico’s *Landscape Architecture Master Degree Program*, humanistic, intellectual, creative, and technological endeavors encourage individuals from diverse backgrounds to explore and excel in a discipline that impacts the public realm, issues of quality of life, the environment, and the future physical development of the island.

The program strives to imbue students with social, ecological, and global responsibilities, empowering them with professional skills essential for inquiry, critical thinking, competent and creative ‘engagement’, and leadership through outstanding scholarship.

Strong students excel at communicating their intentions and realizations, also at conveying technological skills verbally and graphically, being passionate about the stewardship of the landscape entrusted to them, and to the people who live, work and play in it.

1. To highlight the critical role of landscape architecture within a local and regional context.
2. To develop an ethic towards the land.
3. To challenge “myopic” positions regarding landscape in Puerto Rico.
4. To promote landscape architectural research.
5. To contest technology as myth.
6. To build on pedagogical tools and experiences anchored in Puerto Rico.
7. To foster the identification and development of spatial conceptions characteristic of the Caribbean.
8. To encourage debate and critical analysis of the built legacy of landscape architecture locally.
9. To stimulate excellence in landscape architectural design in Puerto Rico.
10. To collaborate in kindling a spirit of stewardship towards the landscape.

**GRADUATE PROFILE & OUTCOMES**

The graduate program intends to develop in the newly formed Landscape Architects, competence in areas of environmental, social and an aesthetic nature. We strive to encourage students to gain: an understanding of how individuals and groups respond to and affect their built and un-built environment; an awareness of the principles and theories that deal with environmental context, and the landscape architect’s responsibility with respect to global environmental issues; and, an understanding of ways in which different forms are successful or unsuccessful in satisfying programmatic, technical, accessibility and contextual objectives in a design proposal.

Students completing the LA degree will be able to acquire knowledge and skills in the:

- Assessment of past and contemporary landscape architecture examples, in light of theoretical tenets in order to be able to inform future changes.
- Dexterity and understanding of the research process required to guide or support a design practice.
- Understanding of the heterogeneity of urban, suburban and other conditions associated to development, and how these circumstances influence human and environmental growth, development and survival.
- Ability to integrate all skills and knowledge gained in positions of leadership at local, regional and international levels.

**CAREER OPPORTUNITIES**

The program aims at graduate students, entrance to the industry’s workforce, pursuit further studies at the doctoral level or work in a research and educational environment.

The landscape architecture, architecture, planning and construction industries in Puerto Rico and the United States comprise the primary sources of employment for professionals holding a Master of Landscape Architecture. Federal, state and local governmental agencies, and conservation entities in the Island and abroad offer additional opportunities for these practitioners. Furthermore, graduates of the Master of Landscape Architecture degree can enter the workplace as educators at the undergraduate and graduate levels, and are poised to pursue a Doctoral degree.

**PROGRAM REQUIREMENTS**

In addition to the General Graduation requirements section stated in this catalog, candidates to the Master’s degree must:
• Complete the plan of study with at least the minimum number of credit hours specified by the MLA II or MLA III curricula.
• Present and defend an independently produced, single-authored, Design Thesis.

Admissions Requirements

The first professional degree (MLA III) option is a program designed for individuals who have completed a four-year Bachelor degree in any discipline, having obtained a minimum GPA of 2.85/4.00, from an accredited institution. The post-professional (MLA II) degree is a two-year post professional program intended for students who have completed a Bachelor of Science in Landscape Architecture (BSLA), a Bachelor of Landscape Architecture (BLA), a Bachelor in Architecture (BArch), or a Master’s in Architecture (MArch). Applicants to the MLA II degree must have completed a degree at an accredited institution with a minimum Grade Point Average (GPA) of 2.85/4.00.

Applicants must meet the following general admission requirements to either curricula, MLA II or MLA III: a) submit an essay (1,200 words maximum in length) describing a local landscape architectural issue, accompanied by an image representative of said issue; and, b) conduct an interview with the program director and/or admissions committee.

Graduation Requirements

In addition to the General Graduation requirements section stated in this catalog, candidates to the Master’s degree must:

• Complete the plan of study with at least the minimum number of credit hours specified by the MLA II or MLA III curricula.
• Present and defend an independently produced, single-authored, Design/Thesis.

Pre-Requisite Structure

Candidates to the first professional degree (MLA III) should have completed the subsequent pre-requisite courses at an undergraduate level with a minimum grade of C, from an accredited institution: Biology, and Botany, prior to entering the program. Applicants to the post-professional degree (MLA II), who have completed a Bachelor of Science in Landscape Architecture (BSLA), a Bachelor of Landscape Architecture (BLA), must complete AutoCad as a pre-requisite prior to entering the MLA program. For those candidates holding a Bachelor in Architecture (BArch), or a Master’s in Architecture (March), Biology, and Botany serve as pre-requisites to the program.

DEGREE OFFERED

The Landscape Architecture Program includes two curricula: a three-year first professional degree (MLA III), and a two-year post-professional degree (MLA II) leading towards one degree: a Master of Landscape Architecture (M.L.A.).

Thesis is required for all Master of Landscape Architecture candidates. For both program offerings, Thesis consists of 5 credit-hours of Theory and Research, and 6 credit-hours of Design/Thesis work.

The thesis research shall be directed by a member of the faculty, which also acts as the student’s graduate committee chairperson. The purpose of the thesis is to expose the student to a reasonable independent research experience that enhances his/her academic development. The student should prepare and carry out a structured and methodical study of pertinence to the profession. Publication of this work in journals, conference proceedings, and/or presentations will be strongly encouraged.

CURRICULAR STRUCTURE AND SEQUENCE

The Master of Landscape Architecture focuses on landscape architecture design and theory within a challenging studio-based curriculum. In addition to the development of a strong foundation of traditional knowledge and skills, the program is committed to scholarship in its various forms, as a means of learning and serving diverse communities and individuals.

The breakdown of credit-hours for the MLA III and MLA II offerings is as follows:

• For students enrolled in the first professional degree track, 58 credit-hours comprise core courses, 11 credit-hours Research and Thesis work, and 9 credit-hours elective courses, for a total of 78 credit-hours.

• For students enrolled in the post professional degree track, MLA II, 40 credit-hours comprise core courses, 11 credit-hours Research and Thesis work, and 9 credit-hours elective courses, for a total of 60 credit-hours.

The required design studio curriculum is organized as a series of units exploring three major themes:

Design process - Considers landscape design skills, including concept abstraction and design development, site analysis, communication and techniques to create ‘built landscapes’ of a scale and character appropriate to their uses. Integral to the graduate curriculum, the design studio addresses conceptual and applied design. The studio format entails lectures, demonstrations, site visits, one-on-one critiques and instruction, as well as group discussions.

The limited number of participants in the design studio allows for greater interaction between faculty and students. Multiple design philosophies are presented, in order to offer students all available options for their consideration.

Site and landscape - Planning integrates bio-regional contexts, historic land use and appropriation, also contemporary programs at a variety of scales, in order to seek a creative synthesis of environment, human use and also landscape manipulation.

Urban, rural and regional landscape design - Involves the systematic evaluation – employing principles of natural
science, rural and regional ecology and landscape design – of a variety of sites in order to creatively develop new approaches to landscape design interventions within the structure of the ‘city’, its suburbs, the countryside and entire regions.

CURRICULAR STRUCTURE

The curriculum reaches maturity with a final thesis. Courses, credit-hours and the curricular sequence are presented in the following table:

MLA III Curricular Sequence

Year 1

<table>
<thead>
<tr>
<th>MLA III Curricular Sequence</th>
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<tbody>
<tr>
<td><strong>Fall Trimester</strong></td>
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<tr>
<td>Course</td>
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<tr>
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<td>Design: Foundations and Drawing</td>
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<td>Course</td>
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<tr>
<td>LA 6120</td>
<td>Design: The Garden Studio</td>
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<td>LA 6320</td>
<td>Soils</td>
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<tr>
<td>LA 6710</td>
<td>Representation: Tools and Techniques</td>
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<td><strong>Spring Trimester</strong></td>
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<td>Course</td>
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<tr>
<td>LA 6130</td>
<td>Design: The Urban Studio</td>
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<td><strong>Year 2</strong></td>
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<td>Course</td>
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<tr>
<td>LA 6410</td>
<td>Environmental Resources</td>
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<tr>
<td>LA 6220</td>
<td>Historiography</td>
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<td>Course</td>
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<tr>
<td>LA 6140</td>
<td>Design: The Rural Studio</td>
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<td>LA 6420</td>
<td>Site Engineering</td>
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<td>Design: The Regional Studio</td>
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<td>Advanced Plant Material and Establishment</td>
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<td>LA 6430</td>
<td>Site Construction</td>
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Year 3

| **Fall Trimester**         |        |
| Course                    | Title                           | Credit-Hours |
| LA 6440                   | Ecology and Technology          | 3            |
| **Winter Trimester**      |        |
| Course                    | Title                           | Credit-Hours |
| LA 6230                   | Theory & Research of Landscape Architecture | 5     |
| LA 6510                   | Professional Practice and Ethics | 3            |
| **Spring Trimester**      |        |
| Course                    | Title                           | Credit-Hours |
| LA 6800                   | Design Thesis                   | 6            |
| LA 6801                   | Design Thesis Extension         | 0            |
| Note: Student must register a program elective for this trimester. |
| **Ejectives Courses**     |        |
| Six (6) credit-hours from the Landscape Architecture program offering. *3 credit-hours from any other Institutional Graduate program offering. Each student must verify pre-requisite requirements prior to registering for said Open Graduate Elective. |
| Course                    | Title                           | Credit-Hours |
| LA 6610                   | Modes of Representation         | 3            |
| LA 6611                   | Computer Representation for Landscape Architecture | 3     |
| LA 6650                   | Gardens: Types, Typologies & Design Approaches | 3     |
| LA 6240                   | Contemporary Issues in Landscape Architecture | 3     |

MLA II Curricular Sequence

Year 1

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Fall Trimester
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<td>Contemporary Landscape Architecture Issues</td>
<td>3</td>
</tr>
<tr>
<td>LA 6440</td>
<td>Ecology and Technology</td>
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<td>LA 6510</td>
<td>Professional Practice and Ethics</td>
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Spring Trimester

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<td>LA 6801</td>
<td>Design Thesis Extension</td>
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Elective Courses
(6 credit-hours from the Landscape Architecture program).

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COURSE DESCRIPTIONS

LA 6110 - Design: Foundations and Drawing
Five credit-hours. Pre-requisite: None. Two three-and-a-half hour lecture/studio periods per week. Design Laboratory Fee.

As the introductory course of the Landscape Architecture program, this design course serves as foundation work, confronting students with the discipline. A range of basic design principles and techniques for graphic representation as applied to landscape architectural design are explored focusing on the development of spatial thinking, and its communication.

LA 6120 - Design: The Garden Studio
Five credit-hours. Pre-requisites: LA 6110, LA 6310. Two three-and-a-half hour lecture/studio periods per week. Design Laboratory Fee.

The first of four landscape architecture design studios addresses issues of landscape design at a small scale, while applying concepts presented during the design foundations course. Design projects explore the domestic context by scrutinizing garden design from theoretical and formal vantage points, placing emphasis on the development of critical thinking, spatial literacy, and design process.

LA 6130 - Design: The Urban Studio
Five credit-hours. Pre-requisite: LA 620. Two three-and-a-half hour lecture/studio periods per week. Design Laboratory Fee.

The second studio in the design-course series, covers the urban context through projects of moderate to high complexity. Urban and suburban development is the focus of this studio where design will be examined as it relates to the philosophies and theories that have shaped neighborhoods, villages, towns, cities, suburbs, and regions of the world throughout history.

