

# ***Graduate Catalogue***

***2006-2007***



**UNIVERSITY OF PUERTO RICO**

**MAYAGÜEZ CAMPUS**

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At the University of Puerto Rico at Mayagüez, every effort is made to provide accurate and up-to-date information. However, the University reserves the right to change without notice statements in the Graduate Catalogue concerning rules, policies, fees, curricula, courses, or other matters when necessary. Changes may apply to current and former students.

In addition, UPRM is currently reviewing and restructuring many of its academic programs in an effort to enhance their quality and efficiency. In that process, some of the programs and courses mentioned in this catalogue may be modified, consolidated with other programs or courses, or eliminated. If you have questions about a particular program or course, you should contact the appropriate university college or department.

The UPRM Graduate Catalogue is available at: <http://www.uprm.edu/catalog>

A publication of the Office of the Dean of Academic Affairs.

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Welcome to the University of Puerto Rico, Mayaguez Campus (UPRM)... an institution that will celebrate its 100<sup>th</sup> Anniversary in 2011. September 23, 1911 marks the beginning of our institution. Starting in 2006 we will initiate a period of five years of preparation to celebrate the values, traditions and successes of this vital institution in Puerto Rico. We want you to be part of this celebration... One hundred years dedicated to teaching, research and service for the benefit of students from Puerto Rico and from many other countries in the world.

Puerto Rico and the countries of this hemisphere are very proud of the University of Puerto Rico and of the Colegio... This support is expressed in many ways, especially by sending their students to do graduate work in our institution and it represents responsibilities and challenges to our academic community. Every graduate academic program is committed to offer the students the level of excellence that is expected from the Colegio. You will be very proud of being a student in this excellent academic institution and you will have many opportunities to leave your mark and to contribute to its successes.

During your years of graduate studies in the Colegio you will learn a lot about this institution. In this academic year, in preparation to our Century Celebration, we will focus on the founders of the University of Puerto Rico at Mayagüez. Through conferences, seminars, publications and concerts we will be able to understand more clearly the history behind the Colegio and the process to establish and to develop it. Each year will be a unique opportunity to understand how this community is being formed and what is in its future; a future that is also your future... and the future of your families.

Our buildings honor many persons that have contributed with excellence to its history. You will know who were Stefani, Celis, Monzón, Figueroa Chapell, Luchetti and Piñero. In your next visit to the Gymnasium observe that there is a picture of Ángel F. Espada, an important athlete who died many decades ago and whose contributions to our legendary sports heritage are honored with this building.

As we initiate academic year 2006-2007, we welcome the master and doctoral students to the Colegio. During your studies you will be part of the preparations for the 2011 Century Celebration and will leave your personal legacy to your Alma Mater. Enjoy the learning process at UPRM...one that strengthens the concept of “the university as a priceless way of life”.

Jorge Iván Vélez Arocho  
Chancellor

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## *HISTORICAL SKETCH*

The University of Puerto Rico was created by an act of the Legislative Assembly on March 12, 1903 emerging as an outgrowth of the Normal School, which had been established three years earlier to train teachers for the Puerto Rican school system. In 1908, the benefits of the Morill-Nelson declared applicable to the island, fostered the rapid growth of the University. Eloquent evidence of that growth was the establishment of the College of Liberal Arts at Río Piedras in 1910 and the College of Agriculture at Mayagüez in 1911.

It was in the College of Agriculture where the Mayagüez Campus as we know it today had its origin. Credit for the establishment of the College is given to the joint effort of D. W. May (Director of the Federal Experiment Station), José de Diego, and Carmelo Alemar. A year later, the school received the name that it bore for 50 years: the College of Agriculture and Mechanic Arts. The strengthening and diversification of the academic programs at Mayagüez were recognized years later when, in 1942, as a result of university reform, the campus was organized with a considerable degree of autonomy into the Colleges of Agriculture, Engineering, and Science under the direction of a vice-chancellor. The expansion continued through the 1950s when many programs flourished in the University. The College of Arts and Sciences and the Nuclear Center were established in Mayagüez. The Colleges of Humanities, Natural Sciences, Social Sciences, and Business Administration emerged in Río Piedras. The Schools of Medicine, Odontology, and Tropical Medicine were established in San Juan.

In 1966, the Legislative Assembly reorganized the University of Puerto Rico as a system of autonomous campuses, each under the direction of a chancellor. The College of Agriculture and Mechanic Arts became the University of Puerto Rico, Mayagüez Campus.

Today, the Mayagüez Campus of the University of Puerto Rico continues its development in the best tradition of a Land Grant institution. It is a co-educational, bilingual, and non-sectarian school comprising the Colleges of Agricultural Sciences, Arts and Sciences, Business Administration, Engineering, and the Division of Continuing Education and Professional Studies.

The College of Agricultural Sciences includes the Agricultural Experiment Station and the Agricultural Extension Service. At present, the campus population is composed of 12,108 students, 1,924 regular staff members and 1,037 members of the educational staff.

## *Accreditations and Affiliations*

The Mayagüez Campus of the University of Puerto Rico is fully accredited by the **Council of Higher Education of Puerto Rico**. It holds membership in the **Middle States Commission on Higher Education** since 1946. Our academic programs are accredited by professional entities such as **The American Chemical Society, The National League of Nursing, and Accreditation Board for Engineering and Technology (ABET)**.

The Mayagüez Campus of the University of Puerto Rico is a member of **Oak Ridge Associated Universities (ORAU)** since 1966. ORAU is a private, non-profit consortium of 65 colleges and universities that acts as management and operating contractor for the US Department of Energy (DOE).

### ***Mission, Goals, and Objectives***

Within the philosophical framework established by the University of Puerto Rico Act, the Mayagüez campus directs its efforts towards the development of educated, cultured citizens, capable of critical thinking, and professionally qualified in the fields of agricultural, social and natural sciences, engineering, humanities and business administration. They should be able to contribute in an efficient manner to the cultural, social, and economic development of the Puerto Rican and international communities. This process is aimed at endowing our alumni with a strong technical and professional background and instills a strong commitment to Puerto Rico and our hemisphere. Our alumni should have the necessary skills and knowledge to participate effectively in the search of solutions to the problems facing us, to promote the enrichment of the arts and culture, the development and transfer of technology as well to uphold the essential attitudes and values of a democratic society.

In order to achieve these long-range goals mentioned above, Mayagüez Campus strives to:

- Direct its efforts and initiatives equally in three fundamental areas: instruction, research, and services to the community.
- Define the priorities and academic approaches of each college in such a way that they will provide opportunities to meet the needs of regular and continuing education.
- Direct the activities and initiatives of both the academic and research components of the Campus in such a way that they will not only share a common perspective but also constitute parts of the same effort and purpose.
- Provide a university education that will equip its graduates for fulfilling professional career and leadership training that will contribute to the enrichment of their spiritual and personal lives.
- Assist students in their understanding of the changing social issues and economic problems and issues of our time.
- Develop students' ability to analyze, judge critically, summarize, formulate hypotheses, consider alternatives, distinguish between feelings and reasons, and reach valid conclusions.
- Encourage students to develop a personal philosophy of life that will make them feel a part of their community and of the world. This will enable them to establish their own values, standards, and ideals; thereby, making them active rather than passive members of the community.
- Develop in students a positive attitude towards learning in order to encourage them to continue to improve and update their knowledge.
- Expedite the establishment of interdisciplinary programs in order to facilitate the full development of the intellectual potential of students and enable them to function in a variety of areas of human endeavor.
- Develop programs which will create student awareness of the need to properly utilize and conserve natural, physical, and economic resources in order to ensure a better life for the people of Puerto Rico and for all humanity.
- Extend cooperative education to selected academic programs based on the needs of the community.
- Promote and encourage the professional and technical development of campus employees based on their capabilities and interests as well as the needs and realities of the Institution.
- Provide students with services and facilities which create a favorable atmosphere for their full intellectual, social, and spiritual development.
- Develop educational technology resources and expand their effective use.
- Develop available library resources.
- Establish and define general criteria to guide the accreditation process of the Institution.

- Stimulate the participation of the total University community in the planning and evaluation of its academic programs and University agencies.
- Standardize procedures for the appointment, tenure, and promotion of academic personnel, without losing sight of the particular needs of academic departments.
- Assist government agencies and the private sector in the search for solutions to the problems that affect our times and the Island.

In accordance with the aforementioned long range goals and general objectives, each department and institutional unit directs its efforts and actions towards the common goal of preparing professionals with the scientific and technological backgrounds and the social awareness necessary to fulfill the needs of our constantly changing society.

### ***Institutional Student Learning Outcomes***

By the time of their graduation, UPRM students will be able to:

- a. Communicate effectively.
- b. Identify and solve problems, think critically, and synthesize knowledge appropriate to their discipline.
- c. Apply mathematical reasoning skills, scientific inquiry methods, and tools of information technology.
- d. Apply ethical standards.
- e. Recognize the Puerto Rican heritage and interpret contemporary issues.
- f. Appraise the essential values of a democratic society.
- g. Operate in a global context, relate to a societal context, and demonstrate respect for other cultures.
- h. Develop an appreciation for the arts and humanities.
- i. Recognize the need to engage in life-long learning.

## **Organization of the University of Puerto Rico**

The University of Puerto Rico is a well-established and mature institution, with a total enrollment of over 69,000 students. The University consists of the Mayagüez Campus, the Medical Sciences Campus, and the Río Piedras Campus, which are dedicated to both undergraduate and graduate education; and the Colleges at Aguadilla, Arecibo, Bayamón, Carolina, Cayey, Humacao, Ponce, and Utuado which provide undergraduate education. Each autonomous institutional unit has a Chancellor as chief administrator and academic officer.

### **Board of Trustees**

The Board of Trustees is the governing body of the University of Puerto Rico. Its membership consists of ten private citizens who represent the public interest in higher education, two faculty members, and a student representative. The Governor of Puerto Rico, with the advice and consent of the Senate of Puerto Rico, appoints the lay representatives. The faculty and student representatives are elected from among the non-university administration members of the University Board. Five of the public interest members are appointed to eight-year terms, three members to six-year terms, and the remaining two members to four-year terms. The faculty and student representatives serve a one-year term. Members representing the public interest may be reappointed to additional terms as long as the total time served does not exceed eight years. The Board of Trustees elects its president from among its members. It is responsible for:

- examining and reviewing the budgetary and institutional development plans of the University
- authorizing the institution of new campus, centers, and other institutional units
- appointing the President and chancellors of each autonomous unit
- defining rights and duties of various constituents in the institutional community
- defining student financial aid standards
- preparing an annual report to the Governor and the Legislature on the state of the University of Puerto Rico

Public sessions are held according to the established annual schedule. Extraordinary meetings may be held at other times as

determined by its president or required by five of its members.

### **President**

The President of the University, the chief executive officer of the University system, is appointed to an indefinite term by the Board of Trustees. Subject to the approval of the Board, he appoints chancellors to the various campuses and colleges. The President represents the University on corporate matters before courts and government agencies. He acts as an ex-officio member of all the UPR faculties, academic senates, and administrative boards.

The President is responsible for submitting an annual budget, an annual report, the institutional development plan and its revisions, regulations, contracts, and agreements which require university approval. He develops and maintains relationships with other cultural and educational institutions.

### **University Board**

The University Board is constituted by:

- the President of the University
- eleven chancellors representing each autonomous institutional unit
- a financial director
- three additional members appointed by the President with the approval of the Board of Trustees
- one faculty representative from each Academic Senate
- one student representative from each unit

The Board is responsible for the preparation of the following documents:

- general bylaws of the University
- general bylaws of the student body
- university's strategic plan with recommendations from the Academic Senates

These documents are submitted to the President and to the Board of Trustees for their consideration and approval. The Board also considers the integrated university budget, and it is the first avenue of appeals against any decision taken by the Administrative Board or the Academic Senate of an autonomous unit.

## **Organization of the Mayagüez Campus**

The Mayagüez Campus serves a student population of 12,136 students. It was organized as a result of the University Act (PL1), which was approved on January 20, 1966 and amended by Law No. 16 in 1993.

### **Chancellor**

The Chancellor of the Mayagüez Campus is the chief executive officer of the institutional unit. The Chancellor's main responsibilities include:

1. Presiding over the Administrative Board, the Academic Senate, and faculty meetings.
2. Appointing deans, departmental directors and university personnel.
3. Resolve controversial appeals against decisions made by deans.
4. Representing the campus at functions, ceremonies, and academic activities.
5. Preparing the campus' annual report and budget petition for submission to the President.
6. Considering and granting promotions and leaves of absence.

### **Administrative Board**

The Administrative Board of the Mayagüez Campus consists of the Chancellor as presiding officer, the deans, two academic senators elected among those faculty members of the Senate who are not ex-officio, senators, and an elected student representative. The President of the University serves as an ex-officio member. The Board acts as an advisory body to the Chancellor, prepares the development plan of the Campus, approves the proposed budget prepared by the Chancellor, and grants tenure, promotions and leaves of absence.

### **Academic Senate**

The Academic Senate at UPRM is composed by a member of the Administrative Board, the Director of the Library, the Director of the Counseling Office, representatives elected from the faculties whose total must not be less than twice the number of the elected ex-officio members, an elected member of the Library and Counseling Office, and ten student representatives. The Academic Senate is the official forum of the academic community. Its

main task is to participate in the formulation of academic processes within the University's legal structure.

### **Faculty**

The faculty is composed of the chancellor, the deans, department's directors and the teaching personnel. The General Regulations of the University of Puerto Rico define the faculty's functions, privileges, duties, and, rights.

### **Students**

The rights and duties of students are set forth in the General Student Regulations. The General Student Council represents students before the university administration, and individual student councils represent them before each of their respective colleges and schools. The students are also represented on the Academic Senate, the Administrative Board, the University Board, and the Board of Trustees.

### **Student Ombudsman Office**

The Students Ombudsman Office was created on November 10, 1999. It is a direct result of the interest and effort of both the Chancellor and the Students General Council. Its creation reinforces our University's belief in dialogue and communication as the best way to pursue truth and the integral development of its students. It also provides adequate and appropriate conditions which enhance their quality of life.

The mission of the Students Ombudsman Office (Oficina de Procuraduría Estudiantil) is to provide an independent, confidential, neutral, and accessible individual support for our students. The informal process facilitates fair solutions to the situations and problems of the parties involved.

The Students Ombudsman Office does not do formal investigations. Instead we listen to people, examine their options for dealing with a particular situation and help guide them toward making wise and healthy decisions. Moreover, the Office offers timely and relevant information concerning campus policies and procedures. The Office welcomes all community members, including professors and employees that wish to present any situation related to students. (<http://www.uprm.edu/procuraduria>)



## UNIVERSITY REGULATIONS

### Rights and Duties of Students of the University of Puerto Rico

#### Article 1

- A. The fundamental right of University students in the academic community is the right to an education. This right is not limited to the classroom but encompasses the aggregate of the students' possible relations and experiences with their fellow students, teachers, and administrators at the University and with their fellow citizens in the community at large. In like manner, the students' principal duty consists of fully exercising that right and conducting themselves in a manner that does not hinder other community members in the exercise of their rights or in the fulfillment of their duties.
- B. These regulations cover separately: (1) student rights and duties inherent in the sphere of the educational program; (2) those pertaining to extracurricular activities within the facilities of the University; (3) those related to student participation in the different aspects of institutional services; (4) those indicated by the standards and restrictions characteristic of academic life; and (5) the sanctions corresponding to violations of regulations and the procedure for the imposition of these sanctions.

#### Article 2

- A. The work involved in the subject under study constitutes the basis of teacher-student relationship. Maximum integrity and intellectual honesty should govern the drive to attain knowledge. The teacher shall foster creative dialogue and freedom of discussion and expression among students. The student shall have the opportunity to present reasonable objections to the facts and opinions stated by the teacher if in disagreement. Both may examine any aspect of the subject under discussion in accordance with the standards of intellectual responsibility vital to all academic endeavors. Neither one nor the other shall use the classroom as a forum to preach

political, sectarian, religious, or other doctrines alien to the subjects being taught. The right to dissent from the opinion of the teacher does not release the student from the responsibility of complying with the teacher's requirements for the course. The student's grade shall be based on considerations relative to academic achievements measured in the varying ways in which this is possible.

- B. The basis of the teacher-student relationship is trust and confidence which should be respected by both and by the administration. Opinions and beliefs expressed by students in the classroom are of a privileged nature, and students are entitled to have their teachers refrain from disclosing them to third parties. The preceding does not bar teachers from stating opinions about students' character and abilities or from discussing their progress with colleagues as part of the academic program and of the students' formative process.
- C. The relationship between students and teachers outside the classroom constitutes a part of the educational process. Students shall have the right to meet with teachers at specially designated times to request guidance on and clarification of aspects of their academic work.
- D. Academic and disciplinary files shall be kept separate. Any information relative to disciplinary files shall not be made available to unauthorized persons within or outside the University without the students' consent except by a court order. No record of the students' political beliefs shall be kept.

The legal and academic tradition recognizes the rights of students as members of the University community and also the obligation of moral and intellectual responsibility concomitant with these rights. The legal and academic tradition also recognizes the responsible participation of students in assuring and maintaining order, safety, and normalcy of academic life. These rights and responsibilities, the disciplinary procedures for dealing with their violation, and many other matters of interest are described in the UPRM Student Manual (Reglamento de Estudiantes del Recinto Universitario de Mayagüez) available in the Office of the Dean of Students.



## ***UPRM STUDENT REGULATIONS***

University law and tradition recognize the rights of students as members of the University community, and dictate the students' moral and intellectual responsibilities as members of that community. Also recognized is the responsible participation of students in insuring and preserving order, safety and normalcy of institutional tasks and procedures. The University graciously welcomes the democratic and responsible participation of its students in the institutional processes.

### **Rights and Duties**

Article 1. To the extent that they are collaborators in the University's mission of education, culture, and service, students are members of the University community and, as such shall be entitled to participate effectively in the life of the community. They shall have all the moral and intellectual responsibilities of members of the community.

Article 2. Students have the duty and right to engage in the search for truth and strive for its expression, always respecting opinions. Academic discipline, behavior intrinsic to the academic community, and the dictates of conscience, itself, shall serve as guides.

Article 3. University students have the duty to seek the elements of intellectual and spiritual formation which can lead to their full development as persons. They also have the right to demand them in view of their responsibility as members of the Puerto Rican community.

Also incumbent upon them is the duty and the rights to preserve, enhance, and disseminate the values of learning and culture both universal and Puerto Rican.

Article 4. Students may hold, pursuant to established standards, any public function, meeting, or ceremony and invite any person they wish to hear speak on any subject of interest provided that the exercise of any of the aforementioned rights does not interrupt the educational, technical, or administrative work of the institution and that there is compliance with the provisions of the regulations in effect.

Article 5. Students may associate freely and may publish and circulate publications in accordance with the prevailing standards set forth by the office of the Dean of Students.

Article 6. No student may be deprived, by reason of sex, race, origin, social condition, or political or religious creed, of the right of association nor of the services and programs offered by the University.

Article 7. University students are entitled to have the University refrain from disclosing information or keeping records related to their political, religious, or philosophical beliefs.

Academic and disciplinary files shall be kept separate. The information contained in the academic and disciplinary files shall be confidential and shall not be made available for use by unauthorized persons within or outside the University without the written consent of the student or the student's parent or guardian, unless a court order to that effect has been obtained.

Article 8. Students shall have the right to meet with teachers at specially designated hours in order to receive guidance and clarification on matters related to their academic work.

Article 9. Students shall have the right and the duty to actively participate in classes and related activities, consult their teachers, express their doubts and differences on criteria, and be informed of their deficiencies and achievements in academic work.

Students shall be entitled to receive from their teachers at the beginning of each session proper guidance on oral or written contents of the course, which shall include: explanations of academic ends and objectives, teaching methods, topics of study, reading assignments, and other work requirements, grading criteria, and other pertinent data. All this must in no way affect the necessary flexibility of the courses.

Students shall have the right to discuss with their teachers the tests taken, the grades received, and the evaluation of the course as an essential part of the college learning process.

Article 10. Students have an obligation to exercise in a comprehensive and responsible manner all the rights and duties established in these Regulations so that the example they set inside and outside the classroom may serve as a bulwark for the continual enjoyment of such rights and duties by them and their fellow students.

(Copies of these Regulations including the remaining provisions are available from the Office of the Dean of Students.)

### **Privacy of Educational Records**

The University of Puerto Rico intends to comply fully with the clauses of the Buckley Amendment of the United States Federal Government (Family Educational Rights and Privacy Act of 1974, as amended). This Act protects the private nature of students' educational files and establishes their right to inspect and examine them. It also provides guidelines to correct the accuracy of such information through informal and formal hearings. In relation to alleged violations of the Act by the institution, students have the right to file complaints written complaints to: The Family Educational Rights and Privacy Act Office, U. S. Department of Health and Human Services, 200 Independence Ave. S.W., Washington, D.C. 20201.

Copies of the institutional policy established by the University in compliance with the Act may be obtained in the Office of the Registrar, the General Library, the Office of the Dean of Students, the Financial Aid Office, and the Student Affairs Office. These offices maintain student lists and the location of students' educational records kept at the University. Questions related to this Act should be addressed to the Office of the Registrar.

### **Equal Opportunity**

The Mayagüez Campus of the University of Puerto Rico guarantees applicants equal opportunities for employment and academic admission. It also guarantees student and employee equality in study and employment opportunities as well as in the benefits of the services and academic programs offered and the terms and conditions of employment. UPRM does not exclude from participation nor denies benefits to nor discriminates against any person

by reason of age, race, sex, color, place of birth, social origin or condition, physical or mental handicap, or political or religious beliefs. Any applicant for academic admission or employment or any student or employee, who feels discriminated against for any of the reasons cited above may file a complaint in writing with the Dean of Academic Affairs. The establishment of this policy as well as its compliance and publication are pursuant to Federal regulations for the implementation of Title IX, Educational Amendments of 1972 and Section 504 of the 1973 Rehabilitation Act.

### **Disabilities**

UPRM is committed to promote a safe atmosphere for disabled students where they will have access to all academic programs, support services, social events, and physical facilities.

Regulations specified in Section 504 of the Vocational Rehabilitation Act (1973) and the Americans with Disabilities Act (ADA) 1980, establish norms and procedures which guarantee handicapped persons' equal access to programs and services.

At present, responsibility for the effective means of providing these services lies in the Office of the Dean of Students through the Coordinator of Services to Handicapped Students (SEI).

Services for handicapped students stem from the following principles:

1. Request for accommodations must be initiated by the student.
2. Accommodations offered by the university have a shared responsibility among student, faculty, staff and Office of the Dean of Students.
3. Procedures and policies must be reasonable and easily understood by all parties involved.
4. The student's right to confidentiality will be protected at all times during the process of accommodation.
5. Appeal processes will take place in a fair manner and within a designated time frame.

### **Foreign Non-Immigrant Students**

The Mayagüez Campus is authorized by law to admit foreign non-immigrant students. Refer to the sections on “Academic Regulations” and to the section on “Special Fees for Non-resident Students” for additional information.

### **Use of Vertebrate Animals in Research**

This institution complies with all applicable provisions of the Animal Welfare Act and other Federal statutes and regulations concerning animals. It also complies with the U. S. Public Health Service policy on human care and use of laboratory animals. Its practices are guided by the U.S. government principles for the utilization and care of vertebrate animals used in testing, research, and training.

### **Protection of Human Subjects in Research**

This institution complies with all Federal regulations regarding human subjects in research, including those stated in the Code of Federal Regulations, the Department of Health and Human Services, Title 45 (Public Welfare), Part 46: Protection of Human Subjects (revised March 8, 1983).

### **Intellectual and Scientific Misconduct**

It is the institutional policy of the Mayagüez Campus to observe the highest standards of intellectual and scientific integrity and to pursue the prosecution of all violations. The lack of integrity and the perpetration of academic and scientific fraud including plagiarism, falsification, false attribution, and all violations of the canons and practices of honesty generally accepted in the academic community, always excepting those which may result from involuntary errors or honest differences in the interpretation or handling of data or information.

### **Sexual Harassment**

This institution adheres to the principles and statutes concerning sexual harassment and discrimination because of gender in the areas of employment, conduct in the workplace, and provision of services. Grievance procedures are stated in Circular Letter 88-07 (May 27, 1988) of the President of the University of Puerto Rico and the Administrative Board Certification #93-94-303 of April 7, 1994.

### **Smoking**

Smoking is forbidden in all enclosed campus areas, including, but not limited to, classrooms, laboratories, lecture rooms, elevators, auditoriums, offices, museums, and all other places where people regularly meet. Smoking is permitted in public areas such as open hallways and other open spaces.

### **Drugs**

The University of Puerto Rico pursues a vigorous policy in combating the manufacture, distribution, supply, possession, and illegal use of controlled substances within its grounds as defined by Puerto Rico Law No. 4 of June 23, 1971, and further treated in subsequent Federal and Commonwealth legislation. The policy, means and procedures for its enforcement are detailed in Circular Letter 89-01 (June 6, 1989) of the President of the University of Puerto Rico.

## **RESEARCH AND DEVELOPMENT ENDEAVORS**

In addition to the numerous research laboratories under direct faculty supervision, Mayagüez Campus has several research and development institutes that provide valuable support for research activities.

### **The Agricultural Experiment Station**

The Station was originally established as a private entity by the Sugar Growers Association of Puerto Rico in 1910 on a 200-acre farm. It was donated to the government of Puerto Rico in 1914 and transferred to the University of Puerto Rico by legislative action in 1933. Its main objective is to conduct scientific research leading to a more ample and efficient agricultural development, the conservation of natural resources, the protection of the environment and the enrichment of the quality of rural life. The Station, a component of the College of Agricultural Sciences, has two main research centers, one at Mayagüez and the other at Río Piedras and six agricultural substations located in Adjuntas, Corozal, Juana Díaz, Gurabo, Isabela and Lajas. The Station's research farms, laboratories, library and other facilities are also available to graduate students for their thesis work. The Station is an active member of the Southern Association of Experiment Stations. This Association serves as a regional link to the U.S. Department of Agriculture, the U.S. Congress and the National Association of State Universities and Land Grant Colleges (NASULGC).

### **Bio-Optical Oceanography Laboratory**

**BIOL** is the site of an active teaching and research program in water optics and satellite remote sensing. Interdisciplinary studies of coastal and oceanic waters of the intra-Americas' sea include: variability of inherent and apparent water optical properties, effects of ultraviolet radiation on tropical marine organisms and on public health, satellite data validation and algorithm development and estimation of oceanic primary production.

### **CASA: Collaborative Adaptive Sensing of the Atmosphere**

CASA seeks to advance fundamental knowledge and provide societal benefits by creating a new engineering paradigm for observing, detecting, and predicting weather and other atmospheric phenomena. Distributed refers to the use of a dense network of radars capable of high spatial and temporal resolution. These systems will operate collaboratively within a dynamic information technology infrastructure, adapting to changing conditions in a manner that meets competing needs of end users, the government, private industry, and the public. This \$40 million center brings together a multidisciplinary group of engineers, computer scientists, meteorologists, sociologists, graduate and undergraduate students, and industry and government representatives to conduct fundamental research, develop enabling technology, and deploy prototype engineering systems based on a new paradigm: Distributed Collaborative Adaptive Sensing (DCAS).

#### **Contacts:**

Dr. Sandra Cruz-Pol, Dr. José Colom Ustáriz  
<http://www.ece.uprm.edu/~pol/CASA>

### **Center for Applied Social Research**

**CISA**, established in 1991, is an integral part of the Department of Social Sciences. CISA promotes and coordinates practical applications of faculty expertise to the analysis and mitigation of problems arising from or inextricably linked to social attitudes and behavior. CISA's specific objectives aim to provide strong research training and mentoring to undergraduate students, to engage faculty and students in interdisciplinary research, to develop collaborative research projects with other research centers, programs and institutions, to enhance the professional development of researchers and students through participation in a diverse number of seminars, workshops, and conferences, and to increase the number of students pursuing a graduate degree in social sciences.

Since CISA's establishment, a diverse number of research projects has been generated by researchers affiliated to the Center such as: drug abuse, socioeconomic impact of resource management among fishermen, poverty and income inequality in the United States and

Puerto Rico, public opinion and political participation, mitigation and preparedness regarding natural disasters, quantitative and qualitative aspects of urban rail transit systems, HIV/AIDS and mental health issues, female labor force participation in the tuna industry, comparative analysis of psychological depression in the Caribbean, and evaluation of the Minority Access to Research Careers (MARC) Program. A CISA research component that has been strongly developed focuses on outcome and process evaluation. Research projects in CISA have received funding from external (i.e., National Science Foundation, National Institute of Health, National Institute of Mental Health, National Fisheries Service, U.S. Army Corps of Engineers, Ford Foundation/American Sociological Association, National Forest Service), state, and local sources as well as from the University of Puerto Rico. All CISA projects involve direct student participation as research assistants, reflecting the center's commitment to undergraduate research training and mentoring.

#### **Center for Computing Research and Development**

**CECORD** was established to support the research activities of the National Science Foundation grant entitled Development of a Computer Engineering Research Environment at UPRM. The main goals of this grant are to develop the research environment necessary to initiate a Ph.D. program in computer engineering and computer science and to increase minority participation in graduate school programs and research. The Center was conceived as an organization supported by research grants. It is currently funded by the National Science Foundation, the Economic Development Administration of Puerto Rico, and the University of Puerto Rico.

#### **Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science**

**CoHemis** is part of the University of Puerto Rico. It is housed in and primarily serves the Mayagüez Campus.

CoHemis was founded in 1991 at a hemispheric conference-workshop sponsored by the National Science Foundation. It brought together national science and technology organization (ONCyT)

delegates from 13 countries of the Americas to discuss ways to increase hemispheric collaborations in science and technology. CoHemis today is the hub of a network of 40 institutions from most countries of the Americas interested in collaborations by such means as joint research faculty, student exchanges, short courses and workshops.

The Center publishes a semi-annual newsletter in English and Spanish distributed to individuals and entities interested in basic fields such as energy, manufacturing, infrastructure, environment and natural resources. This newsletter reaches U. S. Congressional committees and educational and government R&D institutions as well as key members of the Latin American science and technology community. For more information contact: <http://www.ece.uprm.edu/cohemis>.

#### **Center for Internet Enhanced Education**

**CECI**, located at Chardón 217, is an innovative faculty-oriented computer center recently created by Dr. Mario Núñez Molina, professor of Psychology at the University of Puerto Rico at Mayagüez. CECI's main purpose is to aid the Faculty of the Department of Social Sciences in the process of integrating the use of the new information and communication technologies in the teaching of their respective courses. CECI also conducts research evaluating the effects that the Internet and other related technological advances have on the learning process.

CECI has desktop computers and laptops, connected to the Internet; a digital projector; a digital photo camera; a digital video camera; a printer; a photocopier, and a scanner. CECI holds a variety of computer software, as well as journals, magazines and books related to the Internet and education. CECI may be accessed at [www.uprm.edu/ceci](http://www.uprm.edu/ceci).

Besides having its resources available for faculty members, CECI currently provides the following services for the faculty of the Department of Social Sciences: workshops on the development of online courses using WebCT and Internet Classroom Assistant (ICA); workshops on web page design using Trellex Web; individual assistance to faculty members regarding internet enhanced education; and conferences and articles about the implications of the new



education and communication technologies for education.

CECI also publishes *Hermes*, a newsletter which provides information regarding CECI's activities, and includes brief articles describing specific Internet and education related tools and software. It also serves the purpose of identifying and sharing with the faculty useful resources available on the World Wide Web. Although *Hermes* is published in print, it is also available at [www.uprm.edu/ceci/hermes.htm](http://www.uprm.edu/ceci/hermes.htm).

#### **Center Research Instrumentation Laboratory**

**CRIL** was founded in 1982 by the Department of Chemistry it contains sophisticated instrumentation for inorganic, organic and environmental analysis. The staff includes a director and two instrumentation assistants. Available instrumentation include a 500 MHz Bruker and 300 MHz Varian NMR, a System 2000 FT-IR coupled to a Gas Chromatograph and equipped with near and mid IR detectors, a Hewlett Packard Gas Chromatography/Mass Spectrometry system, a Perkin Elmer and Varian Atomic Absorption Spectrophotometers equipped with flame, cold vapor and graphite furnaces; a Leeman Labs Inductive Coupled Plasma-Optical Emission Spectrometry system, a Dionex Ion Chromatograph equipped with conductivity detector; and a Finnigan GC/MS/MS equipped with direct insertion probe, electron impact and chemical ionization sources. The CRIL staff provides services to undergraduate and graduate courses, research groups of the Chemistry Department, as well as other academic departments, the community, government agencies, and local industry.

#### **Heat and Mass Transfer Research Laboratory**

**HMTR** comprises research facilities dedicated to basic and applied theoretical and experimental research in heat and mass transfer phenomena. Administered by the Mechanical Engineering Department of the University of Puerto Rico at Mayagüez it is located on the first floor of the Luchetti Building.

Facilities associated with HMTRL include several Pentium-based personal computers and silicon graphics CAD work stations, a solar collector testing facility, spray cooling

experimental facilities, spray forming experimental facilities, and extensive instrumentation to measure flow, humidity, pressure, and temperature. Research in environmental flows, heat transfer in manufacturing of electronics components, metal sprays, solar energy, spray cooling, and two-phase flows is currently being conducted at HMTRL. External agencies and companies sponsor most research projects.

#### **Laboratory for Applied Remote Sensing and Image Processing**

**LARSIP** is a multidisciplinary laboratory located within the Department of Electrical and Computer Engineering at UPRM dedicated to research and implementation of remote sensing, and to the development of signal and image processing, geographical information systems (GIS), and emergency response system and Global Positioning System (GPS) technologies.

Additional services such as scanning, slide making, color plotting, and accessing aerial color and infrared photographs provided by NASA continue to be in high demand. The Space Information Laboratory receives, processes, and distributes images of the Caribbean and Northern Amazon regions for the purpose of investigation, planning, proposing, deciding upon and implementing studies of the infrastructure of the entire Caribbean community of nations and a large portion of the Amazon region.

The National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), and the American Telephone and Telegraph Corporation (AT&T) provided initial funding for LARSIP and its research projects. Currently, LARSIP receives funding from NASA University Research Centers Program, (NASA-URC), RAYTHEON Corporation, Economic Development Administration of the Government of Puerto Rico (FOMENTO), and UPR through the Tropical Center for Earth and Space Studies (TCESS) established in 1995. TCESS complements and enhances LARSIP. Both LARSIP and TCESS function as training centers in a bilingual (Spanish and English) environment for current and future scientists and engineers of the Caribbean region and the South and Central Americas. The training centers are multidisciplinary in scope, serving Mayagüez and other UPR campuses. Universities and institutions in other countries are encouraged to

form and establish liaisons with LARSIP and TCESS through Memoranda of Understanding or other similar arrangements.

### **Mechatronics Center**

The Mechatronics Center at the Mechanical Engineering (ME) Department is the only training and research center in Puerto Rico dedicated to study intelligent mechanical and electromechanical systems. The center offers training to industry and support for existing ME courses while providing facilities and resources for research in the fields of modeling and computer control of mechanical and electromechanical systems.

