

# *Undergraduate Catalogue*

*2003-2004*



**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 Undergraduate 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 our academic programs in an effort to enhance their quality and improve our 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.

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

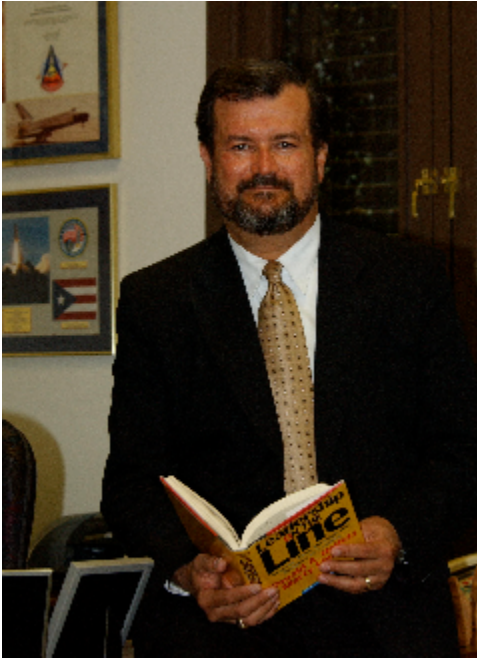
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## *Message from the Chancellor*



*“It is imperative that higher education offers solutions for today’s problems and that it becomes self-innovating in order to prevent these problems from re-occurring. Even in the midst of an economical, political, or social turmoil, it is expected that higher education will contribute to raise the world’s standard of living. In order to function effectively and to maintain excellence, higher education must aim at greater internationalization by integrating international and intercultural dimensions into its functions of teaching, research and service.” UNESCO*

It is a commonly understood fact that we live in world which becomes each day more interdependent, more interconnected, or, at the very least, exists within an ever growing process of integration. This is mostly due to scientific and technological advancements that have eased the flow and exchange of knowledge, products, services, capitals, people and information. Today, this exchange takes place through the “dissipating” frontiers of globalized nations.

The dynamic relation among nations has turned complex and intense through the adoption of new forms of interaction among individuals, businesses, companies, governments and institutions. In one way or another, we have been affected by internationalization. The international dimension affects our personal and professional lives.

Educational and formative processes are not oblivious to today’s processes of integration and market globalization. We speak of an internationalized education which considers contents and knowledge related to world nations and their interdependence. New skills and bodies of knowledge required for performance in the global setting are added emphatically to traditional and professional student formation standards. Future professional employees must perform capably within the international scenario. Professional employees must not only master their own fields of expertise, but must also be familiar with the multiple bodies of knowledge to be encountered during the course of their professional careers and endeavors.

Our University of Puerto Rico has not been unconscious to the expectations and demands imposed by internationalization. Within its trajectory, the University has taken steps to internationalize its perspective and actions. As we celebrate the first one-hundred years of the University of Puerto Rico and face the challenges imposed by the process of internationalization, we propose and participate in new projects of international collaboration and superior educational integration at the regional, hemispheric and international levels.

We invite our students and our professors to participate in these renewed efforts of inserting our Mayagüez Campus of the University of Puerto Rico in this agenda of internationalization. Through new academic programs, student and faculty exchanges, participation in symposiums, workshops, congresses and in the development of skills and abilities for this global village UPRM has become a major contributor in our region.

We welcome this opportunity to extend our thanks and appreciation to so many colleagues and students from other countries who have formed and continue to form part of our college community. Their contribution to our University and to our Mayaguez Campus has been outstanding.

Sincerely,

Jorge Iván Vélez Arocho  
Chancellor

# Degrees Offered

## **BACHELOR OF ARTS:**

Four-year program in Comparative Literature, Economics, English, History, French Language and Literature, Hispanic Studies, Philosophy, Physical Education (Coaching, Recreation and Teaching in Physical Education), Plastic Arts, Political Science, Psychology, General Social Sciences, Sociology, and Theory of Art.

## **BACHELOR OF AGRICULTURAL SCIENCES:**

Four-year program in General Agricultural Sciences, Agronomy, Agricultural Economics, Horticulture, Animal Industry, Crop Protection, Agri-business, Agricultural Education, Agricultural Extension, Soil Sciences, and Mechanical Technology in Agriculture.

## **BACHELOR OF SCIENCE:**

Four-year program in Biology (Biology, Industrial Microbiology, and Pre-Medical Studies), Chemistry, Geology, Mathematics (Pure, Computer Science, and Education), Nursing, and Physics (Physical Sciences and Theoretical Physics).

Five-year program in Industrial Biotechnology.

## **BACHELOR OF SCIENCE IN BUSINESS ADMINISTRATION:**

Four-year program in Industrial Management, Accounting, Finance, Marketing, Organizational Studies and Computerized Information Systems.

## **BACHELOR OF SCIENCE IN ENGINEERING:**

Five-year program in Chemical Engineering, Civil Engineering and Surveying, Computer Engineering, Electrical Engineering, Industrial Engineering, and Mechanical Engineering.

## **BACHELOR OF SCIENCE IN SURVEYING AND TOPOGRAPHY:**

Four-year program.

## **BACHELOR IN OFFICE ADMINISTRATION:**

Four-year program.

## **\*MASTER OF BUSINESS ADMINISTRATION**

## **\*MASTER OF ENGINEERING:**

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

## **\*MASTER OF SCIENCE:**

Agriculture: Agricultural Economics, Agricultural Education, Agricultural Extension, Agronomy, Soils, Animal Industry, Horticulture, Crop Protection, and Food Science and Technology.

Biology.

Chemistry.

Geology.

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

Marine Sciences.

Mathematics: Options in Computer Science, Applied Mathematics, Statistics, Pure Mathematics.

Physics.

## **\*MASTER OF ARTS:**

Hispanic Studies and English Education.

## **\*DOCTOR OF PHILOSOPHY:**

Marine Sciences, Chemical Engineering, Civil Engineering, Computing and Information Sciences and Engineering.

**\* Please refer to the Graduate Bulletin of Information for further information about Master and Doctoral degrees.**

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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 12,136 students, 1,336 regular staff members and 1,026 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 Association of Colleges and Schools** since 1946. It is also a member of the **Association of Hispanic-American Universities**. 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 instill 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.

## ***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. Resolving, on appeal, controversial situations represented by a dean
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, departments 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***

This office was created on November 10, 1999 as a result of the University's belief in dialogue and communication as the best way to pursue truth and enhance its students' quality of life.

One of the University of Puerto Rico's fundamental objectives is to provide adequate and appropriate conditions which respond to the development of its students. The mission of the Student Ombudsman Office (Oficina del Procurador Estudiantil) is to promote an effective though informal process in order to generate solutions to students' problems and conflicts.

According to UPR University Regulations in redressing a grievance or complaint, a student must initiate the pertinent procedure in the corresponding unit. In the event that such pursuit is unsuccessful, a student will be able to seek direct intervention from the student ombudsman as long as complaints are presented personally or in writing.

## 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 right 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.



## Academic Progress and Economic Assistance Eligibility

The Federal Department of Education, through a circular letter in October 1994, notified educational institutions of the need to establish, publish, and apply reasonable norms which measure the student's academic progress for the purpose of determining economic aid eligibility in Title IV programs. These cannot be less restrictive than those applicable to the general student population.

The Board of Trustees of the University of Puerto Rico, through Certification Number 054 (2000-2001), established the Institutional Policy on Academic Progress for Eligibility to the Programs of Economic Assistance. All students are hereby notified of the criteria to be satisfied at the end of the academic year to maintain their possible eligibility and participate in economic aid programs.

### Criteria Applicable to Undergraduate Academic Evaluations

1. By the end of the academic year, the student's grade level must have reached the minimum retention index applicable to the respective year of studies. See table below.

<i>Year of Studies</i>	<i>Retention Index</i>
First year	1.70
Second year	1.90
Third year	1.95
Fourth year	2.00

For the purpose of these guidelines, one year of study is defined as two semesters in which the student registers a minimum of 12 degree credit-hours. Courses taken during the summer immediately following the evaluation do not affect adversely or favorably a student's status.

Students on probation will be ineligible to receive economic aid during that year unless they comply with other criteria established for academic progress.

2. A student may receive economic aid as long as 150% of the normal time required for obtaining an academic degree is not exceeded.

3. The equivalent number of years studied is determined according to the total number of credits attempted or enrolled as shown in the table below.

Number of registered credits per semester	Equivalent years of study
1-5	.125
6-8	.250
9-11	.375
12 or more	.500

4. The determination of academic progress for transfer students from other institutions is made by examining the equivalent number of years studied, the total number of credits attempted up to the time of transfer and the number of credits approved.
5. A student may receive economic aid only if he or she does not exceed 150% of the normal time required for obtaining the degree.

The equivalent number of years studied and enrolled credits will be considered by using the following table:

Academic Progress According to Degree Credits Approved		
Equivalent Years Studied	Four Years Degree	Five Years Degree
1	15%	13%
2	33%	26%
3	50%	40%
4	66%	53%
5	83%	66%
6	100%	80%
7		93%
7.5		100%

6. When a student opts to change academic programs either by internal or external transfer, the time spent in the original program will be considered when determining his academic status.

### **Complementary Norms for Undergraduate Evaluation**

The equivalence in credits of the required remedial courses will be considered in order to determine a student's satisfactory academic progress.

The evaluation of academic progress will take place at the end of the academic year.

Criteria considered in determining a student's satisfactory academic progress applies to all students, regardless of economic assistance. This criteria does not affect established academic norms regarding probation and suspension.

A student who completes the requirements for an academic degree corresponding to the program in which he or she is classified is not illegible for economic assistance, even if he or she has not exceeded 150% of the normal time required for degree completion.

A student is required to approve a minimum of 18 credits during his first year at the university.

### **General Considerations**

1. ***Withdrawals or Incompletes :***  
Degree courses having provisional grades of incomplete (I) with A, B, C, or D are considered approved. Courses with IF or courses that are dropped (withdrawn) are considered attempted but not approved. In those cases where an academic program requires a C as minimum for passing major courses, the grades D, ID, IF, W, NP are not acceptable.
2. ***Re-admissions:*** If a student is re-admitted after discontinuing studies, current academic progress norms standing at the moment of readmission will be applied.

However, if a student does not comply with the number of required credits because of an incomplete F grade in a course (IF), the

economic aid will be re-established when the student presents evidence showing completion of pending course work. The Incomplete Removal Form is processed by the Office of the Registrar.

3. ***Summer Credits:*** Courses taken during the summer will not be utilized in determining the total number of years studied but will be considered in determining the degree-credit percentage progress. However, if a student obtains the minimum required credits including summer credits, a revision will allow the student to be re-established as long as the student complies with established requisites.
4. ***Repeating courses:*** The repetition of courses within the program of studies will be permitted according to existing institutional norms as long as these courses not exceed 150% of the normal time required for degree completion.
5. ***Class Attendance:*** Class attendance is compulsory at the University of Puerto Rico and at all its campuses.

### **Notification procedure**

Students who do not comply with Academic Progress Norms will be notified in writing by the Department of Financial Aid at the student's address kept on file.

### **Revision Procedure**

A student who has valid reasons for not complying with the Norms of Academic Progress may appeal in writing to the Institutional Committee of Revision for Financial Assistance. This Committee is composed of representatives from each Faculty and one representative from the Office of the Dean of Students.

### **Appeals**

Students who are not eligible to receive economic assistance because of academic progress may appeal in writing to the Dean of Students within ten working days after receiving notification.

## **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**

Established in 1910 by the Sugar Producers Association the Agricultural Experiment Station was ceded to the Government of Puerto Rico in 1913 and transferred to the University of Puerto Rico by legislative action in 1933. Its main objective has been to conduct research, to develop technology and to improve agriculture and the quality of life in rural areas. 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 laboratories, research library, farms, and other facilities are available to graduate students for thesis research. The Station is an active member of the Southern Association of Experimental Stations. This Association serves as a regional link to the U.S. Department of Agriculture, the U.S. Congress, the National U.S. 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.

### **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 Trellix 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.

### **Learning Factory**

The Manufacturing Engineering Education Partnership or MEEP (UPR-Mayagüez, Penn State University, and the University of Washington, in collaboration with Sandia National Laboratories and industry), has developed an undergraduate product realization/manufacturing engineering option which addresses various issues of the new ABET 2000 criteria, specifically Criteria 2 and 3. The result of this program is the Learning Factory, an outcome-based undergraduate curriculum integrated with laboratory facilities and industry collaboration.

### **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 is 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 Sámana 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>  
Ramón Vásquez, Co-PI, [reve@ece.uprm.edu](mailto:reve@ece.uprm.edu)  
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UPRM has established, through NASA Grant number NCC5-340, the Partnership for Spatial and Computational Research (PaSCoR). The main goal of this five-year 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 various SMET departments at UPRM (Agricultural Sciences, Biology, Geology, Electrical and Computer Engineering, Civil Engineering, and Mathematics) 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 950 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, Caribbean Pictometry and the PR Planning Board. Due to her outstanding performance, undergraduate student, Fernmarie Rodríguez has been selected to NASA's Summer 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 PRWRERI 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>.

### **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.

## **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**

In order to promote research and development in highway related activities in Puerto Rico and the Virgin Islands, The Puerto Rico Transportation Technology Transfer Center was created on April 1, 1986 in the Civil Engineering Department and Surveying at UPRM. Its primary mission is to promote training, technical assistance and professional development in highway related activities to local transportation officials in Puerto Rico and the US Virgin Islands.

The Puerto Rico Transportation Technology Transfer Center program provides training and technical assistance to local officials of the 78 municipalities, the Department of Transportation and Public Works of Puerto Rico and the US Virgin Islands Department of Public Works. It utilizes a network of 57 centers located throughout the United States under the Local Technical Assistance Programs (LTAP), the Pan American Institute of Highways (PIH), Federal Highway Administration (FHWA), United States Department of Transportation (USDOT) and non-profit organizations in order to obtain

training materials including textbooks, equipment, and instructors to assist us in our training program in Puerto Rico and the US Virgin Islands.

The Center's activities and operational expenses are funded by the Federal Highway Administration, the Department of Transportation and Public Works of Puerto Rico and the US Virgin Islands Department of Public Works. In 1993, Puerto Rico hosted the LTAP national conference: "Moving Towards the Next Century," as well as regional meetings in 1993 and 2002. Other supporting programs conducted at the Center include: Road Scholar Program, the Entrepreneurial Training and Technical Assistance Program (ETTAP), K-12 Garrett Morgan Initiative, Tren Urbano, UPR/MIT Professional Development Program and the Civil Engineering PE Review Courses. The Center is also committed to initiate and support distance learning programs.

#### **Puerto Rico & Virgin Islands Strong Motion Program**

PRVISMP is under the administration of the Civil Engineering and Surveying Department. The main objective of the program is to determine, as accurately as possible, the critical earthquake ground motion for which structures in Puerto Rico should be designed. The program includes 39 free field stations with digital accelerographs distributed throughout a 13 strong motion network for the San Juan Metropolitan Area, 10 for the Mayagüez Metropolitan Area, and 16 around the island. The program also includes 6 joint stations where an accelerograph and a broadband seismograph from the PRSN work simultaneously. Two buildings are seismically instrumented. Within the next two years, 21 additional strong motion stations will be established; a concrete dam and two bridges will be instrumented. Strong motion records are available upon request.

#### **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.

#### **Pre-College Engineering Program**

PCEP is a two-week summer-residential program designed to introduce talented high school students to the engineering profession. The program's main objective is to motivate participants to select and pursue careers in engineering. Upon completion of the program, participants are able to make informed career decisions. The program has served a total of 590 students. Ninety-four percent of the students served by this program pursued careers in engineering. Funding for the program comes from corporate institutions.

## **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 inform 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 three times a year by the Agricultural Experiment Station including technical and scientific articles related to the agriculture of Puerto Rico and the Caribbean. The station publishes a series of 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

### **INTERDISCIPLINARY COURSES**

The Office of the Dean of Academic Affairs oversees the following four courses:

INTD 3355. RESEARCH METHODS IN LIBRARIES. Three credit hours. Three hours of lecture per week.

Organization and services of libraries with emphasis on the Library of the Mayagüez Campus of the University of Puerto Rico. Selection, evaluation, and use of bibliographic resources in print and non-print

format; conventional research strategies through print resources; development of new research strategies through electronic formats.