LA 6140 - Design: The Rural Studio
Five credit-hours. Pre-requisite: LA 6130. Two three-and-a-half hour lecture/studio periods per week. Design Laboratory Fee.

This advanced design course covers complex large scale analysis, planning and design within rural and peri-urban contexts. The expansion of urban areas to the rural fringe and the impact of humans on places of co-habitation with animal and vegetative life are addressed. An interdisciplinary approach to teaching and learning highlights relevant social, environmental, aesthetic, and economic issues.

LA 6150 - The Regional Studio
Five credit-hours. Pre-requisite: LA 6140. Two three-and-a-half hours lecture/studio periods per week. Design Laboratory Fee.

As the last in the sequence of design studios, this course confronts students with complex large scale regional issues. Contemporary topics and trends such as sustainable design, gray and green infrastructure, watershed and coastal zone management, among others, guide discussion.

LA 6210 - History of Landscape Architecture
Three credit-hours. Pre-requisite: None. One four-hour lecture period per week.

The first in a sequence of three history, theory and research courses, this class provides a historical survey of landscape architectural development from ancient times to the present. History is explored with the understanding that the relationship of humans to the land translates into forms which derive from expressions of function, social values, technological influences, economics and politics – landscape as the footprint of culture.

LA 6220 - Historiography
Three credit-hours. Pre-requisite: LA 6210 (non-applicable to students in the MLA II track). One four-hour lecture period per week.

In this course the “history of history” will be examined to provide students with an acute, critical sense of how to interpret processes and events (past and present). Using the
history of landscape architecture “as text” students will be able to apprehend history as a science and grow familiar with the discipline’s attributes and limitations.

LA 6230 - Theory and Research of Landscape Architecture

Five credit-hours. Pre-requisites: LA 6130, LA 6210, LA 6220. Two three-and-a-half lecture period per week.

Theories and research pertinent to the practice and study of landscape architecture, aesthetic and cultural principles, and values related to the ecological aspects are debated upon. The relationship between humans and the design environment are reviewed. A single authored written document is developed as theoretical backdrop for the design phase of the final thesis project.

LA 6240 – Contemporary Landscape Architecture Issues

Three credit-hours. Pre-requisites: None. One four-hour lecture period per week. (NOTE:This course comprises part of the core courses for students in the MLA II track, or a Program Elective for students registered in the MLA III track.)

A graduate seminar designed to explore vital current topics in the theory and practice of landscape architecture. Students will examine and critically discuss important theoretical texts and landscape architectural projects that represent the variety of issues and multitude of complexities confronted in contemporary practice.

LA 6310 - Plant Material and Establishment

Three credit-hours. Pre-requisites: None. Co-requisite: LA 6110. One four-hour lecture period per week.

This course is intended to familiarize the landscape architect with environmental constraints affecting successful plant establishment and growth. Successful planting design will ultimately depend upon knowledgeable analysis, appropriate placement, installation and maintenance specifications by the design professional.

LA 6320 - Soils

Three credit-hours. Pre-requisites: None. One four-hour lecture periods per week.

This course covers in depth soil’s ecological processes and management in terrestrial environments. The class discusses soil’s biological and physical properties, and its interaction with land uses and human interventions in different ecosystems. The emphasis of the course is on plant response to soil conditions, and their interface with building material.

LA 6330 - Advanced Plant Material and Establishment

Three credit-hours. Pre-requisite: LA 6310. One four-hour lecture period per week.

The last in the sequence of science related topics, emphasis is given to plant groups as part of larger systems. Plant population ecology and community analysis will serve as backdrop for field experience with the vegetation of Puerto Rico. Coastal, wetland, karstic systems – among others – comprise part of the organization of a larger ecological region which will be studied in depth throughout the trimester.

LA 6410 - Environmental Resources

Three credit-hours. Pre-requisite: None. One four-credit lecture period per week.

This course will cover in depth the methods employed by the landscape architecture profession to examine and address issues related to environmental resources. A prerequisite to environmental planning is an understanding of and respect for natural ecosystems. Class work on this topic will be considered at a regional scale, examining interrelations between various systems: vegetative, human and riparian.

LA 6420 - Site Engineering

Three credit-hour. Pre-requisite: None. One four-hour lecture period per week.

In this technology course, landscape design will be addressed through bi-dimensional landscape representation of the three-dimensional reality. Site analysis, its intervention or conservation, and structure location in a site, will complement the understanding of the site’s attributes: geographical, topographical, climatic, and ecological. Grading, road alignment, irrigation systems, and storm water management are among the topics explored.

LA 6430 - Site Construction

Three credit-hours. Pre-requisite: None. One four-hour lecture period per week.

Coursework exposes students to the processes and materials required in the assemblage of physical features. It introduces candidates to the properties, uses and qualities of materials inherent to landscape architecture applications and associated construction techniques. Materials and methods are additionally explored as a source of design ideas, form and expression in landscape architecture.

LA 6440 - Ecology and Technology

Three credit-hours. Pre-requisite: LA 6410. One four-hour lecture period per week.

Current concerns regarding environmental conservation are examined and questioned against their impact on available and developing technologies including green roof technology. Appropriateness to resources and culture are discussed in relationship to cost and time effectiveness. Laboratory type projects constitute an integral part of the course.
LA 6510 - Professional Practice and Ethics
Three credits-hours. Pre-requisites: None. One four-hour lecture periods per week.

The role of the practitioner is questioned from the ethical, financial and managerial standpoint. Personnel organization, supervision, office procedures, payments for service, marketing and career options are examined. Critical analysis of moral dilemmas inherent to professional practice, considering wide-ranging implications of ethics in a globalized society where disciplines overlap but also obscure responsibilities form part of class readings, discussions and debates.

LA 6610 – Modes of Representation
Three credit-hours. Pre-requisites: None. One four-hour lecture period per week.

This course delves into concepts, techniques and methods related to the representation of forms and space on a two-dimensional, flat surface, and three-dimensional work.

LA 6611 – Computer Representation for Landscape Architects
Three credit-hours. Pre-requisites: None. One four-hour lecture period per week.

The course aims to inform the design process of landscape architects through the application of digital media. Decision making using the information garnered through digital drawings is clearly articulated to the designer as well as others involved in the implementation process. The course explores the representation of complex geometrical forms, their spatial organization, materiality, interaction with the context, and tectonics.

LA 6650 – Gardens: Types, typologies and design approaches
Three credit-hours. Pre-requisites: LA 6210, LA 6220. One four-hour lecture period per week.

The course focuses on the study of gardens around the world, identifying different types, characteristic elements, typologies and design issues that have changed or remained constant through time. Coursework will unravel design intentions through the analysis of the relation of human activities, epochs, places, function and form.

LA 6710 – Representation: Tools & Techniques
Three credit-hours. Pre-requisites: None. One four-hour lecture period per week.

An introductory class to the skills required for landscape architectural representation, communication of design intent is sought through the use of various two-dimensional and three-dimensional drawing and modeling media. This course concentrates on the use of representation as complement to the design process.

LA 6800 – Design Thesis
Six credit-hours. Pre-requisites: LA 6150, LA 6230, LA 6330; LA 6430, LA 6510. One four-hour studio period per week.

The last in a series of five design studios this course is intended to provide students the forum to pursue an in depth design exploration based on the previously developed single-authored research project. Completion of this work will demonstrate students’ ability to define a contemporary problem and overarching strategies with which to address it. The course provides an opportunity for the student to integrate the theoretical frameworks and technological skills acquired during the degree in a comprehensive manner.

LA 6801 – Design Thesis Extension
Zero credit-hour. Pre-requisite: LA 6800. One four-hour studio period per week.

This course provides students the opportunity to continue and complete design thesis work.

PROGRAM FACULTY

Angueira Andraca, Olga – Master of Landscape Architecture, Harvard University, Graduate School of Design, 2004; BArch, University of Miami, 2001.


Areces Mallea, Alberto – Ph.D., Biology, CUNY, New York, 2003; Master of Philosophy, Biology, CUNY, New York, New York, 1996; Licensure in Biological Sciences and Botany, University of Havana, Cuba, 1969.

Colón Arizmendi, Edmundo – BS in Civil Engineering, University of Puerto Rico, Mayagüez 1974.

Colón Izquierdo, Edmundo - Master of Landscape Architecture, Harvard University, Graduate School of Design, Massachusetts, 2006; BArch, Polytechnic University of Puerto Rico, Hato Rey, Puerto Rico, 2004.


Irizarry Acevedo, Ramón - Master of Landscape Architecture, Louisiana State University, Baton Rouge, Louisiana, 2003; Bachelor of Science, Agriculture, University of Puerto Rico, Mayagüez, 1998.
Lorenzo Torres, José - Master of Urban Design, Harvard University, Graduate School of Design, Massachusetts, 2005; BArch, Polytechnic University of Puerto Rico, 2001.

Olivieri Cintrón, Luis – MS Agricultural Sciences, University of Puerto Rico, Mayagüez, 1985; BS Agricultural Sciences, University of Puerto Rico, Mayagüez, 1982.


Rodríguez Toledo, Marisabel - Master of Landscape Architecture, Cornell University, 1996; BA, Education, University of Puerto Rico, Río Piedras, Puerto Rico, 1982.


Terrasa Soler, José Juan - Master of Landscape Architecture, Harvard University, Graduate School of Design, Massachusetts, 2007; Master of Environmental Studies; Yale University, Connecticut, 1997; MS, Biology, University of Michigan, Michigan, 1992; BS, Biology, Mount Saint Mary’s College, Maryland, 1990.

Velázquez Figueroa, Juan Carlos – Master of Fine Arts, Complutense University, Madrid, Spain, 1988; Bachelor of Fine Arts, School of Fine Arts, San Juan, Puerto Rico, 1985.


**MBA PROGRAM REQUIREMENTS**

**Admission Requirements**

The MBA program is subject to the general admission requirements of the Graduate School. The admission requirements specific to the MBA program are as follows:

- International Enterprises
- General Management
- Computer Information Systems

**Program Philosophy and Objectives**

Organizations today demand multitalented knowledgeable professionals who can contribute and succeed in a team/project management environment. The MBA Program has been carefully crafted to train professionals through the study of management theory and practical problems solving. It focuses on developing versatility through critical thinking, intellectual flexibility, analytical and applied research skills, creativity, and high standards for professional integrity and ethics. Globalization issues of management are instilled into many of the Program courses. Teamwork is an essential component of organizational dynamics, and it is stressed through team projects that encourage face-to-face meetings as well as synchronous and asynchronous on-line meetings. To implement our Philosophy and vision, the MBA Program has established the following goals:

- To help students transform themselves into knowledgeable managers that understand business dynamics at all levels.
- Present the interrelatedness of the functional areas of business, and be able to integrate them in the performance of business decisions and in solving complex business issues.
- Dispense relevant curriculum that combines academic theory with practical problem-solving skills.
- Provide the fundamental concepts and principles that underlie the operation of business enterprises as well as offer a comprehensive set of more specialized courses to allow students to tailor their education to their specific needs and career goals.
- Develop students with the ability and insight to apply cross-functional approaches.

**Career Opportunities**

Because of their ability to analyze problems, address unstructured business challenges, and generate alternatives for a given situation, MBA graduates are among the most sought by companies throughout the world. There are many opportunities in the private sector as well as in the public or not-for-profit sectors, which offer extensive employment opportunities. Success will depend ultimately on self-awareness, research and preparation. The Master of Business Administration degree has been so popularized over the last decades that many employers now consider it a prerequisite for entry into several career fields, and a must for growth consideration. It is a requisite in many companies for certain positions, just as the bachelor's degree was a few decades ago.