Training facilities are equipped with eight laboratory work stations with basic equipment to perform experiments and projects in mechatronics. The center also includes a prototyping laboratory with additional equipment to conduct independent research projects; a design center where students will be able to share ideas and make presentations; and a full-time technician to support the center's activities. The prototyping laboratory provides students with access to specialized mechanical, electrical, and software tools for the design and realization of intelligent machines. The center also utilizes the equipment available in the Manufacturing Processes Laboratory to handle a wide variety of complex projects involving the fusion of mechanics, electronics, and software technologies.

### **Mechanical Systems Response Research Laboratory**

**MSRRL** is located at the Mechanical Engineering Department and supports research efforts in various areas that focus on mechanical/material component systems in military and civil applications. Areas ranging from structural vibration control, material characterization, infrastructure health monitoring and diagnostics to even Micro Electronic Mechanical Systems (MEMS) sensor development and applications are currently being performed. MSRRL is supported through research efforts by five faculty members from different departments.

MSRRL performs research from various government agencies such as DoD, NSF, NSF-EPSCoR, NASA, and private industry with

funding currently approaching \$2 million. Projects include topics such as:

- Characterization of sandwich composite materials used in civil and military stealth applications.
- Vibration control using shape memory alloys.
- Vibration shaker design.
- Damage detection and health monitoring using neural networks.
- Flow induced vibrations.
- Acoustic emission in damage detection and material characterization.
- Novel dynamic material characterization techniques.

The MSRRL laboratory is equipped for research in mechanical/material component systems. The laboratory has a laser vibrometer for structural vibration response, several dynamic signal analyzers, acoustic emission equipment, data acquisition equipment, transducers (acceleration, force, and temperature), conditioning amplifiers, power supplies, oscilloscopes, computer facilities and a vacuum system for composite manufacture.

### **Puerto Rico Commercial Aquaculture Research and Development Center**

**CIDACPR** of the University of Puerto Rico at Mayagüez, Department of Marine Sciences (DMS) was formed in 1994 to assist the Commonwealth of Puerto Rico with development of aquaculture in the Island. CIDACPR is funded by the Industrial Incentives Program (formerly the Science and Technology Board) of the Secretariat for Economic Development and Commerce of Puerto Rico, and the University of Puerto Rico. CIDACPR specializes in economics and marketing, analysis of aquaculture enterprises, research facilities, and extension services, collaborating closely in this area with the Agricultural Extension Service and the Sea Grant College Program.

CIDACPR has research and production facilities in Lajas and Sábana Grande in Southwest Puerto Rico. It offers key services to the Puerto Rican community, performs scientific research to support the local aquaculture industry, and provides fish fingerlings and post-larval prawns for these activities.

**NASA PaSCoR, Partnership for Spatial & Computational Research**, NASA Grant # NCC5-340, <http://www.ece.uprm.edu/pascor>  
Luis J. Olivieri, PI, [olivieri@ece.uprm.edu](mailto:olivieri@ece.uprm.edu)  
Ramón Vásquez, Co-PI, [reve@ece.uprm.edu](mailto:reve@ece.uprm.edu)  
Rosa Buxeda, Coordinator Summer Station, [rbuxeda@ece.uprm.edu](mailto:rbuxeda@ece.uprm.edu).

UPRM has established, through NASA Grant number NCC5-340, the Partnership for Spatial and Computational Research (PaSCoR). The main goal of this project is to strengthen academic programs and integrate research at the undergraduate level in various science, math and engineering/technology (SMET) disciplines, following the strategy of the Learning Factory model implemented by the NSF Manufacturing Engineering Education Partnership. PaSCoR program is outcomes-based and student centered, focused on hands-on learning activities provided throughout the student's academic career. The program's outcomes will be a SMET graduate that is knowledgeable of the technology and applications of remote sensing (RS) and geographical information systems (GIS), and, possesses the necessary skills either to enter graduate school or become a professional in these areas with success. The program also aims to develop values such as diversity, teamwork, global awareness and communication. PaSCoR goals will be achieved through five tasks, namely: curriculum development, undergraduate research and student mentoring, industry collaboration, outreach, and assessment.

Students from the departments of science, math, engineering, and technology at UPRM will be able to earn a certificate in RS/GIS upon completion of 12 credit-hours in course work, 6 credit-hours in undergraduate research and a summer internship. Courses and resources are available to all SMET students on Campus. Currently, there are 11 faculty members involved in student mentoring and course innovation/development. More than 35 students are engaged in undergraduate research and more than one thousand students are taking RS/GIS interdisciplinary courses. NASA site visitors have recognized this project as a model program in the United States. PaSCoR students have spent summers learning about RS-GIS and developing leadership skills in sites such as USGS, NASA, and the PR Planning Board. Due to outstanding performance, two female PaSCoR students have been selected to the prestigious NASA's Academy. More than 70 publications

and presentations in local, national and international forums have acknowledged this curriculum model.

### **Engineering Office of the Associate Dean for Academic Affairs and Research**

It serves as a coordinating and administrative unit of the College of Engineering, overseeing activities in research and technical services among the six departments within the College. In order to stimulate research, this office distributes the External Funds Opportunities Bulletin, which contains information related to grant and fellowship opportunities. In addition, the office provides support in proposal and report preparation. The Office of Academic Affairs and Research houses the Technical Information Center, which issues a monthly publication comprised of titles and abstracts of recently published articles and documents keeping teaching and research groups informed of new advances and developments in engineering, technology and related fields. The Office also houses the Water Resources Research Institute, which pursues research activities regarding the solution of water resource problems in Puerto Rico.

### **Puerto Rico and US Virgin Islands Climatology Center**

Located at the Department of Marine Sciences, this center provides the latest climate data and weather information available for the Caribbean. It has access to a network of over 120 stations located throughout Puerto Rico and over 20 stations around the U. S. Virgin Islands. The Climate Center is also a repository for a wealth of information on climate data obtained from many other organizations, such as the National Climate Center, Asheville, North Carolina, and the Climate Analysis Center, Washington, D. C. The Center receives journals on climate topics and holds a large collection of climate data on CD-ROMS.

### **Puerto Rico Water Resources and Environmental Research Institute**

**PRWRERI** is one of 54 water research centers established throughout the United States and its territories by an act of Congress in 1964 which presently operates under Section 104 of the Water Research and Development Act of 1984 (P.L. 98-242).



Since its foundation, the Puerto Rico Water Resources Research Institute has sponsored a substantial number of research projects supported jointly by federal and university funds.

The PRWERRI is a component of the Research and Development Center of the University of Puerto Rico at Mayagüez. As such, it acts as the official liaison of the University of Puerto Rico with industry and government agencies for all water resources research activities. The Institute also functions as an advisor to these two sectors on water resources issues. This role translates into multidisciplinary functions and activities which add relevance and impact to the Institute's research efforts.

By virtue of the local relevance of its research and the prestige and leadership of its investigators, the Institute has become the focal point for water-related research in Puerto Rico. Meetings, seminars, technical reports, and a quarterly newsletter keep the water resources community and general public informed about advances in research. Approximately, once every two years, the Institute organizes major conferences on water-related research in Puerto Rico and the Caribbean in collaboration with other technical organizations in the region. All these activities facilitate the translation of Institute's sponsored research into practical applications of direct benefit to industry, government, and the general public.

#### **External Resources Research and Development Center**

**ORE** was established in 1986 at UPRM to encourage and manage research and development activities in the areas of engineering, technology, and science, and to provide a technological basis to serve the Puerto Rican community. The R&D Center manages several research programs which include basic and applied research, research sub-stations for seismic investigation, industrial handling and disposal of hazardous chemical substances, natural resources renewal, and biotechnological research as well as technical support for the development of the Caribbean Basin.

The R&D Center's mandate and principal functions are to promote, coordinate, and administer externally funded research projects conducted by faculty members of the Mayagüez Campus for clients from business and industrial

segments, public and private organizations, and government agencies. The Center's Advisory Board Committee is composed of seven renowned professionals, experts in the fields of science and engineering, which provides counseling and advice on its plans and activities. All funding for the Center's research projects comes from grants provided by government agencies (Federal and insular), educational institutions, and private sponsors within the industrial community of Puerto Rico. Industry sponsors include AT&T, Avon, Bacardi, Digital, Martin Marietta, Raytheon, Upjohn Pharmaceuticals, and White Westinghouse.

The R&D Center offers technical and administrative assistance to the UPRM research community through its Accounting and Finance, Budget, Purchasing, Receiving, and External Resources Offices. The Center has its own reference library within the General Library of the UPRM, which holds a specialized collections in the fields of scientific and technological research.

The R&D Center acts on behalf of researchers in conjunction with the university community and the general public. It is the instrument of promotion for the development of research on the Mayagüez Campus and serves as an intermediary between the University, the government, and the private sector. In this role, the R&D Center represents the interests of researchers on academic and administrative forums, plans and establishes UPRM's research policy regarding the island's economy and technology transfer to the community, and administers research centers, institutes, and individual projects to encourage their development and to promote excellence.

#### **Center of Research Excellence in Science and Technology**

**CREST** began in 1988 through the sponsorship of the National Science Foundation as a Minority Research Center of Excellence. This initiative intended to increase participation of underrepresented groups in the areas of science and engineering. The original program consisted of three research segments: Marine Natural Products, Tropical Terrestrial Ecology, and Caribbean Geology, utilizing scientists from the Mayagüez and Río Piedras campuses. The primary focus of the Program continues to be the

development and support of students in undergraduate and graduate programs.

Some of the Center's objectives are to provide research that will enable underrepresented minority students to choose careers in science and engineering, develop the infrastructure necessary to establish collaboration with other institutions, develop a competitive group of scientists, and provide educational improvement activities for professors and students.

Through research activities, students explore and gain career understanding of future alternatives. Student participation in national and international symposia is also encouraged at the Center where they have the opportunity to meet international and national leaders in their research fields, develop leadership skills and share information.

#### **Civil Infrastructure Research Center**

Founded in 1991, **CIRC** began operating within the Civil Engineering Department in January 1992. CIRC received funds from the National Science Foundation through the PR office of the Experimental Program to Stimulate Cooperative Research (PR-EPSCoR). The center also received funds from the University of Puerto Rico and the Department of Transportation and Public Works. It has also participated in the organization of international conferences and workshops.

CIRC's mission is to help government and industry maintain, manage, and improve Puerto Rico's infrastructure while contributing to the expansion and improvement of the College of Engineering's undergraduate and graduate programs in infrastructure-related disciplines. CIRC developed a comprehensive strategic plan which can be accessed at <http://ce.uprm.edu>.

The research program of the Civil Infrastructure Research Center was originally organized into two principal thrust areas and a developing thrust area. These thrust areas have been defined by the intersection of Puerto Rico's most pressing infrastructure problems and the UPR Mayagüez Civil Engineering Department's strongest areas of expertise. The principal thrusts are Transportation and Structural and Geotechnical Systems. The developing thrust is in Water Resources.

At present, the Center plans projects with the Federal Emergency Management Agency, the Sloan Foundation, the National Science Foundation, USAERDC, USDOT, and the Puerto Rico Department of Transportation and Public Works.

The Civil Infrastructure Research Center has a computer center. The computer center was developed with funds from Puerto Rico EPSCoR, the Puerto Rico Legislature, the National Science Foundation, and the Civil Engineering Department. Our computer center exists to support all CIRC researchers.

Since our foundation, the center has administered \$5,125,352 in completed projects. It manages \$2,384,396 in on-going projects. The center actively participates in developing new proposals to support our goals. For more information contact <http://ce.uprm.edu>.

#### **Oak Ridge Associated University (ORAU)**

Since 1966, students and faculty of University of Puerto Rico, Mayagüez have benefited from its membership in Oak Ridge Associated Universities (ORAU). ORAU is a consortium of 91 colleges and universities and a contractor for the U.S. Department of Energy (DOE) located in Oak Ridge, Tennessee. ORAU works with its member institutions to help their students and faculty gain access to federal research facilities throughout the country; to keep its members informed about opportunities for fellowship, scholarship, and research appointments; and to organize research alliances among its members.

Through the Oak Ridge Institute for Science and Education (ORISE), the DOE facility that ORAU operates, undergraduates, graduates, postgraduates, as well as faculty enjoy access to a multitude of opportunities for study and research. Students can participate in programs covering a wide variety of disciplines including business, earth sciences, epidemiology, engineering, physics, geological sciences, pharmacology, ocean sciences, biomedical sciences, nuclear chemistry, and mathematics.

Appointment and program length range from one month to four years. Many of these programs are especially designed to increase the numbers of underrepresented minority students pursuing degrees in science- and engineering-related disciplines. A comprehensive listing of these

programs and other opportunities, their disciplines, and details on locations and benefits can be found at <http://www.orau.gov/orise/educ.htm>, or by calling either of the contacts below.

ORAU's Office of Partnership Development seeks opportunities for partnerships and alliances among ORAU's members, private industry, and major federal facilities. Activities include faculty development programs, such as the Ralph E. Powe Junior Faculty Enhancement Awards, the Visiting Industrial Scholars Program, consortium research funding initiatives, faculty research and support programs as well as services to chief research officers.

For more information about ORAU and its programs, contact: Dr. Fernando J. Bird-Pico, Director of the Research and Development Center, ORAU Councilor for University of Puerto Rico, Mayagüez, or Monnie E. Champion, ORAU Corporate Secretary (865-576-3306); or visit the ORAU Home Page (<http://www.orau.org>).

### **Puerto Rico Seismic Network**

PRSN is administered by the Department of Geology. The staff oversees a network of short-period and broadband seismometers installed in Puerto Rico and nearby islands. The main objective of PRSN is to process and analyze local, regional, and teleseismic earthquakes. Data is made available to the general public and distributed among scientific and academic communities and civil defense organizations.

### **Tropical Center for Earth and Space Studies**

TCESS is funded by NASA's University Research Centers (URC) Program. It is divided administratively into five components:

1. Space Information Laboratory (SIL)
2. Earth Systems Studies (ESS)
3. Advanced Automated Image Analysis (AAIA) for Remotely Sensed Data
4. Sensor Materials and Electronics for Space Applications (SMESA)
5. Outreach and Education

### **The Space Information Laboratory**

Built on the foundations of LARSIP, it is funded by contributions from NASA, UPR, and Fomento (Commonwealth Economic Development) UPRM installed and operates Synthetic Aperture Radar (SAR) and HRPT tracking stations. These are national facilities available by invitation to other NASA and US university researchers. SIL is a training center for scientists and engineers in a bilingual environment. The Laboratory provides opportunities for research applicable to the problems of the Caribbean area. The Earth Systems Studies component contains two working groups who have participated in other NASA programs. The Geology Group investigates surface deformations and hazards of Lesser Antilles island arc volcanoes. The Marine Sciences Group investigates the effects of the thinning of the ozone layer and related surface UV radiation modulation on the development of plant screening pigments.

The Advanced Analysis Information Systems Group from Electrical and Computer Engineering investigates new image-processing algorithms and techniques for storage, processing, and dissemination of remotely-sensed data using high-speed streams with implications for SAR processing.

The Sensor Materials and Electronics for Space Applications component investigates a number of materials with special properties suitable for space sensors. Techniques and materials for power conversion electronics for spacecraft are also studied.

An Outreach and Education component works along with TCESS. An extension of the successful "Science on Wheels" project, a "Space Communications on Wheels" van brings space and earth studies to high school students in Puerto Rico. A Technology Transfer Internship Program is being developed that will allow professors and students to visit U. S. National Laboratories, universities, and NASA field centers to facilitate technology transfer and encourage advanced studies.

## **Laboratories Facilities of Industrial Engineering Department**

### **UPRM Model Factory**

Formerly, the Manufacturing Lab, integrates modern equipment, materials, and people into a manufacturing system. Its mode of operation is through interdisciplinary working teams from several engineering and business disciplines. This is a coordinated effort between several Engineering Departments. The goals of these laboratory facilities are to provide the following:

- Practice based experiences dealing with all aspects of an actual manufacturing system.
- A space where local manufacturing industry issues can be studied.
- A place where modern production technology and techniques can be studied as they are applied in an integrated manufacturing system.
- The opportunity to assist local manufacturers in the development of their production system.
- Incubator facilities where products and process can be developed or improved.
- Serve as a meeting place where people from several disciplines can meet and learn to work in teams, and get an appreciation of the technical aspects of the other's area of knowledge.

Currently, this laboratory houses a for-profit manufacturing activity and provides students from various engineering disciplines with an exemplary manufacturing experience inside the university. The factory houses a printed circuit assembly line for surface mount components in which production and prototype runs are performed for customers in the electronics sector. Prior to working in the manufacturing line, students receive pay and credit for their involvement, similar to a COOP experience. These students are then the ideal candidates to participate in course projects and summer and COOP internship in sector companies. The sector will flourish from these young but experienced graduates. Part of the charter of the Model Factory is to share process breakthroughs with partners of the electronics sector. Close to ten companies have contributed to this initiative, with special mention of Hewlett Packard and Sollectron Corporation.

## **Human Factors/Ergonomics and Work Measurement Lab**

This laboratory has been designed to provide students with hands on experience in the analysis and evaluation of humans and their working environment. Tasks are simulated and evaluated based on anthropometrics, biomechanics, cardiovascular, and force requirements. The lab also counts with instrumentation for the evaluation of illumination and noise levels. The following is a list of some of the equipment installed in the laboratory.

- Computers with licenses of ManQ Pro for workstation design, biomechanics, and the analysis of lifting tasks with the NIOSH lifting guide.
- Chatillon digital force measurement gauges,
- Anthropometers and calipers for the collection of anthropometric data,
- Electrocardiograph,
- Electromyography with data collection software for the analysis of muscular activity.
- Goniometers and data collection software for the analysis of flexion, extension, and rotation of body members,
- Heat stress monitors,
- Hand dynamometers
- Dosimeters for the evaluation of noise levels.
- Photometers for studies of illumination, among many others.
- Hand-held PC's with C4 Software for Time Study and Work Measurement.

### **Manufacturing Automation Lab**

This teaching-learning facility is the hands-on-laboratory for the Real Time Process Control course. Students design, build, and control scaled models, mainly emulating real manufacturing operations. The emphasis is in the use of programmable logic controllers (PLC), industrial sensors and actuators, pneumatics, and computer-based human machine interfaces.

The lab counts with 20 workstations equipped with all the necessary software and hardware. The facility is available for demonstration and custom trainings.

### **Statistical Quality Control Lab**

The lab is equipped with Statistical software for data analysis, design of experiments, and validation procedures. It can also provide hands-

on demonstrations for applied statistics courses and for simulation courses.

### **Computing and Information Infrastructure**

The Department of Industrial Engineering has a modern computing and information technology infrastructure. The computing infrastructure is supported by Windows 2000 servers. There is a WEB server dedicated to the development of WEB-based applications. The other servers support all existing software packages and general applications.

The students count with a newly remodeled computer center. The center has 36 computers, all connected to the Department's local area network and to the Internet. It serves as a general purpose computing facility and training center. It provides printing and plotting capabilities. The computer center is open seven days a week.

The graduate students have their own small network of computers to carry out their research work. The Quality Control Lab has 25 computers, the Human Factors lab has 6 computers and the Manufacturing Automation Lab has 22 computers.

The Department of Industrial Engineering's web page is located at <http://ininweb.uprm.edu>. It is a dynamic information system aimed to provide the most up-to-date information. The site keeps a directory of faculty, staff, students and alumni.

IE Learning is a Web based application dedicated to support online teaching. This effort started as a pilot project in 2000. During a regular academic year, the system has supported 17 courses and 900 students. The system can be reached through the Department's web page.

## ***SPECIAL PROGRAMS***

Several comprehensive programs on campus have a special impact on research and education.

### **Puerto Rico Resource Center for Science and Engineering**

RCSE is a consortium of the major institutions of higher education on the island, which includes

the University of Puerto Rico, Inter-American University, Ana G. Méndez University System, Sacred Heart University, Pontifical Catholic University of Puerto Rico, and Polytechnic University of Puerto Rico in partnership with the Puerto Rico Department of Education. RCSE's mission is to achieve excellence in science, engineering, and mathematics (SEM) education in order to promote full participation of Puerto Rican students in these fields and to develop the human resources and research base needed to support the island's economic and technological development. Created in 1980 with joint funding from the National Science Foundation and the University of Puerto Rico, RCSE has been extremely successful in pursuing its goals and has experienced a sound and steadfast growth in the scope of its programs.

The high level of success at RCSE is in great part due to its development as a consortium based on a collaborative network among major institutions of higher education, while providing access to a broad pool of resources by promoting excellence. Its goals range from efforts to improve science and mathematics curricula from grades K-12 in the island's schools to the establishment of research and development capability on the island. Due to the multi-institutional nature of its structure and complexity of its goals, RCSE was established as an administrative unit of the University's Central Administration, and it is under the direct supervision of the President of the University. As a special institute which is not identified with any particular academic program, level or unit, the RCSE has effectively promoted maximum collaboration among all institutions, facilitating a synergistic effect through the improvement of SEM education on the island. RCSE has acted as an intermediary among consortium institutions, bringing them together to identify major problems and needs in SEM education and to develop innovative programs to address these needs. Key academic and administrative officials from all member institutions participate actively in the planning and implementation of the RCSE programs. Offices for RCSE are located on Río Piedras and Mayagüez Campuses.

### **Puerto Rico Transportation Technology Transfer Center – Local Technical Assistance Program: LTAP-FHWA**

The Local Technical Assistance Program (LTAP) serves as the technology transfer effort



of the Federal Highway Administration's (FHWA) Office of Professional Development. The LTAP mission is to stimulate active, progressive, and cost effective transfer of bridge/highway technology and to provide technical assistance to local and urban governments. A network of 57 LTAP centers (one in each State, one in Puerto Rico, and six that serve Native American Tribal Governments), through its National Association of Transportation Technology Transfer Center (NATTTTC) has implemented a Strategic Plan with emphasis on technology transfer services, products, and educational resources to the local level. Throughout the years, LTAP continues to be a significant avenue for providing training and new technology to the countries, urban areas, small cities and the tribal governments.

The Puerto Rico LTAP Transportation Technology Transfer Center was established in 1986 as part of FHWA Region 1 in order to promote research and development and technology transfer in highway related activities in Puerto Rico and the US Virgin Islands. In 2002, the PR LTAP was moved from Region 1 to Region 4 as part of FHWA Reorganization. The Puerto Rico LTAP Center joined the Southeastern LTAP Centers that include Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee.

Throughout the years more than 10,000 transportation officials of the 78 Municipalities, Department of Transportation and Public Works of Puerto Rico and the Virgin Islands have benefited from our products and services. Partnerships with several professional organizations such as the College of Engineers and the Land Surveyors of Puerto Rico (CIAPR), American Public Works Association (APWA), and the Institute of Transportation Engineers (ITE) have been made to offer seminars on critical issues of interest to professionals and technicians in Puerto Rico and the Virgin Islands. Co-sponsorship with local and internationally recognized scientific and research organizations such as the National Science Foundation (NSF), the Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science (Co-Hemis), Civil Infrastructure Research Center (CIRC) and transportation affiliates such as Northeast Association of State Highway and Transportation Officials (NASTO) have been

used to promote research and development symposiums in transportation related areas. It is the intention of the Center to continue sponsoring a variety of seminars to meet the transportation needs of the municipalities as well as the Department of Transportation and Public Works officials of Puerto Rico and the Virgin Islands.

The Puerto Rico LTAP Transportation Technology Transfer Center has had nineteen (19) successful years since its establishment in April 1986. The success can be attributed to the full support of the Civil Engineering and Surveying Department of the University of Puerto Rico at Mayagüez, the Department of Transportation and Publics Works, the Federal Highway Administration, the Puerto Rico Highway and Transportation Authority, the US Virgin Islands Public Works Department, municipality officials as well as the cooperation and assistance of all the members of the Advisory Committee.

Among the latest accomplishments, the Center has:

- Developed new courses in 2003 and 2004 to address the need of local municipalities as well as state transportation officials from the HTA.
- Participated in web conferences.
- Collaborated with the Federal Highway Administration by participating in activities of the Border Technology Exchange Program (BTEP).
- Organized and host of the 2002 Regional Meeting for Region 4. The Centers that belongs to this region and attended the Region 4 Meeting in Puerto Rico were Alabama, Florida, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee.
- Established a partnership with the College of Engineers and Land Surveyors of Puerto Rico (CIAPR). As part of the partnership, the technical seminars offered by the PR LTAP Center were accredited for Continued Education Units (CEU) for all the CIAPR members.
- Continued update of the web page [www.prt2.com](http://www.prt2.com) with emphasis on the Center activities in Puerto Rico and the US Virgin Islands. It includes the latest version of the editions of the newsletter El Puente, published in English as well

as in Spanish. It also maintains links with the 57 LTAP Centers as well as local, state and federal transportation agencies that have useful information for locals.

- Participated in the Annual Southeastern Local Roads Conference (SELRC) held every year in different locations in which technical presentations associated with Highway Safety, Parking Studies, Pedestrian Accidents, Public Transportation, were presented by the Center Directors.
- Collaborated with programs recognized by FHWA, FTA and international organizations, such as Dwight D. Eisenhower Hispanic Serving Institutions Fellowship Program, University Transportation Research Center, and Pan-American Institute of Highways.
- Continued to be an active member of national and international organizations such as American Public Works Association (APWA), National Association of County Engineers (NACE), National Association of Transportation Technology Transfer Centers (NATTTTC), and the Pan-American Highway Institute (PIH).
- Continued to be an active member of the T2ALL electronic mailing list, managed by the New Hampshire LTAP Center. This list is for open discussion among people who are associated with LTAP.

### **Puerto Rico Strong Motion Program**

**PRSMMP** is under the administration of the Civil Engineering and Surveying Department. Among the main objectives are to develop a Quake Map immediately after an earthquake strike and make it available to the emergency agencies, to determine the critical earthquake ground motion for which structures in Puerto Rico should be designed. The program includes a strong motion network of 88 free field stations with digital accelerographs distributed throughout a 13 strong motion stations in the San Juan Metropolitan Area, 11 stations for the Mayagüez Metropolitan Area, 12 stations for the Ponce Metropolitan Area, and 32 stations around the Island. The network also includes 12 joint stations where an accelerograph and a broadband seismograph, from the PRSN, are collocated.

Lately, eight free field stations have been installed, mostly in UPR-campuses and are transmitting in real time to the **ANTELOPE Network Administrator**.

Another phase of the program is the seismic instrumentation of structures. There are already eight structures instrumented including two buildings, three bridges, and three dams. Within one year the program will be expanded to the neighboring countries installing three strong motion programs at the east side of the Dominican Republic, and to the American Virgin Islands. Strong Motion Records are available upon request, and soon will be available from IRIS and from COSMOS.

### **UPR Sea Grant College Program**

Since 1980, the University of Puerto Rico Sea Grant College Program has been working to promote the conservation, sustainability and wise use of the coastal and marine resources of Puerto Rico and the U.S. Virgin Islands. This is one of 31 programs which conform the National Sea Grant Program created in 1966 with the signing of Public Law 89-688, the National Sea Grant and College Program Act. The aim of UPR Sea Grant is to better inform public policy makers, change resource user attitudes and practices, develop educational curricula and promote conservation and sustainable economic development. The UPR Sea Grant program achieves its mission through a multifaceted approach which includes research, outreach and formal (K-12) education programs.

UPR Sea Grant links the university setting, which focuses on the development of theoretical and applied research, with regional and national agencies, and stakeholders producing a better understanding of marine technologies, seafood production (including marine aquaculture), coastal ecosystem health, and coastal economic development (including human environmental impact, and public safety). Sea Grant provides research and educational opportunities to graduate and undergraduate students of all fields related to conservation of marine resources. The information produced by research activities is organized and disseminated through workshops and activities developed by the Marine Outreach Program and the education component of our program.

## **PUBLICATIONS**

### **Atenea:**

An academic journal published twice a year by the College of Arts and Sciences containing literary articles in Spanish and English.

### **Boletín de Avances Técnicos:**

A free monthly publication by the Technical Information Center comprising titles and abstracts of recently published articles and documents which informing of new advances and developments in the areas of engineering, technology, and related fields.

### **Boletín Informativo de la Facultad de Artes y Ciencias:**

The College of Arts and Sciences bulletin with information related to faculty members, departmental activities and achievements, serving as a link between faculty and students.

### **Boletín Marino:**

A monthly publication of the Sea Grant Program containing information about the program's activities.

### **Boletines Técnicos:**

A series of technical and informative bulletins about research in agriculture and related areas published by the Agricultural Experiment Station.

### **The Caribbean Journal of Science:**

A scientific journal published twice a year by the College of Arts and Sciences highlighting research work related to the Caribbean area.

### **Ceteris Paribus:**

#### **The Puerto Rico Economic Review**

An academic journal of socioeconomic research published twice a year by the Department of Economics of the College of Arts and Sciences focusing on the most recent research on the socioeconomic aspects of Puerto Rico and the Caribbean.

### **Journal of Agriculture of the University of**

**Puerto Rico:** A scientific periodical published two times a year by the Agricultural Experiment Station including technical and scientific articles related to the agriculture of Puerto Rico and the Caribbean. The Journal of Agriculture of the University of Puerto Rico is the only scientific publication in Latin America which has been published without interruption since 1917.

### **Miscellaneous Publications:**

The Cooperative Extension Service publishes bulletins and leaflets of interest to farmers and housekeepers about livestock, agriculture, agricultural engineering, health and hygiene, nutrition, child care, home economics, clothing and textiles, 4-H clubs and other subjects.

### **El Puente:**

A bilingual newsletter (English/ Spanish) of the Transportation Technology Transfer Center published three times a year, serving as a bridge of information with local transportation officials in Puerto Rico and the US Virgin Islands and as a vehicle for reader response consisting of brief articles about the latest transportation-related technology. Keeping abreast on the latest technical publications and audiovisual materials available, it provides a schedule of seminars and workshops sponsored by the center as well as web sites related to training in transportation. An electronic version is available at [www.prt2.org](http://www.prt2.org).

### **Revista Internacional de Desastres Naturales, Accidentes e Infraestructura Civil:**

An international Spanish journal published twice a year by the Department of Civil Engineering discussing areas of natural hazards, accidents and civil infrastructure problems, as well as fundamental and applied research case studies. Papers submitted to the journal are considered through a peer-review process. Its editorial board is formed by researchers from Puerto Rico, U.S., Latin America, and Spain.

## **COLLECTIONS**

**The Art Gallery** located in the Carlos Chardón Building of UPRM was inaugurated in 1959. Works by both local and foreign artists are frequently exhibited. The Department of Humanities holds a permanent collection of copies of some of the great paintings and sculptures of the past.

A **Natural History Collection** located in Celis Hall and collections in the Departments of Geology and Marine Sciences serve as a nucleus for an expanding museum in the near future.

The **Geology Museum** displays a collection of fossils, minerals, and rocks, representative of the Geology of Puerto Rico. **The Planetarium** and the **Astronomical Observatory** located in the Physics building, offer monthly evening shows.



## OFFICE OF THE DEAN OF ACADEMIC AFFAIRS

The Office of the Dean of Academic Affairs is responsible for coordinating and supervising all academic matters and activities of the four academic colleges and the Division of Continuing Education and Professional Studies. These include graduate programs, academic institutional research, continuing education programs, and the professional enhancement of academic personnel. The office is responsible for the assessment, planning, and analysis of new curriculum proposals or changes, updating these curriculum innovations, and developing projects for research that might contribute to academic excellence.

Other auxiliary services like the enforcement of academic procedures and regulations are provided to sustain an efficient teaching and academic research system. The office also maintains a link with other academic institutions in Puerto Rico, the United States, and other countries in order to promote a dynamic development with a global vision.

The Office of the Dean of Academic Affairs supervises the following units and programs:

- Admission Office
- Center for Professional Enhancement
- Department of Aerospace Studies
- Department of Military Sciences
- Division of Continuing Education and Professional Studies
- Graduate Studies Office
- Institute for the Development of Online Teaching and Learning
- Library System
- Registrar's Office

## Graduate Interdisciplinary Courses

**INTD 6005. THE PRACTICE OF TEACHING IN HIGHER EDUCATION.** Three credit hours. Three hours of lecture per week.

Theoretical and practical issues regarding the teaching process at the university level. Study of the fundamentals of the teaching-learning process which includes: teaching and learning theories, instructional objectives, teaching planning, preparation, adaptation and use of educational materials, strategies, methods and techniques for effective teaching; and fundamentals in testing, evaluation, and assessment. All students are required to demonstrate proficiency in the areas studied by making a formal presentation.

**INTD 6006. PROPOSAL AND THESIS WRITING FOR GRADUATE STUDENTS.** One credit hour. One hour of lecture per week.

Principles of professional writing applied to the preparation of research proposals, masters theses and doctoral dissertations; emphasis is placed on the principles of precise, clear, concise, and formal writing that characterize this type of writing.

**INTD 6015. COMPREHENSIVE EXAMINATION PREPARATION.** Zero credit hours. Prerequisite: to be an Option III graduate student and have completed all the courses in his program.

Study period to prepare for the comprehensive examination, which allows students to maintain their regular-student status.

**INTD 6995. INSTITUTIONAL COOP PLAN.** Zero to three credit hours. Six to ten weeks during the summer or twelve to fifteen during the semester, depending on the required duration of the internship. Requisites: to be a regular graduate student with full admission. Cannot be a graduating senior. Apply to the government agency, private enterprise or foundation of his (her) choice, and comply with the requisites established by it. Be selected by the host government agency, private enterprise or foundation.

Work experience supervised and evaluated by a faculty member in coordination with a government agency, private enterprise or foundation, according to the student's academic background and work requirements.

## ADMISSION OFFICE

The Admission Office fulfills these tasks:

1. Receives and processes all applications according to eligibility criteria.
2. Provides orientation regarding eligibility criteria.
3. Compiles, maintains, and updates statistical data regarding admissions and serves as a facilitator to the academic community that utilizes this information for tuition evaluation and other procedures.
4. Enforces University admission regulations.
5. Serves as consultant to the Administrative Board regarding admission indexes.

## CENTER FOR PROFESSIONAL ENHANCEMENT

**The Center for Professional Enhancement (CEP)** was established in July 1996 with matching non-recurrent funds from the Central Administration. The concept for the Center originated in the Extension and Community Services Division under the Dean of Academic Affairs in coordination with the Project Pro-Excellence in Teaching and Learning (PEEA). The PEEA initiative arose mainly from a resolution from the Parents' Association presented to UPRM's Chancellor in 1990.

CPE was created in 96-97 by the Administrative Board, through Certification number 596, which mandates teaching preparation workshops for all faculty personnel dedicated to teaching and who has been hired since August 1997. The workshop consists of 29 contact hours which every professor must comply with during the first year of service. The professor's participation is kept on record and it is taken into consideration for the various personnel actions at the institutional level.

CPE's mission is to expose faculty members to diverse educational strategies in order to promote academic excellence and ensure high-caliber student performance. New faculty, permanent faculty, librarians, counselors, graduate students, and academic management personnel are all considered part of the Center's mission. The Center covers all aspects of professional development including teaching, learning, evaluation, technology, and research. Its goal is

to create a community of well-prepared and motivated individuals who will contribute to the academic excellence of our institution.