INTD 4000. CONGRESSIONAL INTERNSHIP-CÓRDOVA PROGRAM. Nine credit hours. A minimum of thirty-five and a half hours per week for fifteen weeks during the semester. Prerequisites: consent of the Institutional Coordinator for the Córdoba Program and to be selected as participant by the joint Commission for the Córdoba Program in the state Legislature of the Commonwealth of Puerto Rico. Co-requisite: INTD 4010.

Internship in the Congress of the United States of America. Supervised work experience in the office of a congressman or any other congressional office such as the Library, the Office for Science and Technology, and the offices of congressional committees or subcommittees.

INTD 4010. ACADEMIC SEMINAR-WASHINGTON CENTER. Three credit hours. Three hours of lecture per week for fifteen weeks during the semester. Prerequisites: consent of the Institutional Coordinator for the Córdoba Program and to be selected as participant by joint Commission for the Córdoba Program in the state Legislature of the Commonwealth of Puerto Rico. Corequisite: INTD 4000.

Academic complement to the Congressional Internship. The student selects a seminar type course in his academic or professional area of interest among those offered by experts through the Washington Center each semester.

INTD 4995. INSTITUTIONAL COOP PLAN. Zero to nine 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: have completed freshman year of college



before internship begins. Cannot be a graduating senior. Apply to the government agency, private enterprise, or foundation of his or 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**

CPE 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'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 orientation for new faculty and graduate teaching assistants, annual training 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 needs of the audience, 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.

CPE was created in 96-97 by the Administrative Board, through Certification number 596, which mandates a teaching preparation workshop for all faculty personnel dedicated to teaching who have 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.

For more information call (787) 832-4040, extension 3829, 3674, (787) 265-3829, Fax (787) 831-5249. E-mail: [uprm.edu/cep](mailto: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 monthly allowance of \$200. 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 a 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 in Bachelor's and Master's degrees to outstanding students selected for admission to both the four-year and the two-year programs. As long as the program's minimum requirements are maintained, these scholarships cover tuition, laboratories, books and provide a \$200 monthly allowance. Cadets accepted into the Advanced Program and who are first-time scholarship recipients are offered a \$3,000 yearly scholarship (\$1,500 per semester).

### 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 five-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

**LIEUTENANT COLONEL RAMON CORTES**, *Professor of Aerospace Studies*, Master's Degree: Operations Research, Air Force Institute of Technology.

**CAPTAIN CHRISTOPHER CARROLL**, *Assistant Professor of Aerospace Studies*, M.B.A., University of California at Davis.

**CAPTAIN MARTIN SIPULA**, *Assistant Professor of Aerospace Studies*, Master of Arts in Management, National University, San Diego, California.

### COURSES OF INSTRUCTION

ESAE 3001-3002. THE AIR FORCE TODAY. Two credit hours per semester. One hour of lecture and one and a half hours of Leadership Laboratory (Corps Training) per week each semester.

This course is a survey course designed to introduce students to the United State Air Force and Air Force Reserve Officer Training Corps. Featured topics include: mission and organization of the Air Force, officers professionalism, military customs and courtesies, Air Force officer opportunities, group leadership problems, and an introduction to communication skills. Leadership Laboratory is mandatory for Air Force ROTC cadets, and it complements this course by providing cadets with fellowship experiences.

ESAE 3011-3012. THE AIR FORCE WAY. Two credit hours per semester. One hour of lecture and one and a half hours of Leadership Laboratory (Corps Training) per week each semester

This course is a survey course designed to facilitate the transition from Air Force ROTC cadet to Air Force ROTC candidate. Featured topics include: Air Force heritage, Air Force leaders, Quality Air Force, an introduction to ethics and values, introduction to leadership, group leadership problems, and continuing application of communication skills. Leadership Laboratory is mandatory for Air Force ROTC cadets, and it complements this course by providing cadets with their first opportunity for applied of leadership experiences discussed in class.

ESAE 3995-3996. SPECIAL PROBLEMS INAEROSPACE STUDIES. One to three credit hours per semester. Prerequisite: Consent of the Director of the Department.

Study, research or work on a special problem selected jointly by the student and the professor. A written report is required.

ESAE 4001-4002. AIR FORCE LEADERSHIP AND MANAGEMENT. Four credit hours per semester. Three hours of lecture and one and a half hours of Leadership Laboratory (Corps Training) per week each semester.

This course is a study of leadership and quality management fundamentals, professional knowledge, Air Force doctrine, leadership ethics, and communication skills required of an Air Force junior



officer. Case studies are used to examine Air Force leadership and management situation as a means of demonstrating an exercising practical application of the concepts being studied. A mandatory Leadership Laboratory complements this course by providing advanced leadership experiences in officer-type activities, giving students the opportunity to apply leadership and management principles of this course.

ESAE 4011-4012. PREPARATION FOR ACTIVE DUTY. Four credit hours per semester. Three hours of lecture and one-and-a-half hours of Leadership Laboratory (Corps Training) per week each semester.

This course examines the national security process, regional studies, advanced leadership ethics, and Air Force doctrine. Special topics of interest focus on the military profession, military justice, civilian control of the military, preparation for active duty, and current issues affecting military professionalism. Within this structure, continued emphasis is given to refining communication skills. An additional Leadership Laboratory complements this course by providing advanced leadership experiences, giving students the opportunity to apply the leadership and management principles of this course.

## ***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 for male and female undergraduates who are physically and mentally qualified. A student must satisfactorily complete both years of studies in order to be eligible for the advanced course. The advanced course is optional and selective. The US Government furnishes all required uniforms and any special articles of equipment by the ROTC program for both basic and advanced courses. All Government property must be returned to the Military Science Department at the end of classes or prior to a cadet's withdrawal from the course. Students enrolled in the advanced course may receive a living allowance of \$1,500 each year of enrollment and approximately \$700 for attendance at advanced camp at Fort Lewis, Washington.

Under the two-year advanced program, a student is required to attend two summer camps. The first summer camp will earn credit for the two-year basic course required in the four-year program. The second summer camp is the normal requirement for the four-year program.

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 70 or more on the English 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 year. 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 ISRAEL REYES,** *Professor of Military Science, M.S., 1992, North Carolina State University.*

**MAJOR RAUL PADILLA,** *Assistant Professor of Military Science, B.A., 1989, University of Puerto Rico, Mayagüez.*

**CAPTAIN EDWIN REYES,** *Assistant Professor of Military Science, B.A., 1995, Interamerican University.*

**CAPTAIN LUIS A. DUPERON,** *Assistant Professor of Military Science, B.A., 1995, University of South Florida.*

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

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

**MSG KENNY POWER,** Drill Instructor.

**SFC ARVENTO COLLINS**, Drill Instructor.

**SGT ROBERT SANDERS**, Supply Sergeant.

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

**MR. ISAAC MARTINEZ**, English Language Specialist, B.S., 2001, Wayland University.

### **COURSES OF INSTRUCTION**

**CIMI 3011. INTRODUCTION TO MILITARY SCIENCES.** Two credit hours. One hour of lecture and one two-hour drill period per week.

Introduction to the Basic Military Science concepts and principles. A brief history of the U.S. Army ROTC program. Emphasis on principles of leadership and land navigation.

**CIMI 3012. BASIC MILITARY SKILLS.** Two credit hours. One hour of lecture and one two-hour drill period per week.

Training in Basic Military skills such as First Aid, Physical Fitness, Military Drill, and Ceremony, and Land Navigation using a map and compass. Emphasis on the development of leadership and basic military knowledge.

**CIMI 3021. FUNDAMENTALS OF MILITARY TACTICS I.** Two credit hours. One hour of lecture and one two-hour drill period per week.

Study of basic military tactics at the squad level. Introduction to military geography and land navigation. Advanced techniques in the improvement of oral expression. Leadership laboratory.

**CIMI 3022. FUNDAMENTALS OF MILITARY TACTICS II.** Two credit hours. One hour of lecture and one two-hour drill period per week.

Continuation of basic military unit tactics. Principles of military strategies. Study of military formations, support and communication.

**CIMI 3041. BASIC ENGLISH FOR TODAY'S ARMY I.** One credit hour. Two hours of lecture, seminar or practical exercises per week.

Designed for those Military Science students who have demonstrated a limited proficiency in the English language as measured by the English Comprehension Level Test (ECLT), the official Department of Defense English Language proficiency test. Emphasis is on pronunciation, reading comprehension, vocabulary, and a general review of English grammar

using a military functional approach. To be taken only as a free elective.

**CIMI 3042. BASIC ENGLISH FOR TODAY'S ARMY II.** One credit hour. Two hours of lecture, seminar or practical exercises per week.

Designed for those Military Science students who have demonstrated a limited proficiency in the English language as measured by the English Comprehension Level Test (ECLT), the official Department of Defense English Language proficiency test. Emphasis is on pronunciation, reading comprehension, vocabulary, and a general review of English grammar using a military functional approach. To be taken only as a free elective.

**CIMI 3043. INTERMEDIATE ENGLISH FOR TODAY'S ARMY I.** One credit hour. Two hours of lecture, seminar or practical exercises per week.

Designed for those Military Science students who have demonstrated an intermediate level of proficiency in the English language as measured by the English Comprehension Level Test (ECLT), the official Department of Defense English language proficiency test. Emphasis is on aural comprehension, speaking proficiency, pronunciation, vocabulary building, and a general review of English grammar using a military functional approach. To be taken only as a free elective.

**CIMI 3044. INTERMEDIATE ENGLISH FOR TODAY'S ARMY II.** One credit hour. Two hours of lecture, seminar or practical exercises per week.

Designed for those Military Science students who have demonstrated an intermediate level of proficiency in the English language as measured by the English Comprehension Level Test (ECLT), the official Department of Defense English language proficiency test. Emphasis is on aural comprehension, speaking proficiency, pronunciation, vocabulary building, and a general review of English grammar using a military functional approach. To be taken only as a free elective.

**CIMI 3051. MILITARY BRIEFING I.** Two credit hours. Two hours of lecture, seminar or practical exercises per week.

Designed for third year Military Science students who have demonstrated certain ability or dexterity in the English language as a result of the English Comprehension Level Test (ECLT), the official Department of Defense English language proficiency test. Practice in military briefings, with special emphasis on formal and informal outlines, and the correct use of military visual aids. Leadership

evaluation, including an acculturation seminar. To be taken only as a free elective.

CIMI 3052. MILITARY BRIEFING II. Two credit hours. Two hours of lecture, seminar or practical exercises per week.

Designed for third year Military Science students who have demonstrated certain ability or dexterity in the English language as a result of the English Comprehension Level Test (ECLT), the official Department of Defense English language proficiency test. Practice in military briefings, with special emphasis on formal and informal outlines, and the correct use of military visual aids. Leadership evaluation, including an acculturation seminar. To be taken only as a free elective.

CIMI 4011. COMMUNICATION AND PSYCHOLOGY OF MILITARY LEADERSHIP. Four credit hours. One two-hour lecture and one two-hour drill period per week; approximately three one-day weekend training periods; additionally, a three-day field training exercise, plus the six week Advanced Camp at Fort Bragg, North Carolina.

Advanced course on communication techniques, both oral and written. Development of leadership by case studies and problems analysis that require psychological techniques. Army organization. Leadership laboratories.

CIMI 4012. FUNDAMENTALS OF MILITARY STRATEGY. Four credit hours. One two-hour lecture and one two-hour drill period per week; approximately three one-day weekend training periods; additionally, a five-day field training exercise, plus the six week Advanced Camp at Fort Bragg, North Carolina.

Study of the principles and fundamental premises in the development of military strategy. Command-staff functions and responsibilities in each level of command. Study of the principles for defense of a country. Leadership laboratories.

CIMI 4021. MILITARY HISTORY, LEADERSHIP AND MILITARY ADMINISTRATION. Four credit hours. One two-hour lecture and one two-hour drill period per week; approximately three one-day weekend training periods; and a three-day field training exercise.

Army writing style. Military administration. Compendium of military and world history from the war principles to the basic military movements, the Spanish American War, World War I, II, Korea and Vietnam. Leadership Laboratory.

CIMI 4022. SEMINAR: LEADERSHIP AND MILITARY ADMINISTRATION. Four credit hours. One two-hour lecture and one two-hour drill period

per week; approximately three one-day weekend training periods; and a five-day field training exercise.

Analysis of leadership problems. Study of the administration of units and military personnel. Basic military justice, logistics management, command and staff responsibilities, duties and responsibilities of Army officers. Leadership laboratory.

CIMI 4041. MILITARY WRITING I. Two credit hours. Two hours of lecture, seminar, case studies, or practical exercises per week.

Designed for Military Science students who wish to improve their military writing skills in English. Emphasis on military writing styles and formats. Topics include military memorandums, autobiographies, military history analysis, and a military ethics paper. To be taken only as a free elective.

CIMI 4042. MILITARY WRITING II. Two credit hours. Two hours of lecture, seminar, case studies, or practical exercises per week.

Designed for Military Science students who wish to improve their military writing skills in English. Emphasis on military writing styles and formats. Topics include military memorandums, autobiographies, military history analysis, and a military ethics paper. To be taken only as a free elective.

## ***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 and are not presently addressed by traditional offerings in order to foster a closer collaboration between

the university'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 have 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 Training Program for regular students.

#### ***Teacher-Training 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. All participants who successfully complete this training, fulfill the necessary requirements to obtain a teacher's certificate from the Department of Education of Puerto Rico.

#### ***Teacher's Certificate Program***

The Education Program offers courses required by the Department of Education of Puerto Rico. In order to receive a teaching license, students present evidence to the Department of Education at the conclusion of the Education Program.

### **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, 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.

EDPE 4145	3	Theory and Methodology in the Teaching of Mathematics in Secondary School
EDPE 4155	3	Theory and Methodology in the Teaching of History and Social Studies in Secondary School
EDPE 4165	3	Theory and Methodology in the Teaching of Art in Secondary School
EDPE 4185	3	Theory and Methodology in the Teaching of Theatre in Secondary School
EDPE 4215	3	Theory and Methodology in the Teaching of Physical Education in Secondary School
EDPE 4235	3	Theory and Methodology in the Teaching of Spanish in Secondary School
EDPE 4245	3	Theory and Methodology in the Teaching of English in Secondary School

**TEACHER'S CERTIFICATION IN SECONDARY EDUCATION**

The following courses are available to UPRM students and in-service teachers.

***Courses in Education***

Number	Credits	Title
EDES 4006	3	Seminar on the Nature and Needs of Exceptional Children
EDFU 3007	3	Social Foundations of Education
EDFU 3001	3	Human Growth and Development I
EDFU 3002	3	Human Growth and Development II
EDFU 4019	3	Philosophical Foundations of Education
EDPE 3129	3	The Use of Microcomputers in the Classroom

***Courses in Methodology***

Students select among these courses according to their professional major.

Number	Credits	Title
DESC 4005	3	Theory and Methodology in the Teaching of Health in Secondary School
EDPE 4047	3	Innovations in the Teaching of Typewriting
EDPE 4048	3	Innovations in the Teaching of Shorthand
EDPE 4135	3	Theory and Methodology in the Teaching of Science in Secondary School

***Courses in Practice Teaching (Laboratory Experiences)***

Number	Credits	Title
DESC 4015	6	Practice of Teaching Health in Secondary School
EDPE 4137	6	Student Teaching of Biology in Secondary School
EDPE 4138	6	Student Teaching of Physics in Secondary School
EDPE 4139	6	Student Teaching of Chemistry in Secondary School
EDPE 4146	6	Student Teaching of Mathematics in Secondary School
EDPE 4156	6	Student Teaching of Social Studies in Secondary School
EDPE 4157	6	Student Teaching of History in Secondary School
EDPE 4166	6	Student Teaching of Art in Secondary School
EDPE 4186	6	Student Teaching of Theatre in Secondary School
EDPE 4187	6	Student Teaching of Business Education in Secondary School
EDPE 4216	6	Student Teaching of Physical Education in Secondary School
EDPE 4236	6	Student Teaching of Spanish in Secondary School
EDPE 4246	6	Student Teaching of English in Secondary School

**A student may choose three credits from the following courses:**

DESC 3005		Skills Development in Reading, Writing, and Oral Communication
EDFU 3055	3	Legal Foundations of Education
EDFU 4006	3	The Child and His Social Milieu
EDFU 4025	3	School Health Education

EDFU 3115 3 Philosophy of Health Education

Students must complete one of the following courses: History of Puerto Rico or History of the United States.