**Degrees Offered**

The MBA degree offers the following three specializations:

- International Enterprises
- General Management
- Computer Information Systems
1. Possess a Bachelor’s degree in any discipline from an accredited college or university.
2. Have obtained a minimum of a 2.50/4.00 GPA in undergraduate course work.
3. Present results of the EXADEP (Examen de Admisión a Estudios de Posgrado) or GMAT (Graduate Management Admission Test) or GRE (Graduate Record Examination). Scores must be no older than 5 years prior to requesting admission.

Minimum Graduation Requirements

The MBA degree requires a minimum of 48 credit-hours of graduate course work with a minimum grade point average of 3.0 out of a 4.0 scale. No thesis or comprehensive examination is required.

General Prerequisites

The MBA curriculum is designed for students from diverse academic backgrounds. In a broad philosophical sense, the MBA program is not geared exclusively for undergraduate business students; rather, students with a wide range of undergraduate experiences such as engineering, science, liberal arts as well as business administration are encouraged to apply. The student will work with a wide breadth of business disciplines with the objective of maximizing the organization’s effectiveness and financial performance as required by its major stakeholders.

An introductory level course in Marketing from an accredited university is required. Applicants who did not take this undergraduate course can take it at PUPR. A grade of C (2.0) or above in the undergraduate prerequisite courses is necessary to complete the requirement. In addition to the above undergraduate prerequisite courses, MBA students pursuing the Computer Information Systems specialization must have both, a database management and a programming language course.

CURRICULAR STRUCTURE AND SEQUENCE

Core Courses in Management

There are 18 credit-hours in core management courses, which are common to all offered Management degrees. They provide a common body of knowledge in quantitative and qualitative areas, which are necessary prior to undertaking deeper exposure to other business issues. These courses are:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGM 5500</td>
<td>Managerial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>MGM 5700</td>
<td>Probabilities and Statistical Methods</td>
<td>3</td>
</tr>
<tr>
<td>MGM 6070</td>
<td>Managing Human Resources</td>
<td>3</td>
</tr>
<tr>
<td>MGM 6560</td>
<td>Management of Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>MGM 6620</td>
<td>Managerial Finance</td>
<td>3</td>
</tr>
<tr>
<td>MGM 6690</td>
<td>Decision Making Techniques</td>
<td>3</td>
</tr>
</tbody>
</table>

Core Courses in Business Administration

Today’s business managers need to understand how overall economic conditions, marketing strategies, and business operations interact to influence the organization’s desired goals and objectives. To assure an adequate preparation on these subjects, all MBA students are required to take the following Business Administration Core Courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBA 5600</td>
<td>Managerial Economics</td>
<td>3</td>
</tr>
<tr>
<td>MBA 5700</td>
<td>Managerial Marketing</td>
<td>3</td>
</tr>
<tr>
<td>MBA 6830</td>
<td>Operations Management</td>
<td>3</td>
</tr>
</tbody>
</table>

In addition, MBA students pursuing the General Management or International Enterprises specialization complete the academic curriculum with a course in Strategic Management. Using the Harvard Case Study method, students analyze real world business problems, and recommend solutions utilizing the entire body of knowledge acquired throughout the program. Specifically, this core course is:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBA 6900</td>
<td>Strategic Management</td>
<td>3</td>
</tr>
</tbody>
</table>

Instead of the above, MBA students pursuing the Computer Information Systems specialization complete the academic curriculum with a Strategic Management course specific to their field of emphasis. Computer Information Systems students should choose one of the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIS 6905</td>
<td>Strategic Management Project in Database or</td>
<td>3</td>
</tr>
<tr>
<td>CIS 6906</td>
<td>Strategic Management Project in E-Commerce</td>
<td>3</td>
</tr>
</tbody>
</table>

Areas of Specialization

International Enterprises

The specialization in Management of International Enterprises teaches students to view organizational management in a global context, and to realize that marketing strategies must be designed while considering the different cultural perspectives. Business operations and legal ramifications must also be carefully analyzed when operating in a multinational environment. Finally, currency exchange rates and other financial considerations must be carefully managed to properly achieve the parent organization’s objectives. International Enterprises students should complete the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIE 7010</td>
<td>International Business Operations</td>
<td>3</td>
</tr>
<tr>
<td>MIE 7020</td>
<td>International Business Strategies</td>
<td>3</td>
</tr>
<tr>
<td>MIE 7110</td>
<td>International Finances</td>
<td>3</td>
</tr>
<tr>
<td>MIE 7120</td>
<td>Business Law in Global Perspectives</td>
<td>3</td>
</tr>
</tbody>
</table>
General Management

The specialization in General Management allows the students to design their own program to match specific interests. The General Management student completes 12 credit-hours in general interdisciplinary courses. Students could choose courses in fields related to Engineering Management, International Enterprises or Environmental Management, among others. Instead of specializing in any one field, selecting courses from several areas will serve to broaden the student’s perspective.

MBA students pursuing the General Management specialization must also complete six credit-hours in elective courses.

In summary, the MBA General Management 48 credit-hours curriculum is composed of 18 credit-hours in Management core courses, 12 credit-hours in Business Administration core courses, 12 credit-hours in general interdisciplinary courses, and 6 credit-hours in electives.

Computer Information Systems

The Computer Information Systems (CIS) specialization under the MBA degree program provides the knowledge, skills and ability to develop creative solutions to substantive real-world problems. The CIS program has the perfect fitness of the crossover between Computer Science and Information Systems with a healthy emphasis in Electronic Commerce (E-Commerce) and Data Base Management. The CIS program is rated highly among recruiters in the area of Information Technology (IT). It has the ingredients needed for candidates to succeed in the real world (technical and business abilities). This program is especially well suited for professionals in business, government, industry, or education.

CIS as an academic field that encompasses two broad areas: (1) acquisition, deployment, and management of information technology resources and services (the information systems function) and (2) development and evolution of infrastructure and systems for use in organization processes (system development).

CIS students should complete the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIS 6605</td>
<td>Data Base Management Systems</td>
<td>3</td>
</tr>
<tr>
<td>CIS 6615</td>
<td>Software Engineering for Business</td>
<td>3</td>
</tr>
<tr>
<td>CIS 6705</td>
<td>Data Communications and Computer Networks</td>
<td>3</td>
</tr>
<tr>
<td>CIS 6715</td>
<td>Electronic Commerce and Web Information</td>
<td>3</td>
</tr>
<tr>
<td>CIS 6725</td>
<td>Applied Artificial Intelligence for Business</td>
<td>3</td>
</tr>
</tbody>
</table>

MBA students pursuing the CIS specialization must also complete three credit-hours in an elective course oriented either to database or electronic commerce.

In summary, the MBA CIS 48 credit-hours curriculum is composed of 18 credits in Management core courses, 9 credit-hours in Business Administration core courses, 18 credit-hours in CIS courses, and 3 credit-hours in an elective course.

MASTER IN ENGINEERING MANAGEMENT

The Master in Engineering Management (MEM) program prepares engineers for managing complex technological organizations in service and manufacturing industries. The program of study is multi and intra disciplinary, merging the latest development in management and technology theory and practices. The program design aims at developing the knowledge, abilities and judgment to become a successful manager and entrepreneur using best practices, techniques and paradigms of project management, supply chain operations and system thinking. Therefore, it provides a well balanced education among management and business thinking, engineering judgment, and technological operations. The Master’s Degree in Engineering Management was authorized by the Council of Higher Education of Puerto Rico in 1992.

PROGRAM PHILOSOPHY AND OBJECTIVES

The combination of management concepts and technical skills presented in the MEM Program allows engineers to acquire the managerial skills necessary to advance in today’s technological driven organizations, in either the service or manufacturing sector. Emphasizing the continuity of management and engineering related efforts from planning through development, operations and controlling, and stressing the application of management and system theory and techniques to increase the efficiency and effectiveness of the organization, is one key issue facing many organizations. Based on these realities the Program stresses the importance on using practices of project and program management, management information systems, organizational behavior, and system operations. It is amply confirmed that the MEM Program is well designed to develop future industry leaders by combining a core management curriculum with a master’s level education.

The goals of the Program are:

- To help students understand the management dimension, and advantages in technological driven organizations.
- Gain experience using management methods of a quantitative nature to design and efficiently operate today’s technologically involved business systems.
- Demonstrate an understanding of management and organizational theory and the principles of organized labor as they apply to the efficient and effective operation of the organization.
- Develop skills and competencies related to a broad range of management functions, allowing the student to work in fields of management, in organizations of varying size, requiring strategic planning, technical knowledge, development skills, and general operational knowledge of management.
CAREER OPPORTUNITIES
The complete experience is stimulating and offers outstanding career opportunities. The graduates from this program will be adequately qualified to perform effectively as managers of technological or scientific enterprises. The Program has been particularly structured to fit the needs of engineers in Puerto Rico and Latin America. Also, through its areas of emphasis, it provides an opportunity to hold leadership positions in managing business firms in Manufacturing, Public and Service Enterprises, Construction, and Environmental Management.

PROGRAM REQUIREMENTS

Admission Requirements
The MEM program is subject to the general admission requirements of the Graduate School. The admission requirements specific to the MEM program are as follows:

1. Possess an undergraduate degree in Engineering from an accredited college or university.
2. Have obtained a minimum undergraduate GPA of 2.50/4.00.

Graduation Requirements
The MEM degree requires a minimum of 39 credit-hours of graduate course work with a minimum grade point average of 3.00, and approval of a comprehensive examination. No thesis is required.

DEGREE OFFERED
The program offers graduate instruction leading to the Master of Engineering Management Degree. The emphasis areas are:

- Manufacturing Management
- Construction Management
- Environmental Management
- Public Work Management

CURRICULAR STRUCTURE AND SEQUENCE
The structure of the program and the sequence of the curriculum include a series of courses on basic, general, and areas of emphasis.

All students entering the Graduate School of Management will take 18 credit-hours as part of the General Core Courses in Management. These courses are:

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>MGM 5500</td>
<td>Managerial Accounting</td>
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<td>MGM 6620</td>
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</tr>
<tr>
<td>MGM 6690</td>
<td>Decision Making Techniques</td>
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</tbody>
</table>

This core will provide all graduate students with a common and basic core of knowledge needed to carry out further graduate work in their respective areas of specialization.

The present Master in Engineering Management is specially designed for engineers.

Core Courses in Engineering Management
Afterwards, the students in this area will take in 12 credit-hours additional courses in Engineering Management. These courses are:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEM 5600</td>
<td>Engineering Economic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>MEM 6110</td>
<td>Engineering Management I</td>
<td>3</td>
</tr>
<tr>
<td>MEM 6120</td>
<td>Engineering Management II</td>
<td>3</td>
</tr>
<tr>
<td>MEM 6970</td>
<td>Engineering Management Problems</td>
<td>3</td>
</tr>
</tbody>
</table>

Emphasis Area Courses
The students can choose among four emphasis areas: 1) Construction Management; 2) Environmental Management; 3) Manufacturing Management or; 4) Public Works Management.