Services include annual orientations for new faculty and graduate teaching assistants, annual trainings for graduate lab assistants, retreats to recruit and develop interdisciplinary teams of resource professors, and seminars for faculty and graduate students during the academic year. The seminars, tailored to fit the audience's needs, involve theory along with hands-on activities. Services also include workshops for academic management, videotaping of classes for self-evaluation, educational research activities, and individual assistance for departments and faculty.

For more information call (787) 832-4040, extensions 3829 or 3674, (787) 265-3829, Fax (787) 831-5249. E-mail: [mpadilla@uprm.edu](mailto:mpadilla@uprm.edu). URL <http://www.uprm.edu/cep>.

## DEPARTMENT OF AEROSPACE STUDIES

### AIR FORCE ROTC

#### Objectives

The objectives of the Air Force ROTC program at the Mayagüez Campus of the University of Puerto Rico are as follows:

1. To identify, select, and motivate qualified students who will participate in the Program of Aerospace Studies.
2. To provide university-level education that will prepare students to be officers in the United States Air Force.
3. To enhance students' basic appreciation of and dedication to democratic principles.
4. To provide students with an understanding of the Air Force's role in support of the national interest of the United States.
5. To develop each student's potential as leader and manager.
6. To commission Second Lieutenants dedicated to their tasks who will accept responsibilities eagerly, think creatively, and speak and write English fluently.

There are two types of Air Force ROTC Programs offered at the Mayagüez Campus: the

four-year program and the two-year program. These programs are available to male and female students. The four-year program consists of the Basic Course (General Military Course: GMC) and the Advanced Course (Professional Officer Course: POC). Each of these courses lasts two years. The Basic Course includes Aerospace Studies 3001-3002 and Aerospace Studies 3011-3012. These courses provide two credit hours per semester and are included in the general graduation academic index. Students enrolled in the Basic Course participate weekly in two hours of Leadership Laboratory (Corps Training) in addition to the one hour of classroom work. After completing the Basic Course, students may request admission into the Air Force ROTC Advanced Course, which prepares them to be officers in the United States Air Force. The Advanced Course consists of Aerospace Studies 4001-4002 and Aerospace Studies 4011-4012, which provide the equivalent of four credit hours per semester. The students of the Advanced Course (POC) attend three hours of class and two hours of Leadership Laboratory (Supervision of Corps Training) weekly. These courses may be considered as general electives for academic credit up to a maximum of 12 credit hours. Students enrolled in the Air Force ROTC Program receive all required textbooks, uniforms, and equipment. Those students enrolled in the POC receive a starting monthly stipend of \$350. The two-year program consists of the POC only, and it is designed for those students who did not have the opportunity to participate in the Basic Course (GMC). The curriculum of the two-year program is the same as that of the four-year POC program.

### Field Training

Students in the four-year program who apply for the Advanced Course (POC) attend a four-week Field training Program at an Air Force base in the U. S. during the summer between their second and third academic years or before they enter the POC. Students in the two-year program have to attend similar field training for five weeks as a prerequisite for entering the Advanced Course. The major areas of study in the Field Training Program include junior officer training, aircraft and aircrew orientation, career orientation, survival training, base functions and Air Force environment, and physical training. The major areas of study included in the five-week Field Training Program are essentially the same as those in the four-week Field Training

and in the General Military Course including Corps Training. While in field training, the cadets receive approximately \$450 for the four-week program and \$670 for the five-week program. They are provided with transportation, lodging, meals, medical services, uniforms and equipment.

### Organizations

**Arnold Air Society:** This student organization of outstanding cadets has as its main goals maintaining Air Force traditions and ideals and serving the cause of aerospace age citizenship. The Society participates in many Air Force promotional activities, service projects, and social gatherings. Membership in this organization is voluntary.

**Silver Wings:** This is the auxiliary unit of the Arnold Air Society. It is composed of dedicated civilian or cadet students who are interested in promoting the Air Force and the ROTC Program on campus and in the community. These individuals have a distinct uniform and take part in many interesting activities and events, including parades and banquets. They act as official hosts for all Cadet Corps social activities.

### Scholarships

The Air Force offers scholarships for Bachelor's degrees to outstanding students selected for admission to either the four-year or the two-year programs. Provided the minimum requirements are maintained, these scholarships cover tuition, laboratories, and books. Scholarship recipients in the Aerospace Studies (AS) 100 class receive a stipend of \$250 per month, AS 200 scholarship cadets receive \$300 per month, AS 300 cadets receive \$350 per month, and AS 400 cadets receive \$400 per month during the school year.

### Advanced Course Requirements (POC)

In order to be admitted into the POC, a student must satisfy the following requirements:

1. Be a United States citizen
2. Possess high moral standards
3. Be at least 17 years old with parent/legal guardian consent
4. Have two years of academic work remaining before graduation

5. Satisfy Air Force medical examination standards
6. Be interviewed and selected by a board of Air Force officers
7. Successfully complete a four-week field training course if a four-year program cadet; a six-week field training course if a two-year program cadet
8. Pass the Air Force Officer Qualifying Test
9. Be able to meet age limitations before being commissioned
10. Demonstrate proficiency in the English language through an interview

### **Leadership Laboratory (Llab)**

The first two years of the Leadership Laboratory include studying Air Force protocol and courtesies, drills and ceremonies, issuing military commands, instructing, directing, and evaluating the preceding skills, studying the aspects of an Air Force officer's environment, and learning about areas of opportunities available to commissioned officers. The last two years of Llab consist of activities classified as advanced leadership experiences. They involve planning and controlling military activities of the cadet corps; preparation and presentation of briefings and other oral and written communications; and providing interviews, guidance, and information which will increase the understanding, motivation, and performance of other cadets.

### **FACULTY**

**COLONEL IVÁN A. CORRETJER**, *Professor of Aerospace Studies.*

**CAPTAIN ANDREAS KONHAEUSER**, *Assistant Professor of Aerospace Studies.*

**CAPTAIN DAVID SAUCEDO**, *Assistant Professor of Aerospace Studies.*

## **DEPARTMENT OF MILITARY SCIENCE**

### **US ARMY ROTC**

#### **Description Of Aims**

Military science at the University of Puerto Rico is presented under the provisions of the National Act of June 3, 1916, as amended, which established the Reserve Officers' Training Corps (ROTC) Program at colleges and universities throughout the United States.

The mission of the US Army ROTC Program is to obtain well-educated, commissioned officers in sufficient numbers to meet Army requirements. The objectives of the ROTC Program are to attract, motivate, and prepare selected students to serve as commissioned officers in the regular Army, Army National Guard, or the Army Reserve; to provide an understanding of the fundamentals, concepts, and principles of military science; to develop leadership, managerial skills, basic professional knowledge, and a strong sense of personal integrity, honor, and individual responsibility among students in the Program; and to develop an appreciation of the requirements for national security. The Army ROTC Program draws upon the many educational disciplines required for the modern Army. It ensures that men and women educated at a broad spectrum of institutions of higher learning are commissioned annually in the Army Officer Corps. In the future, the Army ROTC Program will continue to be the major source of newly commissioned officers for the active Army and reserve components.

The Army ROTC offers college students a four-year program and a two-year advanced program. The four-year program consists of a two-year basic course (CIMI 3011-3012, CIMI 3021-3022) and a two-year advanced course (CIMI 4011-4012, CIMI 4021-4022). Credits obtained in these courses will be included in the student's general grade point average. Deans may consider these courses as general electives for academic credit by granting up to a maximum of 12 credit-hours.

The basic course is conducted on a voluntary basis as an elective. Students may drop the course at any time as they would any other elective. Students must satisfactorily complete both

years of studies in order to be eligible for the advanced course. The advanced course is optional and selective. The ROTC furnishes all required uniforms and equipment for both basic and advanced courses. All students that contract with the ROTC with the intent of receiving a commission as an officer will receive from \$300-\$500 per month, depending on what year they are in.

Students may qualify to enter the advanced course without completing the basic course if they have attended Basic Training in the past as active duty soldiers or members of the National Guard or Reserves. Students may also qualify to enter the Advanced Course by attending a summer camp offered by the ROTC called the Leadership Training Course, or LTC. LTC is a paid summer camp that trains the students in basic military skills, and incurs no obligation for service or commitment. Students may attend the camp, and decide not to pursue ROTC if they choose.

Students in the Advanced Course are required to attend a paid summer camp known as the Leader Development and Assessment Course (LDAC) between their third and fourth years.

Students requesting admission to the advanced course, senior division, are screened and tested by the professor of Military Science (PMS). These students must satisfy requirements established by the Department of the Army before they are formally enrolled.

**A. Basic Course Requirements:**

1. Enrollment in a baccalaureate or graduate degree program full time (12 credits or more).
2. 2.00 GPA or better to enter second year of basic course.
3. Enrollment in the ROTC English program or satisfy the English requirement by approving an examination.

Note: Cadets will not fail the basic courses for lack of English skills. ROTC will prepare cadets in this area.

**B. Advanced Course Requirements:**

1. 2.00 GPA or better.
2. Be medically qualified (Medical exam is free of charge).
3. Be a full-time student (12 credits or more).

4. Score 80 or more on the Comprehension Level Test (ECLT). \*
5. Be classified as Junior in college according to academic progress standards. (negotiable).

\* ROTC will prepare cadets for the English exam.

**ROTC Scholarship Program**

The Department of the Army grants scholarships to selected outstanding students enrolled in the ROTC Program. The scholarships, ranging from two to four years, include full tuition and laboratory fees, approximately \$300 a year for textbooks, and a living allowance of up to \$1,000 for each academic year that the scholarship is in effect. In addition, ROTC scholarship students receive approximately \$700 for attending Advanced Camp.

**Organizations**

**Pershing Rifle Society:** This military society was organized at the University during the 1958-59 school years. It takes pride in its membership and strives for leadership, sharpness, neatness, and individual and unit achievements. Its members are carefully selected by a Board of senior members. The Precision Drill Team is an integral part of the Society. The Pershing Rifle Society is recognized throughout the US as Company P-16 of the 16th Regiment.

**Association of the United States Army (AUSA):** This Society, organized at the University in 1959, is open to all cadets. AUSA has assumed the basic task of enhancing the public image of the ROTC through civil activities and public information campaigns. AUSA participates in annual Blood and Cancer Fund Drives, high school orientations, and other civic action projects. The Sponsor Platoon is responsible for civil activities, public information, and recruiting. The Bulldog Platoon is responsible for operational plans and training. AUSA is recognized throughout the US by the designation of Bulldog Company.

**C.I. Rangers:** Founded in 1962, the C.I. Rangers is a military society which develops physical fitness and mental alertness, fosters "esprit de corps" among all ROTC cadets, develops military skills and tactical expertise in order to complement the tactical training and leadership training offered by the ROTC Program. It improves leadership and



management abilities, as well as the English language proficiency of its members insuring their success in the ROTC Program, at Advanced Camp, and as commissioned officers. It also supports the ROTC program at detachment ceremonies, demonstrations, and recruiting/retention activities.

### FACULTY

**LIEUTENANT COLONEL FRANCISCO BETANCOURT**, *Professor of Military Science*, M.A., 1999, Ft. Leavenworth University, Kansas.

**MAJOR RAFAEL E. NIGAGLIONI**, *Assistant Professor of Military Science*, B.A., 1994, University of Puerto Rico, Ponce.

**MAJOR RAÚL PADILLA**, *Assistant Professor of Military Science*, M.A.E., 1989, Pontifical Catholic University, Mayagüez, Puerto Rico.

**CAPTAIN HÉCTOR ROMÁN**, *Assistant Professor of Military Science*, B.A., 2001, Washington University.

**CAPTAIN JOSÉ E. DE SANTIAGO**, *Assistant Professor of Military Science*, B.A., M.A., 1999, University of Puerto Rico, Mayagüez.

**MSG EDWIN GARCÍA**, *Battalion Sergeant Major*.

**MSG JAVIER CAMACHO**, *Drill Instructor*.

**MSG NÉSTOR L. GÓMEZ**, *Drill Instructor*.

**MS. OMAIRA VEDBRAATEN**, *English Instructor Supervisor, Training Specialist (Language)*, M.A., 1996, Inter American University, San Germán, Puerto Rico.

**MRS. MARÍA DE LOURDES PÉREZ**, *English Instructor*, B.S., 2001, University of Puerto Rico, Mayagüez. (M.A. in progress).

## DIVISION OF CONTINUING EDUCATION AND PROFESSIONAL STUDIES

### History

The Division of Continuing Education and Professional Studies was created during the 1958-59 academic year. It was established in order to integrate within a unit several UPRM programs which were not administered jointly: the summer program, the evening program and the Saturday course program. The inclusion of these three programs as a new academic unit has served as basis for innovative and extended services in non-traditional fields.

### Goals and Objectives

The goals of the Division of Continuing Education and Professional Studies are to attend the special educational needs at the university level or those related to university work that are not presently addressed by traditional offerings in order to foster a closer collaboration between the universities's physical and human resources and the community's problems and needs.

#### Objectives:

1. To provide educational opportunities for the adult working population and for adults who have interrupted their schooling.
2. To provide educational opportunities to disadvantaged groups, minorities, and other sectors of the community not benefiting from traditional offerings.
3. To initiate educational programs and credit courses in response to educational needs that has not been fulfilled by traditional offerings.
4. To create continuing education offerings for professional groups.
5. To identify continuing education needs of the community at large and provide courses and educational experiences to meet these needs.
6. To provide the community with information and orientation services.
7. To develop awareness and sensitivity to the needs of the community and undertake initiatives to meet those needs.

The Division of Continuing Education and Professional Studies addresses its goals and objectives through various initiatives such as the

creation of projects, educational offerings, and programs which are transitory in nature and short in duration.

At present, the work of the Division consists of the following programs:

1. Education Program
2. Continuing Education Program
3. Special Training Programs
4. Community Services

### **Education Program**

The Education Program originated as an extension program, providing courses for in-service teachers. Besides fulfilling this continuing education service to teachers in both private and public schools systems, it includes a non-degree Teacher's Preparation Program for regular students.

#### ***Teacher-Preparation Program in Secondary Education***

This intensive training program is designed for students pursuing a bachelor's degree in the College of Arts and Sciences or of Business Administration. In addition to education courses, the program includes observation and practice in the classroom under the direct supervision of experienced teachers, and university faculty.

The Education Program offers the sequence of courses required by the Department of Education of Puerto Rico to obtain Certification as Secondary Level Teacher. In order to receive a teaching license, students present evidence to the Department of Education at the conclusion of the Education Program. In addition, students must approve the required teaching certification test offered by the College Board.

### **Continuing Education Program**

Continuing Education is recognized as a growing need for all adults. The Division offers educational options on weekdays, evenings, and Saturdays in order to enable working adults to further their education. It also fulfills different needs for children, adolescents, adults and elderly people interested in developing their knowledge, talents, or abilities.

This non-traditional service offers continuing education hours/credits required to renew licenses and/or certifications pertaining to a variety of professions and provides educational alternatives in special areas such as business administration, microcomputer applications, technical skills, arts, language, handicrafts, and sports where professional and cultural growth might occur independently of traditional degree programs. Continuing Education embraces a wide field of strategies to fulfill the teaching-learning process at different stages in formal or informal settings. It is offered through non-credit courses, seminars, workshops, or special projects.

### **Special Training Programs**

The Division of Continuing Education and Professional Studies collaborates with community institutions, other departments and campuses of the University of Puerto Rico in the creation of these special training programs which blend the traditional offerings at the University, such as language, mathematics, and science courses, with special instruction emphasizing immediately marketable skills. Courses in these programs do not carry college credits and cannot be used to fulfill degree requirements. At the completion of a program, however, a certificate will be issued which might serve as credentials for the job market.

### **Community Services**

The Division of Continuing Education and Professional Studies in association with civic and professional groups offers educational services to the community.

Community activities include conferences, seminars, workshops, group meetings, continuing education courses, and short-term special training sessions.

## **FACULTY**

**JUAN AVILÉS-FONT**, *Professor of Education*, M.A., 1971, University of Puerto Rico.

**CARMEN BELLIDO-RODRÍGUEZ**, *Associate Professor of Education*, Ph.D., 1997, University of Puerto Rico.

**HERBERT BRAVO-GARCÍA**, *Assistant Professor of Education*, M.S. Health Education, 1986, Penn State University.

**MOISÉS CAMACHO-GALVÁN**, *Associate Professor*, Ph.D., 1986, Florida State University.

**DOLLY CLAUDIO-RODRÍGUEZ**, *Assistant Professor of Education*, Ed.D., 2000, Inter-American University of Puerto Rico.

**MIGUEL CRUZ-LÓPEZ**, *Associate Professor of Education*, Ph.D., 1979, Syracuse University, NY.

**ROSA E. CRUZ-MUÑIZ**, *Assistant Professor of Education*, M.A., 1971, University of Puerto Rico.

**BERNADETTE M. DELGADO-ACOSTA**, *Associate Professor of Education*, Ph.D., 1995, Texas A&M University.

**EFRAÍN GRACIA-PÉREZ**, *Professor of Education*, M.A., 1972, Interamerican University of Puerto Rico; Juris Doctor, 1981, Catholic University of Puerto Rico.

**ANA M. LEBRÓN-TIRADO**, *Associate Professor of Education*, Ed.D., 1998, Interamerican University of Puerto Rico.

**ANTONIO SANTOS-CABRERA**, *Associate Professor*, M.A.Ed., 1976, Interamerican University of Puerto Rico.

## **INSTITUTE FOR THE DEVELOPMENT OF ONLINE TEACHING AND LEARNING**

IDEAL facilitates the integration of the Internet and all related information and communication technologies to the teaching-learning process. From IDEAL's perspective, teaching and learning should guide the use of these new technologies and not vice-versa. The Institute provides faculty with individual consulting and/or training on the use of WebCT; web-page design and development of online courses. IDEAL offers workshops and seminars about the development of learning environments on cyberspace. For additional information access: <http://www.uprm.edu/ideal/index.htm>.

## **OFFICE OF GRADUATE STUDIES**

The graduate program at the University of Puerto Rico, Mayagüez Campus began in 1957, prompted by the establishment of the Nuclear Center and postgraduate programs in Mathematics, Physics, and Nuclear Technology. The graduate program in Chemistry was established in 1960, followed by the Biology and Physics programs in 1962. Our first doctoral program, in Marine Sciences, was established in 1972. Doctoral programs in the fields of Civil Engineering, Chemical Engineering, Applied Chemistry, and Computing and Information Sciences and Engineering have also been established. Doctoral programs in Mechanical and Electrical Engineering are under consideration. The Mayagüez Campus currently hosts 32 Masters and 5 doctoral programs.

According to Certification 97-21 of the Mayagüez Campus Academic Senate, this Office supervises and enforces the rules and regulations related to graduate studies. The Office deals with three main areas: graduate admissions, assistantships, and active students. The Office is directed by an Associate Dean of Academic Affairs and Director of Graduate Studies, and an Associate Director of Graduate Studies. The Office is located at **303 Monzón Hall**, and can be reached by phone at extensions **3442** or **3598**. They can also be reached at their direct number **787-265-3809**, via Internet at <http://grad.uprm.edu>, or by email at [egraduados@uprm.edu](mailto:egraduados@uprm.edu).



## LIBRARY SYSTEM

The Mayagüez Campus General Library consists of a main library, a special departmental collection and an Educational Technology Unit.

The main library has an area of approximately 124,335 square feet. It has a seating capacity of 935, 10 study rooms for graduate students and faculty, 6 study rooms for group discussions and 2 library instruction classrooms.

UPRM library serves the local campus community as well as residents of Mayagüez and nearby towns. It fully supports UPRM educational and research mission and objectives by providing the necessary library and information resources, facilities and services. In order to fulfill its purpose, the library is divided into three major areas: **Technical Services**, **Public Services and Educational Technology**.

**Public Services** provide reference and research resources which include the following collections and data centers:

- Álvarez Nazario Collection
- Circulation/ Reserve Collection
- Collection for the Visually Impaired
- Interlibrary Loans Department
- Marine Sciences Collection
- Patent and Trademark Depository Library (PTDL)
- Puerto Rico Census Data Center
- Puerto Rican Collection - Manuel María Sama y Auger
- Reference/Documents Collection
- Serials and Electronic Resources
- Center for the Development of Library Research and Information Literacy (CEDIBI)

**Educational Technology** consists of the departments of Audiovisual Services and the Closed Circuit Television (CCTV), and the Music and Oral History Collection. Its mission is to support the institution's academic programs through multimedia technology applications.

**Audiovisual Services** includes a graphic arts shop, audiovisual equipment, lending and repair shop, a film/video library with fully-equipped projection rooms and online films like video-on-demand, and an audio recording studio. These facilities are all located on the second floor of the Sanchez Hidalgo Building.

**Closed Circuit Television** produces instructional and cultural programs as well as video recording and reproduction services. Other services include on-demand campus-wide multi-channel broadcasting, electronic bulletin board, teleconferencing, satellite connections, 2x2 photo IDs and a television studio. CCTV is located on the first floor of the Nursing Building.

**The Music and Oral History Collection** provides a variety of musical selections from classical to popular to folkloric, recorded in various formats. Also housed in this collection are audio books, pre-recorded sound effects, and audio cassettes for learning other languages, great speeches and oratory from world-renowned personalities, music scores, and books related to music. The Collection is located on the mezzanine between the first and second floors of the General Library Building, accessible through the Reference & Documents Collection.

**Technical Services** acquires and prepares library materials including selecting, ordering, invoicing, bookkeeping, labeling, cataloging, and classifying. Technical Services is also responsible for library automation, staff training, in-house binding and the gift and exchange program.

UPRM library holdings include: 161,321 volumes; 5,253 journals; 259,192 microfiches; 12,719 micro cards; 19,378 microfilms; 561,148 government documents; 714 films; 8,113 maps; 7,828 sound recordings; 606 musical scores; 919 sound magnetic tapes; 24,632 slides; 4,490 videocassettes; 687 filmstrips; 5,087 CD/DVD; 104 computer programs; 2,749 theses; 7 million United States patents, and 3 million United States-issued trademarks.

The library is a selective depository for publications of the U.S. Government, the Inter-American Institute for Agricultural Cooperation (IICA) in San José, Costa Rica, and the Service Center for Aging Information (SCAN). It is one of the coordinating agencies of the Puerto Rico Census Data Center under the Planning Board of Puerto Rico. It serves as depository for the US Bureau of Census publications.

On March 1995, the library became a member of the Patent and Trademark Depository Library Program of the U.S. Patent and Trademark Office. It is one of two libraries outside the

United States that serves the Caribbean and Latin America.

Other library services include book, document and journal loans, interlibrary loans, digital reserve traditional and virtual reference, access to electronic journals, Web based and CD-ROM databases, Internet access, web page (<http://www.uprm.edu/library>), online catalog, (<http://www.unilib.uprm.edu>), library orientations and library tours, library research and instruction courses, document and fax delivery, photocopying, sale of photocopying cards, duplication of materials in microforms, loans of audiovisual equipment, and selective dissemination of information. Librarians assist students and faculty in their study and research endeavors.

Librarian staff teaches the following formal courses: AGRO 4019–Seminar in Horticulture (Horticulture Department), BIOL 3055–Bibliography and Library Research in the Biological Sciences (Biology Department), CISO 3145–Bibliography and Library Research in the Social Sciences (Social Science Department). The Library offers an interdisciplinary course, INTD 3355- Research Methods in Libraries. Any student may enroll in this elective course which appears under the Department of Academic Affairs.

Library services are fully automated. Online catalogs might be accessed from computers in the library and anywhere on and outside UPRM through the Internet. A local area network (LAN) allows for access of databases in CD/DVD. The library maintains database licenses for important databases such as IEEE, ASFA, Government Periodicals Index, and Science Direct. For a complete list of the databases provided by Ebsco, Proquest, Wilson and Gale see our web page (<http://www.uprm.edu/library/cre>) Cataloging and classification are done online using the bibliographic utility of the Online Computer Library Center (OCLC). The library is also a member of the Southeastern Library Network (SOLINET) and the U.S. Agricultural Information Network (USAIN). Library's rules, regulations and bylaws are available at the library's Administrative Office.

## GENERAL LIBRARY FACULTY

**MARÍA DEL C. AQUINO-RUIZ**, *Librarian II*, M.L.S., 1991, University of Puerto Rico, Río Piedras Campus.

**MARÍA VIRGEN BERRIOS-ALEJANDRO**, *Librarian III*, M.L.S., 1989, University of Puerto Rico, Río Piedras Campus.

**CYNDIA CARABALLO-RIVERA**, *Librarian I*, M.L.S., 1997, Interamerican University, San Germán.

**CARMEN CEIDE-NIETO**, *Librarian II*, M.L.S., 1990, Interamerican University, San Germán.

**IVELISSE COLLAZO-RIVERA**, *Librarian I*, M.S.I.S., 2004, Florida State University at Tallahassee; M.A. in Spanish, 2004, University of Puerto Rico, Mayagüez Campus.

**JORGE L. FRONTERA-RODRÍGUEZ**, *Librarian III*, M.S.L.S., 1988, Catholic University of America at Washington, D.C.

**ILEANA GUILFUCCI-GONZÁLEZ**, *Librarian II*, M.L.I.S., 1992, Interamerican University, San Germán.

**FRANKLYN IRIZARRY-GONZALEZ**, *Librarian III*, M.L.S., 1975, University of Puerto Rico, Río Piedras Campus; M.A. in Educational Technology, 1982, New York University.

**GLADYS E. LÓPEZ-SOTO**, *Librarian II*, M.L.S., 2002, University of Puerto Rico, Río Piedras Campus.

**GLADYS LUCIANO-OLIVENCIA**, *Librarian IV*, M.L.S., 1971, University of Puerto Rico, Río Piedras Campus.

**MARÍA DEL C. MARTÍNEZ-MALDONADO**, *Librarian II*, M.A., 1976, M.L.S., 1999, Interamerican University, San Germán.

**RONALDO MARTÍNEZ-NAZARIO**, *Librarian IV*, M.L.S., 1981, Indiana University at Bloomington.

**ARLENE DEL C. MARTÍNEZ-RODRÍGUEZ**, *Librarian II*, M.L.S., 1991, Interamerican University, San Germán.

**DEIXTER MÉNDEZ-LORENZO**, *Librarian IV*, M.L.S., 1990, University of Puerto Rico, Río Piedras Campus.

**LIZ PAGÁN-SANTANA**, *Librarian II*, M.L.S., 1997, Pratt Institute, Brooklyn, New York.

**WANDA PÉREZ-RÍOS**, *Librarian II*, M.L.S., 1991, University of Puerto Rico, Río Piedras Campus.

**IRMA N. RAMÍREZ-AVILÉS**, *Librarian IV*, A.M.L.S., 1984, University of Michigan.

**LOURDES RIVERA-CRUZ**, *Librarian II*, M.L.S., 1990, University of Puerto Rico, Río Piedras Campus.

**GRISELL RODRÍGUEZ-VELÁZQUEZ**, *Librarian III*, M.L.I.S., 1996, University of Wisconsin at Milwaukee.

**SARA RUIZ-GONZÁLEZ**, *Librarian III*, M.L.S., 1989, University of Puerto Rico, Río Piedras Campus.

**ISABEL RUIZ-TARDI**, *Librarian III*, M.L.I.S., 1989, Louisiana State University; M.A. in English, 1976, State University of New York at Fredonia.

**NORMA I. SOJO-RAMOS**, *Librarian III*, M.S.L.S., 1984, Florida State University at Tallahassee.

**EDITH M. TORRES-GRACIA**, *Librarian III*, M.B.A., 1988, Interamerican University, San Germán; M.L.I.S., 1992, Long Island University, New York.

**ELSIE TORRES-NEGRÓN**, *Librarian III*, M.L.S., 1986, University of Puerto Rico, Río Piedras Campus.

**JEANETTE VALENTÍN-MARTY**, *Librarian IV*, M.A.L.S., 1983, University of Michigan.

## REGISTRAR'S OFFICE

The Office of the Registrar provides information in an accurate manner with consistent quality service that is responsive to the needs of the university community.

The office has the responsibility of maintaining academic records of students, current and former, graduate and undergraduate, while ensuring the privacy and security of those records.

The office also provides registration services to departments and students; records and reports grades; certifies attendance, grade point averages and degrees; issues transcripts, and schedules final exams.

The Office of the Registrar seeks to provide the highest quality services using innovative procedures and advanced technology.

### *Confidentiality of Academic Records*

The University of Puerto Rico, Mayagüez Campus, fully complies with the provisions of

the Buckley Amendment (Family Educational Rights and Privacy Act of 1974, as amended). This Act protects the privacy of students' educational records and establishes the students' right to examine their own files. It also provides guidelines for correcting the accuracy of the information contained in those files through informal and formal hearings. Students wishing to do so may file complaints with the Family Policy Compliance Office U.S. Department of Education 600 Independence Avenue, S.W. Washington DC 20202-4605. Copies of the institutional policy established by the University of Puerto Rico in compliance with this Act may be obtained from the Office of the Registrar.

## Veteran Services Office

The Veteran Services Office serves veterans, dependents of veterans, servicemen, and servicewomen in matters pertaining to the Veterans Administration such as: educational benefits, registration, and studies at the university. All beneficiaries must comply with the norms established by this office.

### Academic Progress (applicable to veterans and/or beneficiaries)

Veterans and/or beneficiaries should complete their studies during the regular time allotted (100%) as stated in the program curricula. If they exceed the time allotted they lose eligibility for the benefits of Veterans Programs. This norm is not applicable to federal aids such as Pell Grant or others where eligibility is established by the institution and/or the entity/agency granting the scholarship if the recipients maintain the correspondent requisites. Also students must maintain the minimum average required (general and major average) as established for each program in order to graduate.

### Repetition of courses (applicable to veterans and/or beneficiaries)

The Veterans Administration (VA) only approves payment for the repetition of a failing grade such as "F". The VA does not approve payment for repeated courses with passing grades, unless they are repeated in order to comply with the requirements of the program of study.

## **OFFICE OF THE DEAN OF STUDENTS**

The Office of the Dean of Students assures and maintains an optimal learning environment by providing a variety of services and activities as support systems for academic programs. Students are urged to take full advantage of these services and are encouraged to participate in extra-curricular activities which are designed to enrich their personal development and academic growth. The office is located in the Dean of Students building in room DE-1. For more information contact Dr. Víctor Siberio Torres at 787-265-3862.

## **DEPARTMENT OF ATHLETIC ACTIVITIES**

Students are encouraged to participate in organized sports and other recreational physical activities sponsored by the Department of Athletic Activities.

UPRM is a member of the **Puerto Rico Inter-University Athletic League (LAIPR)** and fully participates in a variety of intercollegiate sports. It is also a corresponding member of the National Collegiate Athletic Association (NCAA). The Inter-University Program offers 15 men's and 13 women's sports for students who demonstrate superior athletic abilities. Men's sports include baseball, basketball, cross-country, judo, soccer, softball, swimming, table tennis, tennis, track and field, decathlon, volleyball, weight lifting, wrestling, and cheerleading. Women's sports include weight lifting, basketball, cross-country, judo, softball, swimming, table tennis, tennis, track and field, heptathlon, volleyball, and cheerleading. Exhibition activities also include Tae Kwon Do, Chess, bowling and women's soccer.

The **Intramural Program** provides activities and competitions that take place mostly on campus grounds. Students, faculty, and staff participate in a wide variety of activities including 3 on 3 basketball, judo, soccer, indoor soccer, softball, swimming, tennis, table tennis, and tennis, 4 on 4 volleyball, water polo, weight lifting, wrestling, billiard and domino. Student teams in the Intramural Program may participate in the Extramural Program and compete with other universities and non-university groups.

The Department of Athletic Activities allows the use of campus athletic facilities and equipment in support of recreational non-traditional unorganized sports. Equipment and facilities are available to students and to university sponsored teams in their free time.

Athletic facilities include a gymnasium, a coliseum, a 50-meter swimming pool, basketball, volleyball, tennis and basketball courts, a synthetic running track, a weight-lifting gymnasium, training and conditioning exercise room, an athletic field for soccer and track, a lighted softball park, as well as judo and wrestling areas. For more information contact the Athletic Department at (787)-265-3866.

## **BAND AND ORCHESTRA**

Students with musical talent may join different music groups such as the concert band, marching band, concert choir, university chorale, jazz ensemble, string orchestra, Latin music group, and the dancing group Millenium RUM Dancers. Students interested in participating in any of these groups are required to perform in an audition.

Groups are required to rehearse twice a week to develop interpretive skills and maintain an ample musical and artistic program. The ensembles present a variety of concerts and performances as representatives of the university also international performances, festivals and competitions. For more information contact: **BAND AND ORCHESTRA DEPARTMENT** at (787) 265-3895.

## **DEPARTMENT OF COUNSELING**

Counseling and guidance are offered to the students so that they may achieve better self-understanding and make adequate adjustment to university environment. Programs and services are offered to diminish the negative impact of everyday stress and to help students cope with academic and environmental demands.

The Department of Counseling provides personal counseling, career and life planning, testing, psychological services and social work services. Counselors assist students with personal, educational, and career development issues and concerns. Counselors teach the freshman orientation course, UNIV 3005 Introduction to

the University Way of Life, during the first semester. Psychologists provide individual therapy, crisis intervention, workshops and lectures on personal, emotional, and social growth topics. A social worker provides direct assistance to individuals, couples, and families who request direct intervention with personal problem solving skills in issues such as relationship with parents, communication, violence, marriage, pregnancy, and financial needs. Workshops are offered throughout the year to meet student needs. Topics such as stress management, assertiveness, personal and social growth, study skills, time management, and decision-making are discussed.

A **Career Resource Office** is available to students. It contains information on undergraduate and graduate studies. Occupational information and test applications for admission to graduate and professional schools are also available through college catalogues and bulletins from other institutions. A counselor assists students in the decision-making process as well as in the application process for graduate school.

A **Tutoring Program** offers remedial help services in basic academic areas such as mathematics, Spanish, English, chemistry, and physics. Tutors are selected among honor or advanced students.

The **Counseling Program for Student Athletes** is focused on helping athletes overcome difficulties resulting from the amount of time and energy spent on sports.

A **Freshman Orientation Week** is offered a week prior to the registration period for the first semester. It is a campus wide activity in which new students receive information about facilities, academic programs, services, and student organizations. It offers freshmen the opportunity to meet faculty, staff, and other students. Members of the **Peer Counseling Program** work intensely during this week and throughout the year in coordination with the Department of Counseling assisting counselors with campus tours, group guidance, open house, and career days.

A **Freshman Orientation Course** is offered during the first semester. It consists of a one-hour lecture per week on diverse topics such as academic regulations, study skills, career

planning, personal development, computer literacy, and institutional resources. It has been designed to enhance college students' academic and social integration.

The **GEO-RUM Technology Training Center** is a new educational service designed to assist students with computer literacy needs.

For additional information you can contact: Nidia S. López, Ph.D. at (787)265-3864 or via internet at <http://www.orientacion@uprm.edu>.