Total credits for education: 30

Total credits for certification: 36

Total credits for health certification: 39

### FACULTY

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

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

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

**MOISES CAMACHO-GALVAN**, *Associate Professor*, Ph.D., 1986, Florida State University.

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

**MIGUEL CRUZ-LOPEZ**, *Assistant 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.

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

**ANA M. LEBRON-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.

### COURSES OF INSTRUCTION

DESC 4005. THEORY AND METHODOLOGY IN THE TEACHING OF HEALTH IN SECONDARY SCHOOL. Three credit hours. Three hours of lecture and a minimum of fifteen hours of

supervised practice per week. Prerequisites: EDFU 3002, EDFU 3007, and EDFU 4019.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of health in secondary school are studied: planning, innovative education, and curriculum analysis; basic content in this area of specialization; preparation, adaptation, and utilization of resources; methodology, teaching techniques and strategies; fundamentals of measurement and evaluation. These contents are integrated on a practical basis. All students must complete at least 15 hours of laboratory experiences in public or private schools. These experiences will enable students to develop critical, dynamic, and creative attitudes toward Puerto Rican health problems.

DESC 4015. PRACTICE OF TEACHING HEALTH IN SECONDARY SCHOOL. Six credit hours. Three hours of seminar and twelve hours of supervised practice per week. Prerequisite: DESC 4005 and consent of the Director of the Department.

The student will be assigned to a secondary school for three hours daily five days a week. Four days will be devoted to teaching Health Education and participating in activities inherent to the work of the teacher. One day a week will be spent in a seminar with the university professor to analyze and discuss the problems encountered in the teaching practice. In this practice, students will be helped in their learning by the supervising teacher, the school principal, and the university professor.

### SPECIAL EDUCATION

EDES 4006. NATURE AND NEEDS OF EXCEPTIONAL LEARNERS. Three credits. Three hours of lecture per week. Three hours of lecture per week.

This course offers a overview of the psychological and educational needs of exceptional learners. It provides the experiences and knowledge necessary for the design and implementation of curricular programs, special teaching techniques, and strategies appropriate for exceptional learners. Laboratory and field experiences will be an integrate part of the course.

### EDUCATION FOUNDATIONS

EDFU 3001-3002. HUMAN GROWTH AND DEVELOPMENT I AND II. Six credits. Three hours of lecture per week each semester.

The first semester will be devoted to an inquiry on the nature of psychology as background for a better understanding of the educational process. The growth and development of children and adolescents will be examined as well as the natural and environmental

forces which influence the development of a well balanced personality.

The second semester, the student will analyze the psychological principles which underlie the teaching-learning process and the individual and social conditions which act upon it. Analysis of the process of evaluation and the principles underlying the creation of educational testing and grading.

EDFU 3007. SOCIAL FOUNDATIONS OF EDUCATION. Three credits. Three hours of lecture per week.

Analysis of the basic social science principles in terms of the educational process. Study and discussion of the social problems that have conditioned the development of education in Puerto Rico.

EDFU 3008. EDUCATIONAL IMPLICATIONS OF THE SOCIAL AND ECONOMIC PROBLEMS OF PUERTO RICO. Three credits. Three hours of lecture per week.

A condensed and intensive analysis and interpretation of the main social and economic problems of Puerto Rico and of their educational implications. Population, production and distribution, standards of living, health, prostitution, crime, illegitimacy, race, education, and political status; their relation with the school task in the community; and the possible solutions offered by the school for these problems.

EDFU 3055. LEGAL FOUNDATIONS OF EDUCATION. Three credits. Three hours of lecture and discussion per week.

Legal aspects related with the overall process of education, the teachers, the students, and the community are examined and analyzed. Two analytical models or schemes will be used: the hierarchy of norms and the jurisprudence. The course includes in its legal approach, the following aspects, among others: the right to education, and the Constitution of the Commonwealth of Puerto Rico vis-à-vis the Constitution of the United States, the Special Education Law, the Puerto Rican Department of Education's Organigram (functions, levels of authority, and administrative apparatus), students' and teachers' civil rights and duties, corporal punishment, discipline, teachers' assaults, vandalism, drug abuse, laws related with child and youth's affairs, Law Number 30 (people access to schools), and the legal implication of AIDS in the school environment.

EDFU 3115. PHILOSOPHY OF HEALTH EDUCATION. Three credit hours. Three hours of lecture per week.

The study and analysis of the principles, philosophy objectives and scope of health education. It considers the analysis between the social, philosophic, cultural,

economic and physiological aspects in the preservation of the individual, familiar and communal health. Includes the socialization process and its relation with health education, the health indicators, the basic statistical principle demographics, the psychology and the interpretation of the principles modules.

EDFU 4006. THE CHILD AND HIS SOCIAL MILIEU. Three credits.

Study of the child from the social and cultural viewpoints; analysis of the social forces and their effects on human behavior; the socializing function of the more important agencies; and their contribution to the realization of educational objectives.

EDFU 4008. THE ROLE OF THE TEACHER IN GUIDANCE. Three credits. Three hours of lecture per week.

This course introduces teachers to the various facets of the guidance function and provides practical help in the operations of that function in the school. Emphasis is given to understanding the needs of children and youth, recognition of recent findings about child and adolescent development, ways of studying individual students, the dynamics of group interaction, the relationship of guidance and the curriculum, opportunities for guidance afforded to the teacher in classrooms, homerooms, and curricular activities, cooperation with parents in encouraging pupil adjustment, and the ways of involving the total school staff in a coordinated guidance program.

EDFU 4019. PHILOSOPHICAL FOUNDATIONS OF EDUCATION. Three credits. Three hours of lecture per week.

Study of philosophic theory and its relation to pedagogical practice. Presentation of major problems that have been caused by conflicting educational philosophies in terms of their historical development and their present day impact. The course emphasizes and clarifies the role of the teacher in regard to educational goals, curriculum programs, and evaluation. Basic philosophical problems such as the meaning of truth and knowledge; the relation between knowledge and action; the nature of beauty, truth, happiness; and their educational implications are analyzed. The course also endeavors to promote an understanding of the way in which the development of the scientific method, the progress of democracy, changes in social and economic institutions, and the advance of human knowledge demand changes in philosophical attitudes as well as in all educational practice.

EDFU 4025. SCHOOL HEALTH EDUCATION. Three credits. Three hours of lecture per week.



A study of the health problems of pupils. The scope of an overall health program in the school; the healthy school environment; provisions for immediate health services; the development of desirable health habits and attitudes; the responsibility of the teacher in the program; the role of health education in the school and in the community.

### **EDUCATIONAL PROGRAMS AND TEACHING**

EDPE 3129. THE USE OF MICROCOMPUTERS IN THE CLASSROOM. Three credits. Three hours of lecture per week.

Introductory courses on the role of microcomputers in the classroom. Special emphasis will be given to the use of Microcomputers in the school setting, resources that are available to the classroom teacher and how to integrate computers to teaching. Workshop experiences and special assignments will complement class discussions.

EDPE 4047. INNOVATIONS IN THE TEACHING OF TYPEWRITING. Three credits. Three hours of lecture per week. Prerequisites: EDFU 3002 and EDFU 3007.

This course will equip the student with the required competencies for directing the acquisition of occupational typing skill.

EDPE 4048. INNOVATIONS IN THE TEACHING OF SHORTHAND. Three credits. Three hours of lecture per week. Prerequisites: EDFU 3001-3002 and EDFU 3007 and 30 credits in Office Administration.

This course will equip the student with the required competencies for teaching elementary and advanced shorthand theory and practice in English and Spanish.

EDPE 4135. THEORY AND METHODOLOGY IN THE TEACHING OF SCIENCE IN SECONDARY SCHOOL. Three credit hours. Three hours of lecture and a minimum of fifteen hours of supervised practice per week. Prerequisite: Consent of the Director of the Department.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of Science in secondary school are studied: planning, innovative education and curriculum analysis; basic content in this area of specialization; preparation, adaptation and utilization of resources; methodology, teaching techniques and strategies; fundamentals of measurement and evaluation. These contents are integrated on a practical basis. All students must complete at least 15 hours of laboratory experiences in public or private schools. These experiences will enable students to develop critical, dynamic and creative attitudes Puerto Rican educational problems.

EDPE 4137. STUDENT TEACHING OF BIOLOGY IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPE 4135 and permission of the Director of the Division.

The student will be assigned to a public (or private) secondary school for three hours daily, five days a week. Four days will be devoted to teaching Biology and participating in other activities that form part of the work of the teacher. One day weekly will be spent in a seminar with the college supervisor to analyze and discuss the problems students are facing in their student teaching. In this laboratory students will be helped in their learning by the cooperating teacher, the school principal and the college supervisor.

EDPE 4138. STUDENT TEACHING OF PHYSICS IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPE 4135 and permission of the Director of the Division.

The student will be assigned to a public (or private) secondary school for three hours daily, five days a week. Four days will be devoted to teaching Physics and participating in other activities that form part of the work of the teacher. One day weekly will be spent in a seminar with the college supervisor to analyze and discuss the problems students are facing in their student teaching. In this laboratory students will be helped in their learning by the cooperating teacher, the school principal and the college supervisor.

EDPE 4139. STUDENT TEACHING OF CHEMISTRY IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPE 4135 and permission of the Director of the Division.

The student will be assigned to a public (or private) secondary school for three hours daily, five days a week. Four days will be devoted to teaching Chemistry and participating in other activities that form part of the work of the teacher. One day weekly will be spent in a seminar with the college supervisor to analyze and discuss the problems students are facing in their student teaching. In this laboratory students will be helped in their learning by the cooperating teacher, the school principal and the college supervisor.

EDPE 4145. THEORY AND METHODOLOGY IN THE TEACHING OF MATHEMATICS IN SECONDARY SCHOOL. Three credit hours. Three hours of lecture and a minimum of fifteen hours of supervised practice per week. Prerequisite: Consent of the Director of the Department.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of Mathematics in secondary school are studied:

planning, innovative education and curriculum analysis; basic content in this area of specialization; preparation, adaptation and utilization of resources; methodology, teaching techniques and strategies; fundamentals of measurement and evaluation. These contents are integrated on a practical basis. All students must complete at least 15 hours of laboratory experiences in public or private schools. These experiences will enable students to develop critical, dynamic and creative attitudes towards Puerto Rican educational problems.

EDPE 4146. STUDENT TEACHING OF MATHEMATICS IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPE 4145 and permission of the Director of the Division.

The student will be assigned to a public (or private) secondary school for three hours daily, five days a week. Four days will be devoted to teaching Mathematics and participating in other activities that form part of the work of the teacher. One day weekly will be spent in a seminar with the college supervisor to analyze and discuss the problems students are facing in their student teaching. In this laboratory students will be helped in their learning by the cooperating teacher, the school principal and the college supervisor.

EDPE 4155. THEORY AND METHODOLOGY IN THE TEACHING OF HISTORY AND SOCIAL SCIENCES IN SECONDARY SCHOOL. Three credit hours. Three hours of lecture and a minimum of fifteen hours of supervised practice per week. Prerequisite: Consent of the Director of the Department.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of History and Social Studies in secondary school are studied: planning, innovative education and curriculum analysis; basic content in this area of specialization; preparation, adaptation and utilization of resources; methodology, teaching techniques and strategies; fundamentals of measurement and evaluation. These contents are integrated on a practical basis. All students must complete at least 15 hours of laboratory experiences in public or private schools. These experiences will enable students to develop critical, dynamic and creative attitudes Puerto Rican educational problems.

EDPE 4156. STUDENT TEACHING OF SOCIAL STUDIES IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: Permission of the Director.

The student will be assigned to a public (or private) secondary school for three hours daily, five days a week. Four days will be devoted to teaching Social Studies and participating in other activities that form

part of the work of the teacher. One day weekly will be spent in a seminar with the college supervisor to analyze and discuss the problems students are facing in their student teaching. In this laboratory students will be helped in their learning by the cooperating teacher, the school principal and the college supervisor.

EDPE 4157. STUDENT TEACHING OF HISTORY IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: Permission of the Director.

The student will be assigned to a public (or private) secondary school for three hours daily, five days a week. Four days will be devoted to teaching History and participating in other activities that form part of the work of the teacher. One day weekly will be spent in a seminar with the college supervisor to analyze and discuss the problems students are facing in their student teaching. In this laboratory students will be helped in their learning by the cooperating teacher, the school principal and the college supervisor.

EDPE 4165. THEORY AND METHODOLOGY IN THE TEACHING OF ART IN SECONDARY SCHOOL. Three credit hours. Three hours of lecture and a minimum of fifteen hours of supervised practice per week. Prerequisite: Consent of the Director of the Department.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of Art in secondary school are studied: planning, innovative education and curriculum analysis; basic content in this area of specialization; preparation, adaptation and utilization of resources; methodology, teaching techniques and strategies; fundamentals of measurement and evaluation. These contents are integrated on a practical basis. All students must complete at least 15 hours of laboratory experiences in public or private schools. These experiences will enable students to develop critical, dynamic and creative attitudes toward Puerto Rican educational problems.

EDPE 4166. STUDENT TEACHING OF ART IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPE 4165 and permission of the Director of the Division.

The student will be assigned to a public (or private) secondary school for three hours daily, five days a week. Four days will be devoted to teaching Art and participating in other activities that form part of the work of the teacher. One day weekly will be spent in a seminar with the college supervisor to analyze and discuss the problems students are facing in their student teaching. In this laboratory, students will be helped in their learning by the cooperating teacher, the school principal and the college supervisor.

EDPE 4185. THEORY AND METHODOLOGY IN THE TEACHING OF THEATRE IN SECONDARY SCHOOL. Three credit hours. Three hours of lecture and a minimum of fifteen hours of supervised practice per week. Prerequisite: Consent of the Director of the Department.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of Theatre in secondary school are studied: planning, innovative education and curriculum analysis; basic content in this area of specialization; preparation, adaptation and utilization of resources; methodology, teaching techniques and strategies; fundamentals of measurement and evaluation. These contents are integrated on a practical basis. All students must complete at least 15 hours of laboratory experiences in public or private schools. These experiences will enable students to develop critical, dynamic and creative attitudes toward Puerto Rican educational problems.

EDPE 4187. STUDENT TEACHING OF BUSINESS EDUCATION IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: Permission of the Director of the Division.

The student will be assigned to a public (or private) Secondary school for three hours daily, five days a week. Four days will be devoted to teaching Business Education and participating in other activities that form part of the work of the teacher. One day weekly will be spent in a seminar with the college supervisor to analyze and discuss the problems students are facing in their student teaching. In this laboratory students will be helped in their learning by the cooperating teacher, the school principal and the college supervisor.

EDPE 4215. THEORY AND METHODOLOGY IN THE TEACHING OF PHYSICAL EDUCATION IN SECONDARY SCHOOL. Three credit hours. Three hours of lecture and a minimum of fifteen hours of supervised practice per week. Prerequisite: Consent of the Director of the Department.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of Physical Education in secondary school are studied: planning, innovative education and curriculum analysis; basic content in this area of specialization; preparation, adaptation and utilization of resources; methodology, teaching techniques and strategies; fundamentals of measurement and evaluation. These contents are integrated on a practical basis. All students must complete at least 15 hours of laboratory experiences in public or private schools. These experiences will enable students to develop critical, dynamic and creative attitudes toward Puerto Rican educational problems.

EDPE 4216. STUDENT TEACHING OF PHYSICAL EDUCATION IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPE 4215 and permission of the Director of the Department.

The student will be assigned to a public (or private) secondary school for three hours daily, five days a week. Four days will be devoted to teaching Physical Education and participating in other activities that form part of the work of the teacher. One day weekly will be spent in a seminar with the college supervisor to analyze and discuss the problems students are facing in their student teaching. In this laboratory students will be helped in their learning by the cooperating teacher, the school principal and the college supervisor.

EDPE 4235. THEORY AND METHODOLOGY IN THE TEACHING OF SPANISH IN SECONDARY SCHOOL. Three credits. Three hours of lecture and fifteen hours minimum of supervised practice per week. Prerequisites: Consent of the Director of the Department.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of Spanish in secondary school are studied: planning, innovative education and curriculum analysis; basic content in this area of specialization; preparation, adaptation and utilization of resources; methodology, teaching techniques and strategies; fundamentals of measurement and evaluation. These contents are integrated on a practical basis. All students must complete at least 15 hours of laboratory experiences in public and private schools. These experiences will enable students to develop critical, dynamic and creative attitudes toward Puerto Rican educational problems.

EDPE 4236. STUDENT TEACHING OF SPANISH IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPE 4235 and permission of the Director of the Division.