The students must complete 9 credit-hours in their emphasis area chosen. The courses in these areas are the following:

Construction Management
Provides managerial knowledge essential in the utilization of different and available information systems in managing construction projects from their initial design, cost estimates, labor organization, contracts and construction management. Real situations are emphasized. The contractor is visualized as a manager who has to administer each phase of the project.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEM 6410</td>
<td>Construction Management</td>
<td>3</td>
</tr>
<tr>
<td>MEM 6170</td>
<td>Cost Estimate and Contracting</td>
<td>3</td>
</tr>
<tr>
<td>MEM 6820</td>
<td>Business and Construction Law</td>
<td>3</td>
</tr>
</tbody>
</table>

Manufacturing Management
Provides managerial knowledge required to administer the design, implementation, operation, maintenance and quality control in the complex technical processes of manufacturing. A substantial number of courses in this specialization are geared toward quality control and modern productivity techniques. The student must choose up to 9 credit-hours from the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEM 6420</td>
<td>Maintenance Management</td>
<td>3</td>
</tr>
<tr>
<td>MEM 6610</td>
<td>Productivity Management</td>
<td>3</td>
</tr>
<tr>
<td>MBA 6830</td>
<td>Operations Management</td>
<td>3</td>
</tr>
<tr>
<td>MGM 5800</td>
<td>Supply Chain Management and Logistics</td>
<td>3</td>
</tr>
</tbody>
</table>
Environmental Management

Provides managerial knowledge that will enable engineers to administer and take charge of, and control projects and processes to minimize environmental pollution. Federal and state laws that regulate the handling, disposal, treatment of contaminants and environmental protection will be stressed. Awareness will be created in the student about environmental problems in Puerto Rico and engineering methods and processes required to minimize and decrease environmental pollution. The student must choose up to 18 credit-hours from the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEM 6910</td>
<td>Air Quality</td>
<td>3</td>
</tr>
<tr>
<td>MEM 6915</td>
<td>Water Quality</td>
<td>3</td>
</tr>
<tr>
<td>MEM 6940</td>
<td>Introduction to Pollution Control of Earth Systems</td>
<td>3</td>
</tr>
<tr>
<td>EPM 6800</td>
<td>Solid Waste Management</td>
<td>3</td>
</tr>
<tr>
<td>EPM 6810</td>
<td>Environmental Regulations</td>
<td>3</td>
</tr>
<tr>
<td>EPM 6850</td>
<td>Management for Sustainable Future</td>
<td>3</td>
</tr>
</tbody>
</table>

Public Works Management

Provide knowledge that will enable engineers to become managers and executive personnel in governmental agencies/departments offices, or public corporations. The emphasis lies specifically on courses designed to train the student in the use of computerized information systems, public policy governmental regulation, cost estimates, contracting and modern productivity techniques. The application of this knowledge will result in a more efficient public administration by the graduate who enters public service.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEM 6170</td>
<td>Cost Estimate and Contracting</td>
<td>3</td>
</tr>
<tr>
<td>MEM 6610</td>
<td>Productivity Management</td>
<td>3</td>
</tr>
<tr>
<td>MEM 6710</td>
<td>Professional Ethics and Public Policy</td>
<td>3</td>
</tr>
</tbody>
</table>

MASTER IN ENVIRONMENTAL MANAGEMENT

Environmental Management is concerned with the development of new and better ways to design and operate facilities and systems that will provide for protection and improvement of environmental quality and the conservation of natural resources. This is a new and developing field, and the emphasis is on environmental resource management and sustainable development. Professionals in this field help industries and government agencies to find ways of accomplishing their objectives without causing pollution and without damaging the environment while protecting public health and safety.

The content of the Master in Environmental Management (MEvM) program covers the disciplines of water pollution treatment and pollution prevention, air pollution control, solid and hazardous waste management, industrial safety and environmental impact assessment. These topics are discussed in a carefully integrated approach with the vision of a world in which it will be possible for everyone to meet their basic needs and to achieve an equitable share of their aspirations while maintaining an environment that is healthy, physically attractive, and biologically productive.

PROGRAM PHILOSOPHY AND OBJECTIVES

To be successful, persons with primary interests in careers in environmental policy and analysis, stewardship, education, consulting, or management dealing with natural resource or environmental issues have to be able to integrate technological knowledge with social studies. The main goal of this program is to prepare students to address ecological and social systems within a complex underlying social and ecological context. This program also provides opportunities for professionals who have graduated in other fields to extend their knowledge in environmental management. This program is designed for professionals who require the skills and knowledge to integrate environmental planning, and monitoring into the broader decision-making process within their organizations.

The main objectives of the MEvM program are:

- To strengthen the proficiency to adapt a multi-disciplinary approach to environmental problem solving and decision making.
- To improve the expertise and skills required to perform strategic planning on environmental and sustainable development issues.
- To reinforce the ability to evaluate alternative means of environmental regulation at the local, and regional level.
- To study the nature and implications of environmental policy options.

GRADUATE PROFILES AND OUTCOMES

Graduates from the MEvM program will be able to:

- Understand complex local and federal environmental laws and compliance regulations.
- Apply statistical analysis, risk assessment, surveying and monitoring techniques to promote solutions to environmental problems.
- Evaluate and prepare environmental impact assessment documents.
- Apply sustainable development as a management tool and use broad based sustainable development laws in the analysis of countries, cities, etc.
- Be up to date in the fields of water pollution treatment and pollution prevention, air pollution control, solid and hazardous waste management, industrial safety and environmental impact assessment.
- Manage environmental emergencies.

CAREER OPPORTUNITIES

Environmental managers work in industrial and service corporations, in consulting firms, in local, state and federal
government, in Universities and with other professional corporations such as lawyers, financial institutions and public-interest groups. Almost all industries and government agencies have Departments or Sections of environmental protection.

The MEnvM degree is designed to prepare professionals for managerial positions and responsibilities in manufacturing, public utilities, and service industries whose operations could produce or generate pollutant or environmental contaminations. These professionals would help the enterprises to meet their environmental responsibilities and improve them.

The program is designed to help the student to develop the knowledge, abilities, and judgment to become a successful manager of the environmental areas and/or occupational safety department or office. The program will teach the student managerial knowledge, skills and abilities to know the environment and its susceptibility to human/industrial impacts, the laws and regulations related to the environment, the techniques to control air, water and solid pollution, the management of hazardous waste and environmental and occupational emergencies and the related licensing and compliance aspects. The latest technological and regulatory know-how and case studies will be emphasized.

**PROGRAM REQUIREMENTS**

**Admission Requirements**

The MEnvM program is subject to the general admission requirements of the Graduate School. The admission requirements specific to the MEnvM program are as follows:

1. Possess an undergraduate degree in Natural Sciences, engineering, architecture, landscaping architecture, business administration, management or related fields from an accredited college or university.
2. Have obtained a minimum undergraduate great point average (GPA) of 2.50/4.00.

Applicants not meeting these requirements may request reconsideration by a committee.

**Graduation Requirements**

The MEnvM degree requires a minimum of 36 credit-hours of graduate course work with a minimum GPA of 3.00/4.00. No thesis is required.

**DEGREE OFFERED**

The program offers graduate education leading to the Master of Environmental Management (MEnvM).

**PROGRAM STRUCTURE AND CURRICULAR SEQUENCE**

The students registered in this degree will take 18 credit-hours in core courses related to management, 12 additional credit-hours in Environmental Management and 6 credit-hours in electives.

### Management Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
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</thead>
<tbody>
<tr>
<td>MGM 5500</td>
<td>Managerial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>MGM 5700</td>
<td>Probabilities and Statistical Methods</td>
<td>3</td>
</tr>
<tr>
<td>MGM 6070</td>
<td>Managing Human Resources</td>
<td>3</td>
</tr>
<tr>
<td>MGM 6560</td>
<td>Management of Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>MGM 6620</td>
<td>Managerial Finances</td>
<td>3</td>
</tr>
<tr>
<td>MGM 6690</td>
<td>Decision Making Techniques</td>
<td>3</td>
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</table>

### Environmental Management Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
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</thead>
<tbody>
<tr>
<td>EPM 6810</td>
<td>Environmental Regulations</td>
<td>3</td>
</tr>
<tr>
<td>EPM 6820</td>
<td>Environmental Impact Assessment</td>
<td>3</td>
</tr>
<tr>
<td>EPM 6850</td>
<td>Management for Sustainable Future</td>
<td>3</td>
</tr>
<tr>
<td>EPM 6900</td>
<td>Environmental Management Applications</td>
<td>3</td>
</tr>
</tbody>
</table>

### Elective Courses

MEnvM students could select the 6 credit-hours in electives from any course labeled as EPM, MEM, MBA, MIE or CIS. Among these, the following are recommended.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPM 6800</td>
<td>Solid Waste Management</td>
<td>3</td>
</tr>
<tr>
<td>MEM 6910</td>
<td>Air Quality</td>
<td>3</td>
</tr>
<tr>
<td>MEM 6915</td>
<td>Water Quality</td>
<td>3</td>
</tr>
<tr>
<td>MEM 6940</td>
<td>Introduction to Pollution Control of Earth Systems</td>
<td>3</td>
</tr>
</tbody>
</table>

**COURSE DESCRIPTIONS**

**Business Administration, Engineering Management and Environmental Management**

**CIS-6605 - Data Base Management Systems**

Three credit-hours. Prerequisite: COMP-3010 or undergraduate equivalent. One four hours session per week.

This course presents methodologies and principles of database design. The focus is on database architectures, logical modeling, the relational model, and database design process and techniques. Topics covered include the entity relationship model, the relational model, relational operators, integrity constraints, the SQL language, and data normalization. Also included are topics in distributed databases, objects-oriented databases, and security issues.

**CIS-6615 - Software Engineering for Business**

Three credit-hours. Prerequisite: ISYS-3520 or undergraduate equivalent. One four hours session per week.

Most relevant concepts of software requirements generation and analysis, software design, structured design
methodologies, data flow design, and programming of an engineering system and testing.

CIS-6705 - Data Communications And Computer Networks

Three credit-hours. Prerequisite: None. One four hours session per week.

Recent advances and new applications in the expanding field of computer networks and distributed systems are examined. The technical fundamentals, architecture, and design of computer networks and distributed systems are described. Strategies, tools, and techniques for network planning, implementation, management, maintenance, and security are delineated. Topics include ISDN, and ATM, the OSI model, transmission media, network operating systems, topologies, configuration protocols, and performance characteristics. Trends in standardization, internetworking, downsizing, and the development of local-networks (LANs), wide-area networks (WANs), metropolitan-area networks (MANs), and enterprise-wide networks are explored.

CIS-6715 - Electronic Commerce and Web Information Systems

Three credit-hours. Prerequisite: None. One four hours session per week.

Enterprises thrive on receiving information. The Internet has emerged as the dominant server for national academic organizations and network host. This course will study the structure, organization, and use of the Internet. Internet technologies ant their potential applications are examined including electronic commerce, database connectivity, and security. An emphasis will be placed on evaluating, organizing, and developing efficient models of electronic transactions.

CIS 6725 - Applied Artificial Intelligence for Business

Three credit-hours. Prerequisite: CIS-6605. One four hours session per week.

Principles and techniques relating to automate support for decision-making and organizational problem solving are studied. Topics include decision theory, modeling and simulation, decision support system architecture and group decision support systems. Knowledge-based expert systems and intelligent agents are studied. Applications of rule chaining, heuristic search, constraint propagation, constrained search, inheritance, and other problem-solving paradigms are presented. Other topics are: the application of identification trees, neural nets, genetic algorithms, and other learning paradigms.

CIS 6833 - Human-Computer Interaction

Three credit-hours. Prerequisite: None. One four hours session per week.

Issues on effective human-computer interaction are presented. Basic elements, procedures, tools, and environments contributing to the development of successful user interface are explored. User interface design principles, guidelines, and methodologies are reviewed. Other topics include multidisciplinary dynamics of human-computer interaction as a field of study, current developments in HCT research and usability engineering.

CIS 6893 - Data Warehousing

Three credit-hours. Prerequisite: None. One four hours session per week.

This course includes the various factors involved in developing data warehouses and data marts; planning, design, implementation, and evaluation; review of vendor data warehouse products; cases involving contemporary implementation in business, government, and industry; techniques for maximizing effectiveness through OLAP and data mining.

CIS 6905 - Strategic Management Project in Data Base

Three credit-hours. Prerequisite: CIS-6605 and CIS-6615. One four hours session per week.

The main objective of this course is to pursue a research study on a current database system topic or to define a business related problem that has a solution through the development of a data base system. Areas of current interest include object oriented database systems, extended relational DBMS, federated or homogeneous database systems, high performance parallel database systems, query optimization and advance logic database modeling. For the development project the analysis and design phases should be applied to the problem with related DFDs to describe the system before and after the proposed solution. Conceptual model will be designed with the use of an E-R diagram. The physical design will be done in a DBMS such as Oracle or SQL server.