## COUNSELING AND GUIDANCE FACULTY

### PROFESSIONAL COUNSELORS

**ARELIS ARCELAY-LÓPEZ**, *Professor (Counselor IV)*, M.A.E., 1980, Interamerican University of Puerto Rico at San Germán Campus.

**LISANDRA COLÓN-RIVERA**, *Assistant Professor (Counselor III)*, M.A.M.C.R., 1994, University of Puerto Rico at Río Piedras.

**OLGA COLLADO-DE CRUZ**, *Professor (Counselor IV)*, M.A.E., 1974, Interamerican University of Puerto Rico at San Germán Campus.

**TERESITA CRUZ-DÍAZ**, *Assistant Professor (Counselor III)*, M.A., 1974, University of Puerto Rico at Río Piedras.

**IVONNE DOMÍNGUEZ-BIDOT**, *Associate Professor (Counselor IV)*, M.A.E., 1983, Interamerican University of Puerto Rico at San Germán Campus.

**AGNES D. IRIZARRY-IRIZARRY**, *Associate Professor (Counselor III)*, M.A.E., 1978, Interamerican University of Puerto Rico at San Germán Campus.

**NEYSA LÓPEZ-GARCÍA**, *Professor (Counselor IV)*, M.P.H.E., 1970, University of Puerto Rico, Medical Sciences Campus, M.A.E., 1983, Interamerican University of Puerto Rico at San Germán Campus.

**VILMA D. LÓPEZ-MUÑOZ**, *Professor (Counselor IV)* M.A.E., 1982, Interamerican University of Puerto Rico at San Germán Campus.

**EDWIN MORALES-TORO**, *Professor (Counselor IV)*, M.A.E., 1977, Interamerican University of Puerto Rico at San Germán Campus.



**ROSA L. MONTALVO-VÉLEZ**, *Associate Professor (Counselor III)*, M.A.E., 1985, Interamerican University at San Germán Campus.

**GLORIA MUÑOZ-CRUZ**, *Associate Professor (Counselor III)*, M.S., 1979, University of Bridgeport.

**DALILA RODRÍGUEZ-DÍAZ**, *Professor (Counselor IV)*, M.A.E., 1981, Interamerican University of Puerto Rico at San Germán Campus.

**MADLINE J. RODRÍGUEZ-VARGAS**, *Instructor (Counselor I)*, M.A.E., 2000, Interamerican University of Puerto Rico at San Germán Campus.

**IVONNE I. ROSADO-TORRES**, *Professor (Counselor IV)*, M.A.E., 1979, Catholic University of Puerto Rico.

**PURA B. VICENTY-PAGÁN**, *Associate Professor (Counselor III)*, M.A.M.C.R., 1987, University of Puerto Rico at Río Piedras.

## PSYCHOLOGISTS

**ZAIDA M. CALDERÓN-FONTANÉS**, *Assistant Professor (Psychologist II)*, M.S., 1988, Louisiana State University at Natchitoches.

**NIDIA S. LÓPEZ-RODRÍGUEZ**, *Associate Professor (Psychologist IV)*, M.A., 1974, Interamerican University of Puerto Rico at Ramey Campus, M.A., 1982, University of Puerto Rico at Río Piedras, Ph.D., 1994, Carlos Albizu University (Centro Caribeño de Estudios Postgraduados).

**NORMA I. MORALES-CRUZ**, *Professor (Psychologist IV)*, Ph.D., 1993, University of Missouri.

**MIRIAM VÉLEZ-MORALES**, *Assistant Professor (Psychologist III)*, M.A., 1994, Interamerican University of Puerto Rico at San Germán Campus.

## FINANCIAL AID DEPARTMENT

The Department of Financial Aid administers financial aid programs to assist students with educational expenses. Even though costs at the University are considered low, each year approximately 64% of the student body qualifies for financial assistance. This assistance is provided through Federal, state, institutional, and private sources. These programs include grants and scholarships which do not have to be repaid, part-time employment for students who wish to work, and loans that require repayment.

The philosophy followed in rendering financial assistance is based on the principle that parents are the ones who are primarily responsible for providing financial means to educate their children. Students are also considered responsible in helping finance their college education through self-help which includes resources from assets, earnings from work, and loans to be repaid from future earnings.

The established requirements for financial assistance are:

- US citizenship or eligible non-citizen.
- Enrollment in a degree or certificate program.
- Satisfactory status in Title IV Program.
- Justified financial need (Except for unsubsidized Stafford Loans).

Financial need is determined by the difference between the cost of education and the amount of aid that parents and student can contribute. The amount which a student may receive is determined according to student's financial need and fund availability. In order to be considered for all financial aid programs, students must complete and submit once every academic year the Application for Federal Student Aid, the Institutional Application Form and all other required documents.

## Financial Aid Programs

### Grants and Scholarships

The *Federal Pell Grant Program* provides grants to undergraduate students who are enrolled in a degree-granting program and who do not hold a previous baccalaureate degree unless enrolled in a teaching certificate program

The ***Federal Supplemental Education Opportunity Grant (FSEOG)*** provides assistance to undergraduates who demonstrate considerable need and are eligible for the Federal Pell Grant. The Leveraging Educational Assistance Program (L.E.A.P.) provides assistance to undergraduating with extreme need and are eligible for the Federal Pell Grant.

The ***Legislative Scholarship Program*** receives funds assigned by the Puerto Rico Legislature to assist students with need and who also meet specific academic criteria.

***Private scholarships and grants*** are received by the University for student assistance which are administered according to criteria and guidelines specified by each donor.

### **Federal Work-Study Program**

The ***Federal Work-Study Program*** provides on campus employment opportunities for undergraduate and graduate students with financial need.

### **Loans**

Based on their determined financial need, the ***FFEL Stafford Loan Program*** allows undergraduate and graduate students to borrow low-interest federally subsidized funds through lending institutions such as banks. Students can also obtain unsubsidized loans regardless of need. Repayment begins six month after the student graduates or ceases to be enrolled.

The ***Geer Loan Program*** is funded through a private trust donation to the Mayagüez Campus. It provides 5 percent interest loans for up to a maximum yearly amount of \$ 1,000 based on financial need. Repayment begins 46 days after the loan proceeds are disbursed.

## **HEALTH SERVICES DEPARTMENT**

The Health Services Department offers primary health care, and first aid services free of charge, for all students. Among the services provided are medical consultation, dental care, emergency and short-stay recuperation care, ambulance services, clinical laboratory tests, psychology service, counseling on addiction and a health education program. The University of Puerto Rico also offers a university health insurance plan throughout a private provider for students who are not cover by a private personal insurance or a government health insurance.

These services are classified in two areas: preventive medicine with emphasis on primary and secondary prevention and therapeutic medicine. Preventive medicine pursues the prevention, detection, screening and control of medical conditions among students that may need immediate attention, observation or special care. Services are offered during regular working hour, except ambulance transportation service, which is coordinated on after hour's basis by the police university thru the municipal or state emergency services.

All students entering the University for the first time are required to complete and submit a medical history form that includes a complete physical examination and laboratory tests. Evidence of immunizations is also required. Failure to comply will result in a medical hold on registration.

Medical consultation and emergency services are offered by general physicians and professional nurses even in extended periods. These services are offered during semesters from 7:30am to 8:00pm, Monday to Thursday and from 7:30am to 4:30pm on Friday. A clinical laboratory complements these services during regular working hours.

Dental services are offered to students by appointments. Services include oral examinations, X-rays, prophylactic treatment, control of infections and cavities, and orientation on dental hygiene. Senior year students of the School of Dentistry of the University of Puerto Rico Health Science Campus provide primary dental care under the supervision of the Health Service Department dentists.



Psychological services are also part of the services offered. This includes psychotherapy, crisis intervention, group therapy and consultation to other health departmental professionals. Workshops on various mental health topics are also available.

The Stress Management Center offers services to all the university community by previous appointment. This center specialized in teaching techniques such as music therapy, visualization and direct relaxation. The psychologist coordinates this service. The Center is a practice center for psychology students from the Social Science Department.

Through a Health Promotion and Prevention Program, individual and group orientations are offered. Some of the areas covered are: nutrition, sexual health, eating disorders, sexually transmitted diseases including AIDS, alcohol and other drug abuse prevention, counseling on addiction and referral. Secondary prevention for chronic illness such as heart diseases, diabetes, asthma and epilepsy, as well as other health related areas with emphasis in the promotion of healthy lifestyles and health maintenance are also included in the program. A resource library with printed health educational and information on material is available to the university community.

The University, through a private company, offers the students an insurance health plan in order to provide more comprehensive health coverage. The plan is required, unless the student provides evidence of other health insurance coverage. Among the services covered by the university plan are consultations to specialists, X-rays and laboratory tests, hospital emergency room care, hospitalization, surgical procedures, maternity services including prenatal and postnatal care. Health plan also offers options on pharmacy, dental and major medical services.

A Title X Family Planning Program offers comprehensive sexual and reproductive health services to all members of the university community. This program offers evaluation and medical consultation, health and sexual health education, guidance in reference to abstinence, natural family planning, referrals, PAP smears tests and others tests for sexually transmitted diseases such as Chlamydia and HIV, as well as education and availability of contraceptive methods. A gynecologist specialist physician is

part of this program. A nominal fee is charged on medical visit and for contraceptive supply.

A Traffic Safety Project sponsored by the Puerto Rico Traffic Safety Commission offers educational and promotional activities establishing traffic safety as part of a healthy way of life among all members of the community.

The Health Services Department considers social health as a very important area to look after in a university setting. Some of the actual health issues such as alcohol and other substance abuse are related to social health. This motivated the development of the project "Café Colegial La Cueva del Tarzan"; a pro-active socialization prevention project that offer social alternatives develop and administer by students where a positive, creative environment is present.

The department also sponsors three student organizations that advocate healthy lifestyles among the student community.

## HOUSING OFFICE

The Off-Campus Housing Department provides services to students, faculty and staff seeking non-university owned housing. It maintains an interactive housing database search listing private homeowner's rooms, efficiency, one-two bedroom apartments or houses and apartment to share. Search can be done by several criteria such as owner's name, location, housing type and rental range. Access to housing listings can be obtained at the website [www.uprm.edu/vivienda](http://www.uprm.edu/vivienda) or <http://vivienda.uprm.edu>.

The housing listing includes units available from landlords registered with our site. Accommodations are not inspected by the University. Students must assume responsibility for making a determination about the condition of the housing and for getting a clear understanding (preferably in the form of a written lease) of the terms and conditions under which he or she will occupy the housing. Because the available housing market changes daily we cannot updated listings of housing for distribution by mail or e-mail nor can give information of this type over the telephone. However an Off-Campus Housing Guide can be provided by mail upon request.

Other services include assistance with landlord tenant questions and consumer general information about leases, utilities, safety, transportation, temporary housing, finances and child care. We also support the students throughout the Off-Campus living experience providing counseling and referral in housing related matters. The Housing Mediation Services is an alternative resource which assists in the resolution of problems which may arise between students, landlords and roommates. For more information contact (787) 832-4040, extensions 3894, 2078 or e-mail: [vivienda@uprm.edu](mailto:vivienda@uprm.edu).

## PLACEMENT DEPARTMENT

The Placement Department's main objective is to assist students in obtaining permanent, summer, or temporary employment. Services provided include arrangement of on-campus interviews with prospective employers, coordination of employer presentations, and job referrals. The Department offers seminars and workshops to facilitate job search, résumé preparation, and interviewing skills.

Once a year, the Placement Department organizes and hosts an annual **Job Fair** for local companies and governmental agencies. A library containing information on companies which recruit students is available for student use at the Student Center, Office 508.

The department prepares an employment report for each graduating class which lists the number of students who find job placement or continue their graduate studies in Puerto Rico and in the United States. Students are advised to initiate their job search as during freshmen year, since this will increase their chances for obtaining summer or co-op employment during their second or third year of studies.

## QUALITY OF LIFE OFFICE

The Quality of Life Office offers a wide variety of services in order to promote a safe campus environment and achieve the educational objectives of this institution. This office encourages a safe and secure environment through various activities each semester. It sponsors peer education and support student groups.

Proactive prevention programs are offered in order to prevent campus crime, violence, sexual assault, and the use and abuse of alcohol and other drugs, which may affect the quality of life on campus. Further information about the office, its services, and activities may be obtained by calling 787-832-4040, Extensions 3107, 5467, or at [calidaddevida@uprm.edu](mailto:calidaddevida@uprm.edu) <http://www.uprm.edu/cvida>.

## CAMPUS SAFETY AND SECURITY

Emergency Numbers: Security Office (787)265-1785, Office of the Dean of Students (787)265-3862, Quality of Life Office (787)265-5467, Health Services (787) 265-3865, Counseling and Guidance (787) 265-3864.

At UPRM, the safety and well-being of our students, faculty, and staff is an important priority.

UPRM's urban campus and its environs are safe and have a relatively low crime rate.

The University is required by federal law to publish an annual security report containing information with respect to campus security policies and statistics on the incidence of certain crimes on and around our campus.

**Statistics of Campus Crime Report:**

**ON-CAMPUS CRIME REPORT-2003-2005  
REQUIRED BY THE PUBLIC LAW 101-542  
(STUDENT RIGHT TO KNOW AND  
CAMPUS SECURITY ACT)**

<b>Criminal Offenses</b>	2003	2004	2005
Murder/Negligent Manslaughter	0	0	0
Non-Negligent Manslaughter	0	0	0
Forcible Sex Offenses (including forcible rape)	0	0	0
Non-forcible Sex Offenses	0	0	0
Aggravated Assault	1	5	2
Robbery	4	0	1
Burglary	44	4	11
Motor Vehicle Theft	3	3	1
Arson	1	1	0
Disciplinary Actions/Judicial Referrals and/or Arrests for:			
Liquor Law Violations	0	0	0
Drug Law Violations	0	0	0
Illegal Weapons Possessions	0	0	0

**STATE POLICE CRIME REPORT OF  
CAMPUS ADJACENT AREAS  
REQUIRED BY THE PUBLIC LAW 101-542  
(STUDENT RIGHT TO KNOW AND CAM-  
PUS SECURITY ACT)**

<b>Criminal Offenses</b>	2003	2004	2005
Murder/Negligent Manslaughter	0	0	0
Non-Negligent Manslaughter	0	0	0
Forcible Sex Offenses (including forcible rape)	0	1	1
Non-forcible Sex Offenses	0	0	0
Aggravated Assault	2	1	1
Robbery	13	19	13
Burglary	184	103	45
Motor Vehicle Theft	6	9	0
Arson	0	0	0
Disciplinary Actions/Judicial Referrals and/or Arrests for:			
Liquor Law Violations	4	0	24
Drug Law Violations	11	0	62
Illegal Weapons Possessions	0	0	6

**ADJACENT AREAS:**

Ave. Pedro Albizu Campos  
Morell Campos Street, West Side  
Barrio Dulces Labios  
Pablo Maiz Street, West Side  
Barrio Paris  
Los Próceres Park  
Méndez Vigo Street (Darlington Building)  
Bosque Street, West Side  
Urb. Ensánche Ramírez  
Dr. Basora Street, West Side  
Urb. La Riviera  
Luna Street  
Urb. Mayagüez Terrace  
Mayagüez Town Center

**SOCIAL AND CULTURAL  
ACTIVITIES**

UPRM offers diverse social and cultural activities such as pep rallies, concerts, shows, dances, plays, films, presentations, tournaments, and exhibitions by recognized artists and performing groups.

Although most activities are celebrated on campus, university-sponsored activities are also offered at municipal government facilities such as the Yagüez Theater, the Cultural Center, and the Municipal Coliseum. For additional information contact: 787-832-4040 ext. 3366.

**STUDENT ORGANIZATIONS AND CLUBS**

The University has over 100 recognized student organizations and clubs which serve the various needs and interests of students. These organizations range from campus branches of national organizations to local clubs and special interest groups which provide an opportunity for involvement in student recreational activities, community service, leadership and personal development. For further information, contact 787-832-4040 ext. 3366, 3370.

**STUDENT GOVERNANCE**

The General Student Council, is composed of representatives from each academic faculty elected by the student body. Additional information regarding the student council and its functions may be obtained at the General Student Council Office located on the first floor of the Student Center or at Extension 3409.

## **STUDENT CENTER**

The Student Center constitutes the university's community center and it is open to students, faculty, staff, alumni, and visitors everyday. Services are available from 7:00 am to 12:00 midnight, Monday to Thursday, Friday until 4:00pm and from 2:00pm to 12:00 midnight on weekends and most holidays. It is a focal point for cultural, social, and recreational activities while providing study areas for students. We also provide wireless connection to our network and the WWW. Several departments under the Office of the Dean of Students are located in the Center, the offices of Campus Housing, Placement, Social and Cultural Activities, and the Student Exchange Program and International Student Service.

Other offices located in the Student Center include the General Student Council Office, the Graphic Arts Workshop, and a small Art Gallery. The Student Center also houses the campus the cafeteria, snack bar, game room, bookstore and unisex hair styling salon. The Student Aid Center, located on the ground floor, provides low cost specialized services, such as photocopying, photographic film development, and fax services. Further information may be obtained from: José Figueroa at [jofigue@caribe.net](mailto:jofigue@caribe.net) or at extension 2287.

## **STUDENT EXCHANGE PROGRAMS AND INTERNATIONAL STUDENT SERVICES**

The Mayagüez Campus is an active member of the National Student Exchange Consortium, the International Student Exchange Program and Global Engineering Education Exchange. Exchange programs offer excellent opportunities to explore academic, social, and cultural settings.

**The National Student Exchange** offers students the opportunity to attend and study at another college or university in the United States and its territories.

[www.nse.org](http://www.nse.org)

**The International Student Exchange Program** offers students the opportunity to study, experience and learn from exposure to different regional, cultural, and ethnic perspectives and to broaden their educational background. A qualified, full-time undergraduate student may participate in the exchange program for an entire academic year and live in one of 35 countries.

[www.isep.org](http://www.isep.org)

**The Global Engineering Education Exchange** is an international program designed specifically for engineering students. More than 50 universities are currently participating in over 17 countries around the world.

[www.iie.org/pgms/global-e3](http://www.iie.org/pgms/global-e3)

The Exchange Program office provides orientation services to students from other countries as they become acquainted with registration procedures, educational facilities, and student services. Information is offered in areas of immigration, financial assistance, foreign embassies located in Puerto Rico, programs sponsored by international agencies, and housing. The office works closely with the academic community, the administration, and the local community.

International students sponsor special events throughout the year to promote cultural exchanges. For more information visit Office 510 at the Student Center.

## **OTHER SERVICES**

### **Alumni**

The Alumni Office is engaged in activities designed to strengthen relations between UPRM and its graduates. This office supports and works in close coordination with the Alumni Association by encouraging membership, seeking donations, and organizing the annual homecoming. For additional information access the web site <http://www.uprm.edu/egresados/>.

### **Bookstore**

The bookstore supplies textbooks, office and school supplies, souvenirs, gifts, and personal effects. It is located on the first floor of the Student Center and opens from 7:00 A.M. to 4:00 P.M. on weekdays.

### **Campus Lodging**

The University Service Enterprises is a department under the Office of the Dean of Administration primarily dedicated to the administration of the campus hotel.

Room Rates: Rooms with a shared bathroom and no air conditioning (80 rooms available),

Single Room	\$16.35
Double Room	\$27.25
Triple Room	\$38.15

Rooms with a private bathroom and air conditioning (8 rooms available),

Single and Double Rooms	\$38.15
Triple Room	\$49.05

For facility availability and reservations, visitors and students at UPRM should contact (787)265-3891, (787)832-4040 extension 3596 or at [www.uprm.edu/decadmi/empunihotel.html](http://www.uprm.edu/decadmi/empunihotel.html).

### **Computer Center**

The Campus Computer Center is part of the Chancellor's Office. It is located on the first floor of the Luis Monzón Building. It operates 24 hours a day, every day of the year. It provides operator assistance 18 hours daily while serving the academic and administrative community in instruction and research. The principal academic and administrative computer facility consists of a HP ALPHA and Sun Sparc Servers.

The institutional network **RUMNET** (Recinto Universitario de Mayagüez Network) is the most valuable resource supported by the Center. With a strong fiber optic infrastructure interconnecting over 40 buildings throughout the campus, it is part of the Internet 2 project with an OC3 to connect UPRM to the outside world. The Computer Center also supports the most widely deployed wireless network for academic purposes in Puerto Rico. The UPRM Wireless Network covers more than seventy-five percent of the campus. The university community can access information resources, including Internet access wirelessly from anywhere, anytime.

Computing services for the academic community are offered through the User Support Office of the Computer Center in the Monzón Building. Consulting and training services, preparation of user guides and manuals plus the operation of the public computer facilities, and computer equipment maintenance and repair services are provided.

The use of computer facilities on campus is free of charge. The University covers the operational expenses of these facilities.

Several academic departments operate their own computer laboratories. Some facilities have specialized hardware or software so their use is restricted to students who enroll in certain courses or who engage in research. Most departmental laboratories are open to the general campus population.

### **Dining**

The cafeteria, located in the Student Center, is conveniently divided into two dining rooms and a snack bar. Breakfast, lunch, dinner, and snacks are served at the main dining room Monday

through Friday from 6:30 A.M. to 8:00 P.M., and at the second dining room Monday through Friday from 7:00 A.M. to 3:00 P.M.

### Press and Publications

The Press Office is the link between the university community as well as local and international media. Press releases and articles regularly published in daily and weekly newspapers and internal publications such as “Cartelera Semanal,” “La Gaceta Colegial,” and the UPRM web page ([www.uprm.edu](http://www.uprm.edu)), keep the general public informed of UPRM’s main events. Radio and T.V. announcements are also prepared by the Press Office.

## FEES AND EXPENSES

### TUITION

For U.S.A. citizen's residents of Puerto Rico:  
 \$100 per credit for students enrolled in graduate programs plus applicable regular or special fees,  
 \$67 for students enrolled in thesis only.

For U.S.A. citizens non-residents of Puerto Rico: Same tuition as resident students, plus an additional sum equivalent to what a Puerto Rican student would have to pay in the public university of their state of origin.

They also pay the applicable regular or special fees.

For foreign students:

\$4,655 per year for students enrolled in graduate programs, plus applicable regular or special fees.

Visiting students:

\$67 per graduate course plus \$13 maintenance fee for each academic session.

### REGULAR FEES

Application for admission	\$20
Graduation fee	\$27
Application for transfer to a different program	\$20
Application for readmission	\$33
Late registration fee	\$13
Academic transcript of credits (per copy)	\$ 1.35
Duplicate of admission letter, class ticket or schedule card (per copy)	\$1.35
Identification card	\$5
Letter of recommendation of the Dean of Students	\$5



**SPECIAL FEES**

Laboratories fees (per laboratory course)	\$33
Maintenance fee (per registration period)	\$47
Annual Basic Medical Insurance	\$684*
Annual Basic Medical Insurance including pharmacy	\$1,536*
Technology Fee	\$25

\* Subject to yearly changes pending insurance company's contract adjustments.

**REGULATIONS**

**Date for Payment of Fees:** All general student fees for each semester are paid in advance on the corresponding registration day.

**Deferred Payment of Fees:** As a general rule, no deferred payment of fees is granted. However, in very exceptional cases, the Dean of Students is authorized to grant an extension of time, which cannot be beyond thirty days before the end of the course. In those exceptional cases, a student must apply for deferred payment of fees prior to the registration day with ample time so that the merits of the application can be evaluated. On the registration day, students to whom deferred payment of fees is granted must pay at least 33% of the tuition fees and 100% of the applicable special fees. The balance must be paid at least 30 days before the last day of classes of the semester. Students who fail to pay accordingly must pay a late payment charge of \$13.00 dollars.

Students who fail to settle their accounts with the university 30 days before the last day of classes every semester or the specified date for each Summer Session will receive no credit for their work, nor will the Registrar release any transcript of record or other official documents until all outstanding fees and charges have been paid. All fees must be paid in United States currency, certified check, or postal money orders made out for the exact amount to the University of Puerto Rico.

**REIMBURSEMENTS**

**Fees:** Students who drop out of the University of Puerto Rico, Mayagüez Campus, within the first two weeks of any semester, or the first week of the Summer Session, are entitled to a 50 per

cent refund of tuition fees. The application for reimbursement must be approved by the corresponding Dean and the Registrar, and filed in the Treasurer's Office within five days following the date of approval. No refunds are allowed thereafter.

Visitors and students forced to withdraw for disciplinary reasons are not entitled to a refund of fees.

The Medical Services fee, the transfer and readmission fees, the construction fee, laboratory fee and late registration fees are not refundable.

**RETURN OF UNIVERSITY PROPERTY**

Before leaving the university, the student must return, in good condition, all ROTC and AFROTC property and any other university properties that he or she may have used during the year. The ROTC and AFROTC property custodians will send a written notice to all students who do not return property. If the property is not returned within 30 days of notification, the individual's name will be forwarded to the Registrar. The value of any property that has been lost, damaged or not returned will be deducted from the total of his or her deposits.

The University will retain all fees and deposits not claimed by the end of the second semester of the academic year following payment. All books and/or library materials should be returned to the Library. If any of these materials are overdue, fines should also be paid. Failure to comply with these regulations will cause the student to be included in the Finance Department Debtor's List.



## ACADEMIC INFORMATION

### GRADUATE STUDIES PROGRAMS AT UPRM

Study within the graduate studies at UPRM leads to the degrees of Master of Arts, Master of Business Administration, Master of Engineering, Master of Science, or Doctor of Philosophy. The departments and programs of study are as follows:

#### **Master of Arts**

in Hispanic Studies and English Education.

#### **Master of Business Administration**

in Human Resources, Industrial Management, Finance, and Marketing, besides a general option.

#### **Master of Engineering**

in Chemical, Civil, Computer, Electrical, Industrial, Management Systems, and Mechanical Engineering.

#### **Master of Science**

in Agricultural Economics, Agricultural Education, Agronomy, Animal Industry, Crop Protection, Extension Education, Food Science and Technology, Horticulture, and Soil Study.

in Biology, Chemistry, Geology, Marine Sciences with the following programs: Biological Oceanography, Physical Oceanography, Geological Oceanography and Chemical Oceanography, Mathematics, Pure Mathematics, Statistics, Scientific Computing, and Physics.

in Chemical, Civil, Computer, Electrical, Industrial, and Mechanical Engineering.

#### **Doctor of Philosophy**

in Marine Sciences, Applied Chemistry, Chemical Engineering, Civil Engineering, and Computing and Information Sciences and Engineering.

A Master of Science degree in Nursing is available through a consortium with the School of Medical Sciences of the University of Puerto Rico.

### PHILOSOPHY AND OBJECTIVES

The fundamental objective of the graduate programs at UPRM is to develop in the graduate student a mastering knowledge of a particular field of study and of the resources and techniques which will enable each student to carry out independent and professional work or research in the arts, sciences, engineering or technology. Since the graduate programs are primarily responsible for the education of future college and university professors, all graduate programs stress the importance of attaining a high level of scholarship.

Additional objectives of the programs are:

1. To extend the boundaries of knowledge through research which contributes to the development of the student, the university, and the social and technological community.
2. To preserve, acquire and transmit knowledge to successive generations.
3. To serve as a focus for research and teaching in the Caribbean, with the recognition of Puerto Rico's unique position as a crossroad of the Americas.

### Graduate Studies Organization

Graduate studies at the Mayagüez campus are organized around four basic units:

- Office of Graduate Studies
- Graduate Council
- Departmental Graduate Committee
- Student's Graduate Committee

The functions and responsibilities of these units are described below.

#### **Office of Graduate Studies**

The Office of Graduate Studies is an academic and administrative unit within the Deanship of Academic Affairs. The office sees that all academic and administrative regulations at the graduate level are followed, coordinates graduate activities, and insures that proper guidance is provided to all academic units which offer graduate programs and related units.

The Director of Graduate Studies, who is also an Associate Dean of Academic Affairs, chairs this office. An Associate Director collaborates in all duties assigned by the Director.

In addition to the usual administrative duties, the Director presides over the Graduate Council, schedules final dissertation, thesis or project examinations, and participates in such exams personally or through the designation of a representative.

### **The Graduate Council**

The Graduate Council is composed of representatives from all academic units which offer graduate programs. The Council is composed by the Director and Associate Director of Graduate Studies, the Dean (or representative) of each college sponsoring graduate programs, a representative of each Departmental Graduate Committee, and a representative of the graduate students of each college.

The Council acts as an advisory board to the Office of Graduate Studies. Its main duties include:

- Serve as forum for the discussion of all matters pertaining to graduate studies.
- Make recommendations on the administration and regulations involving graduate studies.
- Evaluate and decide on regulations which a department submits for its own program.
- Evaluate and decide on those administrative and academic decisions of its jurisdiction.

### **The Departmental Graduate Committee**

The Departmental Graduate Committee consists of at least three members, including the Director of the Department, who usually presides it. In multidisciplinary programs, it includes representation from each department involved.

The functions and responsibilities of the committee include:

- Formulation of complementary regulations.
- Evaluation of applications for admission, readmission, and transfer.
- Accreditation of courses taken in other institutions or prior to admission to the Mayagüez Campus.
- Preparation of qualifying and comprehensive examinations with the assistance of qualified faculty.

- Promotion and periodic evaluation of graduate programs.

### **The Student's Graduate Committee**

The committee consists of three to five members in Master's programs and four to six members in Doctoral programs. The chairperson of the department appoints the student's committee considering the student's interests and those of the faculty. The committee is presided by the student's thesis advisor.

This committee is responsible for:

- Preparing or changing the student's plan of study.
- Revising and approving the student's dissertation, thesis, or project proposal.
- Directing studies and research until the student completes the degree.
- Revising and approving the dissertation, thesis, or project report and its oral defense (if included in the student's program).

### **The Graduate Advisor**

The student's graduate advisor must hold an academic degree equal to or higher than the degree sought by the student. The graduate advisor's responsibilities include:

- Informing the student of regulations and procedures related to graduate studies.
- Overseeing, in consultation with the student and the student's committee, the preparation of the student's plan of study.
- Revising and approving the dissertation, thesis, or project proposal, and recommending changes.
- Meeting regularly with the student to evaluate academic progress, research and/or project development.
- Providing adequate resources to carry out research.
- Verifying that other members of the graduate committee collaborate efficiently.

### The Representative of Graduate Studies

The representative of graduate studies is a professor or professional who represents the Director of Graduate Studies in the oral examination of the dissertation, thesis, or project report. This person must belong to a department or program different from the student's. The representative oversees the examination of the dissertation, thesis, or project report and ensures that it takes place according to regulations. The representative participates in the administration, evaluation and decisions concerning the exam, and makes corrections and changes to improve the final document.

### Application Procedure

A candidate for admission to graduate studies must file an application form with the Office of Graduate Studies. Three letters of recommendation, three official transcripts of the student's academic record at every institution of higher education attended, and the application fee complete the application. Application forms and credentials should be sent to: Director, Office of Graduate Studies, P.O. Box 9020, University of Puerto Rico, Mayagüez Campus, Mayagüez, Puerto Rico 00681-9020. Applications should be completed before **February 15** for admission in the first semester, and before **September 15** for admission in the second semester.

### Admission

Admission to graduate studies requires the favorable recommendation of the Departmental Graduate Committee. The department forwards its recommendation to the Director of the Department for his approval and to the Director of the Office of Graduate Studies for final action.

### Academic Requirements

General requirements for admission to graduate studies include:

1. Holding a bachelor's degree from the University of Puerto Rico or an equivalent degree from an accredited institution.
2. Having a working knowledge of Spanish and English, as determined by the corresponding academic program.

3. Satisfying one of the following academic index requirements:
  - (a) a minimum graduation 2.50 GPA
  - (b) a minimum 3.00 GPA in the area of specialization
  - (c) approved a minimum of 60 credit hours during the last five semesters of the bachelor's program with a 3.00 GPA or better
4. Satisfying all department requirements, which may include, but are not limited to, holding a bachelor's degree in an area of specialization, having a grade point average higher than 3.00, and having approved courses in specific subjects.

Detailed regulations are available in the departmental sections of this catalogue.

Applicants who do not meet the academic index requirements listed under (3) above, but who have practiced their profession for a minimum of three years, may be considered for regular admission if they obtain admission as a non-degree student and approve, with at least a 3.00 G.P.A., a minimum of nine credits in advanced undergraduate and/or graduate courses during the first three semesters following admission. Up to nine credits approved under this provision may be credited towards a degree if the applicant is admitted as a graduate student.

Meeting the above requirements does not automatically grant admission. Candidates are selected on a competitive basis from among those who apply and satisfy the requirements.

### Readmission

Students in good standing who have voluntarily interrupted their studies and desire to continue study must apply for readmission. The application must be filed at the Registrar's Office before the deadline established in the official academic calendar. The student will pay a non-refundable fee of thirty-three dollars (\$33.00). The Registrar processes each application through the Departmental Graduate Committee, the Dean of the College, the Director of Graduate Studies, and notifies the applicant of the action taken. Readmission is granted only once.

## STUDENT CLASSIFICATION

Graduate students at UPRM are classified according to

- **admission status**
- **academic load**
- **academic status**

### Admission Status

A student in **Full Standing** is one who at the time of admission satisfies all requirements and is admitted unconditionally.

A student in **Conditional Standing** is one who at the time of admission satisfies all requirements except for some deficiencies in undergraduate courses. Full-standing status can be granted if the student approves deficiencies within the first two years of study. The maximum numbers of deficiencies are four courses which must be approved with a grade of C or better while maintaining a grade point average of 3.00 or better in the deficiencies.

A **Professional improvement** student is one who does not seek a graduate degree, but desires to take advanced undergraduate or graduate courses for academic or professional benefit. Up to 12 credits of advanced undergraduate or graduate courses approved under this classification may be used to satisfy degree requirements if the student is admitted as a full or conditional-standing student.

A **Visiting student** is one registered in another university and who visits the Mayagüez Campus to participate in a research project. Up to 12 credits of advanced undergraduate or graduate courses approved under this classification may be used to satisfy degree requirements if the student is admitted as a full or conditional-standing student.

A **Special student** is a faculty member in active duty of the UPR system who wishes to take courses at the UPR campuses. Certification number 108 (2005-2006) of the Board of Trustees (<http://www.certificaciones.upr.edu>), establishes the regulations for the authorization for studies for the faculty members of the UPR system in active duty.

### Academic Load

A **Regular** or **Full-time** student is one who takes at least nine advanced undergraduate or graduate credits per semester, who is registered for dissertation, thesis, or project, or who participates in the COOP Plan.

An **Irregular** or **Part-time** student is one who does not meet the academic load requirements of a regular student.

### Academic Status

A student on **Probation** is one whose grade point average drops below 3.00 or receives a non-satisfactory (NS) grade for dissertation, thesis research, or project. Increasing the grade point average to 3.00 or above, or receiving a satisfactory (S) grade in research or project, removes the probation status. Incurring on probation for a third time will lead to academic dismissal from graduate studies. Suspended students may apply for a second and final admission to graduate studies after one year of suspension.

A student in **Good Standing** is one who is not on probation.