The student will be assigned to a public (or private) secondary school for three hours daily, five days a week. Four days will be devoted to teaching Spanish and participating in other activities that form part of the work of the teacher. One day weekly will be spent in a seminar with the college supervisor to analyze and discuss the problems students are facing in their student teaching. In this laboratory students will be helped in their learning by the cooperating teacher, the school principal and the college supervisor.

EDPE 4245. THEORY AND METHODOLOGY IN THE TEACHING OF ENGLISH IN SECONDARY SCHOOL. Three credit hours. Three hours of lecture and a minimum fifteen hours minimum of supervised

practice per week. Prerequisites: Consent of the Director of the Department.

Theoretical and practical approach to the teaching-learning process. All aspects related to the teaching of English in secondary school are studied: planning, innovative education and curriculum analysis; basic content in this area of specialization; preparation, adaptation and utilization of resources; methodology, teaching techniques and strategies; fundamentals of measurement and evaluation. These contents are integrated on a practical basis. All students must complete at least 15 hours of laboratory experiences in public and private schools. These experiences will enable students to develop critical, dynamic and creative attitudes toward Puerto Rican educational problems.

EDPE 4246. STUDENT TEACHING OF ENGLISH IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPE 4245 and permission of the Director of the Division.

The student will be assigned to a public (or private) secondary school for three hours daily, five days a week. Four days will be devoted to teaching English and participating in other activities that form part of the work of the teacher. One day weekly will be spent in a seminar with the college supervisor to analyze and discuss the problems students are facing in their student teaching. In this laboratory students will be helped in their learning by the cooperating teacher, the school principal and the college supervisor.

## GRADUATE STUDIES OFFICE

The Graduate Studies Office is part of the Office of the Dean of Academic Affairs and publishes its own Graduate Catalogue. For more information contact (787) 832-4040, extensions 3598, 3809 or <http://www.uprm.edu/catalog>

## 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>.

## 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 1,278, 18 study rooms for graduate students and faculty, 10 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** provides reference and research resources which include the following collections and data centers:

- Álvarez Nazario Collection
- Circulation/ Reserve
- Collection for the Visually Impaired
- Interlibrary Loans
- Marine Sciences Collection
- Music and Oral History Collection
- Patent and Trademark Depository Library (PTDL)
- Puerto Rico Census Data Center
- Puerto Rican Collection - Manuel María Sama y Auger
- Reference/Documents
- Serials and Electronic Resources

**The Educational Technology Unit** consists of an Audiovisual Services Department and the Closed Circuit Television Department. The unit's mission is to support the academic programs of the institution through multimedia technology applications.

**The Audiovisual Services Department** includes the following units: graphic arts, audio studio, an audiovisual equipment lending repair shop, and a film library. It is located on the second floor of the Sanchez Hidalgo Building.

**Closed Circuit Television Department (CCTV)**, located in the Nursing Building, produces instructional and cultural TV programs and videotape recording services. It provides on-demand multi-channel broadcasting, teleconferencing, satellite downlinks, television studio and a video library.

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

UPRM library holdings include: 220,315 volumes; 5,424 journals; 258,243 microfiches; 12,719 micro cards; 19,232 microfilms; 584,206 government documents; 714 films; 8,214 maps; 8,460 sound recordings; 605 musical scores; 916 sound magnetic tapes; 24,632 slides; 4,177 videocassettes; 687 filmstrips; 4,767 CD/DVD; 104 computer programs; 2,434 theses; 6 million United States patents, and 2.5 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 loans, document and journal loans, interlibrary loans, reference and information services, access to electronic indexes and abstracts, online catalog, (<http://www.uprm.edu/library>), 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, online retrieval services, selective dissemination of information, access to Web based and CD-ROM full text

databases, Internet access, and access to remote government and commercial databases. Librarians assist students and faculty in their study and research endeavors.

Librarian staff teaches the following formal courses for the following departments: 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 terminals and computers in the library, anywhere on and outside UPRM through the Internet. A local area network (LAN) allows for access of databases in CD/DVD. 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

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

**MARIA VIRGEN BERRIOS-ALEJANDRO**, *Librarian II*, 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 I*, M.L.S., 1990, Interamerican University, San Germán.

**MARIA M. FERNANDEZ-SOLTERO**, *Librarian I*, M.L.S., 1986, University of Puerto Rico, Río Piedras Campus.

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



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

**FRANKLYN IRIZARRY-GONZALEZ**, *Librarian III*, M.L.S., 1975, University of Puerto Rico at Río Piedras, M.A. (1982), New York University.

**GLADYS E. LOPEZ SOTO**, *Librarian I*, 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.

**MARIA DEL C. MARTINEZ-MALDONADO**, *Librarian I*, M.A., 1976, M.L.S., 1999, Interamerican University, San Germán.

**RONALDO MARTINEZ-NAZARIO**, *Librarian III*, M.L.S., 1981, Indiana University at Bloomington.

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

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

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

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

**IRMA N. RAMIREZ-AVILES**, *Librarian III*, 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 RODRIGUEZ**, *Librarian II*, M.L.I.S., 1996, University of Wisconsin at Milwaukee.

**SARA RUIZ-GONZALEZ**, *Librarian II*, 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 II*, M.L.I.S., 1992, Long Island University, New York; M.B.A., 1988, Interamerican University, San Germán.

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

**JEANETTE VALENTIN-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, both 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.



## **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 chemistry building in room Q-017. For more information contact Dr. Víctor Siberio at 787-265-3262.

## **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 **Inter-University Athletic League** 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, cheerleading, and Tae Kwon Do as an exhibition activity.

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 basketball, judo, soccer, indoor soccer, softball, swimming, tennis, table tennis, tennis, volleyball, water polo, weight lifting, and wrestling. 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 courts, a synthetic running track, a weight-lifting gymnasium, a training and conditioning exercise room, an athletic field, a 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 and Latin music group. 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 on campus and outside the community as representatives of the University. For more information contact: Mrs. Claudina Brinn, 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 Library** is available to students. It contains information on undergraduate and graduate studies, job hunting techniques, and labor market trends. 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 contact: <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 II)*, M.A.M.C.R. 1994, University of Puerto Rico at Río Piedras.

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

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

**IVONNE DOMINGUEZ-BIDOT**, *Associate Professor (Counselor III)*, 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. LOPEZ-MUÑOZ**, *Associate Professor (Counselor III)* 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 MUÑIZ-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. RODRIGUEZ-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-PAGAN**, *Assistant Professor (Counselor III)*, M.A.M.C.R., 1987, University of Puerto Rico at Río Piedras.

**SOCIAL WORKER:**

**ARISBEL CRESPO-DURAN**, *Associate Professor (Social Worker IV)*, M.S.W., 1978, University of Puerto Rico at Río Piedras.

**PSYCHOLOGISTS:**

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

**NIDIA S. LOPEZ-RODRIGUEZ**, *Associate Professor (Psychologist III)*, 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.

**ANDRÉS VELÁZQUEZ-ACEVEDO**, *Professor (Psychologist IV)*, Ph.D. 1982, Syracuse University.

**MIRIAM VÉLEZ-MORALES**, *Assistant Professor (Psychologist II)*, 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 72% 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.

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 Partnership Program*** (LEAP) provides grants to students who demonstrate substantial financial need.

The ***Special Leveraging Educational Assistance Partnership Program (SLEAP)*** combines federal and state funds to assist needy, undergraduate students of particular academic programs.

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**

The ***Federal Perkins Loan Program*** provides low-interest loans (5%) to both undergraduate and graduate students with exceptional financial need. Repayment begins nine months after the student graduates or ceases to be enrolled.

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 months 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 of 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, free of charge to all UPRM students. Services provided include medical consultation, dental care, emergency and short-stay recuperation care, ambulance services, clinical laboratory tests, psychological services, counseling on addiction, health education and coordination of referrals to off-campus health providers for students under the University health insurance plan or personal health insurance.

**Family Planning Services** are offered for a nominal cost to all members of the university community. These services are classified in two areas: preventive medicine with emphasis on primary and secondary prevention and therapeutic medicine. Services are offered during regular working hours, except ambulance transportation service, which is provided on a twenty-four hour daily basis.

**Medical consultation and emergency services** are offered by general physicians and professional nurses from 7:30A.M. to 8:00P.M., Monday through Thursday and from 7:30A.M. to 4:30P.M. on Fridays. A clinical laboratory complements these services during regular working hours. **Dental services** are offered to students with previous appointment. Services include oral examinations, X-rays, prophylactic treatment, control of infections and cavities, and orientation on dental hygiene. Seniors from the School of Dentistry of the University of Puerto Rico also provide primary dental care under the supervision of UPRM dentists.

All students entering UPRM 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 with these requirements will result in a medical hold at registration time.

In order to provide a more comprehensive health coverage, UPRM, through a private company, offers students a **health insurance plan**. Unless a student provides evidence of another health insurance coverage, the plan is required for all students. Services covered by the university plan

include referrals to specialists, X-rays and laboratory tests.

recommended by physicians, hospital emergency room care, hospitalization, surgical procedures, prescription medicines, and maternity services which include prenatal and postnatal care.

**Psychological services** include psychotherapy, crisis intervention, group therapy and consultation with other health departmental professionals. Workshops on various mental health topics are also available.

Preventive medicine pursues the prevention, detection, screening and control of medical conditions among students who may need immediate attention, observation or special care.

Through the **Health Promotion and Prevention Program**, individual and group orientations are offered. Some of the areas covered include: nutrition, sexual health, eating disorders, alcoholism, and other drug abuse prevention, counseling and referral, secondary prevention for chronic illnesses such as heart diseases, diabetes, asthma and epilepsy, promotion of healthy lifestyles and health maintenance are also included in the program. A health education resource library is available to the community.

**Title X Family Planning Program** offers comprehensive sexual and reproductive health information to the university community. This program offers evaluation and medical consultation, health and sexual health education, guidance with reference to abstinence, natural family planning, referrals, PAP smear tests and tests for sexually transmitted diseases such as chlamydia and HIV. A gynecologist participates in this program.

The **Stress Management Center** services are available to the entire to UPRM community. It specializes in teaching techniques such as music therapy, visualization and direct relaxation. The Center is a practice center for psychology students from the Social Sciences Department. Appointments are required.

The **Traffic Safety Project** sponsored by the Puerto Rico Traffic Safety Commission offers educational and promotional activities which promote traffic safety. The department sponsors three student organizations which advocate healthy lifestyles.

## HOUSING OFFICE

The Housing Office assists students, faculty and staff locating off-campus housing and offers support throughout the off-campus living experience, providing counseling, information and referral in housing-related matters. It maintains an interactive apartment-house search database, which is updated every two weeks and contains hundreds of available rental units. Searches can be done by several customized criteria such as owner's name, location, housing alternatives and rental range.

Other services include consumer information regarding leases, utilities, safety, transportation, temporary housing, and finances.

**The Off-Campus Housing Department** educates the off-campus student community regarding their rights and responsibilities both as tenants and as members of the community. It serves as advisor to home owners interested in establishing lodging.

Other services include **The Child Care Program** sponsored by UPR Río Piedras Campus. The purpose of this program is to provide federal subsidies for off-campus child care while a child's parent attends university classes. Interested students should contact Extension 2085 or visit Office 505 at the Student Center.

The Off-Campus Housing Department complies with the Ethical Principles and Standards for College and University Student Housing Professional of the ACUHO organization. For more information contact: 787-832-4040 Extensions: 3894, 2078 <http://vivienda.uprm.edu> [g\\_hernandez@rumad.uprm.edu](mailto:g_hernandez@rumad.uprm.edu)

**The Housing Mediation Services** is a voluntary confidential resource which assists in the resolution of problems which may arise between students, landlords and roommates. The service offers concerned parties a forum to represent and discuss their problems before a neutral third party. It facilitates the resolution process by providing information to the parties and by suggesting approaches to the handling of problems. The Housing Office does not offer legal advice, but makes referrals to local legal advice programs off-campus.



## 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 [calidad\\_vida@rumad.uprm.edu](mailto:calidad_vida@rumad.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.

## 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 welcomes UPRM students, faculty, staff, alumni, and visitors and serves as a focal point for cultural, social, and recreational activities. The following departments under the Office of the Dean of Students are located in the Center: **Counseling and Guidance, Placement, Social and Cultural Activities, and the Student Exchange Program and International Student Services and Off-Campus Housing.**

Other offices located in the Student Center include the **Alumni Office, the General Student Council Office, the Graphic Arts Workshop, and art exhibitions.** The Student Center also houses the campus **cafeteria, game room, bookstore, post office, and hair styling salon.**

**The Student Aid Center**, located on the ground floor of the student center provides low cost specialized services, such as photocopying, photographic film development, and fax services. For more information contact :Extension 2287.

## STUDENT EXCHANGE PROGRAMS AND INTERNATIONAL STUDENT SERVICES

The Mayagüez Campus is an active member of the National Student Exchange Consortium and the International Student Exchange Program. 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.

**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 23 countries. To be eligible to participate in the program, a student must hold a minimum 2.5 GPA.

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 .

### 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. For prices, facility availability and reservations, visitors and

students at UPRM should contact (787)265-3891, (787)832-4040 extension 3596.

## 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 Digital 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 Monday through Friday from 6:30 A.M. to 9:00 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

The following fees, prescribed by the university are tentative for 2003-04 and are subject to change at the discretion of trustees. University charges such as tuition and fees are due and payable in full by the date announced before the beginning of each term.

### Tuition

For U.S.A. citizens residents of Puerto Rico:

- \$30 per credit for students enrolled in two-year programs plus applicable regular or special fees.
- \$30 per credit for regular students enrolled in four or five-year undergraduate programs plus applicable regular or special fees.
- \$30 per credit for part-time and transient students taking undergraduate courses plus applicable regular or special fees.
- \$50 for students enrolled in thesis only.
- \$75 per credit for students enrolled in graduate programs plus applicable regular or special fees.

For U.S.A. citizens, non-residents of Puerto Rico:

Same tuition as resident students plus an additional amount equivalent to what a Puerto Rican student would have to pay in the public university of their state of origin. These students are also responsible for paying the applicable regular or special fees.

For foreign students:

\$2,400 per year for students enrolled in undergraduate programs, plus applicable regular or special fees.

\$3,500 per year for students enrolled in graduate programs, plus applicable regular or special fees.

Visiting students:

\$25 per undergraduate course plus \$10 maintenance fee each academic session

\$50 per graduate course plus \$10 maintenance fee each academic session

**Regular Fees**

Application for admission.....\$ 15  
 Maintenance fee  
 (per registration period) .....\$ 35  
 Annual basic medical insurance .....\$653  
 Annual basic medical insurance  
 including pharmacy charges ..... \$1,221

**Special Fees**

Laboratory fees per laboratory course.....\$25

Graduation fee .....\$20

Application for transfer to a different program, faculty or campus of the University of Puerto Rico .....\$17

Application for transfer from another university .....\$27

Application for readmission.....\$27

Late registration fee.....\$10

Academic Transcript (per copy).....\$ 1

Duplicate of admission letter, class ticket, or schedule card (per copy).....\$ 1

Identification card..... \$ 5

Students applying for admission, readmission, or transfer after the corresponding due date will pay one-and-a-half times the regular fee. Late applications are accepted only after complete justification is presented.

\*Subject to change according to insurance yearly contract adjustments.

**Regulations**

Deadline for payment: 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 exceed 30 days before the end of the course.

In those exceptional cases, a student must apply for deferred payment of fees in ample time prior to the registration date so that the merits of the application may be evaluated. On registration day, those students to whom deferred payment of fees is granted must pay 100% of Medical Insurance and Special Fees plus 33% of Tuition Fees. The last balance of 33% must be paid at least 30 days before the last class day of the semester. Students who fail to pay accordingly, must pay a \$10.00 late fee.

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 not receive credit for their work. The Registrar will not release any transcript of record or other official documents until all outstanding fees and charges have been paid. All fees must be paid for the exact amount using U. S. currency, certified check or postal money order to the University of Puerto Rico.

***Honor Registration Exemption***

Honor registration is granted only to undergraduate students registered in a full-time program (12 credit hours or more), and it is only effective during the academic year and the following summer session for which it is granted.

### Honor Registration requirements

1. Students who have completed their previous two semesters with full academic programs, a minimum 3.5 GPA and who rank at the top 5% of their class.
2. Students who are readmitted after having interrupted their studies for one or more semesters, who have a minimum 3.5 GPA or higher and who have completed a minimum 12 credit-hours in each of their last two semesters at the institution.

### Reimbursements

Students who withdraw from UPRM within the first two weeks of any semester or the first week of a summer session are entitled to a 50% 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 after deadline.