CIS 6906 - Strategic Management Project in E-Commerce

Three credit-hours. Prerequisite: CIS-6715. One four hours session per week.

The main objective of this course is to pursue a research study on a current e-commerce topic or to define a business related problem that has a solution through the development of an e-commerce application. Areas of current interest include leading edge practices such as electronic publishing, e-shopping, e-distribution, knowledge creation and dissemination, search engines, agent and filters, etc., and understanding issues or problems that surround e-commerce such as security and privacy, new practices, EDI on the Web, evolving options for local access, etc. For the development project the analysis and design phases should be applied to the problem. Conceptual model will be designed with the use of any CASE tool. The physical design will be done using programming tools available to the student that have been used in the classroom (Front Page, Pearl, Java, HTML, etc).
This course presents the state of the art in information technology. Several topics will be offered. A student may take more than one.

EPM 6820 - Environmental Impact Assessment
Three credit-hours. Prerequisite: EPM 6810. One four hours session per week.

This course covers the technology available conduct environmental assessments and needed to establish new operations or projects. The student will acquire the knowledge and develop the expertise about Federal and Local environmental permits and the studies and demonstrations needed to obtain them.

EPM 6900 - Environmental Management Applications
Three credit-hours. Prerequisite: EPM 6820, EPM 6850. One four hours session per week.

The course is an overall application of all the knowledge acquired during the master program in environmental management. The student will generate a project concerned with the development of new and better ways to design and operate facilities and systems that will provide for protection and improvement of environmental quality and the conservation of natural resources. The obtained results will focus on environmental resource management and sustainable development based on Puerto Rico current needs.

MBA 5600 - Managerial Economics
Three credit-hours. Prerequisite: None. One four hours session per week.

Most relevant points regarding supply and demand, analysis of consumer behavior, analysis of production cost, main structures of the market place, linear programming, the economic systems and development of economic concepts and macro economic.

MBA 5700 - Managerial Marketing
Three credit-hours. Prerequisite: MARK-1010 or undergraduate equivalent. One four hours session per week.

The study of the strategic process of creating time and place utilities. It deals with how to identify customer's needs, change those needs to wants, and sustain the desire of the particular product (service or good). How this process can be applied to profit and non-profit organizations.

MBA 5800 - Leadership
Three credit-hours. Prerequisite: None. One four hours session per week.

This course is organized around the concept that leadership involves influencing others in a non coercive manner where capital reigns, competitive advantage occurs when an organization utilizes the knowledge and experience of all its members. “Command and control” leadership styles are limited to specific emergency circumstances. Instead leaders should direct their efforts toward shared goals, collaborative methods and leverage the leadership potential of all members of the entire organization. The course integrates current research on leadership and real world business events. The design offers an experiential, practical and theoretical approach to understanding the qualities, characteristics, styles
and behaviors of successful leaders. The course also provides participants to focus on their own leadership abilities and to explore strategies for building teamwork, motivation, creativity, effective communication, conflict resolution, strategic leadership, and innovative leadership practices that enhance innovation and organizational performance.

MBA 6830 - Operations Management
Three credit-hours. Prerequisite: None. One four hours session per week.

This is a graduate course in manufacturing techniques. In this course the student will acquired deep knowledge of the tools, techniques and types of manufacturing processes and management of the production planning, schedule and operation. Topics such as Production and Inventory Control, just-in-time, total quality control, statistical process control, waste analysis, work measurement and world class Manufacturing will be discussed. Also cover manufacturing systems such as factory layout, machine center, robotics, sensing, manufacturing cells and automated factories will be included.

MBA 6900 - Strategic Management
Three credit-hours. Prerequisite: Department Head Approval Required. One four hours session per week.

The corporate world is becoming a very different place. Mergers and acquisitions have transformed the landscape. International boundaries are fading in importance as businesses take on a more global perspective, and the technology of the “Information Age” is narrowing the time it takes to communicate and make decisions. Business Policy or Strategic Management takes a panoramic view of this changing corporate terrain.

This course unifies the various departments, majors, and sub discipline found in a business school. The material of this course will be explained in the context of cases which have been class tested and revised based on he feedback from those classes. The firms range in size and maturity from large, established multinational to small, entrepreneurial ventures, and cover a broad range of issues and address questions raised.

The students are expected to have a general knowledge of the basic business functions; finance, marketing, operations management, accounting, quantitative methods and human resources.

MBA 5600 - Engineering Economic Analysis
Three credit-hours. Prerequisite: None. One four hours session per week.

This is a graduate course in engineering analysis emphasizing the planning and control of engineering economics including manufacturing costs. In this course project cost evaluation including interest rates and continuous compounding, present-worth and capitalized cost, is discussed. Methodology to determine rate-of-return for various alternatives, benefit/cost ratio evaluation, replacement analysis and others are described. The preparation of cash-flow diagrams and introduction to cost estimation are studied. Determination of break-even values, sensitivity analysis and decision trees and introduction to value engineering techniques is included.

MEM 6110- Engineering Management I
Three credit-hours. Prerequisite: None. One four hours session per week.

In depth discussion of the elements of modern management and business practices is conducted. This course is designed to provide student without specialized business training to understand the principles used by professionally trained managers to guide the typical industrial and business enterprise

MEM 6120 - Engineering Management II
Three credit-hours. Prerequisite: MEM-6110. One four hours session per week.

This course enables students to deepen in the understanding of fundamental concepts and principles of general management emphasizing their application in technological and scientific organizations in industry and government. For the purpose of the study of management, one needs to perceive all major functions in some coherent framework. Such a framework is provided by breaking down the totality of the management process into its four major components: planning, organizing, leading and controlling. In this course, the student will explore the concepts that provide the foundations for these four managerial functions.

MEM 6170 - Cost Estimation And Contracting
Three credit-hours. Prerequisite: None. One four hours session per week.

This course takes the engineer to cover in depth the fundamental principles that govern public enterprises such as government departments, public instrumentalities, state and municipal government, etc. Probability and decision theory in cost- effectiveness studies, profit and risk analysis are also covered.

MEM 6410 - Construction Management
Three credit-hours. Prerequisite: None. One four hours session per week.

The management of construction is at one time an art and a science. Both have to deal with planning, scheduling, controlling, and following different activities of great diversity such as cost estimating, scheduling, contracting, insuring, accounting, labor relations, etc. At times the manager must use highly quantitative methods while at other times the intuitive or empirical approach is all what is available. Therefore construction and maintenance managers must be masters of a wide range of qualitative and quantitative
subjects. Consequently he must possess a very high level of competency in a large number of areas.

This course is designed to help students gain a perspective regarding the construction industry and some cross-sectional understanding of the things to be mastered if they wish to be successful as construction managers.

MEM 6420 - Maintenance Management

Three credit-hours. Prerequisite: None. One four hours session per week.

This course is designed to help students gain a perspective regarding the maintenance of buildings and industries and some cross-sectional understanding of managers. New administrative and management tools and methodology specific to maintenance activities are covered. Students will learn how to manage the resources: money, machines, materials and personnel that are basic to realize effective maintenance.

MEM 6610 - Productivity Management

Three credit-hours. Prerequisite: None. One four hours session per week.

This course moves the engineer through the different approaches to Total Quality Management. Total Quality Management is a system to effectively achieve institutional goals with the active participation of all the employees, clients and suppliers. Through the course traditional management for productivity techniques, TQM, Crosby, Juran and Deming philosophies are discussed. The concepts of quality cycles, changes in institutional culture, zero defects, corrective action, productivity measurements, error cause removal, Pareto Principle, etc, are discussed.

MEM 6710 - Professional Ethics and Public Policy

Three credit-hours. Prerequisite: None. One four hours session per week.

This course permits the engineer to imbue in the law and codes professional ethics that govern public enterprises such as government departments, public instrumentalities, state and municipal governments and professional ethics.

MEM 6820 - Business And Construction Law

Three credit-hours. Prerequisite: None. One four hours session per week.

Concepts of business and construction law in general and applied to Puerto Rico are covered. This course is designed to provide students with the professional skills of understanding the clauses and applications of commercial law emphasizing construction litigation.

MEM 6910 - Air Quality

Three credit-hours. Prerequisite: None. One four hours session per week.

This course will be covering several topics regarding the air quality and pollution control. Some of the topics that will be studied in this course are as follows: Indoor Air, The Atmosphere, Ozone Depleting Substances (Montreal Protocol), Aldrin Inhalation Toxicity Weight (TRI), Banned or Severely Restricted Pesticides (USEPA), Explanation of Criteria, Air Pollutant: Rank States, Particulate Size 10 microns Pollution Locator: Criteria Air Pollutants, Lead, Particulate Size 2.5 Microns, Respiratory Toxicity Health Effects, Greenhouse Gases, (Intergovernment Panel of Climate Change), EPA’S National Ambient Air Quality Standards, The Standard Review and Re-evaluation Process, Introduction to Air-Pollution Control, Air Pollution Effect, and Environmental Preservation.

MEM 6915 - Water Quality

Three credit-hours. Prerequisite: None. One four hours session per week.

This course exposes the student to different methods of water purification for commercial and industrial use, wastewater treatment and disposal, and topics associated to water quality.

MEM 6940 - Introduction to Pollution Protection of the Earth System

Three credit-hours. Prerequisite: None. One four hours session per week.

The course presents the concept of the earth as an integrated system, where human activity, based on the use of the natural resources for material development, generates impacts on the environment, interfering with ecology, and creating scenarios that present challenges related to human health and a balanced environmental.

MEM 6970 - Engineering Management Problems

Three credit-hours. Prerequisite: MEM-6120. One four hours session per week.

This is a project course that provides the opportunity to apply concepts and methods previously studied to the solution of problems in engineering administration. Students work individually or in small groups, on problems proposed by the student and approved by the instructor.

MGM 5500 - Managerial Accounting

Three credit-hours. Prerequisite: None. One four hours session per week.

This is a graduate course where the accounting principles and techniques for making decisions are taught. The role of decision criteria based on General Accepted Accounting Principles and others are explained in detail. Therefore, this course provides the essential information that the manager or
business man needs to have control of the firm in order to obtain his objectives effectively and efficiently.

**MGM 5700 - Probabilities and Statistical Methods**

*Three credit-hours. Prerequisite: None. One four hours session per week.*

This is a graduate course in relevant business statistics emphasizing applications specific to engineering disciplines. In this course various probability and statistical methods to sample, measure of dispersion and skewness, probability distributions are studied. Also testing hypothesis and making decisions, analysis of variance, chi-square analysis and linear regression and correlation are examined. Advanced topics such as nonlinear regression, multivariable analysis, time series analysis and exploratory data analysis are introduced. Case studies of quality control and engineering decisions are assigned and discussed.

**MGM 5800 - Supply Chain Management and Logistics**

*Three credit-hours. Prerequisite: None. One four hours session per week.*

This course introduces students to the concept of value-driven supply chains, a system approach to managing the entire flow of information, materials, and services from raw materials suppliers through factories and warehouses to the end-customer. Emphasis will be placed on understanding the impact of demand and supply flows across the supply chain and its fundamental principles, using insights from both operations management and logistics. The course demonstrates the design and management of effective supply chains based on current research and organizations’ practices, illustrated with case studies. An important message across the course is the need of using a system-thinking view, and the importance of using integrative tools to analyze and evaluate alternative courses of action.

**MGM 6070 - Managing Human Resources**

*Three credit-hours. Prerequisite: None. One four hours session per week.*

Psychology concepts and corresponding methodology to manage human resources in a scientific and technical enterprises. Techniques for hiring, benefits, incentives, promotion, retention, development, replacement of personnel, and creativity, among others are discussed emphasizing the human dimension. Techniques to solve complaints, insubordination, and violations of regulations are introduced.