## GRADES

**The Grading System** is as follows: A, excellent; B, satisfactory; C, approved; D or F, failed; W, authorized withdrawal; I, incomplete (does not carry a provisional grade); S, satisfactory; NS, not satisfactory. Incompletes must be removed during the term following the one in which the course was registered; otherwise an F will be posted. The Academic Index or grade point average is computed as a weighted average (by credit) using these point equivalencies A=4, B=3, C=2, D=0, F=0. Courses with an incomplete grade are not included. Credit for thesis research or project is not given until the thesis or report is approved. A graduate grade point index of 3.00 is considered satisfactory and it is the minimum required for graduation.

## GRADUATE COURSE NUMBERING SYSTEM

Advanced undergraduate courses are codified in the 5000's. Graduate courses are codified with a numbers between 6000 and 8999. Courses codified between 8000 and 8999 are intended for the doctoral level.

### ALPHABETICAL DISCIPLINE CODES

ADMI	BUSINESS ADMINISTRATION
AGRO	AGRONOMY
ASTR	ASTRONOMY
BIOL	BIOLOGY
BOTA	BOTANY
CIIC	COMPUTER AND INFORMATION SCIENCES AND ENGINEERING
CIMA	MARINE SCIENCES
CITA	FOOD SCIENCE AND TECHNOLOGY
CMOB	MARINE SCIENCES BIOLOGICAL OCEANOGRAPHY
CMOF	MARINE SCIENCES PHYSICAL OCEANOGRAPHY
CMOG	MARINE SCIENCES GEOLOGICAL OCEANOGRAPHY
CMOQ	MARINE SCIENCES CHEMICAL OCEANOGRAPHY
COMP	COMPUTER SCIENCE
CONT	ACCOUNTING
ECAG	AGRICULTURAL ECONOMICS
ECON	ECONOMY
EDAG	AGRICULTURAL EDUCATION
EING	ENGLISH EDUCATION
ESHI	HISPANIC STUDIES
ESMA	MATHEMATICAL STATISTICS
ESTA	STATISTICS
EXAG	AGRICULTURAL EXTENSION
FINA	FINANCE
FISI	PHYSICS
GEIN	INDUSTRIAL MANAGEMENT
GEOL	GEOLOGY
GERE	MANAGEMENT
GERH	HUMAN RESOURCES MANAGEMENT
HORT	HORTICULTURE
INCI	CIVIL ENGINEERING
INEL	ELECTRICAL ENGINEERING
INGL	ENGLISH
ININ	INDUSTRIAL ENGINEERING
INME	MECHANICAL ENGINEERING
INPE	ANIMAL INDUSTRY
INQU	CHEMICAL ENGINEERING
MATE	MATHEMATICS

MECU	QUANTITATIVE METHODS
MERC	MARKETING
PROC	CROP PROTECTION
QUIM	CHEMISTRY
SICI	COMPUTERIZED INFORMATION SYSTEMS
ZOOL	ZOOLOGY

### Course Offerings

**I=course usually offered during the first semester**

**II=course usually offered during the second semester**

**S=course usually offered during a summer session**

### PLAN OF GRADUATE STUDY

Although there are a number of core courses required in some programs, there are no specific curricula. The student's Plan of Graduate Study will be prepared by the committee while taking into consideration the student's individual needs. This plan must be approved by the president of the Departmental Graduate Committee and submitted to the Registrar's Office during the student's second semester of graduate work.

### PROPOSAL

Graduate students pursuing a degree in which a dissertation, thesis, or project is required must submit a proposal describing goals, objectives, previous work, justification, and proposed work. This document must be completed before the student is registered for dissertation, thesis, or project credit for a second time.

## **GENERAL ACADEMIC REGULATIONS**

### **Academic Load**

The maximum academic load is eighteen credits during the academic semester and six credits during the summer. Class attendance is compulsory.

### **Academic Residence**

Studying two academic semesters and approving 60 percent of the courses at the Mayagüez campus satisfies residence requirements for the Master's degree. Studying four academic semesters and approving 60 percent of the courses at the Mayagüez campus satisfies residence requirements for the doctoral degree.

### **Validations**

Graduate courses approved in other universities or validated by the Departmental Graduate Committee can be part of the graduate student's plan of studies if the courses were not used as requirements for the student's bachelor degree. The number of validated courses cannot be in conflict with the academic requirements established in the Mayagüez Campus.

### **Transfer**

A student in good standing may apply once for transfer to another department within the Mayagüez Campus during the period described in the official academic calendar. The student will pay a non-refundable fee of twenty (\$20.00) dollars. The department will send its recommendation to the Director of the Department for approval and to the Director of Graduate Studies for final action. Only students with an academic index of at least 3.00 will be considered.

### **Repetition of Courses**

Courses not approved may be repeated without restriction. The repetition of courses approved with C requires the approval of the faculty dean.

### **Withdrawal from Courses**

Graduate students should avoid withdrawing from courses, but can do so during the period prescribed in the official academic calendar.

### **Withdrawal from the University**

A student may withdraw completely from the Mayagüez campus at any time until the last day of classes. The student must obtain written permission from the Dean of the College and the Director of Graduate Studies. The Registrar will post a "W" in every course for the applicable semester. Any student intending to continue graduate work who has withdrawn from Graduate Studies may apply once for readmission during the period prescribed in the official academic calendar.

### **Academic Dismissal**

A graduate student may be dismissed from the graduate school if any of the following conditions occur:

1. During the first two years of study, deficiency courses indicated in the conditional admission are not approved or are approved with a grade point average lower than 3.0.
2. He/She is placed on probation three times.
3. Fails for the second time any of the required degree examinations.
4. Fails to satisfy all requirements for a Master's degree within six academic years after being admitted.
5. Fails to satisfy all requirements for a doctoral degree within ten academic years if admitted with a bachelor's degree, or within eight academic years if admitted with a Master's degree.



## REQUIREMENTS FOR THE MASTER'S DEGREE

At UPRM, there are three options in programs leading to a Master's degree. Applicants should seek information on the program of interest in order to best determine available options.

In all cases, the student shall approve all courses in the Plan of Graduate Study with an academic index of at least 3.00. Graduate courses approved by the student as a senior in the Mayagüez Campus may be accepted as long as these were not utilized to satisfy Bachelor's degree requirements.

Students must inform the Registrar in writing of their intention to use a course as part of their Plan of Graduate Study. The last day to notify the Registrar is the last day to submit the application for graduation from the bachelor's degree. The student must also comply with the established academic residence requirements.

### PLAN I. With Thesis Requirement

In addition to the common requirements stated above, the student shall:

1. Approve all the courses in the Plan of Graduate Study with a 3.0 minimum graduate point average and:
  - (a) A minimum of 30 credits in advanced undergraduate courses and graduate courses.
  - (b) Up to nine credits in advanced undergraduate courses.
  - (c) Up to six credits in thesis research.
  - (d) A minimum of six credits in courses related to, but outside the area of interest.
2. Carry out a research program, as specified in the Plan of Graduate Study and prepare a thesis.
3. Approve an oral exam on the thesis subject. If the student fails the exam, the student will have the opportunity to take a second exam during the same semester or in the following one. The result of the second exam is final.

### PLAN II. With Project Requirement

In addition to the common requirements stated above, the student shall complete specific requirements in PLAN I's description, except that all work completed will lead to a project report instead of a thesis. An oral exam on the

project will also be required. If the student fails the exam, a second exam will be taken in the same semester or in the next one. The result of the second exam is final.

### PLAN III. Without Thesis or Project Requirements

In addition to the common requirements stated above, the student shall:

1. Approve all courses in the Plan of Graduate Study as follows:
  - (a) A minimum of thirty-six credits in advanced undergraduate and graduate courses.
  - (b) A minimum of twenty-seven credits at the graduate level.
  - (c) A minimum of twenty-one credits in the major field of study.
  - (d) A minimum of six credits in courses related to, but outside the area of specialization. Courses within the area of specialization will be used to satisfy this requirement only when there are two or more distinct and well-defined areas.
2. Pass a written examination on the material covered in courses taken within the area of specialization. In the event of failure, the student may take a second exam during the same semester or in the following one. The result of the second exam is final.

## REQUIREMENTS FOR THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy degree is conferred for distinguished scholarly attainment and original contribution to knowledge.

To qualify for the degree, the student shall:

1. Approve a qualifying examination.
2. Approve all the courses in the Plan of Graduate Study with an academic index of at least 3.00.
3. Comply with the academic residence requirements.
4. Pass a comprehensive examination on the courses included in the academic program. The exam may be written, or written and oral. If the student fails, a second exam may

be taken later that semester or in the following semester. The result of the second exam is final.

5. Carry out an independent research project which will produce a significant contribution to the advancement of knowledge, and write a dissertation. The dissertation should be a scholarly presentation suitable for publication.
6. Pass a final oral exam on the research and dissertation. If the student fails, a second exam may be taken later during the same semester or in the one that follows. The result of the second exam is final.
7. Approve all courses in the Plan of Graduate Study as follows:
  - (a) Up to nine advanced undergraduate courses.
  - (b) Up to eighteen credits in thesis research.
  - (c) A minimum of nine credits outside the field of specialization but in related areas.
8. Credits approved before admission to the PhD program may be awarded upon recommendation of the departmental graduate committee, as long as the student meets residence requirements. Master's thesis, or Master's project research will not be awarded credit.

## FINAL EXAMINATION

The final thesis exam takes place after the student has satisfied all other requirements for the degree, except for any courses in which the student is registered at the time. No exam will take place after the last day of classes. The exam should last at least two hours but no more than four.

The examining committee consists of the student's committee and a representative of the Director of Graduate Studies. It will be presided by the student's advisor. All corrections to the thesis or report should be completed within the time period specified by the committee. Such period shall not extend beyond the last day of school of the semester immediately following the day the exam was taken.

## Additional Graduation Requirements

In addition to the requirements specified in the section on general academic regulations, the student must:

1. Satisfy all financial obligations to the University of Puerto Rico, Mayagüez Campus.
2. File an application for the degree at the Registrar's Office before the deadline established in the official academic calendar.
3. Receive recommendation for the degree by the Faculty.
4. Attend Commencement Exercises, unless excused by the Registrar's Office.

## GUIDE FOR THE PREPARATION OF PROPOSALS, DISSERTATIONS, THESES, AND PROJECT REPORTS

A guide for the preparation of proposals, dissertations, theses, and project reports can be found in the Office of Graduate Studies web page at <http://grad.uprm.edu/normastesis.htm>. The student's graduate committee and/or the departmental graduate committee can define the specific format to be followed by the student.

## COLLEGE OF AGRICULTURAL SCIENCES

The College of Agricultural Sciences is the unit within the Mayagüez Campus where formal teaching, research, and extension in agricultural sciences are integrated. The three functions are mutually complementary and are under a central scheme of a three-dimensional organization that includes the Faculty of Agricultural Sciences, the Agricultural Experiment Station, and the Agricultural Extension Service.

University teaching in the field of agriculture began formally in Puerto Rico in 1911 with the establishment of the College of Agriculture at Mayagüez. Graduate instruction in agricultural sciences began in 1963-64 with the approval of the Master of Science degrees in Agricultural Economics, Agricultural Education, Agricultural Extension, Horticulture, Animal Science, Agronomy and Soils Science, through Certification No. 8 of the Council on Higher Education. A program leading to the M. S. in Crop Protection was approved in 1981-82, and in Food Science and Technology in 1990-91.

The Agricultural Experiment Station was originally established in 1910 as a private entity of the Sugar Producers' Association of Puerto Rico. In 1914 it was transferred to the Government of Puerto Rico. With the Jones Act of 1917, the Agency became part of the Department of Agriculture and Labor and it was given the name "Insular Experiment Station". In 1933, and in accordance with Joint Resolution No. 3 of the Legislature of Puerto Rico, the Experiment Station was transferred to the University of Puerto Rico.

The Agricultural Extension Service, established in Puerto Rico in 1934, was made possible by an understanding between the United States Department of Agriculture and the University of Puerto Rico.

The College of Agricultural Sciences was created in accordance with Public Law No. 1, approved on January 20, 1966, known as the University Law, and Certification No. 13 of the Council of Higher Education, dated September 11, 1968, integrating within the Mayagüez Campus the formal teaching, research,

and extension in agricultural sciences. A management team, composed of the Dean and Director of the College of Agricultural Sciences, the Associate Dean of the Faculty of Agricultural Sciences, the Associate Dean and Deputy Director of the Agricultural Experiment Station, and the Associate Dean and Deputy Director of the Agricultural Extension Service, provides direction for the plans and programs of the College, in accordance with Certification No. 174 of the Council of Higher Education, dated September 24, 1980.

The Office of International Programs adds a dimension of hemispheric cooperation to the College of Agricultural Sciences. Through this office, the College coordinates short course offerings to international participants and trainees; facilitates short term technical assistance to institutions in developing nations; sponsors international graduate student programs; and provides logistic support for faculty exchange and internship programs in tropical agriculture.

The Mayagüez Campus is one of two Land-Grant universities in the tropics and the only one where Spanish is the native language (although the English language is also used extensively). The Campus provides a unique setting and, to some extent, is in a privileged position to serve as an international center for studies, training, and research in the fields of agricultural sciences. At the Graduate level, the Faculty of Agriculture offers study programs leading to the Master of Science degree in Animal Industry, Agricultural Economics, Agricultural Education, Agricultural Extension, Agronomy, Soils, Crop Protection, Food Science and Technology, and Horticulture.

Besides the library, laboratories, and farm facilities for research at the Mayagüez Research Center, facilities are also available at the Río Piedras Research Center and at the six research substations located at different geographic regions of Puerto Rico. The USDA Tropical Agriculture Research Station (TARS), adjacent to the Mayagüez Campus, offers technical assistance and makes available to the graduate students its Library and other physical facilities for research.

## AGRICULTURAL ECONOMICS

The Department of Agricultural Economics and Rural Sociology offers a program leading to the degree of Master of Science in Agricultural Economics.

In addition to the admission requirements of the Office of Graduate Studies, a Bachelor's degree in Agricultural Economics or its equivalent is required. There are no specific program requirements above those of the Office of Graduate Studies. All students are required to conduct an original research and to write a thesis. A strong knowledge of macroeconomics, microeconomics, and quantitative methods is needed for every candidate willing to pursue the degree.

It is possible for students to focus their thesis research on the department's research projects. Research facilities of the Agricultural Experiment Station are available to students.

The program includes course offerings and research opportunities in the following areas: Agricultural Production Economics, Farm Management, Marketing, Natural Resource Economics, Global Marketing and others.

### AGRICULTURAL ECONOMICS (ECAG)

#### Advanced Undergraduate Courses

**ECAG 5006. FEASIBILITY STUDIES AGRICULTURAL ENTERPRISES.** Three credit hours. Three hours of lecture per week. Prerequisites: ECAG 4019 or authorization of the Director of the Department.

To develop the necessary skills to complete a feasibility study of the establishment and development of agricultural enterprises, considering the conceptual, technical, environmental, marketing and economic feasibility.

#### Graduate Courses

**ECAG 6601. RESOURCE ECONOMICS.** Three credit hours. Three hours of lecture per week.

Analysis of problems in the development and management of natural resources. Emphasis on

natural resources in agriculture and their impact in economic development. Economic principles involved in efficient utilization of natural resources, such as water, land, sea and forest.

**ECAG 6604. ADVANCED FARM MANAGEMENT (On demand).** Three credit hours. Three hours of lecture per week.

Analysis of situations and problems related with management of farm businesses. Includes study and analysis of methods of collecting and analyzing farm data; marginal analysis and budgeting techniques; and managerial concepts as they apply to all levels of decision-making.

**ECAG 6611. ECONOMICS OF AGRICULTURAL PRODUCTION (On demand).** Three credit hours. Three hours of lecture per week.

Economic analysis of agricultural production. Includes the study of production and cost functions; input-output analysis; and the decision-making process necessary for a proper utilization of resources.

**ECAG 6631. ADVANCED AGRICULTURAL MARKETING (I) (Even numbered years).** Three credit hours. Three hours of lecture per week.

A comprehensive advanced study of the field of agricultural marketing.

**ECAG 6635. GLOBAL AGRIBUSINESS MARKETING.** Three credit hours. Three hours of lecture per week.

Analysis of the different marketing strategies used by agribusiness organizations in the global market.

**ECAG 6641. AGRICULTURAL DEVELOPMENT (On demand).** Three credit hours. Three hours of lecture per week.

Study and analysis of the factors that influence the process of transformation and development of the agricultural sector of the economy, emphasizing those of an economic nature. Emphasis is given to the situation presented by an economy in full process of development. The interrelationships of the agricultural sector with other sectors of the economy are examined and analyzed.

**ECAG 6650. ECONOMICS OF AGRICULTURAL POLICY.** Three credit hours. Three lectures per week.

General comprehensive study of the formulation and implementation of policy for the agricultural sector of the economy, with major emphasis on the economic aspects. Reference is made to specific aspects of policy, especially in Puerto Rico and the United States.

**ECAG 6654. RURAL SOCIOLOGY PROBLEMS.** Three credit hours. Three lectures per week.

The application of sociological theories to the analysis of rural social problems; investigation of factors detrimental to community development and human welfare.

**ECAG 6660. AGRICULTURAL PRICES (II)** (Even numbered years). Three credit hours. Three hours of lecture per week.

A cross-sectional analysis of the factors affecting demand and product prices, study of empirical techniques of economic model building and interpretation and of forecasting.

**ECAG 6665. APPLIED ECONOMETRICS I.** Three credit hours. Three hours of lecture per week.

Use of econometrics in the agricultural economics problems and its application in production, price and consumption models.

**ECAG 6990. SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR COOP STUDENTS.** From three to six credit hours. Only three credits will be considered within the minimum of the required 30 credits for the graduate program.

Practical experience in Agricultural Economics and Agribusiness Management in cooperation with the private sector or government. To be jointly supervised by the academic department, the Coop program coordinator, and an official from the cooperating entity. A written report will be required upon completion of each work period.

**ECAG 6995. SPECIAL PROBLEMS IN AGRICULTURAL ECONOMICS.** Two to six credit hours. One to three research periods per week.

This course provides for study in any phase of Agricultural Economics in which the student is especially interested. Individual problem method.

**ECAG 6997. SELECTED TOPICS (On demand).** One to three credit hours. Prerequisite: authorization of the Director of the Department.

Selected topics in agricultural economics such as economic evaluation of agricultural projects, agricultural law, environmental economics, agricultural finance and others.

**ECAG 6998. SELECTED TOPICS (On demand).** One to three credit hours. Prerequisite: authorization of the Director of the Department.

Selected topics in agricultural economics such as economic evaluation of agricultural projects, agricultural law, environmental economics, agricultural finance and others.

**ECAG 6999. RESEARCH IN AGRICULTURAL ECONOMICS (I, II, S).** One to six credit hours. One to six research periods per week.

Organized research in Agricultural Economics on a Master's thesis level, including thesis presentation and discussion as part of the requirements for a Master of Science degree with a major in Agricultural Economics.

## AGRICULTURAL ECONOMICS FACULTY

A list of professors who engage in graduate activities in the Department follows, including the highest earned degree, date, and institution granting the degree. Research and teaching interests are also included.

**CARMEN I. ÁLAMO-GONZÁLEZ**, *Associate Professor* (Agricultural Economics), M.S., 1988, University of Puerto Rico, Mayagüez Campus. Research and Teaching interest: Agricultural Economics.

**VIVIAN CARRO**, *Professor*, M.A., 1976, University of London. Research and Teaching interest: Rural Sociology.

**MYRNA COMAS-PAGÁN**, *Associate Professor*, M.S., 1990, University of Puerto Rico. Research and Teaching interests: Farm Management and Agricultural Marketing.

**MILDRED CORTÉS-PÉREZ**, *Associate Professor* (Economics), M.A., 1995, University of Puerto Rico, Río Piedras Campus. Research and Teaching interest: General Economics.

**EDNA DROZ**, *Associate Professor*, M.A., 1962, University of California, Stanford. Research and Teaching interest: Rural Sociology.

**JORGE FERNÁNDEZ-CORNEJO**, *Adjunct Professor (Agricultural Economics)*, Ph.D., 1990, University of Delaware. Teaching interest: Agricultural Economics.

**GLADYS GONZÁLEZ**, *Professor*, Ph.D., 1984, University of Missouri. Research and Teaching interests: Natural Resources Economics, Land Use, Production Economics.

**JORGE A. GONZÁLEZ**, *Professor*, Ph.D., 1986, University of Missouri, J.D., 1995, Pontifical Catholic University of Puerto Rico. Research and Teaching interests: Agricultural Marketing and Agribusiness.

**ALWIN J. JIMÉNEZ**, *Associate Professor (Agribusiness)*, M.S., 1995, University of Puerto Rico, Mayagüez. Research interest: Finance and Agribusiness.

**JOSÉ E. MARTÍNEZ**, *Assistant Professor (Rural Sociology)*, Ph.D., 2004, University of Massachusetts, Amherst, MA. Research and Teaching interest: Rural Sociology.

**MADÉLINE MENDOZA-MALDONADO**, *Professor (Economics)*, M.S., 1988, University of Puerto Rico, Río Piedras Campus. Research and Teaching interest: General Economics.

**JUAN ORTIZ-LÓPEZ**, *Associate Professor*, M.S., 1986, University of Puerto Rico. Research and Teaching interests: Agricultural Economics.

## AGRICULTURAL EDUCATION

The Department of Agricultural Education offers programs leading to a Master of Science degree with emphasis in Agricultural Education and Extension Education. In addition to the admission requirements of the Office of Graduate Studies, a Bachelor of Arts in Home Economics, a Bachelor of Science degree in Agricultural Education, in Agriculture, in Home Economics or its equivalent is required.

The minimum course work required for the Master of Science degree is 30 credits, including three research credits. Candidates for the Master of Science degree are required to prepare and present a thesis.

Graduate programs include the following areas: Teaching Methods, Farming Programs, Evaluation, Curriculum Designs and Construction, Adult Education, Program Planning, Organization and Administration in Education, Community Organization, Communication and Supervision.

## AGRICULTURAL EDUCATION (EDAG)

### Graduate Courses

**EDAG 6601. ADVANCED METHODS IN TEACHING VOCATIONAL AGRICULTURE.** Three credit hours. Three hours of lecture per week.

A comparative study of teaching methods and techniques.

**EDAG 6602. FARMING PROGRAMS.** Three credit hours. Three hours of lecture per week.

Study of farming programs at the all-day, young and adult farmer's level, with special emphasis on farm management, financing, recording and evaluating.

**EDAG 6603. EVALUATION.** Three credit hours. Three hours of lecture per week.

Study of the fundamentals of tests and measurements. Emphasis will be given to measures of central tendency and dispersion, measures for comparing differences and the significance of the difference at various confidence levels, interpretation of results, and formulation of plans of action.



**EDAG 6605. TEACHER TRAINING.** Three credit hours. Three hours of lecture per week.

Study of the problems of the rural farm population, with emphasis on youth and adult organizations, such as 4-H Clubs, Future Farmers, and Advisory Councils.

**EDAG 6607. INVESTIGATION PROCEDURES.** Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Assembling, selecting, organizing, interpreting and reporting data pertinent to investigation made in the fields of education and related sciences.

**EDAG 6608. PREPARATION OF TEACHING MATERIAL.** Three credit hours. Three hours of work per week.

The preparation by the students of teaching materials such as samples, specimens, charts, graphs, pictures, slides, job analysis, lesson plans, basic units and enterprise units.

**EDAG 6610. SEMINAR IN AGRICULTURAL EDUCATION.** Three credit hours. Three hours of lecture per week.

A critical study of selected problems in vocational agriculture. Students are requested to make individual investigations and to report on their findings. Some aspects of the work will be conducted through committees.

**EDAG 6611. CURRICULUM DEVELOPMENT.** Three credit hours. Three hours of lecture per week.

The planning of course of study for young and adult farmer groups at a functional level.

**EDAG 6612. ADULT EDUCATION IN VOCATIONAL AGRICULTURE.** Three credit hours. Three hours of lecture per week.

A comprehensive study of the philosophy of this type of instruction, with emphasis on the organization of course content on a long-term basis. Teaching techniques, supervision, evaluation and reporting will be discussed.

**EDAG 6631. ORGANIZATION AND ADMINISTRATION IN VOCATIONAL AGRICULTURE.** Three credit hours. Three hours of lecture per week.

Study of the laws affecting agricultural education, criteria for selection of students, classroom

management, farm management, Future Farmers of America and other phases of the vocational agriculture program.

**EDAG 6671. PROGRAM PLANNING.** Three credit hours. Three hours of lecture per week.

A detailed analysis of the job of the teacher of vocational agriculture, with special emphasis on the development of a sound philosophy of the program of instruction and the work.

**EDAG 6999. RESEARCH IN AGRICULTURAL EDUCATION.** Three to six credit hours. Three to six research periods per week.

The selection by students of topics in agricultural education for individual study; the preparation of designs; the determination of the adequate statistics to use; and the completion of the project.

## AGRICULTURAL EXTENSION (EXAG)

### Graduate Courses

**EXAG 6601. COMMUNITY ORGANIZATION AND LEADERSHIP.** Three credit hours. Three hours of lecture per week.

A study of how the community is organized and how it changes, the relationship of organization and change to work in adult education, community development and Extension work. Special attention will be given to the role of professional leadership in organization and change.

**EXAG 6603. ORAL AND WRITTEN COMMUNICATION.** Three credit hours. One hour of lecture and two three-hour laboratory periods per week.

The learning process and the principles involved in written and oral communication. The course is especially designed for Extension Agents, teachers of Vocational Agriculture, and others interested in improving their teaching abilities. Laboratory practice in the arts of communication is provided.

**EXAG 6610. PRINCIPLES OF EXTENSION TEACHING.** Three credit hours. Three hours of lecture per week.

The theories and principles of teaching and learning, and their application to Agricultural Extension.

**EXAG 6612. PSYCHOLOGY IN EXTENSION EDUCATION.** Three credit hours. Three hours of lecture per week.

The scientific study and interpretation of human behavior; basic psychological principles applied to Extension Education.

**EXAG 6614. ADMINISTRATION AND SUPERVISION IN EXTENSION EDUCATION.** Three credit hours. Three hours of lecture per week.

Theory and principles of personnel administration and supervision in Extension Education.

**EXAG 6620. EXTENSION EVALUATION.** Three credit hours. Three hours of lecture per week.

A study of the principles involved in Extension evaluation, and of adequate methods and processes for measuring and evaluating Extension work according to the results obtained. Questionnaire construction, sampling, interviewing, and analysis and interpretation of data will be discussed.

**EXAG 6622. PROGRAM DEVELOPMENT IN EXTENSION.** Three credit hours. Three hours of lecture per week.

The basic principles, procedures and problems in the process of Extension program development in both agriculture and homemaking.

**EXAG 6628. ADVANCED SEMINAR IN EXTENSION PROBLEMS.** Three credit hours. Three hours of lecture per week.

Study of problems from such fields as administration, supervision, personnel recruitment and training, and scope of programs. Selection will be made in the light of the special interest of seminar members.

**EXAG 6630. PRINCIPLES AND PHILOSOPHY OF ADULT EDUCATION.** Three credit hours. Three hours of lecture per week.

Critical comparison of present day schools of thought on the philosophy and principles of adult education programs; the nature, objectives, and functions of such programs. A term paper is required.

**EXAG 6640. SOCIAL RESEARCH METHODS.** Three credit hours. Three hours of lecture per week.

Methods and theory of investigation as applied to the social sciences. Emphasis is given to the collection, analysis and interpretation of information in connection with special problems of research. The student is required to plan research in his field of interest.

**EXAG 6642. RURAL YOUTH PROBLEMS.** Three credit hours. Three lectures per week.

Study of problems faced during adolescence, such as the adolescent value system, interests, and group life; the relationship of adolescent culture to adult culture; the relationship of the sociology of adolescence to educational programs such as the 4-H Clubs, Vocational Agriculture and the school.

## AGRICULTURAL EDUCATION FACULTY

A list of professors who engage in graduate activities in the Department follows, including the highest earned degree, date, and institution granting the degree. Research and teaching interests are also included.

**SANTIAGO ARIAS**, *Extension Specialist*, M.A., 1986, University of Puerto Rico. Research and Teaching interests: Clubs 4-H, Program of youth organization.

**AURY M. CURBELO-RUIZ**, *Assistant Professor*, Ph.D., 2002, The Ohio State University. Research and Teaching interests: Instructional media design, distance education, research and statistics.

**AMANDA DÍAZ-DE HOYO**, *Associate Extension Specialist*, M.S., 1987, Bridgeport University. Research and Teaching interests: Communication and publication.

**MILDRED FELICIANO**, *Associate Extension Specialist*, Ph.D., 1994, The Pennsylvania State University. Research and Teaching interests: Health and Security Education.

**FRED FERNÁNDEZ**, *Extension Specialist*, M.A., 1979, Virginia Polytechnic Institute and State University. Research and Teaching interests: Food Technology.

**JUAN B. FREMAINT**, *Assistant Specialist*, M.S., 1993, University of Puerto Rico, Mayagüez Campus. Research and Teaching interests: Computer education.

**JOSÉ A. GARCÍA-LUIÑA**, *Associate Specialist*, M.S., 1983, University of Puerto Rico, Mayagüez Campus. Research and Teaching interests: External Resources.

**CARMEN OLGA GÓMEZ**, *Associate Extension Specialist*, M.A., 1999, University of Phoenix. Research and Teaching interests: Children, Youth and Family relations.

**VILMA F. GONZÁLEZ-NOLLA**, *Extensión Specialist*, MPH.N., 1981, University of Puerto Rico, Medical Sciences Campus. Research and Teaching interests: Food and Nutrition.

**JUAN F. GONZÁLEZ-NOLLA**, *Instructor*, M.S., 1985, University of Puerto Rico, Mayagüez Campus. Research and Teaching interests: Extension Education.

**JOSÉ M. HUERTA-JIMÉNEZ**, *Extension Specialist*, Ph.D., 1993, The Ohio State University. Research and Teaching interests: Research, Evaluation, and Rural Development.

**ALAN E. IRIBARREN-SÁNCHEZ**, *Extension Specialist*, M.A., 1998, University of Puerto Rico, Mayagüez Campus. Research and Teaching interests: Clubs 4-H, Program of youth organization.

**ANDRÉS IRIZARRY-CARLO**, *Assistant Extension Specialist*, M.A., 1998, University of Phoenix. Research and Teaching interests: Clubs 4-H, Program of youth organization.

**ADA LAUREANO**, *Associate Specialists*, Ph.D., 2002, University of Puerto Rico. Research and Teaching interests: Administration and supervision programs, adult education, group dynamics and leadership.

**RUTH LEBRÓN**, *Associate Extension Specialist*, M.S., 1991, University of Puerto Rico, Medical Sciences Campus. Research and Teaching interests: Clubs 4-H, Programs of youth organization.

**SILVERIO MONTALVO**, *Extension Specialist*, M.S., 1985, University of Puerto Rico, Mayagüez Campus. Research and Teaching interests: Community Resource Development.

**ANGÉLICA MARTÍNEZ**, *Associate Specialist*, M.A., 2003, University of Phoenix. Research and Teaching interests: Administration and Supervision.

**ANN MACPHERSON**, *Extension Specialist*, Ph.D., 1993, University of Puerto Rico. Research and Training interests: Food and Nutrition, Curriculum Development, Home Economics.

**GLORISSELLE NEGRÓN-RÍOS**, *Associate Specialist*, M.A., 1994, University of Puerto Rico, Medical Sciences Campus. Research and Teaching interests: Community Resource Development.

**DAVID PADILLA-VÉLEZ**, *Professor*, Ph.D., 1993, The Ohio State University. Research and Teaching interests: Agricultural Education, Teacher Education.

**GLORIA PICÓ-ACOSTA**, *Agricultural Agent*, M.S., 1989, University of Arkansas. Research and Teaching interests: General Agriculture.

**ROBERTO L. RIGAU-LLORENS**, *Associate Specialist*, M.A., 1997, University of Phoenix. Research and Teaching interests: External Resource.

**ÁNGELES RODRÍGUEZ**, *Assistant Extension Specialist*, M.A., 1996, University of Puerto Rico. Research and Teaching interests: Audiovisual technology.

**MARÍA DEL C. RODRÍGUEZ**, *Assistant Extension Specialist*, Ph.D., 1997, Cornell University. Research and Teaching interest: Evaluation and Research in the Field.

**LUIS F. SILVA-GUERRERO**, *Professor*, Ph.D., 1988, Cornell University. Research and Teaching interests: Curriculum Development, Higher Education, Developments in International Agricultural Projects, Communications, Microcomputers in Education.

**NOEL TORRES**, *Agricultural Agent*, M.S., 1987, University of Puerto Rico. Research and Teaching interests: Education and Farm Security.

**SANDRA VARELA**, *Assistant Extension Specialist*, M.A., 2003, University of Puerto Rico, Rio Piedras Campus. Research and Teaching interests: Consumer Education.

**JOSÉ A. VILLAMIL-FREYTES**, *Professor*, Ph.D., 1978, University of Connecticut. Research and Teaching interests: Curriculum Development, Supervision, Higher Education and Administration, Multicultural Education, Community Organization and Leadership.

**CARLOS A. VIVONI-REMUS**, *Extension Specialist*, Ph.D., 1991, University of Massachusetts, Amherst. Research and Teaching interests: Communication and distance education.

## AGRONOMY AND SOIL

The Agronomy and Soil Department offers graduate programs leading to a Master's Degree in Agronomy and Soil Science. In addition to the admission requirements of the Office of Graduate Studies, a Bachelor of Science or its equivalent is required, but a degree in Agricultural Sciences is preferred.

Although there are no specific course requirements, most graduate students are expected to take two courses each in seminar and agricultural biometrics. All students are required to undertake a research project, prepare a thesis, and approve an oral exam based on the thesis subject. There are no additional academic requirements above those stated by the Graduate Studies Department.

The Department includes special laboratory facilities at UPRM for the study of nitrogen fixation, soil chemistry, soil physics, soil fertility, plant physiology and plant molecular biology. Other laboratory facilities are located at the Agricultural Experimental Station in Río Piedras. The Department is actively involved in the research areas of nutrient management, soil chemistry, soil physics crop modeling, crop physiology, plant breeding, and plant molecular genetics.

## AGRONOMY (AGRO)

### Advanced Undergraduate Courses

**AGRO 5005. BIOMETRICS (I, S).** Three credit hours. Two hours of lecture and three hours of laboratory per week.

Basic concepts of statistical reasoning applied to problems in agricultural, biological and environmental sciences. Data gathering, graphical description and numerical summarization. Concepts of probability and sampling. Estimation and hypothesis testing, analysis of variance, linear regression and correlation. Students describe and analyze real data sets and use statistical computing programs.

**AGRO 5006. GENESIS, MORPHOLOGY AND CLASSIFICATION OF SOILS (I).** Three credit hours. Three hours of lecture per week. Prerequisite: AGRO 3005 or authorization of the Director of the Department.

Historical development of concepts of soil and systems of soil classification; principles and nomenclature of "Soil Taxonomy"; environmental factors and processes of soil formation; and field study of soil profiles. Field trips are required.

**AGRO 5007. SOIL PHYSICS (I)** (Even numbered years). Three credit hours. Two lectures and one three-hour laboratory per week.