Visitors and students forced to withdraw for disciplinary reasons are not entitled to a refund. Medical services, maintenance, laboratory, late registration, and transfer and readmission fees are non-refundable.

### Return of University Property

Before leaving the University, a student is expected to return in good condition all ROTC and AFROTC property and any other UPRM property used during the year. The ROTC and AFROTC property custodians will send written notices to all students who do not comply with this policy. If property is not returned within 30 days after notification, the individual's name will be forwarded to the Registrar. The value of any property which has been lost, damaged, or not returned will be deducted from the total deposit.

Unclaimed fees and deposits will be retained by the university by the end of the second semester of the academic year. Fines will be assessed on any overdue books and library materials. Failure to comply with these regulations will result in the student's inclusion on the Finance Department Debtors' List.

## ACADEMIC STANDARDS

### Freshmen Admission

**Academic Requirements:** Candidates for admission to the first-year class at the University of Puerto Rico, Mayagüez Campus, must file an application for admission with the Admission Office. Applicants must have a high school diploma or its equivalent from an educational institution duly accredited by the Department of Education of Puerto Rico.

**Entrance Examination:** Prospective applicants for admission to the freshman class must take the University Evaluation and Admissions Tests (PEAU in Spanish) administered by the College Entrance Examination Board in Spanish. This includes aptitude test and achievement tests. Application forms may be obtained in a high school, or by writing directly to College Entrance Examination Board, P.O. Box 71101, San Juan, Puerto Rico 00936-8001. These tests are offered in February, June, and October.

Application forms for the English version of the test (SAT and Achievement Tests on English (Reading-Writing), Mathematics Level I and Level II, and Spanish (Reading)) are available from the Scholastic Aptitude Test, P.O. Box 592, Princeton, New Jersey 08540. These tests are offered in January, May, and December. Candidates take this the test no later than February of their last year in high school.

**Application Procedure:** First-year applicants are only considered for admission in August of the first semester. Applications should be submitted before November 30 of the year prior to admission. The following official documents are to be sent to the Admissions Office:

- (a) High school academic transcript.
- (b) Official report of test scores obtained on the college entrance examination (CEEB or SAT).
- (c) A certified check or money order for \$15.00 payable to the University of Puerto Rico. (Late fee is \$22.50).

**Selection of Candidates:** Admission to UPRM is based on an admission index formula. The General Admission Index is based on the Aptitude Test of the College Entrance Exam It is calculated as follows: 50% of the score is based on high school academic index, 25% on the

mathematical score and 25% on the verbal score on the Aptitude Test of the College Entrance Examination. These raw scores are converted to a scale figure in order to obtain the General Admission Index. Admission is granted to students whose index strictly complies with the minimum value established by the Administrative Board of the respective campus to which students apply. Admission index varies according to program demands and admission limitations.

**Non-resident Applicants:** Admission may be granted to students from other countries whose previous courses are comparable to those required in Puerto Rico. Candidates must submit evidence of their ability to undertake university work. Applicants from countries where the College Board offers an entrance examination are required to present these results in order to be eligible for admission.

**Advanced Placement:** Advanced placement is granted to students who approve the College Board Advanced Placement tests with scores of 4 or 5 in the English, Spanish, mathematics sections (Level I and Level II), Calculus AB or Calculus BC. Students who meet these criteria, receive credits for the first-level course which appear in the student record as approved courses (P) and are placed in the next level course as specified by their curricula. These credits qualify as graduation requirements. Admission for students with scores of 3 varies according to the guidelines established by the specific academic department.

**Placement in First Level Courses:** Students who do not qualify for advanced placement (in a second level course) must take the first level course in Spanish, mathematics, and/or English, but they may be placed in different programs following criteria defined by their respective academic departments which may include but are not limited to College Board Achievement test scores. Placement is compulsory.

**Pre-calculus Intervention System:** In accordance with regulations approved by the Academic Senate and recommendations from the Department of Mathematics:

- Students who score 650 or less on the mathematics part of the Achievement test of the College Entrance Examination must take

a diagnostic exam prepared by the Department of Mathematics.

- Students who score less than 50% on the diagnostic exam, are required to attend the Pre-calculus Intervention Laboratory during one semester. After attending the Support Center for Pre-calculus and Calculus Teaching and obtaining a passing grade on the diagnostic exam, the student will be allowed to register in the pre-calculus course.
- Students who obtain a score between 50% and 65% on the diagnostic exam are advised to voluntarily attend the laboratory and pass the diagnostic exam before taking the pre-calculus course. This will raise their probability of passing the course successfully.
- Student with a grade higher than 65% on the diagnostic exam may take the pre-calculus course without any previous notification.

### Early Admission Program

The Admission Office has established an Early Admission Program for those students who have requested admission to UPRM. Students will attend especially designed summer courses at our campus if they meet the following required criteria for early admission:

- A minimum 3.50 GPA
- Compliance with the General Admission Index established by the receiving college
- 1,300 points or more in the mathematics and verbal sections of the entrance examination administered by the College Entrance Examination Board (CEEB or SAT)

### Re-admission

Students in good standing who have voluntarily interrupted their studies or students who have had at least one year of academic suspension must apply for readmission if they wish to continue studying at UPRM. Applications must be filed at the Office of the Registrar according to the following schedule:

- |             |   |
|-------------|---|
| February 1  | Last day for submitting applications for re-admission to the summer session and the first semester. |
| September 1 | Last day for submitting applications for re-admission to the second semester.                       |



The Registrar will process each application with the respective college Dean or with the Dean of Academic Affairs, as the case may be, and will notify the applicant of its decision. The non-refundable application fee is \$27.00. UPRM reserves the right to grant re-admission according to space availability in specific colleges, departments, or programs, especially if a student has exceeded the number of years required for degree completion.

## TRANSFERS

### Transfers from Outside the University of Puerto Rico System

Any student who has approved courses taken at any college-level accredited institution outside the University of Puerto Rico shall be considered a transfer student applicant.

#### *Eligibility Criteria:*

Candidates for admission with advanced standing by transfer from accredited colleges or universities must fulfill the following requirements:

- (a) Be free of any disciplinary action at the previous institution.
- (b) Have completed at least 48 credit hours with a minimum 2.0 GPA (on a scale of 1 to 4).
- (c) Comply with specific departmental requirements.

#### *Application Deadlines:*

Applications must be filed by **February 15** for the summer session (June, July) or for the first semester (August), and by **September 15** for the second semester (January),

**Application Procedure:** Applications must be accompanied by the following documents:

- (a) Two official transcripts of all courses previously taken in any post-secondary level institution.
- (b) A copy of the catalogue or announcements of the institutions attended, describing the courses offered. This applies only to institutions outside Puerto Rico.
- (c) A certified check or money order payable to the University of Puerto Rico in the amount

of \$25.00. Non-refundable late fees total \$37.50.

All documents should be mailed to:

U.P.R. - Mayagüez Campus  
Admission Office  
P.O. Box 9021  
Mayagüez, P.R. 00681-9021

**Transfer Credits:** UPRM reserves the right to accept as transfer credit those courses taken at other institutions of higher education. Only those courses with a grade of C or better will be evaluated for credit transfer. The maximum number of transferable credits is half of the total required for the degree.

**Selection of Candidates:** Applicants for a program will be evaluated according to the minimum requirements established for that program. If a program does not have sufficient space to accommodate all qualified candidates, it will be filled with the best qualified applicants.

### Internal Transfers

Undergraduate students of the Mayagüez Campus may apply for transfer from one program to another program within campus. Transfer applicants must meet the following requirements:

1. File an application in the Office of the Registrar by February 15 for first semester transfers and by September 15 for second semester transfers.
2. Have approved a total of 48 credit hours towards the program to which admission was originally granted.

If a student does not meet the required 48 minimum approved credit hours, the application will be considered as long as the student meets the following requirements:

- a. Fulfills the General Admission Index (GAI) requirements established by the Administrative Board for the program to which the student applied at the time of admission to the Mayagüez Campus.
- b. Holds a competitive grade point



- average (GPA) as determined by the particular college.
- c. Has approved a minimum of 24 credit hours with 3.0 GPA.
  - d. Meets other academic requirements specified by the program of interest. (Students should visit their specific academic department of interest for further information).
  - e. Pays a nonrefundable fee of \$17.00.
  - f. Does not transfer more than twice.

### External Transfers

Students from other units of the University of Puerto Rico may also apply for transfer. Applicants must meet the following requirements:

1. Apply for transfer to the unit concerned through the Office of the Registrar within the transfer dates established by the Central Administration of the University of Puerto Rico.
2. Have a minimum of 48 approved credit-hours towards the program to which admission was originally granted.
3. Meet any other academic requirements specified by the program of interest.
4. Pay a nonrefundable fee of \$19.00.

The Mayagüez Campus reserves the right to grant transfers according to the available capacity of each college, department, or program.

### Language of Instruction

Spanish is the language of instruction in most courses at UPRM, but students are required to have a working knowledge of the English language. The individual professor decides the language used in class lectures and in student evaluation activities.

### Registration

Registration procedures are published by the Office of the Registrar prior to each enrollment period. Students are required to register according to the published schedule. New students are required to turn in their Admission Certificates in order to receive registration

materials. They are also required to comply with Health Service Department requirements prior to registration. Failure to comply with these procedures will result in the cancellation of enrollment authorizations.

Registration is neither complete nor valid until a student has paid all tuition and related fees to the Bursar's Office. Students must attend the courses in which they are registered. Failure to do so will result in a failing grade in the course. Students are also held responsible for the fulfillment of all academic obligations as specified in their academic programs.

### Classification of Students

Students at the Mayagüez Campus are classified in one of the following categories:

- (a) **regular students:** those who have fulfilled UPRM entrance requirements, who are candidates for a degree, and carry an academic course load of at least 12 credit-hours.
- (b) **part-time students:** those who have fulfilled all UPRM entrance requirements, who are candidates for a degree, and carry an academic course load of less than 12 credit-hours.
- (c) **auditing students:** those who, regardless of whether or not they fulfill admission requirements, do not intend to earn a degree. They attend classes with the permission of the head of the department, the professor of the course, and the Registrar. These students will neither take exams, receive grades nor credit for work done in a course.
- (d) **transient students:** those who, regardless of whether or not they fulfill requirements for admission to UPRM, have been authorized by other institutions to attend classes at this campus. These students are not interested in earning credits towards a degree from this campus. Being accepted as a transient student does not guarantee that courses requested by the student will be offered.
- (e) **professional development students:** a person may be admitted under the classification of "professional development" if the person has a degree and does not want

to obtain another degree, but wishes to take courses for personal enrichment.

### Maximum Academic Load

The maximum academic load is 18 credit hours per semester except in cases where the curriculum requires a higher number of credits. Students with a minimum 3.0 GPA may carry a maximum 21 credit-hour load. During the last two semesters, students may carry a maximum 21 credit-hour load per semester pending recommendation of the Director of the Department and approval by the Dean of the Faculty.

### Summer Session Programs

Students attending summer sessions are normally allowed to register for a maximum of seven credit-hours, but candidates for graduation and honor students may be permitted to carry a maximum of 10 credit-hours subject to approval by the corresponding dean. The same rule applies for students authorized to take summer courses for credit in other colleges or universities. Class programs for such students must have the approval of the Director of the Department and the Dean of their respective College. Courses taken at institutions outside the University of Puerto Rico system will not be accepted unless they are approved with C (2.0) or higher grade.

### Withdrawal

#### Partial Withdrawal

A student may withdraw from a course before the deadline established in the university academic calendar. Partial withdrawal will not be permitted after the established deadline. Federal regulations require that the course professor specify the last day of attendance to class and sign the withdrawal form. After the student completes the established procedure and submits the completed official request to the Office of the Registrar. The Registrar will post a "W" (withdrawal) for the particular course or courses on the student's permanent record.

#### Complete Withdrawal

A student may completely withdraw from UPRM at any time up to the last day of classes

by obtaining written permission from the respective college. After the student completes and submits an official request, the Registrar will post a "W" in every course in the student's academic program for that semester and will record the official date of withdrawal. Federal regulations require faculty to specify the last day of attendance in each course.

### Course Coding System

Courses are designated by a four-letter alphabetical code based on the Spanish titled of the academic discipline represented.

#### Academic Discipline Codes

ADMI	BUSINESS ADMINISTRATION
ADOF	OFFICE ADMINISTRATION
AGRO	AGRONOMY
ALEM	GERMAN
ANTR	ANTHROPOLOGY
ARTE	ART
ASTR	ASTRONOMY
BIND	INDUSTRIAL BIOTECHNOLOGY
BIOL	BIOLOGY
BOTA	BOTANY
CFIT	PLANT SCIENCE
CIBI	BIOLOGICAL SCIENCES
CIFI	PHYSICAL SCIENCES
CIMA	MARINE SCIENCES
CIMI	MILITARY SCIENCES
CIPO	POLITICAL SCIENCES
CISE	SECRETARIAL SCIENCES
CISO	SOCIAL 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
DESC	DIVISION OF CONTINUING EDUCATION AND PROFESSIONAL STUDIES
ECAG	AGRICULTURAL ECONOMICS
ECON	ECONOMY
EDAG	AGRICULTURAL EDUCATION
EDES	SPECIAL EDUCATION
EDFI	PHYSICAL EDUCATION
EDFU	EDUCATION FOUNDATIONS
EDPE	EDUCATIONAL PROGRAMS AND TEACHING
EDUT	EDUCATIONAL TECHNOLOGY

ENFE	NURSING
ESAE	AEROSPACE STUDIES
ESCO	BUSINESS SPANISH
ESHI	HISPANIC STUDIES
ESMA	MATHEMATICAL STATISTICS
ESOR	ORGANIZATIONAL STUDIES
ESPA	SPANISH
ESTA	STATISTICS
EXAG	AGRICULTURAL EXTENSION
FILO	PHILOSOPHY
FINA	FINANCE
FISI	PHYSICS
FRAN	FRENCH
GEOG	GEOGRAPHY
GEOL	GEOLOGY
GERE	MANAGEMENT
GERH	HUMAN RESOURCES MANAGEMENT
GRIE	GREEK
HIST	HISTORY
HORT	HORTICULTURE
HUMA	HUMANITIES
ICOM	COMPUTER ENGINEERING
INAG	AGRICULTURAL ENGINEERING
INCI	CIVIL ENGINEERING
INCO	BUSINESS ENGLISH
INED	INDUSTRIAL EDUCATION
INEL	ELECTRICAL ENGINEERING
INGE	GENERAL ENGINEERING
INGL	ENGLISH
ININ	INDUSTRIAL ENGINEERING
INME	MECHANICAL ENGINEERING
INPE	ANIMAL INDUSTRY
INQU	CHEMICAL ENGINEERING
INTD	INTERDISCIPLINARY
ITAL	ITALIAN
JAPO	JAPANESE
LATI	LATIN
LITE	LITERATURE
MATE	MATHEMATICS
MERC	MARKETING
METE	METEOROLOGY
MUSI	MUSIC
NUEG	NUCLEAR ENGINEERING
PROC	CROP PROTECTION
PSIC	PSYCHOLOGY
QUIM	CHEMISTRY
RECR	RECREATION
RUSO	RUSSIAN
SICI	COMPUTERIZED INFORMATION SYSTEMS
SOCI	SOCIOLOGY
TEAT	THEATER
TMAG	MECHANICAL AGRICULTURAL TECHNOLOGY
ZOOL	ZOOLOGY

The first digit of the four-digit numbers which follow the alphabetical code indicates course level according to the following guide:

- 0- Remedial courses.
- 1- First-level courses corresponding to a technical two-year associate degree program.
- 2 - Second-level courses corresponding to a technical, two-year associate degree program.
- 3- First-level courses of undergraduate programs. Usually, courses offered during the first two years of a program which leads to a bachelor's degree.
- 4- Second-level courses of undergraduate programs. Usually, courses offered in the third and fourth year of a program which leading to a bachelor's degree.
- 5- Advanced undergraduate courses that may a be taken for graduate credit.
- 6- Graduate courses.
- 7- Doctoral courses.

## GRADES

**Unit of instruction: One-credit hour** comprises one hour of lecture-discussion or two to four hours of laboratory practice, language drill, or any other work of a similar nature each week during the semester. **One hour of academic work** is equivalent to a fifty-minute class period. **A semester** comprises a minimum of fifteen weeks of instruction exclusive of final examinations.