**MGM 6560 - Management of Information Systems**

*Three credit-hours. Prerequisite: None. One four hours session per week.*

Information systems that provide support for management in areas such as finance, manufacturing, cost estimation, and marketing. Introduction to analysis of data flow diagrams, databases, and data communication are introduced.

**MGM 6620 - Managerial Finances**

*Three credit-hours. Prerequisite: MGM-5500. One four hours session per week.*

Financial concepts encountered in engineering. Situations are introduced based on the fact that they are an integral part of planning, organizing, directing and controlling activities.

The financial cycle budgeting, accounting, controlling and auditing is discussed.

**MGM 6690 - Decision Making Techniques**

*Three credit-hours. Prerequisite: MGM-5700. One four hours session per week.*

This is a graduate course where the scientific management methods for making decisions and solving administrative problems are taught. The role of decision criteria and subjective factors, Bayesian analysis, advanced decision making methods, linear programming and analysis of alternatives are discussed. Also the value of reliable and representative information, utilization of statistical information, strategic analysis and projections, forecasting, PERT, CPM and other management techniques to solve problems are introduced.

**MIE 7010 - International Business Operations**

*Three credit-hours. Prerequisite: None. One four hours session per week.*

This course examines the basics of international business operations. The course begins discussing the global environment and reasons for an organization to become global, including the two main ways about how international business takes place. Then, the characteristics of multinational companies will be explained, followed by global competitiveness and affairs. Among the material that will be covered are Michael Porter's diamond theory of international competitiveness, the latest work in the theory of multinational enterprises, global markets, and new research on organizational learning within corporations.

**MIE 7020 - International Business Strategies**

*Three credit-hours. Prerequisite: None. One four hours session per week.*

This course examines international business strategies using an integrative approach, specially set around the questions of "how functional strategies are integrated?" It begins discussing functional international strategies and explaining actual actions by global companies in different global settings. Then, an integrative approach for global strategy will be taken. Among the materials that will be covered are foreign exchange rate management (currency swapping), "absolute" and "comparative" advantages in developing multinational strategies, and strategies for doing business in the "triad" markets.
MIE 7110 - International Finances

Three credit-hours. Prerequisite: None. One four hours session per week.

Financial concepts encountered in engineering situations are presented based on the fact that they are an integral part of planning, organizing, directing and controlling, and auditing is discussed. The general goal is to provide the necessary knowledge to the student about different financial concepts that a manager of scientific and technological activities uses in order to prepare budgets, secure funding, analyze financial alternatives and control expenses.

MIE 7120 - Business Law In Global Perspective

Three credit-hours. Prerequisite: None. One four hours session per week.

Concepts of Business Law in general and on a global dimension as applied to cross-cultural and cross-border legal issues. This course is designed to provide students with the fundamental and professional skill of understanding the concepts and applications of business and commercial law in a global environment.

FACULTY


Dávila Aponte, Edwin – Assistant Professor - Ph.D., Entrepreneurship Development, Interamerican University of Puerto Rico, Río Piedras Campus, 2006; MBA Accounting, Interamerican University of Puerto Rico, Río Piedras Campus, 1999; BBA, Accounting, Caribbean University, Bayamón, Puerto Rico, 1986.

Elias Rivera, Johnny- Professor - J.D., University of Puerto Rico, 1974; Accepted to practice Law at the Commonwealth of Puerto Rico and the United State District of Puerto Rico, U.S. Court of Appeals for the First Circuits, Registered Attorney at Law, 1974; Licensed in Real Estate, 1990; LLM, Economy, Catholic University of Puerto Rico, 1983; Ph.D., Civil Engineering, University of California, 1964; BSCE, Civil Engineering, 1959.


González Miranda, Carlos J. – Professor, Ph.D., Industrial Engineering, North Carolina State University, 1995; M.M.S.E., North Carolina State University, 1990; B.S., Industrial Engineering, University of Puerto Rico, Mayagüez Campus, 1987.


Mueses Pérez, Auristela – Professor, Ph.D. in Civil Engineering, University of Florida; M.S.C.E., University of Puerto Rico, Mayagüez Campus, 1992; B.S.C.E., Technological Institute of Santo Domingo, Dominican Republic, 1987; P.E.

Pabón González, Miriam - Professor, Ph.D., Industrial Engineering, University of Massachusetts, Amherst 2001; M.E.M., Polytechnic University of Puerto Rico, 1995; B.S., Industrial Engineering, University of Puerto Rico, 1990.

Pagán, Leticia – Associate Professor, Ph.D., Information Systems and Globalization, Lesley University, Cambridge, Massachusetts 2004; M.B.A., Inter-American University, San Juan, Puerto Rico, 1976; B.S., Business Administration, University of Puerto Rico, 1979.

Pons Fontana, Carlos A. – Assistant Professor, Ph.D., General Psychology, Carlos Albizu University, 2004; M.M.S.E., Polytechnic University of Puerto Rico, 1994; B.S.E.E., Polytechnic University of Puerto Rico, 1986; M.S. Psychology, Carlos Albizu University, 1975; B.A. Psychology, University of Puerto Rico, 1972.


Villalta Calderón, Christian A. – Assistant Professor, Ph.D. in Civil Engineering, University of Puerto Rico, Mayagüez Campus, 2009; M.S.C.E., University of Puerto Rico, Mayagüez Campus, 2004; B.S.C.E. University of Costa Rica, 2001.
GRADUATE CERTIFICATE
Certification in Information Assurance & Security

Information assurance and security has actually become important areas of interest in the Computer Science field due to the IT boom of the twenty-first century. The increase in the number of Internet applications and users, combined with the computerization of business processes, has made IAS professions of great demand. Studies have revealed that computer-based criminal activities are costing businesses and government organizations billions of dollars every year. Due to the shortage of information system security professionals there exists a need for comprehensive programs and certificates to educate more individuals in the field of Information Assurance and Security (IAS). As the US government in general, and the Department of Defense (DoD) in particular, become more dependent on computer networks, systems and software, we become more vulnerable to hostile intelligence gathering as well as computer network attacks. The need for graduate computer scientists specialized in IAS is pervasive in industry, scientific research, academic institutions, business, commerce, appliance manufacturing, and the government.

PROGRAM OBJECTIVES & GOALS
The main objective of this certificate is to prepare students in one of the most demanding fields in IT at this moment: Information Assurance and Security (IAS).

The goals of the PUPR GCIAS program are to:

1. Develop a national/internationally-recognized quality Graduate Certificate Program in Information Assurance and Security (GCIAS).
2. Develop joint research projects in IA between university and industry partnerships.
3. Prepare IT professionals in computer and information security areas, which are of great demand, worldwide.
4. Attract more faculty members with specializations in these areas of great concern.
5. Increase the quality of IAS education, which will lead to strengthening our curriculum and augmenting the quantity of research projects in the areas of information assurance and security.

GRADUATE PROFILE
Students taking the GCIAS courses will learn how to use many of the tools and technologies used in these security related occupations including: Network analyzers or LAN analyzers, Protocol analyzers, authentication server software, identity management and password management software, remote authentication dial-in user service software, Internet directory services software, Network monitoring software, hardware and software auditing software, system testing software, network security or Virtual Private Network (VPN) management software, Intrusion Detection System IDS software; Intrusion Prevention System IPS software; network and system vulnerability assessment software; snort intrusion detection technology, transaction security and virus protection software; stack smashing protection SSP software; and virus scanning software.

The graduate of the GCIAS should possess the following know-how:

1. Enough knowledge of computer hardware and software, (including applications and programming) to recognize the physical and logical threats that can affect information assets.
2. As consultants or service providers, graduates should have knowledge of principles, standards, ethical and legal aspects, processes, auditing and controls for providing secure operations and IT security services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.
3. Law and Government knowledge of laws, legal codes, court procedures, precedents, government regulations, executive orders, agency rules, and the democratic political process.
4. IT security management. The knowledge of business and management principles involved in strategic planning, resource allocation, human resources modeling, leadership techniques, production methods, and coordination of people and resources, in order to plan and evaluate secure business operations throughout the organization.
5. Change Management. The knowledge to determine how, when and why a system requires change to improve its effectiveness, and provide its' secure operations.
   a. The judgment and decision-making required to consider the relative costs and benefits of the potential actions that are implicated in the changes; to be able choose the most appropriate one.
   b. Ability to manage the resistance of employees, managers, and even administrators to changes in both logical and physical controls.
6. Risk Management. The ability to identify and control the risks facing an organization.
   a. Risk identification to document the security posture of an organizations IT and the risks it faces.
   b. Risk control to apply the controls to reduce the risks to data and information systems.
7. Knowledge of IT Auditing. The review of a system; the observation, evaluation, and action taken to ensure secure operations; effective controls for physical and logical security in IT systems. Determine if misuse or malfeasance has occurred.
8. Engineering and technology knowledge of the practical application of engineering science and technology to
administer and evaluate security systems. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services for secure IT operations and for the evaluation of these systems and products.

9. Telecommunications knowledge of transmission, broadcasting, switching, control, and operation of telecommunications systems.

10. Education and training knowledge of principles and methods for curriculum and training design, teaching and instruction for individuals and groups, and the measurement of training effects.

11. Public safety and security knowledge of relevant equipment, policies, procedures, and strategies to promote effective local, state, or national security operations for the protection of people, data, property, and institutions.

12. Understand the importance of contingency planning, and be able to develop and execute business continuity, disaster recovery, and strategic security plans, and their applications, without affecting business performance.

Graduates of the GCIAS should also have the following personal and professional skills:

1. Understand the implications of information assurance and security for both current and future problem solving and decision-making in the development of IT systems and secure IT operations.

2. Have technical knowledge of cryptography and cryptanalysis skills to secure the transmission of critical information and to decrypt coded information. Be able to test these systems periodically to ensure the efficient use of these techniques.

3. Identify controls, processes or procedures that can endanger information assets and affect system security, and the actions needed to improve these, relative to the goals of the system.

4. Critical thinking using logic and reasoning to identify the strengths and weaknesses of IT systems and develop alternative solutions, conclusions or approaches to problems related to the security of information assets.

5. Time management skills to manage one's own time and the time of others.

6. Systems Analysis skills to determine how a system should work and how changes in conditions, operations, and the environment will affect outcomes.

7. Troubleshooting skills to determine the causes of security breaches and operational errors in IT systems, and decide who is responsible and what to do about it.

8. Effective writing and communication skills to disseminate security policies and practices, including awareness on new company policies. Ability to read and understand information and ideas presented in writing, arranging things or actions in a certain order or pattern.

9. Ability toward inductive reasoning in order to combine pieces of information to sense when something is wrong or is likely to go wrong with a system. This does not necessarily involve solving the problem in its initial stage, but recognizing there is a problem and taking actions to correct it.

PROGRAM REQUIREMENTS

Admission

Prerequisites necessary to apply for enrollment in the GCIAS:

- Calculus I or equivalent
- A high level programming language
- Bachelor Degree in related areas such as Computer Science, Information Systems, Computer Engineering, Mathematics, Computational Mathematics, among others.
- Minimum GPA of 2.80

The student applies for admission to the GCIAS (as a non-seeking degree) to work towards the Certificate. The student that intends to enter the graduate program in Computer Science with a specialization in ITMIA (after completing the GCIAS) has to apply for admission to this program with the established requirements.

- Two courses approved in the GCIAS can be validated towards the MS CS (thesis option) ITMIA specialization. Up to a maximum of 6 credits can be transferred to the Graduate program that has a total of 15 core credits, 9 area of interest credits, and 6 credits of thesis. This is a total of 33 credits.