Physical properties of soils, and factors affecting them; soil consistency, structure, water, air, temperature, tillage; evaluation and influence in determination of soil productivity.

**AGRO 5008. SOILS OF PUERTO RICO (II).** Three credit hours. Two hours of lecture and three hours of laboratory per week.

Study of the genesis and distribution of the soils of Puerto Rico, based on environmental conditions; classification of soils using the "Soil Taxonomy" system; evaluation of the morphological, chemical, physical, and mineralogical properties of soils with respect to agricultural and not agricultural uses. Representative soil profiles are studied during field trips.

**AGRO 5010. MANAGEMENT OF NATURAL FORESTS.** Three credit hours. Three hours of lecture per week. Prerequisites: BIOL 3435 or BIOL 3051 or CFIT 3005 or authorization of the Director of the Department.

The study of the composition and structure of the different forest systems of the tropics; wet forest, deciduous forest, conifer forest and mangrove from the stand point of multiple use and sustainability. Field trips required.

**AGRO 5015. CONSERVATION, MANAGEMENT AND DEVELOPMENT OF NATURAL RESOURCES (I)** (Even numbered years). Three credit hours. Three hours of lecture per week. Prerequisite: AGRO 4035 or authorization of the Director of the Department.

Study of concepts, methods and techniques in the conservation, management and development of natural resources, and their effects on environmental quality. Contemporary issues and problems in the management and allocation of natural resources will be discussed.

**AGRO 5501.** AGRICULTURAL BIOTECHNOLOGY (II) (Even numbered years). Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 3062 and (BIOL 3015 or BIOL 3300) and (BIOL 3770 or PROC 4016) or authorization of the Director of the Department.

Biological concepts for biotechnology: enzymes, nucleic acids, genetic transfer mechanisms, operons, plasmids, vectors, cloning, DNA sequencing, monoclonal antibodies, clonal production and hybridization.

**AGRO 5502.** AGRICULTURAL BIOTECHNOLOGY LABORATORY (II) (Even numbered years). One credit hour. One three-hour laboratory per week. Corequisite: AGRO 5501.

Experiments or demonstrations on microbial growth, DNA isolation, embryo transfer, protoplast isolation, tissue culture, plant hybridization, mutagenesis, plasmid isolation, and DNA electrophoresis. Restriction enzymes and other DNA techniques.

### Graduate Courses

**AGRO 6005.** USE OF STATISTICAL COMPUTER PACKAGES IN BIOMETRY. Two credit hours. Two hours of lecture per week.

Use of statistical computer packages in the analysis of experimental data.

**AGRO 6600.** ADVANCED BIOMETRICS (II). Three credit hours. Two hours of lecture and three hours of laboratory per week.

Advanced study of analysis of variance, covariance and multiple regression, design and analysis of experiments applied to research problems in agricultural, biological and environmental sciences. Students design experiments, analyze data and use statistical computing programs. Previous knowledge of basic statistics is required.

**AGRO 6602.** PASTURE CROPS AND MANAGEMENT. Three credit hours. Two lectures and one three-hour laboratory per week.

The relationship of pasture crops to types of rainfall, soils and other environmental factors as they affect the production, conservation, and utilization of forages.

**AGRO 6604.** SOIL-PLANT RELATIONSHIPS (I) (Odd numbered years). Three credit hours. Three hours of lecture per week.

Study of the processes that affect root growth and development, methods of study of such processes, availability of nutrients and factors that affect their movement and absorption; growth as a function of dry matter accumulation, root proliferation and nutrient uptake.

**AGRO 6607.** SOIL CHEMISTRY (I) (Odd numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Chemical composition and properties of soils, chemical processes of weathering, soil solution reaction, chemical properties of clays, and ionic exchanges in soils.

**AGRO 6612.** MANAGEMENT OF TROPICAL SOILS (I) (Odd numbered years). Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Application of principles of soil science in the interpretation and use of recent research relating to problems in the management and production of tropical soils.

**AGRO 6624.** SOIL MINERALOGY (I) (Even numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Identification of the constituent minerals of soils, and their relation to soil classification and agricultural practices.

**AGRO 6651-6652.** SEMINAR (I, II)-(I, II). One credit hour per semester. One research period per week each semester.

Discussion of assigned or selected readings of investigation related to problems in Agronomy, presentation of original work related to research in Agronomy.

**AGRO 6995-6996.** SPECIAL PROBLEMS (I, II, S)-(I, II, S). One to three credit hours per semester. One to three research periods per week each semester.

Advanced studies, investigations and special problems in Agronomy or related fields. Problems or topics will be assigned according to the interests and needs of the individual student.



**AGRO 6997.** SPECIAL TOPICS IN AGRONOMY (I, II, S). One to three credit hours. Prerequisite: authorization of the Director of the Department.

Topics not covered in other courses or specialized studies in the areas of crops and soil sciences.

**AGRO 6998.** SPECIAL TOPICS IN AGRONOMY (I, II, S). One to three credit hours. Prerequisite: authorization of the Director of the Department.

Topics not covered in other courses or specialized studies in the areas of crops and soil sciences.

**AGRO 6999.** RESEARCH (I, II, S). One to six credit hours. One to six research periods per week.

Organized research in crops at the Master's thesis level, including thesis presentation and discussion as part of the requirement for a Master of Science degree with a major in Crops.

### PLANT SCIENCE (CFIT)

**CFIT 5006.** PHYTOREMEDIATION. Three credit hours. Three hours of lecture per week. Prerequisites: (CFIT 4005 or BIOL 3435 and QUIM 3002) or authorization of the Director of the Department.

Advanced undergraduate course where the principles used in Phytoremediation will be discussed. These include the use of vascular plants for the phytoextraction, rhyzofiltration, phytostabilization and phytovolatilization of organic contaminants from the soils and water resources. Phytoremediation offers a permanent solution for removing the contaminants from the environment.

**CFIT 6611.** ADVANCED PLANT BREEDING (II) (Even numbered years). Three credit hours. Three hours of lecture per week.

Types of genetic action in plant breeding, use of the principle of population genetics and quantitative genetics in the improvement of crops; relationship of population structure to the induction of genetic variation and selectivity processes. Application of cytogenetics and polyploid concept to plant improvement.

**CFIT 6644.** ENVIRONMENTAL PHYSIOLOGY (On demand). Three credit hours. Three hours of lecture per week.

Environmental aspects of phytophysiology, including energy, nutrition cycles, pollution, and others.

**CFIT 6645.** ADVANCES IN BIOLOGICAL NITROGEN FIXATION (I) (Odd numbered years). Three credit hours. Two hours of lecture and one hour of seminar per week.

Mechanism by which atmospheric nitrogen is incorporated into plant proteins and modern techniques utilized for its study, organisms capable of fixing nitrogen in a free-living state or in symbiosis with plants, methodology to take advantage of this process in agriculture.

### AGRONOMY AND SOILS FACULTY

A list of professors who engage in graduate activities in the Department follows, including the highest earned degree, date, and institution granting the degree. Research and teaching interests are also included.

**MYRNA ALAMEDA,** *Researcher*, M.S., 1977, University of Puerto Rico, Mayagüez Campus. Teaching and Research interest: Microbiology.

**ALBERTO BEALE-COSIO,** *Professor*, Ph.D., 1979, University of Florida, Gainesville. Teaching and Research interests: Agronomy.

**JAMES SCOTT BEAVER,** *Professor*, Ph.D., 1980, University of Illinois at Urbana. Teaching and Research interests: Plant Breeding.

**LINDA W. BEAVER,** *Professor*, Ph.D., 1981, University of Illinois at Urbana. Teaching and Research interests: Plant Breeding.

**FRIEDRICH H. BEINROTH,** *Professor*, Ph.D., 1965, University of Stuttgart, West Germany. Teaching and Research interests: Soil Classification, Soil Formation, Soil Interpretation.

**SYLVIA CIANZIO,** *Ad Honorem*, Ph.D., 1978, Iowa State University. Teaching and Research interest: Plant Breeding.

**MAGALY CINTRÓN,** *Assistant Professor*, M.S., 2003, University of Puerto Rico, Río Piedras Campus. Teaching and Research interest: Chemistry.

**WINSTON DE LA TORRE,** *Professor*, Ph.D., 1988, North Carolina State University. Teaching and Research interests: Plant Physiology and Plant Biochemistry.



**JOHN ERPELDING**, *Ad Honorem*, Ph.D., 1996, Montana State University. Teaching and Research interests: Plant Breeding and Molecular genetics.

**RICARDO GOENAGA**, *Ad Honorem*, Ph.D., 1986, North Carolina State University. Teaching and Research interest: Crop Physiology.

**WANDA LUGO**, *Associate Researcher*, M.S., 1982, North Carolina State University. Teaching and Research interest: Crop Protection.

**RAÚL E. MACCHIAVELLI**, *Professor*, Ph.D., 1992, Pennsylvania State University. Teaching and Research interests: Statistics, Biometry.

**GUSTAVO MARTÍNEZ**, *Professor*, Ph.D., 1995, Ohio State University. Teaching and Research interest: Soil Chemistry.

**EDWIN MÁAS**, *Ad Honorem*, M.S., 1985, North Carolina State University. Teaching and Research interests: Soil Conservation and Agriculture.

**MIGUEL A. MUÑOZ**, *Professor*, Ph.D., 1988, Ohio State University. Teaching and Research interests: Soil Chemistry and Soil Mineralogy.

**JULIA O'HALLORANS**, *Associate Professor*, Ph.D., 2001, New Mexico State University. Teaching and Research interest: Soil Fertility.

**RAFAEL OLMEDA**, *Extension Specialist*, M.S., 1983, University of Puerto Rico, Mayagüez Campus. Teaching and Research interest: Agronomy.

**CARLOS ORTIZ**, *Professor*, Ph.D., 1993, University of Arkansas. Teaching and Research interest: Plant Breeding.

**JUAN G. PÉREZ-BOLIVAR**, *Associate Professor*, Ph.D., 2000, University of Florida. Teaching and Research interests: Soil Classification, Wetlands.

**TIMOTHY PORCH**, *Ad Honorem*, Ph.D., 2001, Cornell University. Teaching and Research interests: Plant Breeding.

**YAMIL QUIJANO**, *Associate Extension Specialist*, M.S., 1989, University of Puerto Rico, Mayagüez Campus. Teaching and Research interest: Pasture Management.

**LUCAS RAMÍREZ-RAMOS**, *Associate Researcher*, M.S., 1986, University of Puerto Rico, Mayagüez Campus. Teaching and Research interest: Agronomy.

**RAFAEL RAMOS-SANTANA**, *Professor*, M.S., 1984, University of Puerto Rico, Mayagüez. Teaching and Research interest: Pasture Management.

**LUIS E. RIVERA**, *Researcher*, M.S., 1983, University of Puerto Rico, Mayagüez Campus. Teaching and Research interest: Agronomy.

**ELVIN ROMÁN-PAOLI**, *Professor*, Ph.D., 1997, Kansas State University. Teaching and Research interest: Agronomy.

**EDUARDO C. SCHRÖDER**, *Professor*, Ph.D., 1980, North Carolina State University. Teaching and Research interests: Soil Microbiology, Agronomy.

**VÍCTOR SNYDER**, *Professor*, Ph.D., 1980, Cornell University. Teaching and Research interest: Soil Physics.

**DAVID SOTOMAYOR-RAMÍREZ**, *Associate Professor*, Ph.D., 1996, Kansas State University. Teaching and Research interests: Soil Fertility, Nutrient Management.

**RAMÓN I. TORRES-LÓPEZ**, *Professor*, Ph.D., 1993, Texas A&M University. Teaching and Research interests: Plant Genetic and Physiology.

**ELIDE VALENCIA**, *Professor*, Ph.D., 1997, University of Florida. Teaching and Research interest: Pasture and Forage Management.

**SKIP VAN BLOEM**, *Assistant Professor*, Ph.D., 2004, Michigan State University. Teaching and Research interest: Forest Management.

**STEFANIE WHITMIRE**, *Assistant Researcher*, Ph.D., 2003, Michigan State University. Teaching and Research interest: Biogeochemistry.

## ANIMAL INDUSTRY

The Department of Animal Industry offers a program of studies leading to a Master of Science degree in Animal Industry. All applicants must have a Bachelor of Science degree in Agricultural Sciences or in a closely related field. They must meet the requirements for admission set by the Office of Graduate Studies and must conduct a research project and write a thesis on a relevant subject.

The graduate program in Animal Industry is designed to develop research skills in subjects related to food producing animals, including dairy and beef cattle, swine, poultry, rabbits, and small ruminants. Available courses deal with production and management of the most important animal species as well as nutrition, breeding, reproduction, behavior and animal products' processing and manufacturing.

Students accepted to the program are expected to take basic courses in statistics, biochemistry and physiology and complete their course work with elective courses offered by the Department.

Research facilities consist of modern laboratories located on-campus and animal facilities located at research centers and agricultural experiment stations of the College of Agricultural Sciences. New or remodeled facilities for slaughtering poultry, swine and cattle are located at the Lajas Sub-station.

As part of their training, graduate students may apply for an assistantship and acquire some teaching experience while serving as instructors in charge or as an aide in the laboratory sections of certain courses.

### ANIMAL INDUSTRY (INPE)

#### Advanced Undergraduate Courses

**INPE 5346. DAIRY BY-PRODUCTS** (On demand). Three credit hours. Two lectures and one three-hour laboratory per week. Prerequisite: INPE 4008 or authorization of the Director of the Department.

The manufacture of ice cream, cheese, and butter.

**INPE 5347. VETERINARY PARASITOLOGY** (II). Three credit hours. Two hours of conference and three hours of laboratory per week. Prerequisites: INPE 3005, BIOL 4015 or BIOL 3022 or BIOL 3052 or authorization of the Director of the Department.

Morphology, life cycle, and control of farm animals' parasites.

**INPE 5355. ADVANCED BEEKEEPING** (On demand). Three credit hours. Two hours of conference and three hours of laboratory per week. Prerequisite: INPE 4016 or authorization of the Director of the Department.

Commercial Management of apiaries. Including the bees, and the various methods used to obtain honey and wax.

**INPE 5357. SCIENCE AND TECHNOLOGY OF FRESH MEATS** (On demand). Three credit hours. Two hours of lecture and one four-hour laboratory per week. Prerequisite: INPE 4005 or authorization of the Director of the Department.

Principles and practices in the handling, processing and preservation of beef, pork, and poultry meats.

#### Graduate Courses

**INPE 6600. DAIRY CATTLE MANAGEMENT** (II). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Care and management of dairy cattle.

**INPE 6601. ADVANCED ANIMAL BREEDING** (On demand). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Advanced course in population genetics, with special emphasis on quantitative characteristics, breeding and selection of farm animals.

**INPE 6603. MEAT ANIMAL PRODUCTION** (I). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A comprehensive review of recent advances in the research of various phases of meat animal production.

**INPE 6604. ANIMAL NUTRITION** (I). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Physiological mechanisms involved in thirst and appetite; digestion, absorption and utilization of nutrients; respiration and body temperature regulation.

**INPE 6607-6608.** GRADUATE SEMINAR (I, II) (On demand). One credit hour per semester. One meeting per week per semester.

Lectures, discussions, and reports on selected topics in Animal Industry.

**INPE 6609.** ADVANCED DAIRY BACTERIOLOGY (On demand). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

The microbiology of milk and milk products.

**INPE 6611.** RUMINANT NUTRITION (II). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Physiological and biochemical processes of digestion; relation of rumen function to animal response; chemical analyses and nutrient composition and requirements of feedstuffs, primarily forages; in vitro methodology for determining nutrient digestibility.

**INPE 6613.** MILK SECRETION (On demand). Three credit hours. Three hours of lecture per week.

Physiology of milk secretion.

**INPE 6614.** ADVANCED POULTRY PRODUCTION (II). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Commercial poultry farm operation, processing and marketing of poultry products.

**INPE 6615.** ADVANCED SWINE PRODUCTION (I). Three credit hours. Three hours of lecture per week.

Study of the problems of modern swine production and on going research to solve them.

**INPE 6617.** ADVANCED REPRODUCTION (I). Three credit hours. Three hours of lecture per week.

Anatomical, physiological, and pathological processes of reproduction in farm animals. Current concepts in endocrinology and their application in management and control of reproduction. Effect of tropical environment on reproduction.

**INPE 6625.** ANIMAL ENERGY METABOLISM (II). Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Cell structure and its relationship with energy metabolism; concept and types of energy; laws of thermodynamics and their relationship with animal metabolism; energy utilization for different processes; energy requirements of animals; environmental effects on energy metabolism; control systems of energy metabolism; techniques utilized to study energy metabolism.

**INPE 6626.** ANIMAL PROTEIN METABOLISM (I). Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Nutritional and biochemical aspects of animal protein metabolism; digestion and absorption; metabolism of free aminoacids; protein synthesis and turnover; excretion of nitrogenous products; nutritional value of proteins; protein requirements; general features of metabolic and hormonal control.

**INPE 6637.** NEUROENDOCRINE AND CIRCULATORY PHYSIOLOGY. Three credit hours. Three hours of lecture per week.

Study of the processes of the nervous, endocrine and cardiovascular functions with emphasis on cellular control mechanisms in domestic animals.

**INPE 6638.** RENAL, RESPIRATORY AND DIGESTIVE PHYSIOLOGY. Three credit hours. Three hours of lecture per week.

Study of the processes of the renal respiratory and gastrointestinal functions with emphasis in the cellular control mechanisms in domestic animals.

**INPE 6990.** SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR CO-OP STUDENTS. From three to six credit hours. Prerequisites: authorization of the Director of the Department and to be a Coop Plan student. Only three credits will be considered within the minimum of the required 30 credits for the graduate program.

Practical experience in animal management and production and/or animal products in cooperation with the private sector or government. To be jointly supervised by the academic department, the Coop program coordinator and an official from the cooperating entity. A written report will be required upon completion of each work period.

**INPE 6995-6996.** SPECIAL PROBLEMS (I, II, S)-(I, II, S). One to five credit hours per semester. One to five research periods per week each semester.

Advanced studies in animal industry problems and procedures. Problems will be assigned according to experience, interests, and need of the individual student.

**INPE 6997.** SELECTED TOPICS (I,II). One to three credit hours. Prerequisite: authorization of the Director of the Department.

Selected topics in biotechnology, physiology, nutrition, reproduction, animal health and management of domestic species.

**INPE 6998.** SELECTED TOPICS (On demand). One to three credit hours. Prerequisite: authorization of the Director of the Department.

Selected topics in biotechnology, physiology, nutrition, reproduction, animal health and management of domestic species.

**INPE 6999.** RESEARCH AND THESIS (I,II,S). One to six credit hours. One to six research periods per week.

Organized research in Animal Industry at the Master's thesis level, including thesis presentation and discussion as a part of the requirements for a Master of Science degree with a major in Animal Industry.

### ANIMAL INDUSTRY FACULTY

The following is a list of professors who engage in graduate activities in the Department, including the highest earned degree, date, institution granting degree as well as research and teaching interests:

**AMÉRICO CASAS-GUERNICA**, *Associate Researcher*, M.S., 1984, University of Puerto Rico. Teaching and Research interest: Beef Cattle Production.

**DANILO S. CIANZIO-MUJICA**, *Professor*, Ph.D., 1980, Iowa State University. Teaching and Research interest: Beef Cattle Production and Meat Technology.

**ÁNGEL A. CUSTODIO-GONZÁLEZ**, *Associate Professor*, Ph.D., 1983, Texas A&M University. Teaching and Research interest: Animal Breeding and Genetics.

**JOHN A. FERNÁNDEZ-VANCLEVE**, *Professor*, Ph.D., 1986, University of Kentucky. Teaching and Research interest: Reproductive Physiology.

**JORGE GONZÁLEZ-ORTIZ**, *Associate Extension Specialist*, M.S., 1986, University of Puerto Rico. Teaching and Research interest: Swine Production.

**JOSÉ R. LATORRE-ACEVEDO**, *Professor*, Ph.D., 1986, University of Arkansas. Teaching and Research interest: Poultry Production and Physiology, Food Safety.

**CARLOS NAZARIO-PAGÁN**, *Assistant Extension Specialist*, M.S., 1988, North Carolina State University. Teaching and Research interest: Poultry husbandry.

**MELVIN PAGÁN-MORALES**, *Assistant Researcher*, Ph.D., 2002, Michigan State University. Teaching and Research interests: Molecular Genetics & Glow Physiology.

**JOSÉ PANTOJA-LÓPEZ**, *Associate Extension Specialist*, Ph.D., 1994, Ohio State University. Teaching and Research interest: Dairy Science; DHIA Records.

**DANIEL G. PESANTE-ARMSTRONG**, *Professor*, Ph.D., 1985, Louisiana State University. Teaching and Research interest: Apiculture.

**LEYDA PONCE DE LEÓN-GONZÁLEZ**, *Assistant Professor*, Ph.D., 1999, University of Wisconsin-Madison. Teaching and Research interest: Milk and Dairy Products Technology.

**ARIEL RAMÍREZ-RAMÍREZ**, *Associate Extension Specialist*, M.S., 1983, Louisiana State University. Teaching and Research interest: Mastitis and Mechanical Milking.

**PAUL F. RANDEL-FOLLING**, *Researcher*, Ph.D., 1963, Louisiana State University. Teaching and Research interest: Ruminant Nutrition.

**ERNESTO O. RIQUELME-VILLAGRÁN**, *Professor*, Ph.D., 1975, Washington State University. Teaching and Research interests: Animal Nutrition, Rabbit Production.

**EDGARDO R. RIVERA-COLÓN**, *Associate Professor*, D.V.M., 1984, Tuskegee University. Teaching and Research interests: Veterinary Physiology; Swine Production.

**BENJAMIN RIVERA-HERNÁNDEZ**, *Assistant Professor*, D.V.M., 1975, Michigan State University. Teaching and Research interests: Horse Production, Animal Diseases and Parasites.

**AIXA RIVERA-SERRANO**, *Assistant Specialist*, M.S., 1985, University of Puerto Rico. Teaching and Research interest: Beef Cattle Production.

**ABNER RODRÍGUEZ-CARIAS**, *Associate Professor*, Ph.D., 1996, Michigan State University. Teaching and Research interest: Ruminant Nutrition; Microbiology.

**HÉCTOR RODRÍGUEZ-PASTRANA**, *Associate Specialist*, M.S., 1987, University of Puerto Rico. Teaching and Research interests: Small ruminant and rabbit production.

**TEODORO RUIZ-LÓPEZ**, *Professor*, Ph.D., 1993, University of Florida. Teaching and Research interests: Dairy Cattle Nutrition; Forage Utilization.

**CARMEN SANTANA-NIEVES**, *Associate Professor*, Ph.D., 1993, University of Illinois. Teaching and Research interests: Swine Production; Environmental Physiology; Animal Behavior.

**HÉCTOR L. SANTIAGO-ANADÓN**, *Assistant Researcher*, Ph.D., 2002, Virginia Polytechnic Institute and State University. Teaching and Research interests: Poultry Production, Animal Growth.

**VÍCTOR SIBERIO-TORRES**, *Professor*, Ph.D., 1996, Michigan State University. Teaching and Research interests: Swine Production; Non-ruminant Nutrition.

**BERNARDO VALLEJO-ALMEDA**, *Assistant Researcher*, D.V.M., 1985, Louisiana State University. Teaching and Research interests: Reproduction.

**SAÚL WISCOVITCH-TERUEL**, *Assistant Extension Specialist*, M.S., 1985, University of Puerto Rico. Teaching and Research interest: Aquaculture.

## CROP PROTECTION

The Department of Crop Protection offers a program leading to a Master of Science degree in Entomology, Nematology, Phytopathology, and Weed Science.

Applicants must meet the Graduate Studies Office requirements and have a Bachelor of Science degree in Agricultural Sciences or its equivalent. Candidates are expected to have approved undergraduate courses in the main departmental disciplines, soil science and crop production.

The program in crop protection is designed to develop research skills in subjects related to this field. Courses from other departments such as statistics, experimental design, and biology, may be considered for this program.

Laboratories to conduct crop protection research are available to students at Mayagüez and at the Río Piedras Research Center of the Agricultural Experiment Station. Field facilities are available at the College Farm in Mayagüez and at the six sub-stations.

### CROP PROTECTION (PROC)

#### Advanced Undergraduate Courses

**PROC 5005. PHYTOPATHOGENIC FUNGI (I)** (Even numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: PROC 4006 or authorization of the Department Director.

Examination of the most interesting groups of fungi from the phytopathogenic point of view: their taxonomy, nomenclature, morphology, genetics, host-parasite relationship, physiology, and ecology. Distinctive characteristic of specific pathogens. Field trips for collection and observation are required.

**PROC 5006. INSECTS OF TROPICAL CROPS.** Three credit hours. Two hours of lectures and one three-hour laboratory per week. Prerequisite: PROC 4008 or CFIT 4008 or authorization of the Director of the Department.

Major insects affecting tropical crops, their biology and taxonomy; identification of damages in the field as well as in the laboratory; appropriate measures of control.



## Graduate Courses

**PROC 6009-6010. SEMINAR (I, II)-(I, II).** One credit hour per semester. One hour of discussion per week.

Discussion of topics on crop protection including results of research work.

**PROC 6601. PROPERTIES AND ACTIONS OF HERBICIDES.** Three credit hours. Two hours of lectures and one three hour laboratory per week.

Classification and structure of chemicals used in weed control; the action of herbicides and their effects on the morphology and internal mechanisms of plants; physiological processes affected by herbicides, and edaphic and climatic factors influencing the performance of weed killers.

**PROC 6603. METHODS OF RESEARCH IN PATHOLOGY (II)** (Odd numbered years). Four credit hours. Two hours of lecture and two laboratories of three hours per week.

A course intended to give the graduate student practice and skill in methods of laboratory and field research in Plant Pathology.

**PROC 6604. DIAGNOSIS AND CONTROL OF PLANT DISEASES (II)** (Even numbered years). Three credit hours. One hour of lecture and two three-hour laboratory periods per week.

Techniques used in diagnosis of plant diseases. Sources of descriptive information on phytopathogens, fungi identification, and control measures.

**PROC 6605. URBAN PESTS.** Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Study of urban pests of major economic impact that infest residential, industrial and commercial structures. Methods for the control of urban pests, with emphasis on arthropods.

**PROC 6608. ADVANCED TROPICAL PHYTOPATHOLOGY (I)** (Even numbered years). Four credit hours. Four hours of lecture per week. Prerequisite: PROC 6604 or CFIT 6604.

Study and analysis of the etiology, pathology, epiphytology, and control of major plant diseases of the most important economic tropical crops.

**PROC 6609. INTEGRATED PEST MANAGEMENT (I).** Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Integrated management of agricultural pests based on the understanding of basic ecological principles and through the use of environmentally compatible pest management tactics and strategies which include ecological management, and the biological, mechanical, genetic, chemical and legal factors.

**PROC 6620. TOXICOLOGY OF PESTICIDES (II)** (Odd numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Classification, analysis, uses and toxicity of pesticides used in agriculture; methods in toxicology research; residual effects of pesticides on the environment, and on public health.

**PROC 6624. MORPHOLOGY AND TAXONOMY OF PHYTOPARASITIC NEMATODES.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: PROC 4018 or CIFI 4018.

Morphology, anatomy, and taxonomy of phytoparasitic nematodes; rules and problems of nomenclature.

**PROC 6630. CONTROL OF PHYTOPARASITIC NEMATODES (I)** (Even numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Study and evaluation of the physical, biological and chemical control of phytoparasitic nematodes.

**PROC 6635. TROPICAL AGRONEMATOLOGY (I)** (Odd numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A detailed study covering the most important aspects of plant nematodes in the tropics, especially those concerned with sugar cane, coffee, tobacco, citrus fruits, pineapple, plantains, bananas, rice, and vegetables.



**PROC 6645. BIOLOGICAL CONTROL: CONCEPTS AND THEORIES (I)** (Odd numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: authorization of the Director of the Department.

Ecological theories that study the use of beneficial organisms for the population density regulation of organisms noxious to crops of economic importance. Other topics to be studied are: the structure of the agroecosystem community, predator-prey ecological relations, types and components of predation, post-introduction programs and aspects of integration, perspectives and development of biological control strategies, with emphasis on insect control.

**PROC 6650. PHYTOVIROLOGY (II)** (Odd numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Fundamental concepts of plant viruses including transmission, vector identification, their effects on insect vectors, host range, classification, serology, and physical properties and methods of control. Research methods are emphasized in the laboratory.

**PROC 6993. SELECTED TOPICS** (On demand). One to three credit hours. Prerequisite: authorization of the Director of the Department.

Study of selected topics in Crop Protection not covered in existing courses.

**PROC 6994. SELECTED TOPICS** (On demand). One to three credit hours. Prerequisite: authorization of the Director of the Department.

Study of selected topics in Crop Protection not covered in existing courses.

**PROC 6995-6996. SPECIAL PROBLEMS (I, II, S)-(I, II, S)**. One to three credit hours per semester. One to three study and research periods per week.

Study or investigation of a special problem in the field of crop protection.

**PROC 6999. RESEARCH AND THESIS (I,II,S)**. Three to six credit hours.

Thesis research.

## CROP PROTECTION FACULTY

A list of professors who engage in graduate activities in the Department follows, including the highest earned degree, date, and institution granting the degree. Research and teaching interests are also included.

**EDWIN ABREU**, *Professor*, M.S., 1977, University of Puerto Rico, Mayagüez Campus. Teaching and Research interests: General Entomology, Population Dynamics, Integrated Pest Management, Insect Biology, Biology, Biological Control, and Plant Mites.

**WANDA ALMODÓVAR**, *Associate Professor*, M.S., 1989, University of Puerto Rico, Mayagüez Campus. Teaching and Research interest: Plant Pathology, Diagnosis and Control of Plant Diseases.

**ADA ALVARADO**, *Auxiliar Specialist*, University of Puerto Rico, Mayagüez Campus. Teaching and Research interest: Integrated Pest Management, Plant Pathology, Diagnosis and Control of Plant Diseases.

**ARÍSTIDES ARMSTRONG**, *Professor*, M.S., 1981, University of Puerto Rico, Mayagüez Campus. Teaching and Research interests: General Entomology, and Control of Insect Pests on Economic Crops.

**JULIO BIRD**, *Emeritus Professor*, Ph.D., 1957, University of Minnesota. Teaching and Research interest: Plant Virology.

**JOSÉ A. CHAVARRÍA**, *Professor*, Ph.D., 1997, University of Auburn, Alabama. Teaching and Research interest: Plant Pathology.

**JOSÉ A. DUMAS**, *Professor*, Ph.D., 1999, University of Puerto Rico-Río Piedras. Research interest: Pesticide Residues Analysis. Teaching interest: Analytical Chemistry.

**CONSUELO ESTÉVEZ-DE JENSEN**, *Assistant Professor*, Ph.D., 2000, University of Minnesota. Teaching interests: Diagnostic and management of fungal diseases. Research interest: Etiology and control of soilborne diseases. Developing integrated disease management programs for vegetable cropping systems. Interactions between cropping systems, soil amendments, residue management, and tillage practices on the management of soilborne diseases. The effects of environmental and edaphic factors on host characteristics contributing to disease susceptibility.

**ROSA A. FRANQUI**, *Professor*, Ph.D., 1995, University of Wisconsin, Madison. Teaching and Research interest: General Entomology and Biological Control.

**FERNANDO GALLARDO**, *Professor*, Ph.D., 1990, Louisiana State University. Research and Teaching interest: Biological Control of Insects.

**ÁNGEL L. GONZÁLEZ**, *Professor*, Ph.D., 1997, University of Illinois, Urbana. Teaching and Research interests: General Entomology, Biological Control.

**RAFAEL INGLÉS**, *Researcher*, M.S., 1990, University of Puerto Rico, Mayagüez Campus. Research and Teaching interests: General Entomology, Pesticide Registration.

**MARÍA DE L. LUGO**, *Professor*, Ph.D., 1993, University of Arkansas. Teaching and Research interest: Weed Science.

**SILVERIO MEDINA-GAUD**, *Emeritus Professor*, Ph.D., 1978, Iowa State University. Teaching and Research interest: Entomology.

**HIPÓLITO O'FARRILL**, *Associate Extension Specialist*, Ph.D., 1996, Pennsylvania State University. Teaching and Research interest: Entomology, Integrated Pest Management, Urban Entomology.

**LYDIA I. RIVERA-VARGAS**, *Professor*, Ph.D., 1994, Ohio State University. Teaching and Research interests: Plant Pathology, Biochemistry of Host-pathogen Interaction.

**PEDRO RODRÍGUEZ-DOMÍGUEZ**, *Extension Specialist in Weed Science*, M.S., 1982, University of Puerto Rico, Mayagüez Campus. Teaching and Research interest: Weed Science, Weed Ecology and Management.

**JESSE ROMÁN**, *Emeritus Professor*, Ph.D., 1968, North Carolina State University. Research and Teaching interests: Nematology, Taxonomy, Chemical Control, Biological Control of Nematodes and Insects.

**CARLOS ROSARIO**, *Professor*, Ph.D., 1988, Pennsylvania State University. Research and Teaching interests: Urban Entomology, Integrated Pest Management and Medical Entomology.

**ALEJANDRO E. SEGARRA-CARMONA**, *Associate Professor*, Ph.D., 1985, University of Maryland. Teaching and Research interests: Entomology, Ecology and Behavior of Insects, Biotechnology and Agricultural Research Policy.

**NELSON SEMIDEY**, *Researcher*, Ph.D., 1992, University of Arkansas, Fayetteville. Teaching and Research interests: Weed Science.

**FELICITA VARELA**, *Associate Researcher*, Ph.D., 2002, The Ohio State University. Research and Teaching interests: Plant Pathology, Integrated Disease Management, Host-Parasite Relationship.

**ROBERTO VARGAS**, *Professor*, Ph.D., 1995, Auburn University. Teaching and Research interests: General Nematology, Plant Pathology, Biological Control, Rhizosphere Microecology, Organic Nematicides and Sustainable Agriculture.

**NYDIA E. VICENTE**, *Professor*, M.S., 1983, University of Puerto Rico, Mayagüez Campus. Teaching and Research interests: Nematology, Nematode Diseases of Vegetables and Integrated Nematode Management.

**MILDRED ZAPATA**, *Professor*, Ph.D., 1989, University of Nebraska. Teaching and Research interests: Plant Pathology, Phytobacteriology, Plant-microbe Interactions, Determinants of Pathogenicity of Phytopathogenic Bacteria, Diseases of Legumes, Vegetables and Ornamentals, Biological Control.

## FOOD SCIENCE AND TECHNOLOGY

Please refer to the Interdisciplinary Programs section for information on this program.

## HORTICULTURE

The Department of Horticulture offers a program leading to a Master of Science degree in Horticulture.

In addition to the admission requirements of the Office of Graduate Studies, a Bachelor of Science degree in Agricultural Sciences or its equivalent is required. Students who are deficient in horticulture may be required to complete satisfactorily certain horticultural courses. These courses will not contribute credits towards the degree. A maximum of four (4) courses could be taken in the first year of study if needed. A minimum of thirty (30) credits is required for the completion of the Master's degree including a thesis.