At UPRM grades are awarded as follows:

- A - excellent 4.0
- B - good 3.0
- C - satisfactory 2.0
- D - passing but deficient 1.0
- F - failure 0
- P - passing
- W - authorized withdrawal

In the case of thesis or research in progress, the grades S (Satisfactory) and NS (Not Satisfactory) will be used, but like the grade P, they will not be considered in computing the grade point average of a student. The same rule may apply in some seminars.

The minimum grade for passing any graduate and major course in the Colleges of Business Administration, and Engineering and in the major courses in the Departments of Nursing, Mathematics, and Physical Education is C. The

minimum grade for passing other undergraduate courses is D.

**Grade point average (GPA):** This is the official measurement of the merit awarded to student work. It is computed by dividing the total number of honor points acquired by the total number of units of credit in which the student has received final grades. Honor points are assigned for each grade as follows: A= 4, B= 3, C= 2, D= 1, F= 0. Grades received in courses marked "W," "S," or "P" make no contribution to the student's GPA.

GPA is computed after considering all courses completed. In determining academic progress, grades received in courses taken during summer sessions are considered in the computation of the GPA for the following academic year.

**Provisional grades:** A provisional grade or "Incomplete" (I) may be given to a student when, for justifiable reasons acceptable to the instructor, he or she has been unable to complete the academic requirements of a given course. The provisional grade will be computed on the basis of assigning a grade of F to the incomplete work. If the student has made up the deficiency before the end of the following semester, the instructor shall notify the Registrar of the final grade. Provisional grades that have not been changed become final at the end of the following semester. The academic calendar specifies applicable deadlines.

**Repetition of courses:**

- (1) Courses in which students obtain a grade of D, or F, or are not approved may be repeated without restrictions.
- (2) If requested by a student and, after analyzing the specific academic circumstances, the Dean of the College may authorize, in exceptional cases, the repetition of a course in which a student has obtained a grade of C. The Registrar has to be notified of the authorization in a written communication.
- (3) If a student repeats a course, only the higher grade will be counted in the computation of the GPA, but all grades will appear on the official transcript.

**Graduation index:** This is computed with honor points as defined above including only

courses which meet degree requirements and have been approved with a final passing grade.

**Evaluation of Student's Academic Course Work**

Grading criteria will be based on academic progress utilizing the existing diverse forms of evaluation according to the nature and content of the course curriculum. The forms and elements to be taken into consideration in the evaluation of the student's academic progress in a course will be justified by the professor. Nevertheless, at the beginning of each semester, the professor should inform students of the evaluation procedure and the relative value of daily class participation, laboratory work, tests, and other aspects of a course.

Professors will offer students at least one evaluation of the academic work before the official partial withdrawal date. Examinations and all work handed in by the student up to two weeks before the scheduled withdrawal date shall be graded and returned to the student before the last day for partial withdrawal.

Professors will allow students an opportunity to discuss grades or doubts regarding course work.

A student should discuss such matters with the professor within a ten-day period after an exam or partial work is graded.

**Class Attendance and Examinations**

**Class attendance:** Class attendance is compulsory. UPRM reserves the right to address individual absenteeism cases at any time. Professors are expected to record students' absences. Frequent absences will affect adversely a student's final grade, and may even result in the total loss of credits. Arranging to make up missed work after a legitimate class absence is the student's responsibility.

**Final examinations:** Final written examinations must be given in all courses unless, in the judgment of the Dean, the nature of the subject makes it impractical. The professor evaluates the final examination choosing the method deemed most appropriate and renders an evaluation providing sufficient objective evidence for the grade awarded.

If necessary, final examinations scheduled by special arrangement must be given during the examination period prescribed in the Academic Calendar including Saturdays and Sundays. Change in the date assigned for a final exam may only be effected with the written authorization of the respective Dean and the Registrar.

**Absence from examinations:** Students are required to attend all examinations. Students who are absent from an examination for a justifiable reason acceptable to the professor, will be given a make-up exam. If the exam is not taken, the student will receive an F on the missed examination.

**Reading period:** A reading or review period will be scheduled for each semester between the end of the semester and the beginning of final examinations. During this recess, students will be free of any academic obligations so that they may devote this time to study for their final examinations.

## Retention Standards

### Satisfactory Academic Progress

A student will be considered as having satisfactory academic progress and “in good standing” if the following conditions are met at the end of the academic year:

1. Attains the minimum GPA allowed according to the number of years completed at UPRM:

Completed year of study	Minimum GPA required
First	1.70
Second	1.90
Third	1.95
Fourth and Fifth	2.00

2. Approves sufficient credit hours to demonstrate academic progress toward degree completion as illustrated in the following timetables:

2-year programs	4 consecutive years
4-year programs	8 consecutive years
5-year programs	10 consecutive years

### Probations and Suspensions

Students who, at the end of an academic year, do not show satisfactory academic progress may continue studying under probationary status if they satisfy the following three conditions:

1. Maintain GPA not lower than 0.20 below that required by the corresponding academic department.
2. Approve during the last two semesters at least twelve credits, if regular students and six credits, if part-time students.

Minimum Percentage of Approved Credit hours According to the Duration of the Program			
Academic years studied	Two-year programs	Four-year programs	Five-year programs
1	25%	12.5%	10%
2	50%	25.0%	20%
3	75%	37.5%	30%
4	100%	50.0%	40%
5		62.5%	50%
6		75.0%	60%
7		87.5%	70%
8		100%	80%
9			90%
10			100%

3. Accumulate a percentage of credit-hours according to the following set standards:

Minimum Percentage of Approved Credit hours According to the Duration of the Program			
Academic years studied	Two-year programs	Four-year programs	Five-year programs
1	12.5%	7.5%	5%
2	37.5%	17.5%	15%
3	62.5%	30.0%	25%
4	87.5%	42.5%	35%
5		55.0%	45%
6		67.5%	55%
7		80.0%	65%
8		92.5%	75%
9			85%
10			95%

Students who do not qualify for probation according to the requirements stated above will be dismissed from the University of Puerto Rico, Mayagüez Campus. The Registrar will notify the student and pertinent authorities of this action.

Regular students on probation will carry a course load of no less than nine and no more than fifteen-credit hours per semester, and no less than three nor more than six credit-hours per semester if part-time students. Students must also maintain the number of credit-hours required under probationary status.

After a year on probation, students must:

1. Comply with the minimum GPA
2. Attain the minimum number of credit hours required for good standing
3. Satisfactorily complete more than half the credit hours registered during the academic year

Students who comply with only two of the three criteria stated above will be placed on probation for another year. Students who do not comply with at least two of these criteria in the first year on probation or those who do not comply with any criteria in the second year on probation will

be dismissed from the University of Puerto Rico, Mayagüez Campus.

Dismissed students not eligible for probation will not be able to continue studying during the following year. Students must apply for readmission after at least one year of academic suspension within the time period established in the academic calendar. Applications will be evaluated by the Committee on Scholastic Achievement. Re-admitted students will be placed on academic probation and will be subjected to the established norms.

## Graduation Requirements

The University of Puerto Rico, Mayagüez Campus, reserves the right to make changes in the different curricula and degree requirements whenever, in its judgment, these are considered beneficial to the institution. As a rule, a student is entitled to graduate under the officially established requirements at the time of his or her entrance to the institution and should consult his academic department to obtain a copy of its specific requirements upon enrollment. Both a student who fails to fulfill the graduation requirements within the time period specified in the corresponding curriculum and a student who re-registers after a period of absence from the university are governed by the requirements specific to their graduating class.

To receive a degree, a student must satisfy the following conditions:

- (a) Pass the prescribed courses with a minimum 2.0 GPA. Students with a 3.0-3.32 GPA graduate with honors (**Cum Laude**) and those who achieve 3.33 GPA or higher graduate with high honors (**Magna Cum Laude**). In order to be eligible for graduation with honors or high honors, a student must have completed at least 50% of the credit hours required for graduation at UPRM.
- (b) Complete the last 28 required degree credits at UPRM with the understanding that these credits are required for the last phase of the program of studies. In exceptional cases, this requirement may be waived by authorization of the Dean of the respective college and the Dean of Academic Affairs.



- (c) Satisfy the following time-limit requirements for degree-completion:

Normal Time Required for Completion of Programs	Maximum Time Allowed
2 years	4 years
4 years	8 years
5 years	10 years

After this period, the University reserves the right to require that a student repeats all courses which, in the opinion of the respective Dean, need review. In all such cases, the student must obtain the Dean's written authorization in duplicate form as well as a list of the courses to be repeated. Copies of this authorization must be submitted to the director of the respective department and to the registrar.

- (d) Satisfy all financial obligations to the University.
- (e) File an application for the degree, in the Registrar's Office no later than the date specified in the Academic Calendar approved by the Administrative Board.
- (f) Receive faculty recommendation for the degree.
- (g) Attend Commencement Exercises, unless excused by the Registrar.

UPRM celebrates commencement exercises once during the academic year at the end of the second semester. Students who meet their course requirements for the degree at the end of the summer session or at the end of the first semester may apply to the Registrar's Office for a certificate indicating that they have completed their studies.

## COLLEGE OF AGRICULTURAL SCIENCES

### Organizational Structure

The College of Agricultural Sciences is the unit within the Mayagüez Campus where formal teaching, research, and extension in agricultural sciences are integrated. These three functions are mutually complementary and exist under a central scheme of a three-dimensional organization which 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.

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 through 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, known as the University Law which was approved on January 20, 1966, and Certification No. 13 of the Council of Higher Education, dated September 11, 1968. The College integrated within Mayagüez Campus 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 Administrator of the Agricultural Extension

Service, provides direction to the plans and programs of the College, in accordance with Certification No. 174 of September 24, 1980 issued by the Council of Higher Education..

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, it 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 Masters 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 six substations located in 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 graduate students its library and other physical facilities for research.

### Areas of Study

The Faculty of Agricultural Sciences is responsible for higher learning in the agricultural sciences and its basic function is performed at three different levels. The main emphasis is placed on the bachelor programs, but it includes a non-degree program in Pre-Veterinary and graduate studies at the Masters' degree level.

At the undergraduate level, the Faculty of Agricultural Sciences offers programs leading to the Bachelor of Agricultural Sciences. Students are trained in all areas related to the science and art of modern agriculture, as well as in the knowledge and ability to express themselves. In addition, the student is provided with opportunities for the development of an analytical, critical, and reflective mind.

To accomplish these aims, the Faculty of Agricultural Sciences offers eleven programs leading to the Bachelor's degree:

- Agribusiness
- Agricultural Economics
- Agronomy-Crops
- Agronomy-Soils
- Animal Industry
- Crop Protection
- Education in Agricultural Extension
- General Agriculture
- Horticulture
- Mechanical-Agricultural Technology
- Vocational Agriculture Education

In addition, the Faculty offers a non-degree program of study in Pre-Veterinary Studies for those students pursuing studies in Veterinary Medicine.

The Faculty follows an interdisciplinary approach in its programs of study, which in addition to the various specialties in the agricultural sciences, encompass teaching natural sciences, social sciences, humanities, and languages. The goal of formal teaching is to prepare scientists, agronomists, and technicians for the development and progress of Puerto Rico's agriculture and to provide them with the knowledge and competence in their field of specialization as well as with indispensable background in socio-humanistic disciplines and the positive attitudes necessary to serve the Island well. The first year of study is the same for all programs in the Faculty of Agricultural Sciences, with the exception of the Pre-Veterinary Program. Beginning in sophomore year, students take the required courses and the professional electives pertaining to a particular field of specialization. All programs require students to enroll at the end of the third year of study in a summer practicum under the supervision of a professor of the department.

The Faculty of Agricultural Sciences also offers graduate courses leading to the Master of

Science Degree. The student is able to specialize in one of the following seven disciplines: Agronomy-Crops, Agronomy-Soils, Horticulture, Crop Protection, Animal Industry, Agricultural Economics, and Food Science and Technology. For more information refer to the Graduate Studies Catalogue of the Mayagüez Campus.

### **Cooperative Education Program**

The Co-op Program offers all qualified students majoring in Agricultural Economics, Agribusiness, Agronomy, Soil Sciences, Animal Industry, Crop Protection, Horticulture, Mechanical Technology in Agriculture and General Agricultural Sciences Program, an opportunity to enhance their academic preparation, acquire valuable work experience, and explore career options. Through this program, students alternate terms of full-time study with terms of full-time paid employment. Work experiences are supervised jointly by a mentor in the cooperating institution (private business or government agency) and a faculty member. A fundamental purpose of cooperative education is on the job training.

#### **Student eligibility**

To be eligible for the Coop-program, students must meet the following minimum requirements:

- 2.5 GPA
- complete 2 years of study
- take professional courses which are considered as pre-requisites by some employers

#### **Employment participation**

The coop organization is committed, through a written agreement to provide the student with a learning experience in the workplace and to evaluate the student's work experience. Since during work-experience periods students are considered employees of the hiring organization, the following norms are applicable:

- Student is considered an employee of the hiring organization and subject to policies and laws that relate to other employees.
- Student receives compensation in the form of wages for work performed.
- Student is under the supervision of the employer and performs work assigned.

- Employers make hiring decisions.

#### The Plan

- Work periods are integrated within the curriculum. They do not occur before the initial school term or after the final school term has been completed.
- A student must be registered in the cooperative education course assigned and will receive six credit-hours in free electives for a minimum of two work experiences, one must take place during a regular semester.

### Agricultural Experiment Station

The role of the Agricultural Experiment Station is to provide the scientific and technological base necessary for the development of the agricultural and rural sectors of Puerto Rico. As part of its functions, the Agricultural Experiment Station also conducts agro-industrial research related to the preservation, processing and added-value of agricultural products. The research program has incorporated urban horticulture and the assessment of quality and use of agricultural and industrial by-products. This program is in accordance with the appropriate environmental and governmental policies. In each field, activities are developed in both basic and applied research.

The Station has central offices and research activities at the two main research centers at Mayagüez and Río Piedras. In addition to the main Research Centers, the Agricultural Experiment Station has six substations with a total area of more than 2,000 acres of land distributed in different geographical and ecological zones of Puerto Rico. The centers at Adjuntas and Corozal are located in the central, humid and mountainous region. Those at Lajas and Juana Díaz are in the dry, flat and coastal southern region. The center at Isabela is in the sub-humid region. This wide distribution allows for the evaluation of different crops and animal production systems in the ecological zones where they best adapt.

### Agricultural Extension Service

The Agricultural Extension Service's basic aim is to educate on recommended practices in order to maintain a prosperous agriculture, improve the quality of family life, and provide adequate orientation and guidance for youth and for the development of community resources.

The Agricultural Extension Service is the informal education branch of the College of Agricultural Science and offers its services through four main programs:

- Educational Programs in Agriculture, Marketing and Natural Resources
- Family and Consumer Sciences
- Youth and 4-H Clubs
- Community Resources Development.

The administrative unit of the College of Agricultural Sciences has two main offices located at Mayagüez and Río Piedras, and five located in San Juan, Arecibo, Mayagüez, Ponce and Caguas. In addition, 69 local offices fulfill educational functions by serving the 78 municipalities of Puerto Rico. In each of the areas served by the Agricultural Extension Service, a citizens' committee collaborates with professional personnel in the preparation and development of annual work plans for the agency which respond to Puerto Rico's needs.

### *International Programs in Agriculture*

The **Office of International Programs in Agriculture** administers a number of training and research programs in tropical agriculture, mainly through the use of external funds provided to the University by international agencies in the field of agriculture.

## GENERAL PROGRAM IN AGRICULTURAL SCIENCES

(Interdepartmental Program)

The great diversity of crop and animal enterprises which characterizes the Island's agriculture requires well prepared individuals to identify and solve the multiple and varied problems which commonly affect agricultural enterprises, rural life, economics and social development.

The curriculum of the Agricultural Sciences General Program is primarily designed to prepare students for employment as agronomists and professional agriculturists. Graduates from this program may occupy positions which require broad general knowledge and skills in agricultural sciences.

The General Program in Agricultural Sciences offers greater opportunities for studying the technical aspects of agriculture. A student of this program chooses electives in Agricultural Education Extension Programs or any of the other programs in agriculture. A three-credit summer practicum is required as part of the curriculum.

Graduates from this program may occupy positions which require a broad general knowledge of agricultural sciences.