- Five courses approved in the GCIAS can be validated towards the MCS (non-thesis option) ITMIA specialization. Up to a maximum of 15 credits can be transferred to the Graduate program. 15 core credits, 9 area of interest credits, 12 electives credits. This is a total of 39 credits.

- Graduate students that are currently enrolled in any of the other ECECS Department Master Degrees or MS CS specializations and have approved the prerequisites can obtain the GCIAS by completing the required 18 credits. Prerequisites must be approved. Some courses may apply.

- Students in a Master in Business Administration program with a Track in Computer Information Systems or Information Systems can enroll in the GCIAS program if they have completed the prerequisites of admission for the certification.

Graduation Requirements for the GCIAS

Students must complete the following requirements for the Graduate Certificate in Information Assurance and Security (GCIAS):

- Complete a total of 18 credits in six courses specified for the GCIAS.
- Have a minimum GPA of 3.00 when completing the 18 credits.
CAREER OPPORTUNITIES

Work activities include using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information; keeping up-to-date technically and applying new knowledge to your job; observing, receiving, and otherwise obtaining information from all relevant sources; analyzing information and evaluating results to choose the best solution and solve problems; developing, designing, or creating new applications, ideas, relationships, systems, or products; providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in person; compiling, coding, categorizing, calculating, tabulating, auditing, or verifying information or data; identifying the underlying principles, reasons, or facts of information by breaking down information or data into separate parts; developing specific goals and plans to prioritize, organize, and accomplish your work; entering, transcribing, recording, storing, or maintaining information in written or electronic/magnetic form.

CURRICULAR STRUCTURE AND SEQUENCE

Core Courses

The student programs must include 18 credit-hours of core courses specified below:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit-Hours</th>
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<tbody>
<tr>
<td>CECS 6005</td>
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<td>IT Auditing and Secure Operations</td>
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<td>EE 6130</td>
<td>Data Communication Networks</td>
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XVI. COMBINED BACHELOR’S MASTER’S DEGREE PROGRAM

Polytechnic University of Puerto Rico, has designed the combined bachelor's-master's degree program. The objective is to provide the talented PUPR undergraduate students the opportunity to complete the combined bachelor's-master's degree in a reduced time period, after completing 105 credit hours of the undergraduate program (excluding the remedial or preparatory courses).

Admission

Conditions for admission to the combined program will be the following:

1. Be an honor student (GPA of 3.25 to 4.00). When the student has a GPA of 2.75 to 3.24 his application may be evaluated and conditionally admitted to the combined program.

2. Complies with the minimum undergraduate number of credit-hours for the combined Bachelor's – Master’s Program.
3. Recommended by the corresponding Department Head and Graduate Program Coordinator.
4. Be authorized to enroll in graduate courses by the Dean of Graduate School.

Procedure

1. Once the student confirms that he/she qualifies to the combined program, he/she must complete and submit the application to the Graduate School Student Affairs Office. Also the student must include with the application an official academic evaluation analysis.
2. The application is evaluated to verify that the student indeed qualifies to the program.
3. The Department Chairperson and Graduate Program Coordinator submit their recommendations to the Dean of Graduate School.
4. The Dean verifies the recommendations and approves or not the student's application. The final decision is notified to the student in a formal letter. Also a copy of the letter is sent to the student file at the Registrar’s Office and Financial Aid Office.

General Comments

1. Whenever any of the courses is passed with a grade of “C” or lower, the student is disqualified to continue in the combined program.
2. In the event that the application is denied, the student may appeal the decision, to a committee composed by the Undergraduate Department Head, Graduate Program Coordinator, Dean of Graduate School and the Vice President of Academic Affairs. The decision of the committee is final.

XVII. DECLARATIONS AND CERTIFICATIONS

NON-DISCRIMINATION CLAUSE

Polytechnic University of Puerto Rico does not discriminate against any individuals for reasons of gender, political or religious affiliation, economic or social status, ethnic origin, or for any other reason considered unlawful. This policy applies both in the recruitment of personnel and in the acceptance of students.

STUDENTS’ RIGHTS TO REVIEW THEIR RECORDS

Annual Notice to Students

Each year, Polytechnic University of Puerto Rico informs the students about the Family Educational Rights and Privacy Act enacted in 1974. This Law, with which the University will
totally comply, was designed to protect the privacy of students' academic records, to establish the students' rights to inspect and review their educational records, and to provide guides in cases where incorrect or misleading information must be corrected through formal or informal hearings. Students will also have the right to file complaints concerning alleged failure by the University in complying with the Law.

Our institutional policy explains in detail the procedure which Polytechnic University of Puerto Rico will follow to comply with the provisions of the Law. This policy can be found in the Library, in the Reference section. There the Institutional Regulations to Protect the Student' Right to Privacy may be found.

Questions related to this Law will be referred to the Dean of Student Affairs Office. The student who files a complaint and who considers that the decision granted has been unfair, or does not conform with the dispositions within the Law, may request in writing the mediation of the University President. As an additional recourse, the student who considers that his/her rights have been violated can file a complaint with the Family Educational Rights and Privacy Act Office, Department of Education, Office 4074, Switzer Building, Washington, D.C. 20201. This complaint must be related to alleged deficiencies incurred by Polytechnic University of Puerto Rico in complying with FERPA.

PUBLIC NOTICE DESIGNATING THE DIRECTORY INFORMATION

Through these means, Polytechnic University of Puerto Rico designates the following categories of information about students as Public information or Directory Information. This information may be divulged by Polytechnic University of Puerto Rico for any particular purpose, and at its discretion.

Category I Name, address, telephone number, attendance date, courses.

Category II Institutions previously attended, specialized fields, awards, honors (including Dean’s List), and degrees obtained, including dates.

Category III Present and past participation in sports and officially recognized activities, physical appearance (height, weight) of athletes, place and date of birth.

Students who are registered at the present time have the right to request that no information about them be divulged under FERPA. To forbid the University to divulge information, a written request must be sent to the Registrar's Office of Polytechnic University of Puerto Rico at the following address:

Polytechnic University of Puerto Rico
P.O. Box 192017
San Juan, Puerto Rico 00919 2017

The form used to request that no Directory Information be divulged is found in the Registrar's Office. Polytechnic University of Puerto Rico understands that if a student does not make this request to prevent information from being divulged, the information can be made public.

RESERVATION OF THE RIGHT TO MODIFY THE CATALOG

The provisions of the various sections of this Catalog are to be considered directive in character and not as an irrevocable contract between the student and the University. The University reserves the right to make any changes that are deemed necessary or desirable.

APPROVAL OF THE CATALOG

I certify that this Catalog has been approved for distribution for the academic years 2010-11 to 2011-12.

Ernesto Vázquez Barquet
President
August 2010
Los arquitectos paisajistas se desempeñan en el ámbito privado y en el gubernamental. La industria ofrece a estos profesionales la oportunidad de emplearse en oficinas de diseño con arquitectos paisajistas, arquitectos, ingenieros, planificadores o en aquellas que operan de modo multidisciplinario. En el foro público, se emplean arquitectos/as paisajistas en dependencias de parques y recreo, de planificación y en departamentos de carreteras. Algunos profesionales practican como peritos en áreas específicas como: la preservación histórica, el diseño de campos de golf, el desarrollo de sectores urbanizados, y otros. Tendencias actuales en la industria recobran el carácter inter y multidisciplinario de la profesión diseñando proyectos que se valen del peritaje de disciplinas varias.

Bajo el lema de que lo natural complementa lo construido y lo construido complementa lo natural, el programa aspira a repensar el paisaje del siglo XXI, ampliando el debate sobre temas medioambientales locales y más allá de nuestras costas. La carrera así asume un rol renovado de líderazgo ante la trascendencia que aumente el legado del paisaje.

**¿Cuáles son las oportunidades de empleo?**

Alberto Areces Mallea, PhD, Biología, Universidad de la Ciudad de Nueva York
Olga Angueira Andraca, MLA, Universidad de Harvard
Edmundo Colón Arizmendi, BEng, Universidad de Puerto Rico, Mayagüez
Edmundo Colón Izquierdo, MLA, Universidad de Harvard
Ramón Irizarry Acevedo, MLA, Universidad de Louisiana
José Lorenzo Torres, MArch, Diseño Urbano, Universidad de Harvard
Luis Olivieri Cintrón, MS, Universidad de Puerto Rico, Mayagüez
Fernando Payán Aparicio, MS, Horticultura, Universidad de Puerto Rico, Mayagüez
Jorge Rigau Pérez, M Historia, Universidad de Cornell
Jaime Suárez Toro, M Artes, Diseño, Universidad de Columbia
José Juan Terrasa-Soler, MLA, Universidad de Harvard
Juan Carlos Velázquez, MFA, Escultura, Universidad Complutense de Madrid

**Programa Graduado de Maestría en Arquitectura Paisajista**

Universidad Politécnica de Puerto Rico
Calle Alhambra #53, P.O. Box 192017
Hato Rey, PR, San Juan PR, 00919-2017
Tel: 787-622-8000 ext. 690 ó 663
Fax: 787-294-1914
E-mail: mrodriguez@pupr.edu

**Programa de Maestría en Arquitectura Paisajista**

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Tel: 787-622-8000 ext. 690 ó 663
Fax: 787-294-1914
E-mail: mrodriguez@pupr.edu
El Programa Graduado de Maestría en Arquitectura Paisajista de la Universidad Politécnica de Puerto Rico abrió sus puertas en agosto del 2006. Ubicado en medio de la Milla de Oro en Hato Rey, el Programa y la Institución ofrecen a los estudiantes el escenario urbano como telón de fondo para poner a prueba los temas examinados en el salón de clases. La fusión entre ciudad y paisaje facilita el estudio de la flor endémica de la región, su aplicación en el entorno urbano, la arquitectura y la gente que lo rodea. La exploración de lo que constituirá el espacio público del siglo XXI, su sostenibilidad y el apoyo al quehacer humano forman parte de estas exploraciones.

Personas de extractos distintos se han unido al quehacer del Programa Graduado para estudiar una segunda carrera que les conduce a un grado profesional. De igual modo, individuos que ya han completado un grado profesional en arquitectura paisajista o en arquitectura, buscan en esta maestría un grado post profesional.

¿Qué es la carrera?

A lo largo de la carrera, se analiza, planifica y diseña el ámbito natural y edificado, creando espacios que sirven al disfrute de todos. Intervenciones residenciales – sea su casa o Versalles – así como proyectos comerciales e institucionales, urbanos, rurales y regionales, comprenden las áreas en que se desempeña la disciplina. Temas actuales – ecología, sustentabilidad, conservación, ecoturismo, diseño y salud pública - forman parte de las problemáticas que aborda el trabajo de la profesión.

La carrera de la arquitectura paisajista - más que sembrar plantas y "adornar" con ellas - se ocupa de diseñar el entorno, ese espacio exterior que nos rodea. El foco de interés de la profesión es el paisaje como escenario de la actividad humana. A medida que la población mundial crece, el entorno requiere ser organizado con mayor rigor, a fin de proteger la salud, la seguridad y el bienestar público.

¿Qué hace un arquitecto paisajista?

Proyectos puntuales como plazas – desde Las Delicias en Ponce, hasta la Plaza del Zócalo, en México - áreas de juego de niños “playgrounds”, parques pasivos – el parque Luis Muñoz Rivera o Central Park, en Nueva York - parques recreativos, campos de pelota, canchas de baloncesto, campos de golf, pistas para correr, jardines botánicos, arboretos, zoológicos, componen algunos ejemplos de proyectos en los que trabaja un(a) arquitecto(a) paisajista.