The program includes courses in plant propagation, production, management, and physiology in such commodities as vegetables, starchy crops, fruits, coffee and ornamentals.

### HORTICULTURE (HORT)

#### Advanced Undergraduate Courses

**HORT 5005.** ADVANCED FLORICULTURE (II). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: HORT 4025.

A comprehensive review of scientific literature and research on the ecology, physiology, propagation, improvement, and other growth processes of important flowering and foliage plants.

**HORT 5006.** ADVANCED VEGETABLE GARDENING (On demand). Two credit hours. One hour of lecture and one three-hour laboratory per week. Prerequisite: HORT 4008.

This course aims to review the different phases of experimental work in vegetable growing with assigned field problems. Field trips required.

#### Graduate Courses

**HORT 6601.** FOOD PROCESSING I (I). Three credit hours. Three hours of lecture per week.

Fundamentals and commercial practice of food preservation by heat treatment, drying, freezing, canning, irradiation and microwaves. Topics included are selection of raw material, preparation, unit of operations and processing, packaging and storage. Processes covered will include aseptic packaging of juice and milk as well as canning of fruits and vegetables.

**HORT 6611.** ADVANCED PLANT PROPAGATION (II). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Techniques in plant propagation through embryo culture, meristematic culture in vegetative propagation, culture of eggplants, and other advanced methods; review of recent findings in this field.

**HORT 6616.** ADVANCED TROPICAL FRUITS (II) (On demand). Three credit hours. Three hours of lecture per week.

A study of the problems encountered in the production of fruits of major economic importance, with special emphasis on tropical conditions. The influence of stocks, varieties, planting sites, soils and ecological factors will be stressed.

**HORT 6650.** POST HARVEST PHYSIOLOGY AND MANIPULATION OF HORTICULTURAL CROPS (On demand). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

The physiology of maturation and ripening, and the handling of horticultural crops to preserve quality and ensure storage life.

**HORT 6652.** PHYSIOLOGY OF VEGETABLE CROPS (II) (On demand). Three credit hours. Three hours of lecture per week.

The study of photoperiodism, thermoperiodism, deficiencies, growth substances, rooting, germination and fruit setting in each of the major vegetable crops.

**HORT 6653.** PHYSIOLOGY OF FRUIT PRODUCTION (I) (On demand). Three credit hours. Three hours of lecture per week.

The study of fruit production, including water, light, soil and nutrition relationships; pruning, fruit setting, and other growth and productivity factors.

**HORT 6665.** PLANT GENETIC TRANSFORMATION (I) (On demand). Four credit hours. Three hours of lecture and one four-hour laboratory per week.

Theory and practice of the concepts in the genetic transformation of plants by direct and indirect methods. Emphasis will be given to Agrobacterium tumefaciens mediated transformation.

**HORT 6669.** GROWTH REGULATORS IN HORTICULTURE (I). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

The use of growth regulators and other chemicals in the modification and alteration of natural plant processes; the application of these substances in the commercial production of fruits, vegetables, and ornamentals.

**HORT 6705.** GRADUATE SEMINAR. One credit hour. One hour of lecture per week. Prerequisite: authorization of the Director of the Department.

Discussion of topics in Horticulture including results of research work.

**HORT 6990.** SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR COOP STUDENTS. From three to six credit hours. Only 3 credits will be considered within the minimum of the required 30 credits for the graduate program.

Practical experience in Horticulture in cooperation with the private sector or government. To be jointly supervised by the academic department, the Coop program coordinator and an official from the cooperating entity. A written report will be required upon completion of each work period.

**HORT 6995-6996** (On demand). RESEARCH IN HORTICULTURE. One to three credit hours per semester. One to two research periods per week for a total of three to six hours each semester.

Research on an important horticultural problem. A thesis presentation is not required, but a report of the investigation should be made.

**HORT 6997.** SELECTED TOPICS (On demand). One to three credit hours. Prerequisite: authorization of the Director of the Department.

Selected topics in plant propagation, production, management, physiology, genetic engineering, molecular biology, and other areas of interest in horticulture.

**HORT 6998.** SELECTED TOPICS (On demand). One to three credit hours. Prerequisite: authorization of the Director of the Department.

Selected topics in plant propagation, production, management, physiology, genetic engineering, molecular biology, and other areas in horticulture.

**HORT 6999.** RESEARCH AND MASTER'S THESIS (I, II). Six credit hours. One to three research periods per week each semester.

Organized research in Horticulture at the Master's thesis level, including thesis presentation and discussion as part of the requirements for a Master of Science degree with a major in Horticulture.

## HORTICULTURE FACULTY

A list of professors who engage in graduate activities in the Department follows, including the highest earned degree, date, and institution granting the degree. Research and teaching interests are also included.

**BRYAN BRUNNER-FULTON**, *Researcher*, Ph.D., 1992, Michigan State University. Research and Teaching interests: Breeding and Germplasm Improvement (Fruits and Ornamentals).

**JOAQUÍN ANDRÉS CHONG-NÚÑEZ**, *Assistant Researcher*, Ph.D., 2005, Clemson University, South Carolina. Research and Teaching interest: Plant and Environmental Science.

**FEIKO H. FERWERDA**, *Assistant Researcher*, Ph.D., 2001, University of Florida. Research and Teaching interests: Plant Tissue Culture and Molecular Markers.

**JOHN M. GILL**, *Professor*, Ph.D., 1994, Rutgers University. Research and Teaching interests: Plant Tissue Culture and Plant Genetic Transformation.

**LIZZETTE GONZÁLEZ-GILL**, *Associate Professor*, Ph.D., 1996, Rutgers University. Research and Teaching interests: Ornamental Horticulture.

**SALLY GONZÁLEZ-MIRANDA**, *Associate Extension Specialist*, M.L.A., 1987, Ball State University. Research and Teaching interests: Landscape Design, Arboriculture and Urban Forestry, Urban Horticulture.

**MARÍA DEL C. LIBRÁN-SALAS**, *Professor*, Ph.D., 1996, University of Illinois. Research and Teaching interests: Ornamental Horticulture.

**JOSÉ P. MORALES PAYÁN**, *Associate Professor*, Ph.D., 1999, University of Florida, Gainesville.

**MIGUEL MONROIG-INGLÉS**, *Extension Specialist*, M.S., 1983, University of Puerto Rico, Mayagüez Campus. Research and Teaching interests: Coffee Production and Management.

**EDNA NEGRÓN-DE BRAVO**, *Professor*, Ph.D., 1987, The Pennsylvania State University. Research and Teaching interests: Food Science.

**LYNETTE ORELLANA-FELICIANO**, *Assistant Professor*, Ph.D. 2004, Washington State University. Research and Teaching interest: Research in the areas of food microbiological, post harvest processing, safety and quality of fruits and vegetables, thermal and non-thermal processing of food and food science and technology.

**SALVADOR SALAS-QUINTANA**, *Professor*, Ph.D., 1988, Rutgers University. Research and Teaching interests: Plant Physiology and Biochemistry (Coffee, Vegetables and Starchy Crops).

**ANNETTE WZSELAKI**, *Assistant Professor*, Ph.D., 2001, University of California U.C. Davis. Research and Teaching interests: Post harvest physiology and maintaining crop quality from the field to the table. Certified organic vegetable production. Vegetable sensory quality and its relationship to field management practices. Consumer perception of quality and the food system.

**JOSÉ ZAMORA-ECHEVARRÍA**, *Assistant Extension Specialist*, M.S., 1991, University of Puerto Rico, Mayagüez Campus. Research and Teaching interests: Tropical Fruit Crop Production and Management.

## COLLEGE OF ARTS AND SCIENCES

The School of Science was organized in 1943 according to the provisions of the University Act of 1942, and was authorized to grant the degree of Bachelor of Science in the fields of Biology, Chemistry, Geology, Mathematics, and Physics. A Division of General Studies was set up later, independently, with the purpose of offering a series of introductory or basic courses leading an incoming student to a better understanding of the physical, intellectual, and social world in which we live. The School of Science and the Division of General Studies were fused to form the College of Arts and Sciences of the Mayagüez Campus in 1959.

Graduate instruction at UPRM began in 1957 with the establishment of the Puerto Rico Nuclear Center. The construction of this facility in Mayagüez led to the beginning of graduate studies in the fields of nuclear science and technology, radiological physics and mathematics. At present the College offers graduate instruction leading to the degree of Master of Science in Biology, Chemistry, Geology, Marine Sciences, Mathematics and Physics as well as the Master of Arts in Hispanic Studies and the teaching of English as a second language. In 1972, the College initiated a program leading to the degree of Doctor of Philosophy in Marine Sciences. The Mayagüez Campus is the only institution in Puerto Rico offering a Ph.D. in this field. The Applied Chemistry Ph.D. program started on 2004. A multidisciplinary doctorate degree in Computer Information Science and Engineering is offered in collaboration between the Mathematics and the Electric and Computer Engineering Departments.

Depending on individual department regulations, the student may have various options for fulfilling Master degree requirements. Most departments require a thesis, while some may also offer the option of a project report or grant the degree under a non-thesis option.

## BIOLOGY

The Department of Biology offers a program leading to a Master's degree in Science. Although there are no formal options, students are able to specialize in conservation biology, environmental microbiology, botany, cellular and molecular biology, ecology, physiology, genetics, mycology, microbiology (bacteriology), parasitology, virology and zoology.

In addition to the admission requirements of the Graduate Studies Office, a Bachelor of Science degree in Biology or its equivalent is required. Generally, only applicants with a minimum overall 3.00 GPA or a minimum 3.00 GPA in biology courses will be considered for admission. Candidates must submit scores of the Graduate Record Examination (GRE), the general and the GRE subject in area of interest, TOEFL scores (foreign applicants) is an additional requirement for admission.

Requirements for the major in the Department of Biology are met with the approval of at least twenty-one credit hours of graduate courses including the thesis. BIOL 6689 (Biological Research Methods) and BIOL 6690 (Graduate Seminar) are required for all students. All other program requirements are those of Graduate Studies. All students are required to write a thesis, and to present a departmental seminar related to their thesis research prior to graduation.

Departmental facilities include laboratories dedicated to research in botany, cellular and molecular biology, comparative physiology, entomology, virology, microbiology, mycology, and other areas of biology; a herbarium and a greenhouse; zoological collections, a laboratory of animal behavior, and a darkroom. In addition, the Biology Department operates a Microscopy Center, housed in the Physics Building. A new Biology Building is under construction.



**Advanced Undergraduate Courses**

**BIOL 5005.** ELEMENTARY PLANT ANATOMY (II) (Even numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3435 or BIOL 3417 or authorization of the Director of the Department.

The study of simple and complex tissues of the organs of vascular plants; the study of the characteristics of parenchyma, sclerenchyma and collenchyma cells, as well as the elements composing the xylem and phloem tissues.

**BIOL 5007.** GENERAL PLANT MORPHOLOGY (II) (Even numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3417 or BIOL 3435 or authorization of the Director of the Department.

The general principles of plant morphology, including evolutionary tendencies, phylogenetic lines and the life cycles of the principal groups of plants.

**BIOL 5009.** PTERIDOLOGY (On demand). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3417 or BIOL 3435 or authorization of the Director of the Department.

Lectures and laboratories on the morphology, taxonomy and ecological distribution of the local ferns and their allies. Assigned readings and field trips.

**BIOL 5016.** PLANT EVOLUTION (I) (Odd numbered years). Two credit hours. Two hours of lecture per week. Prerequisite: BIOL 3417 or BIOL 3435 or authorization of the Director of the Department.

Analysis of the geological, morphological, anatomical, physiological, and geographical evidence showing how the different plant phyla have evolved, with emphasis on the evolution of tracheophytes. Assigned reading reports.

**BIOL 5017.** TROPICAL BRYOLOGY (On demand). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3417 or authorization of the Director of the Department.

The biology of mosses, liverworts, and hornworts, emphasizing the structure, identification, reproduction, and ecology of the native species of Puerto Rico. Field trips required.

**BIOL 5018.** PLANT PHYSIOLOGY (II). Four credit hours. Three hours of lecture and one laboratory of three hours per week. Prerequisites: BIOL 3417 or BIOL 3435 or authorization of the Director of the Department. Corequisite: QUIM 3032 or QUIM 3062 or QUIM 3463 or authorization of the Director of the Department.

Plant physiology: diffusion, transpiration, absorption and transport, mineral nutrition, metabolism, growth and development, hormones, effects of environmental factors.

**BIOL 5045.** SCANNING ELECTRON MICROSCOPY (SEM). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: authorization of the Director of the Department.

Theoretical and practical aspects of the scanning electron microscope (SEM) with emphasis on sample preparation for SEM, detection of the different types of signals emitted by the specimen, and image analysis.

**BIOL 5397.** EUKARYOTIC MOLECULAR GENETICS. Four credit hours. Two hours of lecture and two four-hour laboratory per week. Prerequisites: (BIOL 3300 and QUIM 5071) or authorization of the Director of the Department.

Genome complexity; gene structure, regulation of transcription; mRNA processing; transposons; signal transduction; the genetics of development, the cell cycle, and cancer; research techniques in molecular genetics.

**BIOL 5416.** HERPETOLOGY (I). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A study of the biology, classification and morphology of amphibians and reptiles, with emphasis on local species. Field trips.

**BIOL 5417.** ICHTHYOLOGY (On demand). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A study of the biology, classification and morphology of fishes, with emphasis on local species. Field trips.

**BIOL 5585.** MEDICAL AND VETERINARY ENTOMOLOGY (I) (Even numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

This course offers the student interested in entomology, animal husbandry or veterinary science, an opportunity to become familiar with the recognition, characteristics, habits and control of insects, ticks, mites, and other arthropods that attack man and domestic animals.

**BIOL 5755.** VIROLOGY (I). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770 or authorization of the Director of the Department.

The classification, structure, physiology and biochemical activities of viruses.

**BIOL 5758.** BACTERIAL GENETICS. Two credit hours. Two hours of lecture per week. Prerequisites: BIOL 3300 or BIOL 3770 or authorization of the Director of the Department.

DNA replication and expression in the prokaryotic cell; transfer of genetic information; the impact of genetic processes on the physiology and ecology of bacteria.

**BIOL 5759.** BACTERIAL GENETICS LABORATORY. Two credit hours. Two four-hour laboratory periods per week. Co-requisite: BIOL 5758.

Molecular techniques for the study of the genetics of bacteria and bacteriophages. Practical experiences in the processes of recombination, complementation, the control of genetic expression, and the transmission of genetic information among microorganisms.

**BIOL 5765.** MYCOLOGY (II) (Even numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770 or authorization of the Director of the Department.

A study of the morphology, physiology, classification and relation of fungi to man. Emphasis is given to the isolation and identification of the different groups.

**BIOL 5815.** ANIMAL BEHAVIOR (I). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A study of activities and responses of animals in meeting their life requirements. Field trips.

**BIOL 5955.** INTRODUCTION TO RESEARCH METHODS IN ECOLOGY (II) (Even numbered years). Three credit hours. One hour of lecture and two three-hour laboratory periods per week. Prerequisite: authorization of the Director of the Department.

Field and laboratory exercises serve to introduce the student to the basic methods used in ecological research. The student is trained in the use of computers for the analysis of ecological data.

**BIOL 5990.** FIELD BIOLOGY WORKSHOP (On demand). One to three credit hours. Thirty to sixty hours of workshop/practice per credit. Prerequisite: authorization of the Director of the Department.

Intensive practical experience in selected areas of field biology, in or outside of Puerto Rico. A final written report will be required.

### Graduate Courses

**BIOL 6015.** INSECT MORPHOLOGY (I) (Odd numbered years). Four credit hours. Two hours of lecture and two two-hour laboratories per week.

A study of the general internal and external morphology of insects.

**BIOL 6155.** PLANT ECOLOGY (II) (Odd numbered years). Four credit hours. Two hours of lecture and two three-hour laboratories per week. Prerequisite: authorization of the Director of the Department.

The interrelations of plants and environment; climatic, edaphic, and biotic factors in their relation to origin, development, and structures of vegetation; introduction to ecological fieldwork and the methods of ecological research. Practice is given in the recognition of associations, determination, and description of their structure, and relationships and measurements of environmental factors. Reports required.

**BIOL 6199.** BEHAVIORAL ECOLOGY (II) (Odd numbered years). Three credit hours. Three hours of lecture per week.

Recent developments in behavioral ecology. Evolutionary and ecological models applied to the behavioral problems of survival and reproduction. Integration of theory with field and laboratory evidences. Field trips required.

**BIOL 6356.** CYTOGENETICS (II) (Even numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A study of different aspects of the cell that affect inheritance.

**BIOL 6369.** POPULATION GENETICS (II) (Even numbered years). Three credit hours. Three hours of lecture per week.

Genetic variation in natural populations of both plants and animals in different communities, covering selection, migration, mutations, mating systems, and the effect of population size on the maintenance of genetic variation.

**BIOL 6605.** ENVIRONMENTAL POLLUTION AND DISTURBANCE (II) (Even numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: authorization of the Director of the Department.

An ecological consideration of pollution and disturbance of the environment; the effects of industrial, domestic and other pollutants of the ecosystem; the physical, chemical and biological parameters used in pollution control and abatement. Field trips.

**BIOL 6607.** POPULATION ECOLOGY (I) (Even numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Study of populations for analysis of the control and interaction among them. Topics such as mortality, fertility, population growth, competition and predator-prey interaction will be discussed.

**BIOL 6610.** LIMNOLOGY (II) (Odd numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A study of the physical, chemical and biological characteristics and interrelations of these factors in aquatic situations; community structure in still and running water; studies of local streams and ponds.

**BIOL 6617.** ADVANCED GENETICS (I) (Odd numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: authorization of the Director of the Department.

Discussion of selected topics in genetics.

**BIOL 6631.** CELLULAR BIOCHEMISTRY AND PHYSIOLOGY (I). Four credit hours. Three hours of lecture and one three-hour laboratory per week.

The interconversions of energy in living cells; photosynthesis and carbohydrate metabolism as energy sources; the utilization of metabolic energy for protein synthesis; solute and solvent movements; nerve and muscle phenomena. Emphasis on metabolic regulation and enzyme action.

**BIOL 6635.** MEDICAL MYCOLOGY (I) (Odd numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: authorization of the Director of the Department.

A study of the fungi pathogenic to man.

**BIOL 6637.** TAXONOMY AND MORPHOLOGY OF FUNGI (I) (Even numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A thorough coverage of the phycomyces, ascomycetes, deuteromycetes and basidiomycetes from a taxonomical and morphological approach, with emphasis on saprophytes, zoopathogens and phytopathogens.

**BIOL 6642.** ADVANCED MYCOLOGY (I) (Odd numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A study of fungi with emphasis on current literature and methods of research.

**BIOL 6650.** BACTERIAL DIVERSITY. Three credit hours. Two hours of lecture and two hour-and-a-half laboratories per week.

The diversity of prokaryotic organisms in relation to ecophysiological and evolutionary perspectives, emphasizing their isolation, identification, and application.

**BIOL 6688.** SCIENTIFIC PHOTOGRAPHY FOR BIOLOGISTS (I). Two credit hours. Two three-hour laboratories per week. Prerequisite: authorization of the Director of the Department.

Photographic techniques in biological research. A presentation and a portfolio of the student's work are required.

**BIOL 6689.** BIOLOGICAL RESEARCH METHODS (I). Two credit hours. Two hours of lecture per week.

Methods and theory of investigation in the biological field, including study of the biological literature and sources of information from major institutions active in this field. The student is required to write a research proposal in his area of interest.

**BIOL 6690.** GRADUATE SEMINAR (I). One credit hour. Two hours of lecture per week.

Discussion of recent literature in biology and related fields. Students will discuss principal topics in their special fields.

**BIOL 6705.** ADVANCED FOOD MICROBIOLOGY (I) (Even numbered years). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Microbiology of food commodities. The nature and function of beneficial and harmful microorganisms. Foodborne diseases. Effects of food processing and storage on microorganisms.

**BIOL 6990.** RESEARCH (I, II). One to six credit hour periods per week.

Research for a thesis.

**BIOL 6991-6992.** SPECIAL STUDIES IN BIOLOGY (I, II)-(I, II). One to three credit hours per semester. One to three research periods per week each semester.

Supervised research in some special topics of biology other than a thesis problem, but designed to provide experience and training in scientific investigation.

**BIOL 6993.** SPECIAL TOPICS IN BIOLOGY I (On demand). One to six credit hours. One to six hours of lecture per week.

Selected topics in biology, botany, microbiology, and zoology.

**BIOL 6994.** SPECIAL TOPICS IN BIOLOGY II (On demand). One to six credit hours. One to six hours of lecture per week.

Selected topics in biology, botany, microbiology, and zoology.

**BIOL 6997.** SPECIAL TOPICS IN BIOLOGY: LABORATORY (On demand). One to six credit hours. One to six two-to four-hour laboratories per week.

Laboratory practice of selected topics in biology, botany, microbiology, and zoology.

### Botany (BOTA)

**BOTA 6006.** PHYSIOLOGY OF BACTERIA (II). Three credit hours. Two hours of lecture and one three-hour laboratory per week.

The physiology of bacteria and the biochemistry of microbic processes.

**BOTA 6007.** PHYTOGEOGRAPHY (II) (Even numbered years). Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

A study of the geographical distribution of plants, with special emphasis on the ecological and historical factors affecting their distribution.

### Zoology (ZOOL)

#### Advanced Undergraduate Course

**ZOOL 5005.** INVERTEBRATES OF PUERTO RICO (I) (Odd numbered years). Three credit hours. Two hours of lecture and one-three hour laboratory per week.

Taxonomy and ecology of the most common invertebrates of Puerto Rico, especially Arthropoda (exclusive of insects and marine forms) and Mollusca. Field trips.

#### Graduate Courses

**ZOOL 6019.** ADVANCED PARASITOLOGY. Four credit hours. Three lectures and one three-hour laboratory per week. Prerequisite: authorization of the Director of the Department.

Lectures, conferences, reading and laboratory work dealing with practical problems of classification, morphology and host relations of animal parasites.

**ZOOL 6025.** SYSTEMATIC ZOOLOGY (II) (Even numbered years). Three credit hours. Three hours of lecture per week.

The naming and classification of animals, rules and basis of nomenclature, quantitative methods of analysis, and methods for presentation of systematic findings.

**ZOOL 6039. ANIMAL ECOLOGY** (On demand). Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: authorization of the Director of the Department.

A study of the principles of ecology as applied to animals.

**ZOOL 6056. ZOOGEOGRAPHY (I)** (Even numbered years). Three credit hours. Three hours of lecture per week.

A study of the geographical distribution of animals, with special emphasis on factors affecting this distribution. Assigned readings and reports.

**ZOOL 6058. INSECT TAXONOMY (II)** (Odd numbered years). Three credit hours. One hour of lecture and two two-hour laboratory periods per week.

The classification of the hexapoda. Construction of keys, preparation of description, nomenclatural problems, faunistic and monographic studies, catalogs and bibliographies.

## BIOLOGY FACULTY

A list of professors who engage in graduate activities in the Department follows including the highest earned degree, date, and institution granting the degree. Research and teaching interests are also included.

**DIMARIS ACOSTA-MERCADO**, *Assistant Professor*, Ph.D., 2003, University of Guelph, Canada. Research interests: Ecology of Soil Protozoa, Biodiversity and Ecosystem Function. Teaching interests: Ecological and Research Methods, Protistology, Philosophy of Sciences, Microbial Ecology.

**JAIME A. ACOSTA**, *Associate Professor*, Ph.D., 1995, Virginia Polytechnic Institute and State University. Research interests: Entomology, Biocontrol of Hymenoptera, Ecology of Fire Ants. Teaching interests: Biology, Ecology, Zoology, Entomology.

**MÓNICA ALFARO**, *Associate Professor*, Ph.D., 2002, University of Puerto Rico. Research interests: Marine Biology, Ecology of Zooplankton. Teaching interests: Marine Ecosystems, Zoogeography, and Biological Sciences.

**FERNANDO BIRD-PICÓ**, *Associate Professor*, Ph.D., 1994, University of Kansas. Research interests: Herpetology, Ecology and Population Genetics, Conservation Biology. Teaching interests:

Herpetology, Systematic Zoology, Population Genetics, Comparative Vertebrate Anatomy.

**SONIA BORGES**, *Professor*, D.Sc., 1988, Universidad Complutense de Madrid. Research interests: Systematics and Ecology of Terrestrial Oligochaetes (Annelida), Organic Waste Management by Vermicom-posting. Teaching interests: Zoology.

**GARY J. BRECKON**, *Professor*, Ph.D., 1974, University of California at Davis. Research interests: Taxonomy and Ecology of Antillian Plants, especially rare and endangered species. Teaching interests: Botany and Ecology.

**LUCY BUNKLEY-WILLIAMS**, *Professor*, Ph.D., 1984, Auburn University. Research interests: Fish Parasitology and Pathology, Parasite Taxonomy. Teaching interests: Parasitology, Zoology, Ichthyology.

**ROSA BUXEDA**, *Professor*, Ph.D., 1993, Rutgers University, New Brunswick. Research interests: Science Education, Microbial. Teaching interests: Microbial Physiology, Microbiology, Microbial Biochemistry.

**MATÍAS CAFARO**, *Assistant Professor*, Ph.D., 2003, University of Kansas, Lawrence. Research interests: Mycology, Symbiosis, interactions between arthropods and fungi. Teaching interests: Topics in symbiosis, Advanced Mycology, Systematics of Fungi, Molecular Systematics.

**FRANKLIN CARRERO**, *Assistant Professor*, Ph.D., 2005, University of Illinois, Urbana. Research interests: Cell and Developmental Neurobiology and Synaptogenesis. Teaching interests: Neurobiology, Cell and Developmental Biology, Cell Signaling and Communication.

**MILDRED CHAPARRO**, *Professor*, Ph.D., 1985, Texas A&M University. Research interests: Food Microbiology. Teaching interests: Microbiology, Food Microbiology.

**JESÚS D. CHINEA**, *Associate Professor*, Cornell University, Ph.D., 1992, Research interests: Ecology, Forest Dynamics, Exotic Species, Restoration Ecology, Applications of Remote Sensing and GIS to Ecology. Teaching interests: Ecology, Botany.

**CARLOS A. DELANNOY**, *Professor*, Ph.D., 1984, University of Colorado. Research interests: Endangered Species. Teaching interests: Ornithology, Ecology, and Conservation Biology.

**NANETTE DIFFOOT-CARLO**, *Professor*, Ph.D., 1992, Virginia Polytechnic Institute and State University. Research interest: Molecular Studies of Viral Replication. Teaching interests: Virology, Molecular Biology.



**NICO M. FRANZ**, *Assistant Professor*, Ph.D., 2005, Cornell University, Ithaca, New York. Research interest: Insect Systematics (Morphology, Phylogeny, Classification), Theory and Practice of Systematics, Philosophy of Sciences. Teaching interests: Insect Morphology, Insect Taxonomy, Advanced Methods in Biogeography and Systematics Insect Plant Interactions, Philosophy of Science.

**DUANE A. KOLTERMAN**, *Professor*, Ph.D., 1982, University of Wisconsin. Research interests: Conservation Biology, Plant Biosystematics, Plant Nomenclature. Teaching interests: Botany, Biological Nomenclature, Conservation Biology.

**ALLEN R. LEWIS**, *Professor*, Ph.D., 1979, University of Rochester. Research interests: Behavioral Ecology, Population Biology. Teaching interests: Ecology, Animal Behavior.

**SANDRA L. MALDONADO-RAMÍREZ**, *Associate Professor*, Ph.D., 2001, Cornell University, Ithaca, New York. Research interests: Mycology, Aerobiology, Plant Pathology, Fungal Endophytes. Teaching interests: Mycology.

**JOSÉ A. MARI-MUTT**, *Professor*, Ph.D., 1978, University of Illinois, Urbana. Research interests: Taxonomy of Apterygota. Teaching interests: Zoology, Entomology, Invertebrates.

**JUAN C. MARTÍNEZ-CRUZADO**, *Professor*, Ph.D., 1988, Harvard University. Research interests: Molecular Population Genetics and Evolution. Teaching interests: Genetics, Molecular Genetics.

**ARTURO A. MASSOL**, *Professor*, Ph.D., 1994, Michigan State University. Research interests: Biodegradation, Microbial Diversity, Environmental Microbiology. Teaching interests: Microbial Ecology, General Microbiology, Industrial Microbiology.

**RAFAEL MONTALVO**, *Professor*, Ph.D., 2003, University of Nebraska. Research interest: Extremophiles, Taxonomy, Physiology and Genetics of Archaea. Teaching interest: Micology.

**VIVIAN NAVAS**, *Professor*, Ph.D., 1990, University of Illinois, Urbana. Research interests: Cell and Structural Biology. Teaching interest: Biology, Histology, Electron Microscopy.

**CARLOS A. PÉREZ-MUÑOZ**, *Professor*, Ph.D., 1991, University of California, Davis. Research interests: Botany, Structural Biology, Plant Morphogenesis. Teaching interests: Biology, Botany, Plant Morphology, Plant Anatomy, Microtechniques, Scientific Photography for Biologists.

**CARLOS RIOS-VELÁZQUEZ**, *Associate Professor*, Ph.D., 2000, University of Wisconsin-Madison. Research interest: Bacterial Genetics and Physiology, Microbial Biotechnology and

Bioprospecting. Teaching interest: Microbial Physiology and Genetics, Prokaryotic Molecular Genetics and Gene Regulation, Microbial Biotechnology.

**JUAN A. RIVERO**, *Distinguished Professor*, Ph.D., 1953, Harvard University. Research interests: Herpetology, Evolution and Ecology of Reptiles and Amphibians. Teaching interests: Herpetology, Evolution, and Sex Biology.

**CARLOS M. RODRÍGUEZ-MINGUELA**, *Assistant Professor*, Ph.D., 2005, Michigan State University. Research interest: Molecular Ecology of Antibiotic Resistance Genes, Development of Quantitative Molecular Methods for Microbial Source Tracking, and the Ecology of Microbial Processes involved in the removal of Environmental Pollutants. Teaching interests: Microbiology, Microbial Ecology, Application of Bioinformatics to Molecular Microbial Ecology, Diversity of Prokaryotes.

**ALEJANDRO RUIZ-ACEVEDO**, *Professor*, Ph.D., 1981, University of Oklahoma. Research interests: Microbiology, Immunology, Medical Mycology. Teaching interests: Medical Mycology, Immunology, Clinical Microbiology, Industrial Microbiology.

**CARLOS J. SANTOS-FLORES**, *Associate Professor*, Ph.D., 2001, University of Wisconsin-Madison. Research interests: Limnology, Freshwater Ecology, Taxonomy of Algae and Microinvertebrates, Aquatic Fungi Taxonomy and Ecology. Teaching interests: Limnology, Freshwater Biology, Plankton Ecology.

**INES SASTRE-DE JESÚS**, *Professor*, Ph.D., 1987, City University of New York. Research interests: Systematic of Bryophytes, Bryophyte Ecology and Conservation. Teaching interests: Scientific Writing, Tropical Bryology, Plant Evolution, Botany.

**DIMUTH SIRITUNGA**, *Assistant Professor*, Ph.D., 2002, Ohio State University. Research interests: Plant Molecular Biology, Metabolic Engineering, Genetics. Teaching interest: Plant Molecular Biology, Plant Physiology, Genetics.

**RICHARD D. SQUIRE**, *Professor*, Ph.D., 1969, North Carolina State University. Research interests: Genetics and toxicology of the brine shrimp, *Artemia*. Teaching interests: Genetics, Citogenetics.

**JOHN M. USCIAN**, *Professor*, Ph.D., 1994, University of Nebraska. Research interests: Marine Fish, Biochemistry/Physiology. Teaching interests: Physiology, Cell Biology, Genetics.

**MARÍA M. VARGAS**, *Professor*, Ph.D., 1997, Arizona State University. Research interests: Mycology, Entomopathogenic fungi, Microscopy. Teaching interests: Mycology, Microbiology, Microscopy.



## CHEMISTRY

The Department of Chemistry offers a program leading to a Master degree in Chemistry, and a Doctor of Philosophy degree in Applied Chemistry.

The department is housed in a four-story building (214,000 square feet) with modern facilities for teaching and research which has 40 research and 20 teaching laboratories as well as 10 classrooms, a computer center, a visualization center, and cold and dark rooms. Research facilities include a large variety of sophisticated instrumentation, including systems for femtochemistry (laser system), NMR spectroscopy, atomic force microscopy, scanning electron microscopy, and electrochemistry. The department hosts several research groups and two research centers: the Center for Protein Characterization and Function, and the Center for Development of Chemical Sensors. An outreach program, Science on Wheels, is also housed within the departmental facilities.

Approximately thirty faculty members with PhD. degrees have on-going research projects in the areas of organic synthesis, environmental chemistry, molecular spectroscopy, material characterization, computational chemistry, electrochemistry, and biochemistry.

### M.S. in Chemistry Program

In addition to the admission requirements of the Graduate Studies Office, a Bachelor of Science in Chemistry or its equivalent, as determined by the departmental graduate committee, is required. The Graduate Record Examination (GRE) is also required for admission. Although there are no formal options, students are able to specialize in these areas:

- Analytical Chemistry
- Physical Chemistry
- Inorganic Chemistry
- Organic Chemistry
- Biochemistry

The requirements for the Master Degree in the Department of Chemistry are met with the approval of at least eighteen credit hours of graduate courses in Chemistry, exclusive of the thesis. Three of the following core courses are required: Advanced Inorganic Chemistry I

(QUIM 6011), Advanced Organic Chemistry I (QUIM 6401), Advanced Physical Chemistry (QUIM 6605), Advanced Analytical Chemistry (QUIM 6215), and Advanced Biochemistry (QUIM 6715). In addition, students are required to take QUIM 6005 and QUIM 6006, (Graduate Seminar I and II), and write a thesis.

### Ph.D. in Applied Chemistry

The PhD Program in Applied Chemistry started at the University of Puerto Rico – Mayagüez on January of 2004. The program started with emphasis in two principal fields of research: biophysics, and chemistry of materials. The Department's web site: <http://www.uprm.edu/wquim/>, offers additional information on the program and the research interests of the professors involved in the program.

#### Admission Requirements:

1. A bachelor or master degree in chemistry from a recognized university or its equivalent, with a minimum grade point average of 3.00 in a scale of 0 to 4.00. Applicants who have a bachelor's degree which is not in chemistry will be evaluated based on their own merits.
2. Take the aptitude Graduate Record Examination (GRE).
3. Master Spanish and English. If there are deficiencies in either one of the languages the student must take remedial courses when they enter the program.

#### Placement Tests:

Placement tests will be offered to the students who have been accepted to the Doctoral Program before beginning their studies. These consist of five placement tests which will evaluate the student's knowledge at the undergraduate level in the following areas: Organic Chemistry, Inorganic Chemistry, Analytical Chemistry, Physical Chemistry and Biochemistry. For students with an MS in chemistry, the Graduate Committee may accredit up to fifteen credits of the previous

graduate level courses towards the Ph.D. degree.

Program Requirements:

Research Proposal –The student will present a written proposal for research that defines his/her doctoral thesis project and will defend it orally in front of the thesis committee.