### PROGRAMS OF STUDY

#### CURRICULUM: GENERAL PROGRAM IN AGRICULTURAL SCIENCES (Interdepartmental Program)

##### FIRST YEAR

First Semester

Number	Course	Credits
*INGL 3---	First year course in English	3
*ESPA 3101	Basic Course in Spanish	3
*MATE 3171	Pre-Calculus I	3
QUIM 3001	General Chemistry	4
CFIT 3005	Fundamentals of Crop Production	
	Or	
INPE 3005	Fundamentals of Animal Science	4

EDFI ----	Basic Course in Physical Education	$\frac{1}{18}$
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Second Semester

*INGL 3---	First year course in English	3
*ESPA 3102	Basic Course in Spanish	3
*MATE 3172	Pre-Calculus II	3
QUIM 3002	General Chemistry	4
INPE 3005	Fundamentals of Animal Science or	
CFIT 3005	Fundamentals of Crop Production	4
EDFI ----	Basic Course in Physical Education	$\frac{1}{18}$

##### SECOND YEAR

First Semester

INGL 3---	Second year course in English	3
BIOL 3435	Elementary Botany	4
QUIM 3061	Fundamentals of Organic Chemistry and Biochemistry I	4
ECON 3021	Principles of Economics I	3
ELECTIVES	**Electives	$\frac{3}{17}$

Second Semester

INGL 3---	Second year course in English	3
FISI 3091	Elements of Physics	3
FISI 3092	Elements of Physics Laboratory	1
QUIM 3062	Fundamentals of Organic Chemistry and Biochemistry II	4
EDAG 3005	Agricultural Orientation	1
BIOL 4015	General Zoology	3
ELECTIVES	**Electives	$\frac{3}{18}$

##### THIRD YEAR

First Semester

BIOL 3300	Genetics	3
CISO ----	***Elective Course in Social Sciences	3
PROC 4006	Tropical Plant Pathology	3
AGRO 3005	General Soils	3
INPE 4005	Veterinary Physiology	3
PROC 4008	Agricultural Entomology	$\frac{3}{18}$

Second Semester

TMAG 4015	Agricultural Machinery I	3
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**DEPARTMENT OF  
AGRICULTURAL  
ECONOMICS  
AND RURAL SOCIOLOGY**

BIOL 3770	General Microbiology	3
CISO ----	***Elective Course in Social Sciences	3
HORT 4009	Horticultural Crops	3
INPE 4010	Animal Feeding and Nutrition	4
ELECTIVES	**Electives	<u>2</u>
		18

**SUMMER SESSION**

****	Summer Practicum	3
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**FOURTH YEAR**

First Semester

HUMA ----	***Elective Course in Humanities	3
CFIT 4005	Physiological Principles of Crop Production	3
ECAG 4019	Introduction to Farm Management	3
***** ----	**** Seminar	1
ELECTIVES	**Electives	<u>6</u>
		16

Second Semester

HUMA ----	***Elective Course in Humanities	3
***** ----	**** Seminar	1
ELECTIVES	**Electives	<u>12</u>
		16

Total Credits required for program: 142

- \* Refer to the Academic Regulations section for information on Advanced Placement.
- \*\* Minimum requirements of electives. The General Agriculture Program requires a minimum of 26 credits in elective courses. At least 14 of these credits should be professional electives chosen from among the course offerings of the Faculty of Agricultural Sciences, with the approval of the Dean of the Faculty. The twelve remaining courses correspond to free electives.
- \*\*\* Elective courses in the Social Sciences and Humanities will be chosen from among the offerings of the corresponding department with the approval of the Dean of Agriculture.
- \*\*\*\* Students may enroll in Summer Practice in any Department of the Faculty of Agricultural Sciences with the authorization of the Department Director.
- \*\*\*\*\* Students should enroll in seminars in the same department in which they take their Summer Practice.

The Department of Agricultural Economics and Rural Sociology undergraduate education program offers a Bachelor of Agricultural Sciences (B.S.) degree with options in Agricultural Economics or Agribusiness. Curricula in both programs is designed to prepare graduates for positions in agriculture, agribusiness, general business, private sector and government. The developing of entrepreneurial skills is emphasized.

The Agricultural Economics option prepares students in understanding and solving problems in production, marketing, financing and distribution of food products and resource management. Applying economic concepts and problem-solving techniques to economic and business decisions is important. The program develops student's decision-making skills applicable to daily events in the private sector, government and the local and global economy.

The B.S. degree in Agribusiness prepares students for careers in the agribusiness and business sectors which provide goods and services for the production, processing and marketing of foods and fibers. Agribusiness students should have skills and knowledge in order to solve problems within and among related industries. Students learn how to integrate business management and marketing principles with technical knowledge to develop necessary decision-making skills.

The Agricultural Economist Student Association is an affiliate of the American Agricultural Economics Association.

**PROGRAMS OF STUDY**

**AGRICULTURAL ECONOMICS CURRICULUM**

**Summary of Credits in Program**

General education courses	60
Faculty requirements	27
Departmental requirements	43
Free electives	<u>12</u>
Total	142

**FIRST YEAR**

First Semester

Number	Course	Credits
*INGL 3---	First year course in English	3
*ESPA 3101	Basic Course in Spanish	3
*MATE 3171	Pre-Calculus I	3
QUIM 3001	General Chemistry	4
CFIT 3005	Fundamentals of Crop Production	4
	Or	
INPE 3005	Fundamentals of Animal Science	4
EDFI ----	Basic Course in Physical Education	<u>1</u>
		18

Second Semester

*INGL 3---	First year course in English	3
*ESPA 3102	Basic Course in Spanish	3
*MATE 3172	Pre-Calculus II	3
QUIM 3002	General Chemistry	4
INPE 3005	Fundamentals of Animal Science	4
	Or	
CFIT 3005	Fundamentals of Crop Production	4
EDFI ----	Basic Course in Physical Education	<u>1</u>
		18

**SECOND YEAR**

First Semester

INGL 3---	Second year course in English	3
BIOL 3435	Elementary Botany	4
ECON 3021	Principles of Economics I	3
EDAG 3005	Agricultural Orientation	1
MATE 3049	Mathematical Analysis for Management Sciences	3
ELECTIVES	**Electives	<u>3</u>
		17

Second Semester

INGL 3---	Second year course in English	3
FISI 3091	Elements of Physics	3
FISI 3092	Elements of Physics Laboratory	1
ECON 3022	Principles of Economics II	3
ECAG 3005	Principles of Agricultural Economic Analysis	3
ELECTIVES	**Electives	<u>3</u>
		16

**THIRD YEAR**

First Semester

ECON 3091	Micro-economic Theory	3
ECAG 4007	Marketing of Agricultural Products	3
AGRO 3005	General Course in Soils	3
ESMA 3101	Applied Statistics I	3
BIOL 4015	General Zoology	3
CISO ----	***Elective course in Social Sciences	<u>3</u>
		18

Second Semester

ECON 3092	Macro-economic Theory	3
ECAG 4028	Agricultural Finance	3
TMAG 4015	Agricultural Machinery I	3
CFIT 4005	Physiological Principles in Crop Production	3
ESMA 3102	Applied Statistics II	3
CISO ----	***Elective course in Social Sciences	<u>3</u>
		18

**SUMMER SESSION**

ECAG 4005	Summer Practicum	3
	Or	
ECAG 4997	Supervised Professional Occupational Experience for Coop Students	

**FOURTH YEAR**

First Semester

HUMA ----	***Elective Course in Humanities	3
ECAG 4025	Seminar	1
ELECTIVES	**Electives	<u>12</u>
		16

Second Semester

HUMA ----	***Elective course in Humanities	3
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ECAG 4019	Farm Management and Accounting	3
ELECTIVES	**Electives	<u>12</u>
		18

Total credits required for program: 142

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*Minimum requirements in electives. The Department of Agricultural Economics requires a minimum of 30 credits in elective courses. At least 12 should be in professional electives chosen from among Department offerings or from related areas. Also, 6 elective credits should be taken from offerings of other departments in the Faculty of Agricultural Sciences. In both cases, courses must be selected with the consent of the Director of Agricultural Economics. The remaining 12 credits are free electives.

\*\*\*The elective courses in Social Sciences and Humanities will be selected with the consent of the Director of the Department of Agricultural Economics and Rural Sociology.

### AGRI-BUSINESS CURRICULUM

#### Summary of Credits in Program

General education courses	60
Faculty requirements	27
Departmental requirements	42
Free electives	<u>12</u>
Total	<b>141</b>

#### FIRST YEAR

##### First Semester

Number	Course	Credits
*INGL 3---	First year course in English	3
*ESPA 3101	Basic Course in Spanish	3
*MATE 3171	Pre-Calculus I	3
QUIM 3001	General Chemistry	4
CFIT 3005	Fundamentals of Crop Production	
	Or	
INPE 3005	Fundamentals of Animal Science	4
EDFI ----	Basic Course in Physical Education	<u>1</u>
		18

##### Second Semester

*INGL 3---	First year course in English	3
*ESPA 3102	Basic Course in Spanish	3

*MATE 3172	Pre-Calculus II	3
QUIM 3002	General Chemistry	4
INPE 3005	Fundamentals of Animal Science	
	Or	
CFIT 3005	Fundamentals of Crop Production	4
EDFI ----	Basic Course in Physical Education	<u>1</u>
		18

#### SECOND YEAR

##### First Semester

INGL 3---	Second year course in English	3
BIOL 3435	Elementary Botany	4
CONT 3005	Elementary Accounting I	4
ECON 3021	Principles of Economics I	3
EDAG 3005	Agricultural Orientation	1
MATE 3049	Mathematical Analysis for Management Sciences	<u>3</u>
		18

##### Second Semester

INGL 3---	Second year course in English	3
FISI 3091	Elements of Physics	3
FISI 3092	Laboratory for Elements of Physics	1
ECON 3022	Principles of Economics II	3
CONT 3006	Elementary Accounting II	4
ESMA 3101	Applied Statistics I	<u>3</u>
		17

#### THIRD YEAR

##### First Semester

CISO 3121	An Intro. to the Study of the Social Sciences	3
ECAG 4007	Marketing of Agricultural Products	3
AGRO 3005	General Soils	3
BIOL 4015	General Zoology	3
ELECTIVES ****	Electives in Agricultural Sciences	3
ELECTIVES **	Professional Electives	<u>3</u>
		18

##### Second Semester

CISO 3122	An Intro. to the Study of the Social Sciences	3
ECAG 4028	Agricultural Finance	3
TMAG 4015	Agricultural Machinery I	3
CFIT 4005	Physiological Principles of Crop Production	3
ELECTIVES	Free Electives	3
ELECTIVES **	Professional Electives	<u>3</u>
		18

**SUMMER SESSION**

ECAG 4005	Summer Practicum	
Or		3
ECAG 4997	Supervised Professional Occupational Experience for Coop Students	

**FOURTH YEAR**

First Semester

GERH 4006	Introduction to Organizations	3
ECAG 4025	Seminar	1
ELECTIVES	***Elective course in Humanities	3
ELECTIVES	****Electives in Agricultural Sciences	3
ADMI 4001	Business Law I	3
ELECTIVES	**Professional Electives in Business Adm. Faculty	<u>3</u>
		16

Second Semester

ELECTIVES	Free Electives	3
ECAG 4019	Farm Management and Accounting	3
ELECTIVE	***Elective course in Humanities	3
ELECTIVE	Free Electives	<u>6</u>
		15

Total Credits required for program: 141

- \* Refer to the Academic Regulations section for information on Advanced Placement.
- \*\* Minimum required credits in electives. A minimum of 9 credits as professional electives, to be taken from among the offerings of the Department of Agricultural Economics and Rural Sociology, the Department of Economics of the College of Arts and Sciences and the College of Business Administration. At least 3 credits must be taken in this last College.
- \*\*\* A minimum of 6 credits as electives in Humanities must be taken from among the offerings of the Department of Humanities with the authorization of the Director of the Department of Agricultural Economics and Rural Sociology.
- \*\*\*\* A minimum of 6 credits must be taken as electives in agricultural sciences from among the offerings of the different departments of the Faculty of Agricultural Sciences, except the Agricultural Economics and Rural Sociology and Agricultural Education Departments.

**DEPARTMENTAL FACULTY**

**CARMEN I. ALAMO-GONZALEZ**, *Assistant Researcher (Agricultural Economics)*, M.S., 1988, University of Puerto Rico, Mayagüez Campus.

**MYRNA COMAS-PAGAN**, *Associate Specialist of Extension (Agricultural Economics)*, M.S., 1990, University of Puerto Rico, Mayagüez Campus.

**VIVIAN CARRO-PAGAN**, *Associate Researcher (Rural Sociology)*, M.A., 1976, University of London.

**MILDRED CORTES-PEREZ**, *Assistant Researcher (Agricultural Economics)*, M.A. 1995, University of Puerto Rico, Río Piedras Campus.

**FLOR M. DELGADO-PHILIPPI**, *Associate Professor*, M.B.A., 1983, Louisiana State University.

**EDNA DROZ-LUBE**, *Associate Researcher (Rural Sociology)*, 1962, University of California, Stanford.

**JORGE FERNANDEZ-CORNEJO**, *Adjunct Professor (Agricultural Economics)*, 1990, Ph.D., University of Delaware.

**GLADYS M. GONZALEZ-SOTO**, *Professor*, Ph.D., 1984, University of Missouri, Columbia.

**JORGE A. GONZALEZ-SOTO**, *Professor*, Ph.D., 1986, University of Missouri, Columbia, J.D., 1995, Pontifical Catholic University of Puerto Rico.

**MADELINE MENDOZA-MALDONADO**, *Associate Specialist of Extension (Agricultural Economics)*, M.S., 1988, University of Puerto Rico, Río Piedras Campus.

**LUIS R. MEJIA-MAYMI**, *Assistant Specialist of Extension (Agricultural Economics)* M.S., 1986, University of Puerto Rico, Mayagüez Campus.

**JUAN ORTIZ-LOPEZ**, *Associate Researcher (Agricultural Economics)*, M.S., 1984, University of Puerto Rico, Mayagüez Campus.

**ROOPCHAND RAMGOLAM**, *Professor*, Ph.D., 1974, Louisiana State University, Ad Honorem.

**COURSES OF INSTRUCTION**

**DEPARTMENT OF AGRICULTURAL  
ECONOMICS AND RURAL SOCIOLOGY**

**UNDERGRADUATE COURSES**

ECAG 3005. PRINCIPLES OF AGRICULTURAL ECONOMIC ANALYSIS. Three credit hours. Three hours of lecture per week.

Introduction to the field of agricultural economics, with emphasis on the aspects of production. Includes study of the use of economic principles in agricultural production and of supply and demand, and elementary notions of policy making.

ECAG 3007. INTRODUCTION TO THE USE OF MICROCOMPUTERS IN THE AGRICULTURAL SCIENCES. Three credit hours. Two hours of lecture and one hour of practice per week. Prerequisite: Consent of the Director of the Department.

Basic concepts in the use and operation of microcomputers; software packages for word processing, data base management, and spread sheets. Information on software packages for agriculture.

ECAG 3015. AGRICULTURAL LAW. Three credit hours. Three hours of lecture per week.

Analysis of different aspects of law relevant in the agribusiness decision-making process.

ECAG 4005. SUMMER PRACTICUM IN AGRICULTURAL ECONOMICS. Three credit hours. Six weeks duration. Prerequisite: Consent of the Director of the Department and twelve credits in Agricultural Economics.

Practical scientific work and field experience, or its equivalent, in any of the various phases of agricultural economics.

ECAG 4007. MARKETING OF AGRICULTURAL PRODUCTS. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021 or ECAG 3005.

A general comprehensive study of agricultural products marketing institutions, functions and problems, with emphasis on the Puerto Rican situation. Includes study of supply and demand, market structures, prices, and marketing costs at the various levels of the distribution process.

ECAG 4009. COOPERATIVE ENTERPRISES. Three credit hours. Three hours of lecture per week.

Study of economic and social principles of cooperativism and their implication for development. Discussion of the functioning of different types of cooperatives, including legal aspects.

ECAG 4015. INTRODUCTION TO RESOURCE ECONOMICS. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021 or ECAG 3005.

Introduction to the application of economic and political science concepts to problems in the use of natural resources including water, land, forest, and marine resources. Emphasis is given to concepts of regional growth, to the impact of urban development, and the process of public decision-making in the area of natural resources.

ECAG 4019. FARM MANAGEMENT AND ACCOUNTING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: ECON 3021 or ECAG 3005.

Use of economic principles and farm records in the organization and management of a farm business. Includes methods of keeping and analyzing farm records, farm inventory, income and net worth statements, receipts and expenses records, production records, income tax returns; use of economic principles and of records in budgeting; and analysis of aspects of the problems of risk and uncertainty in agriculture. Emphasis is placed on decision-making.