A escala más agrandada, estos profesionales atienden intervenciones en ciudades, municipios, estados y regiones que miran problemas con distintos niveles de complejidad. Proyectos de espacios públicos como "streetscaping", de diseño y alineación de carreteras, paseos lineales y ciclo-vías, malecones, frentes marinos, restauraciones de ríos y quebradas responden a las necesidades de hoy día, valiéndose de técnicas y tecnologías contemporáneas. Se requiere, que los arquitectos paisajistas contemporáneos estén preparados para atender problemas de distintos tamaños y complejidad, en colaboración con otros profesionales.

¿Qué nos hace particulares?

Cuatro renglones potencian el carácter particular de este programa:

- La Institución ubica en el entorno urbano, propiciando la reflexión sobre problemas que aquejan a la ciudad, pero repercuten a nivel de la isla.
- La Escuela mira el paisaje puertorriqueño estrictamente desde la óptica de esta profesión y a la escala urbana y regional.
- Los tópicos de estudio examinan: la aplicación de la flora endémica a la isla en el paisaje y tecnologías que se adaptan a Puerto Rico.
- Personas de extractos distintos se han unido al quehacer del Programa Graduado para estudiar una segunda carrera que les conduce a un grado profesional. De igual modo, individuos que ya han completado un grado profesional en arquitectura paisajista o en arquitectura, buscan en esta maestría un grado post profesional.

¿Cómo y dónde se preparan estos profesionales?

El Programa Graduado de Maestría en Arquitectura Paisajista de la Universidad Politécnica de Puerto Rico ofrece el primer y único grado de Maestría en Arquitectura Paisajista en Puerto Rico y el Caribe. La oferta se plantea como una nueva oportunidad ocupacional, para aquellos interesados en temas de vigencia contemporánea. El Programa confiere un sólo grado, pero dos maneras de alcanzarlo. Un primer grado profesional va dirigido a personas que provienen de áreas distintas a la disciplina de arquitectura paisajista. El grado Post-profesional enfoca en aquellos individuos con un primer grado profesional en arquitectura paisajista o arquitectura.

El currículo del programa incluye cursos en diseño y representación del paisaje, nuevas tecnologías y sistemas de construcción, la historia de la profesión, inquietudes relativas a la planificación local, regional y global, y a los procesos ecológicos, botánicos y geológicos sobre los que se sustenta el diseño del paisaje. Profesionales locales e internacionales y alianzas con entidades hermanas al tema, nutren el currículo con experiencias prácticas y visiones alternas. El programa graduado tiene una duración entre 3 y 2 años, dependiendo del trasfondo académico de cada estudiante.

¿Cuáles son los requisitos y costos de admisión al programa?

El currículo requiere dos cursos de pre-requisito, Botánica y Biología sub-graduados o AutoCAD; la solicitud de admisión a la Escuela Graduada, un bachillerato en una institución acreditada, cuyo promedio general sea de 2.85/4.00, tres cartas de recomendación, una trascipción de créditos, un ensayo que conste de 1200 palabras en donde se articule un problema de arquitectura paisajista en Puerto Rico, acompañado de una (1) imagen que ilustre dicho problema y una entrevista. Los costos por crédito ascienden a $225.00, más los costos por tarifas de laboratorios y talleres de diseño. Las clases se reúnen de lunes a jueves durante el día y la noche y los viernes o sábados.
Job ID: 3813
Title: Assistant Professor of Landscape Architecture
City: San Juan
State: Puerto Rico
Zip Code: 00919
Country:
Category: Landscape Architects
Years of Experience: 4-6 Years
Compensation: N/A
Description: The Graduate School of Landscape Architecture at the Polytechnic University of Puerto Rico is accepting nominations and applications for a full-time position at the rank of Assistant Professor, effective Fall 2008, with a renewable 12-month term. Successful candidates will teach courses and design studios at the professional graduate level as well as perform administrative functions.

Skills Required: Candidates must have successfully completed a Master's degree in Landscape Architecture, and demonstrate professional work and teaching experience. Registration as a Landscape Architect is encouraged, as well as pursuing local licensure. Persons in this position must demonstrate intellectual rigor and knowledge of current and emerging theoretical and practice endeavors within the discipline of landscape architecture. A notable record of professional and/or academic accomplishment in landscape architecture is encouraged. Applicants must submit a current curriculum vitae, a description of pedagogical strategies in the classroom and internship pursuits, three letters of recommendation, and evidence of self-study examples of student and personal work (pdf format).

Education Requirements: Master of Landscape Architecture
Travel Required: No
Date Posted: May 14, 2008

Job Contact Information
Polytechnic University of Puerto Rico, School of Landscape Architecture

Marisabel Rodriguez
Phone: 787-622-8000, ext. 690
Fax: 787-294-1914
Email: mrodriguez@pupr.edu

PO Box 19201
San Juan, PR 00917
<table>
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<th>PROGRAM</th>
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Course name: Historiography
Coding: LA 6220
Credit hours: 3

Course Description:

This course examines the forms through which human beings have imagined, studied and represented their past and how these representations weigh in the understanding of architecture. Employing history texts and the historiography of landscape architecture and architecture as objects of scrutiny, class discussions survey the ways of thinking and doing historical analysis, from pre-Socratic times to the "post-modern" present. Also, the course explains the methods of the discipline in its contemporary expressions, the limits of the scientific pursuit of “truth”, and the boundaries of any related strategy.

Class discussions will address the “history of history”, the course purports to develop in students an acute, critical sense of how to interpret past and present processes (and events) pertaining to the discipline of Landscape Architecture, as these have been explained by authors with diverse points of view throughout the centuries. Analysis of texts as narratives anchored in their own time will render students more capable of apprehending history’s attributes, limitations, and possibilities, understanding the often shifting discourses underlying them.

Expanded Coursework Scope:

Examination of historiographical efforts representative of a broad chronological, geographic and theoretical spectrum assists students in better understanding the paradigms of History as products of paradoxical and ambivalent social agreements regarding the present and the future. Students develop the ability to discern between History as an exercise of power relations and a discipline capable of relative scientific autonomy; between History as an instrument for legitimizing the “status quo” of social conventions or a discipline capable of elucidating, with enough certainties, the past.

To examine how human beings have imagined, studied and represented landscape ideals throughout the ages, texts will become objects of classroom scrutiny, discussion, and dissection. Ways of thinking, arguing and analyzing will
be scrutinized from pre-Socratic times to the “post Post-Modern” present, addressing the limits of any scientific pursuit of “truth”, overlapping fields, and the evanescence of boundaries in most related undertakings.

This course has been conceived as an immersion in the discipline’s culture of debate. Through extensive reading and complementary research, students grow aware of the difficulties inherent to the making (and acceptance) of history. To underline the vitality of Theory in Practice, issues pertaining to Puerto Rico and the Caribbean will be re-framed in terms of the texts addressed in class.

Class Format:

Classes will be conducted as discussion seminars. Assigned readings constitute the backbone of the trimester’s work. Students are expected to play a critical role in the illustration, argumentation and debate of topics presented. Class participation will be essential. Before initiating discussions at any class, each student will be required to submit in writing two (2) questions related to each reading assigned.

Selected guests invited to join the seminar will expand on contemporary trends and issues related to current historical discourses in the Caribbean region.

Students will coordinate guest participation, as well as the illustration of examples addressed in texts in a power point presentation. In parallel, they will be researching other readings to be incorporated to this course in the future. As Final Project, students will produce a 15-20 page “position paper” making a case for two (2) additional readings to be added to this course’s syllabus. These readings will require prior approval of the professor. Arguments for their inclusion must be on a comparative basis with texts and issues discussed in class.

Course Contents:

Adhering to a somewhat flexible, but consistent, chronological scaffolding, themes addressed are grouped as follows:

I. Background: what is behind our understanding of the world.

   Context as Perspective
   Direct Experiences, Home as Hearth; Regional Reach
   Definitions
   History and Landscape; Changing Meanings
   Perception and Interpretation
   Eye, Mind, and Senses; Science and Subjectivity
II. Foreground: Key Moments in the History of Landscape Architecture

Royal and Imperial Views
Royal Gardeners; The Picturesque Unmasked
Modernity’s Claims
Abstraction, Austerity, and Authorship
Walls Crack
Modern Discourse’s Day of Atonement

III. Leak Windows: Peeking into Current Ideas
Story-telling
New (?) Arguments, New Stances
Today
Infrastructure, Brownfields and Landscape Urbanism
In Our Backyard
Contemporary Historiography in the Caribbean

Objectives:

Knowledge:
Upon completion of this course, students with a passing grade will have demonstrated the following:

• Awareness of the ties as well as the relevancy of history and its methods, to the discipline of landscape architecture
• Fluency with the methods of history and its manifestations through time

Skills to be developed:

• Command of critical thinking needed to confront historical information.
• Familiarity with the evolution of the discipline, its past and present stances, including the local historiography from the Nineteenth century to present historiographical practices.
• Comprehension of the diverse approaches, methods and questions of both, social and architectural history of our present.
- **Dexterity** in the application of research skills acquired in previous courses.

- **Ability** to use necessary tools in the critical examination of history texts.

**Activities:**

- Analysis of Texts and Readings
- Selection, Organization, and Presentation of Images
- Class Discussion and Debate
- Identification, Selection and Comparison of Texts for Syllabus
- Correction of Multiple Drafts
- Writing a 15 – 20 page Position Paper

**Values:**

- **Inspiration** coming to terms with a profound definition of History, beyond the one that reduces it to “the spring of events that once happened”

- **Command** of the needed skills to confront historical information with appropriate judgment

**Evaluation Methods:**

1. Test #1 20%
2. Test #2 20%
3. Final Paper 35%
4. Question submission 15%
5. Attendance 10%

TOTAL 100%
Universidad Politécnica de Puerto Rico  
Escuela de Arquitectura Paisajista

Hoja de Evaluación de Curso y Autoevaluación

Curso: .............................................................  Trimestre: ..............................

Este documento pretende recoger información que permita describir la pertinencia y aplicabilidad de los cursos que ofrece la Escuela de Arquitectura Paisajista. La rúbrica para contestar el formulario es la siguiente: Otorgará una puntuación de 4, si le parece que el criterio se cumple siempre; 3, si le parece que el criterio se cumple casi siempre; 2, si le parece que el criterio se cumple casi nunca; y 0, si le parece que el criterio nunca se cumple. En el caso que piense que el criterio no es aplicable, favor de indicarlo bajo la columna con dicho criterio.

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<td>5. Las actividades y experiencias de aprendizaje resultan efectivas, es decir, que corresponden a los temas y permiten el logro de los objetivos del curso.</td>
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Autoevaluación

1. ¿Conoce usted los objetivos del curso? ____________________________________________

2. ¿Qué por ciento de lecturas del curso usted completó? ________________________________

3. ¿Ha asistido regularmente al curso? _______________________________________________

4. ¿La secuencia de los ejercicios del curso le pareció apropiada? ¿Por qué?
   ____________________________________________________________________________
   ____________________________________________________________________________
   ____________________________________________________________________________

5. ¿Qué sugerencias concretas tiene sobre la secuencia temática o del tipo de ejercicios?
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6. ¿Cuáles son las destrezas que usted desarrolló? _____________________________________
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7. ¿Cuántas veces usó el taller de diseño para completar sus trabajos de diseño?
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### School of Landscape Architecture
Polytechnic University of Puerto Rico
MLA Program Course Matrix

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1. Landscape architectural history and theory
2. Natural and cultural systems
3. Design theories, methodologies and applications
4. Landscape planning and management at various scales and applications
5. Site design and construction such as grading, drainage and circulation
6. Communication in written, verbal and visual applications
7. Plants and ecosystems at various scales and situations
8. Construction materials, methods, technologies and applications
9. Professional practice methods, values, and ethics
10. Computing applications and other advanced technology
11. Research applications and scholarly work
### ESTUDIANTES EGRESADOS DE ARQUITECTURA PAISAJISTA

#### MLA III - 2006

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