Doctoral Exam –The Student will take a Doctoral Exam which will measure his/her knowledge at the graduate level. This should occur during the third year of studies. The exam will involve both a written and oral part.

Internship – Every student will work one semester or four months in an academic, industrial, or government lab outside the UPR-Mayagüez campus. Since the department does not have funds to subsidize the internship, research advisors and the graduate students must seek funding for the internship through grants or scholarships.

It is recommended that the four month period be flexible, but cumulative to include a period of at least four months. This period may be distributed as follows:

1. A period of four months without interruption.
2. Two summer terms.

The internship period may include a maximum of three weeks in workshops related to the student's research. Each workshop should have a minimum duration of one week.

After returning from the Practicum, students must present a progress report, make a presentation in the Graduate Seminar or in a scientific conference such as the Puerto Rico Senior Technical meeting and receive a formal evaluation from the Practicum supervisor or host.

Upon approval of the report, the President of the students Graduate Studies committee will submit a letter (similar to that in Appendix VII) to the Graduate Coordinator, informing him of the completion of this requirement.

Publications–Students will be required to have two accepted publications before defending their doctoral dissertation.

The academic requirements to grant the degree are:

- A. A minimum of 52 credits, of which no more than 9 can be at the 5000 level and no less than 43 at the 6000 level or higher. Of the previous 43 credits, 18 credits will be thesis. A minimum of nine credits will be required in areas outside of the specialty.
- B. The minimum grade point average required for graduation will be 3.00.

Course Distribution

Core Courses (3 courses @ 3 credit hours) – 9 credit hours  
 Grade Requirements – 28 credit hours  
 Recommended Courses and Electives by Area of Specialty – 15 credit hours

**Advanced Undergraduate Courses**

**QUIM 5065.** CHEMISTRY OF SYNTHETIC DRUGS (On demand). Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3032 or QUIM 3072 or QUIM 3450 or QUIM 3463 or authorization of the Director of the Department.

The chemistry of synthetic organic compounds of medical and physiological interest. Topics to be covered will include anesthetics, antispasmodics, antipyretics, analgesics, hypnotics, sedatives, anticonvulsants, anticoagulants, antihistamines, tranquilizers, antimalarials, and anthelmintics.

**QUIM 5066.** TOXICOLOGICAL CHEMISTRY (II). Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3032 or QUIM 3072 or QUIM 3450 or QUIM 3062 or authorization of the Director of the Department.

Chemical properties, reactions, origin, and use of toxic substances, including chemical aspects of their effects upon biological systems, and their transformation and elimination.

**QUIM 5071. GENERAL BIOCHEMISTRY I.** Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3463 or QUIM 3072 or QUIM 3450 or QUIM 3062 or authorization of the Director of the Department.

Chemical characterization of proteins, carbohydrates, lipids, and nucleic acids; principles of enzymology and bioenergetics; biological membranes and transport; recombinant DNA techniques; biological oxidations.

**QUIM 5072. GENERAL BIOCHEMISTRY II.** Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 5071.

Biosynthesis and biodegradation of carbohydrates, lipids, amino acids, and nucleic acids; integration and regulation of animal metabolism; chemistry of genetic expression and regulation.

**QUIM 5073. GENERAL BIOCHEMISTRY LABORATORY I.** One credit hour. One four-hour laboratory per week. Corequisite: QUIM 5071.

Isolation and characterization of proteins, lipids, and nucleic acids; enzymatic processes; the use of recombinant DNA techniques.

**QUIM 5074. GENERAL BIOCHEMISTRY LABORATORY II.** One credit hour. One four-hour laboratory per week. Prerequisite: QUIM 5073. Corequisite: QUIM 5072.

Characterization of carbohydrates, molecular modeling, and spectroscopic analysis of biomolecules.

**QUIM 5085. FOOD CHEMISTRY (On demand).** Four credit hours. Three hours of lecture and four hours of laboratory per week. Prerequisite: QUIM 3072 and (QUIM 3463 or QUIM 3062) or authorization of the Director of the Department.

A study of the chemistry of the principal food resources and food additives, their role in nutrition, and the effect of processing treatment on their chemical composition.

**QUIM 5095. NUCLEAR CHEMISTRY (II).** Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 3042 or QUIM 3002 and MATE 3031 or MATE 3183 or MATE 3144.

A course describing the fundamental concepts of nuclear science. Selected topics on nuclear properties, nuclear forces and structure, radioactivity, mathematical relations of radioactive decay, statistics, nuclear reactions, effects of

nuclear radiations and transitions, application of nuclear phenomena of chemistry and other related fields.

**QUIM 5105. PRINCIPLES OF QUANTUM CHEMISTRY.** Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 4042 or authorization of the Director of the Department.

Conceptual development, postulates, and models of quantum mechanics. Approximation methods to the solution of the time-independent Schrödinger equation.

**QUIM 5125. CHEMICAL THERMODYNAMICS (On demand).** Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 4042 or authorization of the Director of the Department.

Systematic analysis of the fundamental concepts of chemical thermodynamics and their applications.

**QUIM 5135. PHYSICAL ORGANIC CHEMISTRY (On demand).** Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 4042 and QUIM 3072 or QUIM 3450 or QUIM 3463.

A mathematical and quantitative study of organic chemical phenomena. Applications of modern theoretical concepts to the chemical and physical properties of organic compounds, and to the kinetics and mechanisms of organic reactions.

**QUIM 5145. HETEROCYCLIC COMPOUNDS (On demand).** Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3032 or QUIM 3072 or QUIM 3450 or QUIM 3463 or authorization of the Director of the Department.

Structure, synthesis, and reactions of ring systems containing other atoms besides carbon. Alkaloids will be given special consideration.

**QUIM 5150. SPECTROSCOPIC IDENTIFICATION OF ORGANIC COMPOUNDS (I).** Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3032 or QUIM 3072 or QUIM 3450 or QUIM 3463 or authorization of the Director of the Department.

Elucidation of the structure of organic compounds by spectroscopic methods, including infrared, ultraviolet, nuclear magnetic resonance, and mass spectrometry techniques.

**QUIM 5165.** POLYMER CHEMISTRY (On demand). Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3450 or QUIM 3072 or QUIM 3032 or QUIM 3463 or authorization of the Director of the Department.

Structure, properties, syntheses, reactions, and physical behavior of polymers. Experimental methods used in their analysis.

**QUIM 5175.** EXPLOSIVES DETECTION AND ANALYSIS. Four credit hours. Three hours of lecture and one four-hour laboratory period per week. Prerequisites: QUIM 4041 and, or QUIM 3065 or QUIM 3055.

General aspects, chemical and physical properties, and analytical techniques for the detection and analysis of explosives.

#### Graduate Courses

**QUIM 6005-6006.** GRADUATE SEMINAR (I, II)-(I, II). One credit hour per semester. One hour of lecture per week each semester.

Lectures, discussions, and reports on selected topics in chemistry.

**QUIM 6007.** SPECIAL TOPICS I. From one to three credit hours. From one to three hours of lecture per week.

Selected topics in inorganic chemistry, organic chemistry, analytical chemistry, physical chemistry, and biochemistry.

**QUIM 6008.** SPECIAL TOPICS II. From one to three credit hours. From one to three hours of lecture per week.

Selected topics in inorganic chemistry, organic chemistry, analytical chemistry, physical chemistry, and biochemistry.

**QUIM 6009.** SPECTROSCOPY OF BIOLOGICAL MOLECULES. Three credit hours. Three hours of lecture per week.

Spectroscopy techniques to study the structures and conformational changes of biological molecules.

**QUIM 6011.** ADVANCED INORGANIC CHEMISTRY I (I). Three credit hours. Three hours of lecture per week.

Electronic properties; theories of bonding and structures of inorganic compounds, including metals and their complexes; reactions and applications of acid-base, coordination, and bioinorganic systems.

**QUIM 6012.** ADVANCED INORGANIC CHEMISTRY II (II). Three credit hours. Three hours of lecture per week.

Physical and chemical properties of elements; kinetics and reaction mechanisms of coordination compounds; organometallic chemistry.

**QUIM 6016.** BIOPHYSICAL CHEMISTRY. Three credit hours. Three credit hours of lecture per week.

Spectroscopic methods, molecular simulation, bioenergetics, reaction kinetics, and solution thermodynamics applied to nucleic acids, protein and other biological molecules.

**QUIM 6026.** SPECIAL TOPICS IN INORGANIC CHEMISTRY (On demand). Three credit hours. Three hours of lecture per week. Corequisite: QUIM 6011 or authorization of the Department Director.

Discussions of areas of inorganic chemistry that are expanding very rapidly or that have developed recently, including newly developing areas of inorganic chemical research.

**QUIM 6028.** CRISTALLOGRAPHY. Three credit hours. Three lectures per week. Prerequisite: QUIM 4042.

A study of X-rays, crystal geometry, symmetry group diffraction by lattices, the reciprocal lattice, powder and single crystal patterns, structure factors, the phase problem and structure determinations, and refinements including Fourier, Patterson and least square methods.

**QUIM 6035.** NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY (On demand). Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Department Director.

Fundamental concepts and practice of high-resolution nuclear magnetic resonance (NMR) spectroscopy emphasizing instrumentation with Fourier transform, pulse methods, and the information these provide.

**QUIM 6215.** ADVANCED ANALYTICAL CHEMISTRY (On demand). Three credit hours. Three hours of lecture per week.

Advanced topics in chemical analysis including various electrochemical, chromatographic, and complexometric methods.

**QUIM 6216.** SURFACE ANALYTICAL CHEMISTRY. Three credit hours. Three hours of lecture per week.

Analytical and spectroscopic methods for characterization of surfaces and of chemical and electrochemical reactions on surfaces.

**QUIM 6218.** CHEMICAL SEPARATIONS. Three credit hours. Three hours of lecture per week.

Advanced techniques of chemical separations, and their analytical and preparative applications, recent methods of extraction, chromatography, electrophoresis and sedimentation.

**QUIM 6335.** FOOD ANALYSIS (II) (On demand). Four credit hours. Two hours of lecture and eight hours of laboratory per week.

Theory and practice of methods used in food analysis.

**QUIM 6395.** INFRARED SPECTROSCOPY AND MICROSCOPY. Three credit hours. Three hours of lecture per week.

Instrumentation and recent applications of infrared spectroscopy and microscopy.

**QUIM 6401.** ADVANCED ORGANIC CHEMISTRY (I). Three credit hours. Three hours of lecture per week.

Electronic theory, condensation reactions, molecular rearrangements, stereochemistry, reaction mechanisms, and free radicals.

**QUIM 6605.** ADVANCED PHYSICAL CHEMISTRY (II). Three credit hours. Three hours of lecture per week.

Chemical applications of statistical thermodynamics, selected topics in kinetic theory of gases, quantum chemistry and chemical thermodynamics.

**QUIM 6606.** ELECTROCHEMISTRY (On demand). Three credit hours. Three hours of lecture per week.

Theory of weak and strong electrolytes, activity coefficients, potentials, reference electrodes, electrochemical cells, etc. Consideration is also given to ionic transport phenomena and electro-deposition of metals.

**QUIM 6705.** SUPERVISED CHEMISTRY TEACHING. Three credit hours. Three hours of lecture per week. Corequisites: Teach a Chemistry course.

Aspects of the teaching-learning process: strategies, methods and techniques for teaching chemistry: fundamentals of evaluation and assessment.

**QUIM 6815.** PLANT BIOCHEMISTRY. Three credit hours. Three hours of lecture per week.

Chemistry of plant constituents. Chemical processes occurring during the growth and development of plants; biochemistry of photosynthesis.

**QUIM 6915.** ENZYMES (On demand). Three credit hours. Three hours of lecture per week.

Fundamental principles of enzymatic reactions, including topics such as: mechanisms, kinetics, inhibitors, and activators.

**QUIM 6994.** SPECIAL TOPICS: LABORATORY. From one to three credit hours. From one to three laboratories of two to four hours per week.

Selected laboratory topics in inorganic chemistry, organic chemistry, analytical chemistry, physical chemistry, and biochemistry.

**QUIM 6998.** CHEMISTRY RESEARCH (I, II, S). Six credit hours.

The student will choose a member of the faculty as his adviser. Presentation of a thesis is required for credit.

**QUIM 8008.** SCIENTIFIC COMMUNICATION IN CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: twelve credits in chemistry graduate courses.

Topics related to the preparation and organization of an effective presentation, and to the writing of proposals, scientific articles, and technical reports. Development, presentation and defense of an original research proposal required.



**QUIM 8615.** CHEMICAL KINETICS (On demand). Three credit hours. Three hours of lecture per week.

The discussion of measurements of reaction rates and theories of chemical reactions, study of gas phase and solution kinetics, and rates of biochemical, inorganic and organic reactions.

**QUIM 8980.** DOCTORAL RESEARCH SEMINAR. One credit hour. One hour of seminar per week. Prerequisite: authorization of the President of the Graduate Committee (Research Counselor).

Oral presentation and discussion of the doctoral thesis work.

**QUIM 8995.** SPECIAL TOPICS IN APPLIED CHEMISTRY. One to three credit hours. One to three hours of lecture per week.

Selected topics in applied chemistry.

**QUIM 8997.** RESEARCH AND DOCTORAL THESIS. One to eighteen credit hours. Three to eighteen hours of research or thesis per week. Prerequisite: authorization of the President of the Graduate Committee.

Research that constitutes a significant contribution to the student's field of specialization. Preparation and defense of the dissertation is required.

### GRADUATE FACULTY INVOLVED IN RESEARCH AND THEIR RESEARCH INTERESTS

**MARÍA A. APONTE HUERTAS**, *Professor*, Ph.D., 1982, University of Florida. Research interest: Biodegradable polymers for controlled released technology.

**MAYRA E. CÁDIZ**, *Professor*, Ph.D., 1985, University of Puerto Rico. Research interests: Synthesis of derivatives of cisplatin; synthesis and interaction of platinum drugs with DNA; Synthesis of metal complexes as potential antitumor compounds.

**ARNALDO CARRASQUILLO**, *Associate Professor*, Ph.D., 1995, Texas A&M. Research interests: Understanding the role played by electrode surface composition and structure in determining and controlling the electrochemical reactivity of species present at the electrode-solution interfaces. Study of electrocatalysis and of biosensor technologies by using XPS, AES, LEDD, TDMS, thin layer and classical electrochemical method.

**MIGUEL E. CASTRO**, *Professor*, Ph.D., 1991, University of Texas at Austin. Research interests: Synthesis and characterization of electronic materials; application of heterogeneous catalysis to drug synthesis; time resolved mass and infrared spectroscopy; time-of-flight measurements of oriented molecules.

**JOSÉ E. CORTÉS**, *Professor*, Ph.D., 1989, University of North Texas. Research interests: Synthesis and characterization of fullerene-transition metal complexes. Electronic and geometric structure of fullerene-transition metal complexes and the relationship of their structure with the complexes chemical reactivities. Integration of high school biology, chemistry, mathematics, and physics using calculator-based laboratory technology.

**ASTRID J. CRUZ**, *Professor*, Ph.D., 1993, University of Massachusetts. Research interests: Theoretical studies of molecular scattering phenomena by means of wave packets and fast Fourier Transform techniques. Quantum finite temperature studies of molecule-surface energy transfer processes.

**MARCO DE JESÚS**, *Assistant Professor*, Ph.D., 2004, University of Tennessee, Knoxville. Research interests: Study the potential health threats posed by exposure to trace aromatic pollutants, in particular pesticides, and PPCP's, in the environment. Use advanced air and water monitoring technologies in combination with information rich spectroscopies to evaluate the bioavailability of these chemicals in P.R.

**MARITZA DE JESÚS**, *Professor*, M.S., 1984, University of Puerto Rico-Mayagüez Campus. Research interests: Optimization of GC-MS and GC-FID tropical analysis of thermally labile essential oils in plants. Development of methodologies for the analysis of samples of environmental origin.

**EMILIO DÍAZ**, *Professor*, Ph.D., 1986, University of Wisconsin, Madison. Research interests: Isolation and characterization of oxidative enzymes from fungi; study of the role of oxidative enzymes on fungal pathogenicity. Isolation and inhibition studies of histidine decarboxylase from microorganisms which contaminate fish and dairy products. Study of the effects of antioxidants on the development of rancidity in frozen tilapia.

**SAMUEL P. HERNÁNDEZ**, *Professor*, Ph.D., 1986, Johns Hopkins University. Research interests: Molecular spectroscopy of crossed molecular beams and jets; Laser Raman and surface enhanced Raman spectroscopy of biomolecules and their interactions with heavy metal ions and carcinogenic compounds; molecular spectroscopy of coordination compounds, superconductors and explosives; theoretical calculations correlating measured spectroscopy properties.



**AIDALÚ DE LOS A. JOUBERT-CASTRO**, *Associate Professor*, Ph.D., 1998, Washington State University, Pullman. Research interests: Evaluation of liquid chromatography-particle beam mass spectrometry as a technique for the analysis of vanadyl geoporphyrins. Implementation and development of new teaching techniques that relate chemical concepts and the direct application of such concepts to the classroom.

**JORGE LABOY**, *Professor*, Ph.D., 1993, University of Cincinnati. Research interests: Mid-infrared FT-IR spectroscopy of transient species and reaction intermediates, mainly radicals using matrix-isolation. Photochemical reactions and reactions dealing with semiconductor materials.

**JUAN LÓPEZ-GARRIGA**, *Professor*, Ph.D., 1986, Michigan State University. Research interests: Study of the structure and function relationships in heme proteins using site directed mutagenesis, FT-IR, resonance Raman vibrational analysis, and NMR spectroscopy. Kinetic study of the reaction between hemoglobin and ligands (for example, O<sub>2</sub>, CO, NO, and H<sub>2</sub>S) using time-resolved infrared and resonance Raman techniques. Ultrafast geminate chemical dynamics analysis using time-resolved picosecond and femtosecond spectroscopy. Development and implementation of a coherent link between pre-college education and the university.

**GUSTAVO E. LÓPEZ**, *Professor*, Ph.D., 1992, University of Massachusetts. Research interests: Classical and Path integral Quantum Monte Carlo simulations of the thermodynamic properties of condensed matter systems; *ab-initio* calculations of weakly bound systems.

**ENRIQUE MELÉNDEZ**, *Professor*, Ph.D., 1992, University of Utah. Research interests: Synthesis, kinetics, and metal-DNA interactions of titanocenes. Bonding and reactivity of transition metal diene complexes.

**NAIRMEN MINA**, *Professor*, Ph.D., 1996, Baylor University. Research interests: FT-IR, Near IR, VIS and photoacoustic spectroscopy of organic compounds at cryogenic temperatures. Chemical kinetics and spectroscopy of CFC's.

**LUIS A. MORELL**, *Associate Professor*, Ph.D., 1993, University of California, Riverside. Research interests: Organic synthesis and development of hetero Diels-Alder reaction. Conformational analysis of sugar derivatives.

**ELSIE I. PARÉS-MATOS**, *Associate Professor*, Ph.D., 2000, Purdue University, Indiana. Research interest: Regulation of gene expression by DNA-protein and protein-protein interactions.

**BELINDA PASTRANA**, *Professor*, Ph.D., 1995, Rutgers University, New Jersey. Research interests: Use of recombinant DNA technology to express proteins for the biophysical study of protein-peptide and protein-ligand interactions. Molecular modeling studies of biological molecules.

**FRANCIS PATRON**, *Associate Professor*, Ph.D., 1997, Purdue University. Research interests: Chemistry education research on the teaching and learning of chemistry with particular interest in physical chemistry.

**DORIS RAMÍREZ-SOTO**, *Professor*, Ph.D., 1989, Rutgers University. Research interests: Isolation and characterization of gibberellins in tropical crops.

**ROBERT RIOS**, *Professor*, Ph.D., 1995, Rutgers University, New Jersey. Research interests: Chemotherapeutic approach to the treatment of tumors and the chemistry involved in the synthesis of ligands. Methodology development for the synthesis of useful intermediates to be used in the construction of novel chemotherapeutic drugs.

**JORGE L. RIOS-STEINER**, *Associate Professor*, Ph.D., 1991, University of Puerto Rico. Research interests: Analysis and structural studies of macromolecules, natural products, organic and inorganic molecules, utilizing X-ray crystallography as the main analytical tool.

**LUIS A. RIVERA**, *Researcher*, Ph.D., 1990, University of Puerto Rico. Research interests: Synthesis, spectroscopic studies and theoretical correlations of heterocyclic and substituted polycyclic aromatic compounds with potential activity. Analytical method development for trace detection of energetic compounds. Thermal stability studies of substituted polycarbonates, polyesters and other polymeric substances with potential applications as insulation materials in aircraft.

**CYNTHIA ROBLEDO-LUIGGI**, *Professor*, Ph.D., 1981, University of Florida. Research interests: Synthesis of oligopeptides containing one or more aromatic amino acids; study of small molecule-nucleic acid interactions; synthesis of oligopeptides with unusual amino acids.

**LOLITA RODRÍGUEZ**, *Professor*, M.S., 1985, University of Puerto Rico-Mayagüez Campus. Research interests: In vitro evaluation of decoctions from plants of reputed ethnopharmaceutical activity to treat kidney stones disease. The project includes measurements of free and complex Ca<sup>2+</sup> in solution, dissolution of calcium oxalate or calcium phosphate by plant decoctions, and inhibition of crystal or stone growth by plant extracts.

**FÉLIX ROMÁN**, *Professor*, Ph.D., 1989, University of Nebraska. Research Interests: Development of analytical method for the determination of trace levels of metals and pesticides in biological and environmental matrices.

**RODOLFO ROMAÑACH**, *Professor*, Ph.D., 1986, University of Georgia. Research interests: Development of near infrared, spectroscopic methods for use in the pharmaceutical industry. Development of analytical methods to study interactions between excipients in solid oral dosage forms and tablet surfaces. Continuing education and professional/personal development of chemists. Use of polarized light microscopy in chemical education.

**ISMAEL SCOTT**, *Professor*, Ph.D., 1985, University of Florida. Research interests: Infrared and Laser-Raman spectroscopic studies of RNA and DNA bases, including both experimental and theoretical work; toxicological and environmental effects of chemicals.

**FERNANDO A. SOUTO**, *Professor*, Ph.D., 1978, University of Alberta. Research interests: Association of organic dyes in solution, equilibrium polymerization, electronic absorption and emission spectra, excitation energy transfer, photochemistry of alkaloids. N-oxides, amperometric glucose biosensor, solid-state impedance immunological biosensors. In addition, there is on-going work with *Lippia dulcis* Trey: Formation and growth in tissue culture; initiation, growth, and viability of calli and cell suspension cultures; production and biosynthesis of terpenes and terpenoids by *in vitro* cell cultures.

**CARMEN A. VEGA**, *Professor*, Ph.D., 1975, University of Florida. Research interests: Thermodynamics, electrochemistry and spectroscopy of solutions. HPLC studies of limits of detection of drugs in physiological fluids. Studies of the interaction of platinum drugs with amino acids and DNA.

**MARISOL VERA**, *Professor*, Ph.D., 1986, Purdue University. Research interests: Characterization of oligonucleotide structures and small molecule-nucleic acid complexes by NMR; analytical applications of multinuclear NMR Evaluation of pesticides in soils amended with compost.

**RENÉ S. VIETA**, *Professor*, Ph.D., 1984, Texas A&M University. Research interests: Synthesis and mass spectrometric studies of saturated nitrogen heterocycles. Mechanisms of oxazoline formation. Synthesis of diamines that are precursors of cyclic ureas.

## ENGLISH

The Department of English offers a program leading to a Master of Arts degree in English Education (MAEE).

In addition to fulfilling the admission requirements set forth by the Office of Graduate Studies, prospective candidates must verify that they have successfully completed study in the following areas:

Introduction to Linguistics or Language (3 credits)  
American Literature (3 credits)  
British Literature (3 credits)

They must also have successfully completed **one** of the following requirements:

Structure/Grammar (3 credits) or  
Syntax (3 credits)

If the prospective candidate does not fulfill these requirements, a conditional admission may be granted in accordance with the established regulations of the Office of Graduate Studies.

Candidates are expected to speak and write English fluently and accurately.

Within the MAEE program, there are four core courses required for all students. Outside of the core, students may opt to tailor their programs to meet their individual interests, selecting from courses in literature, linguistics, pedagogy and research. Students in the MAEE Program choose from one of three options:

Option I: Thesis  
Option II: Creative Project  
Option III: Comprehensive Exam

The thesis option requires students to complete a thesis as the program requirement. The Creative Project requires the production of a significant creative project worthy of publication and a report in which the contents of the project is set into its historical and/or intellectual framework. The comprehensive exam option requires students to take an additional two courses and to pass an exam that has a three-part written component and an oral presentation to the department.

Each option is defined clearly in the English Department Graduate Handbook that is provided to students upon entry into the program.

### Advanced Undergraduate Courses

**INGL 5009.** CONTRASTIVE GRAMMAR (II) (On demand). Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Analysis of the descriptive grammars of English and Spanish to identify areas of divergences and to achieve an understanding of linguistic universals.

**INGL 5010.** PERSPECTIVES ON TEACHING ENGLISH AS A SECOND LANGUAGE (I) (On demand). Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Historical overview of language teaching methods from grammar-translation to the most recent approaches; students will develop applications for teaching English as a second language.

**INGL 5015.** ENGLISH AND AMERICAN LITERARY CRITICISM (On demand). Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Theory and practice of literary criticism within the tradition of English and American literature. A research paper will be required.

**INGL 5025.** CURRENT APPROACHES IN LINGUISTIC THEORY (On demand). Three credit hours. Three hours of lecture per week. Prerequisite: authorization of the Director of the Department.

Recent developments in linguistic theory and their application to related issues.

### Graduate Courses

**INGL 6006.** RESEARCH METHODS. Three credit hours. Three hours of seminar per week.

Research techniques in language study with emphasis on English.

**INGL 6008.** BILINGUALISM AND LANGUAGE-CONTACT. Three credit hours. Three hours of lecture per week.

The linguistic and social-psychological aspects of bilingualism; the sociology of language-contact.

**INGL 6009.** MODELS FOR TEACHING LITERATURE. Three credit hours. Three hours of seminar per week.

The teaching of literature in English: explication of texts, literary theory and its value in the classroom, the establishment of historical context; problems of teaching literature to speakers of English as a second language.

**INGL 6010.** TESL MATERIALS AND TESTING (II). Three credit hours. Three hours of lecture per week.

Study and development of materials and techniques for the teaching and evaluation of English as a second language, with emphasis on oral communication skills.

**INGL 6016.** TOPICS IN SOCIOLINGUISTICS. Three credit hours. Three hours of lecture per week.

Selected topics based on current research interests in sociolinguistics.

**INGL 6018.** TOPICS IN PSYCHOLINGUISTICS. Three credit hours. Three hours of lecture per week.

Selected topics based on current research interests in psycholinguistics.

**INGL 6020.** SECOND LANGUAGE ACQUISITION (I). Three credit hours. Three hours of lecture per week.

An overview of research topics in second language acquisition, and an in-depth study of one of these topics.

**INGL 6028.** PSYCHOLINGUISTICS AND THE READING PROCESS. Three credit hours. Three hours of lecture per week.

The reading process and the measurement of reading skills and comprehension in native and second languages; degree of transfer of reading skills from native to second language; current psycholinguistics research in the field of reading.

**INGL 6030. THEORY AND PRACTICE OF COMPOSITION (On demand).** Three credit hours. Three hours of lecture per week.

Practice in the techniques of writing. Study of its research and theory.

**INGL 6040. PRACTICE IN THE TEACHING OF COMPOSITION (On demand).** Three credit hours. Three hours of lecture per week.

Development and demonstration of materials and methods for the teaching of writing. Study of recent theory, research, and pedagogy.

**INGL 6055. STUDIES IN LITERATURE I (I).** Three credit hours. Three hours of lecture per week.

Study of selected authors, themes, or movements in the literature of the English language.

**INGL 6056. STUDIES IN LITERATURE II (II).** Three credit hours. Three hours of lecture per week.

Study of selected authors, themes, or movements in the literature of the English language.

**INGL 6058. STUDIES IN LITERATURE III.** Three credit hours. Three hours of lecture per week.

Study of selected authors, themes, and movements in the literature of the English language.

**INGL 6985. SPECIAL TOPICS I (I).** Three credit hours. Three hours of seminar per week.

Selected topics in linguistics, literature, or pedagogy.

**INGL 6986. SPECIAL TOPICS II (II).** Three credit hours. Three hours of seminar per week. Selected topics in linguistics, literature, or pedagogy.

**INGL 6995. RESEARCH (I, II).** One to three credit hours. Three to nine hours per week of research.

Research on a topic, which focus and breadth of study will be designed by the student and approved by the supervising professor prior to registration in the course.

**INGL 6999. THESIS.** Three to six credit hours.

Research in the fields of English language and applied linguistics, and presentation of a thesis.

### ENGLISH EDUCATION (EING)

**EING 6005. FOUNDATIONS OF ENGLISH EDUCATION (I).** Three credit hours. Three hours of lecture per week.

Foundations of English education emphasizing an analysis of the social, economic, and political issues which affect the teaching of the language in Puerto Rico.

### ENGLISH FACULTY

A list of professors who engage in graduate activities in the department follows including their highest earned degree, the date of completion, and the degree-granting institution. Research and teaching interests are also included.

**JOAN BAKER-GONZÁLEZ, Professor, MS, 1965,** University of Wisconsin; Teaching and Research interests: L2 Vocabulary Acquisition, L2 Reading, Materials Development, Listening Comprehension, Phonetics, Structure of English (written and spoken).

**NANDITA BATRA, Professor, PhD, 1986,** University of Rochester. Research and teaching interests: British Literature (1660 to the present), Postcolonial Studies, Gender Studies, Disability Studies, Anthrozoological Studies, Literary Theory.

**EILEEN BLAU, Professor, PhD, 1980,** University of Florida. Teaching interests: Reading in a Second Language, ESL, Applied Linguistics. Research interests: ESL Reading and Listening Comprehension, ESL Materials Development.

**JUDITH CASEY, Associate Professor, Ed. D., 2001,** University of Arizona. Research and Teaching interests: ESL Writing, ESL Tutoring, ESL Literacy Development.

**ELIZABETH DAYTON, Professor, 1996,** University of Pennsylvania. Research and Teaching interests: Linguistics.

**KATHLEEN FERRACANE, Professor, PhD, 1987,** State University of New York. Teaching interests: Caribbean Literature, Shakespeare, American Literature, Gender-related Studies. Research interests: Caribbean Literature.

**CATHERINE FLECK, Associate Professor, PhD, 2003,** Michigan State University. Teaching and Research interests: Linguistics and Applied

Linguistics—Bilingualism, Language Contact, Sociolinguistics, and Perceptual Dialectology.

**LEONARDO FLORES**, *Assistant Professor*, ABD, University of Maryland. Teaching and Research interests: Poetry, Electronic Literature, American Literature, Film, Media and Writing, Science Fiction, and Fantasy.

**JOCELYN GÉLIGA-VARGAS**, *Assistant Professor*, PhD, 1999, University of Massachusetts-Amherst. Research and Teaching interests: Cultural Identity and Representation; Film History and Criticism; Media Literacy and Critical Pedagogy; Race, Gender and Representation; Ethnography and Action Research.

**GAYLE GRIGGS**, *Assistant Professor*, ABD, Nova Southeastern University. Research and Teaching interests: Instructional Technology, Graduate TA Education, Online Learning, General Education learning theories and learning styles, Public Speaking, Communications, Peer Review, Conversational English.

**NICHOLAS HAYDOCK**, *Professor*, PhD, 1995, University of Iowa. Research and Teaching interests: Middle English, Middle Scots, Movie Medievalism, Film, Scottish Makkers, Robert Henryson, William Dunbar, Gavid Douglas, Epic, History of English.

**JOSÉ IRIZARRY**, *Professor*, PhD, 1999, Indiana University of Pennsylvania. Research and Teaching interest: Early 20th Century Puerto Rican Writing in the US, African American Intellectual Discourse, Autobiographical Discourse.

**RAYMOND KNIGHT**, *Associate Professor*, MA, 1986, Inter American University, San Germán. Teaching interests: ESL. Research interests: Literacy, L2 Literacy, Integration of Computers in Teaching, Media Literacies, Composition and Identity.

**NEVIN LEDER**, *Associate Professor*, PhD, 2003, Michigan State University. Teaching interests: Linguistics, Syntax, Phonetics, ESL methods, literacy. Research interests: Sense and Reference (semantics), Literacy, Second Language Acquisition, Dialect Variation.

**MARY LEONARD**, *Associate Professor*, PhD, 2003, University of the West Indies. Teaching and Research interests: Film, Media, Twentieth and Twenty-First Century Literature.

**ROBERTO LÓPEZ**, *Professor*, MA, 1972, New York University. Research interests: Translator for Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Sciences. Teaching interests: American Literature; British Literature; Children's Literature and Folklore.

**JEANNETTE LUGO**, *Professor*, MA, 1980, New York University. Research and Teaching interests: ESL Testing, ESL Reading Development

**CATHERINE MAZAK**, *Assistant Professor*, PhD, 2006, Michigan State University. Research and Teaching interests: ESL Teaching and Teacher Training, Second Language Literacy, and Language Policy.

**CARMEN MALDONADO**, *Associate Professor*, MA, 1980, New York University. Research and Teaching interests: ESL and Second Language Acquisition.

**SONJA MONGAR**, *Assistant Professor*, MFA, 2004, University of New Orleans. Research and Teaching interests: Autobiography in Cyberspace and Other Digital Formats, Life Narrative, Autobiography, Memoir, Creative Nonfiction, Life Narrator, and Creative Writing and Technology.

**BETSY MORALES-CARO**, *Associate Professor*, PhD, 1999, University of Texas at Austin. Research and Teaching interests: Culture Studies, ESL, Linguistics, WID, English Education in Puerto Rico, Pedagogy.

**WALESKA MORCIGLIO**, *Instructor*, MAEE, 1998, University of Puerto Rico at Mayaguez. Research and Teaching interests: Second Language Writing, Basic Writing, and ESL.

**DARNYD W. ORTIZ-SEDA**, *Professor*, PhD, 1999, Indiana University of Pennsylvania. Research and Teaching interests: Drama, Theater, Short Story, Rhetoric and Composition, Teaching Literature, and Teaching Composition.

**MABEL ORTIZ**, *Assistant Professor*, MA, 1974, State University of New York at Fredonia. Teaching and Research interests: Assessment, Curriculum, Literature, Writing Skills, Ethics, and Study Skills.

**ELLEN PRATT**, *Professor*, PhD, 1999, Indiana University of Pennsylvania. Research and Teaching interests: Writing Center Pedagogy, Writing in the Disciplines, Writing Theory and Pedagogy, ESL Writing.

**SANDRA RIOS**, *Associate Professor*, PhD, 2005, Rensselaer Polytechnic Institute. Research and Teaching interests: Rhetoric, Environmental rhetoric, and Technical Writing.

**ISMAEL RIVERA**, *Professor*, PhD, 1995, Pennsylvania State University. Research and Teaching interests: Renaissance Drama, and John Webster

































































































































































