ECAG 4025. SEMINAR. One credit hour. One meeting per week. Prerequisites: Consent of the Director of the Department and twelve credits in Agricultural Economics.

Reports and discussions of problems, observation and recent research. Written and oral reports are required.

ECAG 4026. INTRODUCTION TO RURAL SOCIOLOGY. Three credit hours. Three hours of lecture per week.

Scientific study of rural society, its population, structure and social processes. Emphasis is given to the rural area of Puerto Rico.



ECAG 4028. AGRICULTURAL FINANCE. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021 or ECAG 3005.

Study of the methods and problems in financing the farm business, with emphasis on the aspects of credit. Includes study and analysis of credit requirements, institutions, types and effects.

ECAG 4029. AGRIBUSINESS MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: ECAG 4019.

Managerial concepts. Application of economic principles. Analytical techniques and decision making procedures in agribusiness. Planning, organization, financial analysis and control; human relations. Case studies, discussion, and work problems involving actual managerial situations.

ECAG 4997. SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR COOP STUDENTS. Three to six credit hours. A minimum of two practice periods is required, one of them in a semester. Prerequisites: Consent of the Director of the Department and to be a Coop program student.

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.

## DEPARTMENT OF AGRICULTURAL EDUCATION

The Agricultural Education Department offers a program leading to the degree of Bachelor of Science in Agriculture with majors in Agricultural Education or Extension Education. These programs prepare students for teaching agriculture and agricultural extension, and also for educational and public relations work related to agriculture in federal and state agencies, business, commerce, and industry. Employment in these positions requires agricultural experience, preparation in basic sciences and technical agriculture, and understanding of the principles and techniques of the teaching-learning process as well as the ability to work with people.

Graduates from this department may qualify to teach vocational agriculture upon completion of the program of study which includes supervised teaching (courses EDAG 4018-4019) and other courses required for certification to teach in the school system of Puerto Rico. Those who register for courses EDAG 4018-4019, must have a 2.00 GPA or better, authorization from the head of the department, and may be required to take certain physical and psychological examinations and meet other admission criteria. Graduates in Extension Education may qualify to enter extension and other related educational and public service jobs.

### PROGRAMS OF STUDY

#### AGRICULTURAL EDUCATION CURRICULUM

##### Summary of Credits in Program

General education courses	60
Faculty requirements	33
Departmental requirements	19
Professional electives	18
Free electives	<u>12</u>
	<b>142</b>

**FIRST YEAR**

First Semester

Number	Course	Credits
*INGL 3---	First year course in English	3
*ESPA 3101	Basic Course in Spanish	3
*MATE 3171	Pre-Calculus I	3
QUIM 3001	General Chemistry	4
CFIT 3005	Fundamentals of Crop Production	
	or	
INPE 3005	Fundamentals of Animal Science	4
EDFI ----	Basic Course in Physical Education	<u>1</u>
		18

Second Semester

*INGL 3---	First year course in English	3
*ESPA 3102	Basic Course in Spanish	3
*MATE 3172	Pre-Calculus II	3
QUIM 3002	General Chemistry	4
INPE 3005	Fundamentals of Animal Science	
	or	
CFIT 3005	Fundamentals of Crop Production	4
EDFI ----	Basic Course in Physical Education	<u>1</u>
		18

**SECOND YEAR**

First Semester

INGL 3---	Second year course in English	3
BIOL 3435	Elementary Botany	4
ECON 3021	Principles of Economics I	3
BIOL 4015	General Zoology	3
EDAG 3005	Agricultural Orientation	1
CISO ----	***Elective course in Social Sciences	<u>3</u>
		17

Second Semester

INGL 3---	Second year course in English	3
FISI 3091	Elements of Physics	3
FISI 3092	Elements of Physics Laboratory	1
AGRO 3005	General Soils Course	3
CISO ----	***Elective course in Social Sciences	3
ELECTIVES	**Electives	<u>4</u>
		17

**THIRD YEAR**

First Semester

TMAG 4015	Agricultural Machinery I	3
PROC 4006	Tropical Plant Pathology	3
INPE 4005	Veterinary Physiology	3
ECAG 4019	Introduction to Farm Business Administration	3
EDAG 4005	Methods in Teaching Vocational Agriculture	3
HUMA ----	***Elective course in Humanities	<u>3</u>
		18

Second Semester

CFIT 4005	Physiological Principles of Crop Production	3
EDAG 4006	Curriculum Development	3
EDAG 4007	Organization and Administration in Vocational Agriculture	3
HUMA ----	***Elective course in Humanities	3
ELECTIVES	**Electives	<u>6</u>
		18

**FOURTH YEAR**

First Semester

INPE 4036	Farm Animal Diseases	3
EDAG 4018	Teaching Practice I	3
ELECTIVES	**Electives	<u>12</u>
		18

Second Semester

PROC 4008	Agricultural Entomology	3
EDAG 4015	Youth Organization and Programs	3
EDAG 4017	Agricultural Education Seminar	1
EDAG 4019	Teaching Practice II	3
ELECTIVES	**Electives	<u>8</u>
		18

Total Credits required for program: 142

\* Refer to the Academic Regulations section for information on Advanced Placement.

\*\* Minimum requirements in electives: The Agricultural Education Program requires a minimum of 18 of these credits to be selected from the courses offered by the Agricultural Science Faculty or by the Division of Continuing Education and Professional Studies and the remaining 12 credits are free electives.

\*\*\* The electives in Social Sciences and Humanities require authorization of the Director of the Agricultural Education Department.

**AGRICULTURAL EXTENSION CURRICULUM**

**Summary of Credits in Program**

General education courses	60
Faculty requirements	51
Departmental requirements	13
Professional electives	6
Free electives	<u>12</u>
	142

**FIRST YEAR**

First Semester

Number	Course	Credits
*INGL 3---	First year course in English	3
*ESPA 3101	Basic Course in Spanish	3
*MATE 3171	Pre-Calculus I	3
QUIM 3001	General Chemistry	4
CFIT 3005	Fundamentals of Crop Production	
	or	
INPE 3005	Fundamentals of Animal Science	4
EDFI ----	Basic Course in Physical Education	<u>1</u>
		18

Second Semester

*INGL 3---	First year course in English	3
*ESPA 3102	Basic Course in Spanish	3
*MATE 3172	Pre-Calculus II	3
QUIM 3002	General Chemistry	4
INPE 3005	Fundamentals of Animal Science	
	or	
CFIT 3005	Fundamentals of Crop Production	4
EDFI ----	Basic Course in Physical Education	<u>1</u>
		18

**SECOND YEAR**

First Semester

INGL 3---	Second year course in English	3
BIOL 3435	Elementary Botany	4
ECON 3021	Principles of Economics I	3
AGRO 3005	General Soils Course	3
EDAG 3005	Agricultural Orientation	1
CISO ----	***Elective course in Social Sciences	<u>3</u>
		17

Second Semester

INGL 3---	Second year course in English	3
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FISI 3091	Elements of Physics	3
FISI 3092	Elements of Physics Laboratory	1
BIOL 4015	General Zoology	3
HORT 3005	Plant Propagation	3
CISO ----	***Elective course in Social Sciences	<u>3</u>
		16

**THIRD YEAR**

First Semester

PROC 4006	Tropical Plant Pathology	3
INPE 4005	Veterinary Physiology	3
EXAG 4005	Extension Philosophy and Objectives	3
HUMA ----	***Elective course in Humanities	3
ELECTIVES	**Electives	<u>6</u>
		18

Second Semester

CFIT 4005	Physiological Principles of Crop Production	3
TMAG 4015	Agricultural Machinery I	3
EDAG 4015	Youth Organization and Programs	3
EXAG 4006	Extension Teaching Methods and Techniques	3
AGRO 4037	Soil Fertility and Fertilizers	3
HUMA ----	***Elective course in Humanities	<u>3</u>
		18

**SUMMER SESSION**

EXAG 4007	Summer Practice	3
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**FOURTH YEAR**

First Semester

INPE 4036	Farm Animals Diseases	3
PROC 4008	Agricultural Entomology	3
ECAG 4007	Marketing of Farm Products	3
ECAG 4026	Introduction to Rural Sociology	3
ELECTIVES	**Electives	<u>6</u>
		18

Second Semester

EXAG 4009	Extension Education Seminar	1
HORT 4009	Horticultural Crops	3
HORT 4008	Vegetable Gardening	3
ECAG 4019	Introduction to Farm Management	3
ELECTIVES	**General Electives	<u>6</u>
		16

**Total credits required for program: 142**

- \* Refer to the Academic Regulations section for information on Advanced Placement.
- \*\* Minimum requirements in electives: The Agricultural Extension Program requires a minimum of 18 credits in elective courses. At least 6 of these credits should be professional electives chosen among the course offerings of the Faculty of Agricultural Sciences, with the approval of the Director of the Department. The remaining 12 credits are free electives.
- \*\*\* The electives in Social Sciences and Humanities require authorization of the Director of the Agricultural Education Department.

#### DEPARTMENTAL FACULTY

**AURY M. CURBELO-RUIZ**, *Assistant Professor*, Ph.D., 2002, The Ohio State University.

**AMANDA DIAZ –DE HOYO**, *Associate Extension Specialist*, M.A., 1987 Bridgeport University.

**MILDRED FELICIANO**, *Associate Extension Specialist*, Ph.D. 1994, Pennsylvania State University.

**JOSE A. GARCIA-LUIÑA**, *Associate Specialist*, M.S., 1983, University of Puerto Rico, Mayagüez Campus.

**CARMEN O. GOMEZ**, *Auxiliar Extension Specialist*, M.A., 1998, University of Phoenix.

**JUAN F. GONZALEZ-NOLLA**, *Instructor*, M.S., 1985, University of Puerto Rico, Mayagüez Campus.

**JOSE M. HUERTAS-JIMENEZ**, *Associate Extension Specialist*, Ph.D., 1993, The Ohio State University.

**ALLAN E. IRIBARREN**, *Auxiliar Extension Specialist*, M.S., 1985 University of Puerto Rico, Mayagüez Campus.

**ANDRÉS IRIZARRY-CARLO**, *Assistant Extension Specialist*, M.A., 1998, University of Phoenix.

**RUTH LEBRON**, *Associate Extension Specialist*, M.S., 1991, University of Puerto Rico, Medical Sciences Campus.

**SILVERIO MONTALVO**, *Extension Specialist*, M.S., 1985 University of Puerto Rico, Mayagüez Campus.

**GLORISELLE NEGRON-RIOS**, *Auxiliar Extension Specialist*, M.A., 1998, University of Puerto Rico.

**DAVID PADILLA-VELEZ**, *Professor*, Ph.D., 1993, The Ohio State University.

**ANGELES RODRIGUEZ**, *Assistant Extension Specialist*, M.A., 1996 University of Puerto Rico.

**LUIS F. SILVA-GUERRERO**, *Professor*, Ph.D., 1988, Cornell University.

**SANDRA SUAREZ**, *Assistant Extension Specialist*, MAED, 1996 University of Puerto Rico.

**JOSE A. VILLAMIL-FREYTES**, *Professor*, Ph.D., 1978, University of Connecticut.

**CARLOS A. VIVONI-REMUS**, *Associate Extension Specialist*, Ph.D., 1991, University of Massachusetts.

#### COURSES OF INSTRUCTION

##### DEPARTMENT OF AGRICULTURAL EDUCATION

##### UNDERGRADUATE COURSES

**EDAG 3005. AGRICULTURAL ORIENTATION.** One credit hour. One hour of lecture per week.

A survey of the general goals, functions and policies of the main agricultural organizations working in Puerto Rico, emphasizing the objectives of the College of Agricultural Sciences, thus guiding the student in the selection of courses and field of specialization.

**EDAG 3006. INTRODUCTORY INTERNATIONAL AGRICULTURE.** Three credit hours. Three hours of lecture per week. Prerequisite: EDAG 3005.

Study and discussion of world agriculture and food production issues including factors such as: geographical characteristics, cultural issues, and political, social and economic problems. Special attention is given to agricultural production in developing countries and the tropics.

EDAG 4005. METHODS IN TEACHING VOCATIONAL AGRICULTURE. Three credit hours. Three hours of lecture per week. Prerequisite: Junior standing.

This course is intended to help students develop a sound philosophy of all-day instruction in vocational agriculture. It emphasizes the preparation of annual teaching calendars, job analyzing, the learning process, methods and techniques of teaching, lesson planning and the evaluation of learning.

EDAG 4006. CURRICULUM DEVELOPMENT. Three credit hours. Three hours of lecture per week. Prerequisite: EDAG 4005.

Curriculum planning theory and practices. Problems and principles in curriculum development. Defining goals and objectives. Selecting appropriate curriculum designs, and planning curriculum implementation and evaluation.

EDAG 4007. ORGANIZATION AND ADMINISTRATION IN VOCATIONAL AGRICULTURE. Three credit hours. Three hours of lecture per week. Prerequisite: EDAG 4005.

The Vocational Education Act: general rules and regulations for the administration and functioning of Vocational Agriculture Department, and the qualification and duties of the teachers of vocational agriculture.

EDAG 4008. SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAMS. Three credit hours. Three hours of lecture per week. Prerequisite: EDAG 4005.

Principles, practices and procedures to planning, programming, implementing and evaluating comprehensive supervised farming programs and supervised occupational experience programs. Emphasis will be given to purpose of farm and off farm occupational experience programs. Analysis of home farm and off farms employment experience opportunities and program planning and supervision.

EDAG 4009. TEACHING YOUNG AND ADULT FARMERS. Three credit hours. Three hours of lecture per week. Prerequisite: EDAG 4005.

Principles and practice of planning, organizing, promoting, implementing and evaluating young adult farmer courses. Emphasis will be given to the

decision-making approach, selection of methods and techniques, lesson planning, class management and evaluation techniques.

EDAG 4015. YOUTH ORGANIZATION AND PROGRAMS. Three credit hours. Three hours of lecture per week.

History, philosophy, importance, objectives, and work programs of youth organization. Advisors, function, and characteristics, planning programming, implementation, and evaluation of the organization work program, with emphasis in F.F.A., 4-H, and young farmers.

EDAG 4016. AUDIOVISUAL MEDIA IN TEACHING VOCATIONAL AGRICULTURE. Three credit hours. Two hours of lecture and three hours of laboratory per week.

Philosophical and psychological implication of the use of audiovisual media in teaching. Location, selection, and evaluation of the audiovisual material for teaching purposes. Planning, designing and preparation of audiovisual material to teach vocational agriculture. Practice in the operation and management of audiovisual equipment and a media center.

EDAG 4017. SEMINAR. One credit hour. One hour of lecture per week. Prerequisite: Nine credits in agricultural education or agricultural extension.

Discussion of problems related to the development of instructional programs in vocational agriculture; planning, organization, development, follow-up, evaluation, related legislation and trends.

EDAG 4018-4019. TEACHING PRACTICE I AND II. Three credit hours per semester. One hour of lecture and six hours of laboratory work per week, each semester. Prerequisite: EDAG 4005, EDAG 4006. Co-requisite: EDAG 4007.

Supervised observation of vocational agriculture teaching. Full time participatory experience of trainees in all phases of the work of vocational agriculture teachers.

EDAG 4025. EVALUATION OF STUDENTS IN VOCATIONAL AGRICULTURE. Three credit hours. Three hours of lecture per week. Prerequisite: EDAG 4005.

Principles, criteria, procedures and techniques employed in the evaluation of the performance of students in Vocational Agriculture.



EDAG 4026. SUPERVISION IN AGRICULTURAL EXTENSION AND VOCATIONAL AGRICULTURE. Three credit hours. Three hours of lecture per week.

Theories, principles and practice pertaining to supervision in agricultural extension and vocational agriculture; factors that influence needs, philosophies, and types of supervision at the local, regional, state and national levels; training, responsibilities, personal traits and duties of the supervisor.

## AGRICULTURAL EXTENSION

### UNDERGRADUATE COURSES

EXAG 4005. EXTENSION PHILOSOPHY AND OBJECTIVES. Three credit hours. Three hours of lecture per week.

This course is designed to familiarize students with the organization, philosophy, and objectives of the Agricultural Extension Service.

EXAG 4006. TEACHING METHODS AND TECHNIQUES IN EXTENSION. Three credit hours. Three hours of lecture per week.

This course covers the various educational methods used by the Extension Service. The students will participate in the major activities of the extension work in the district in cooperation with the local agent of the Puerto Rico Agricultural Extension Service.

EXAG 4007. SUMMER PRACTICUM IN EXTENSION. Three credit hours. Six weeks duration.

The student is required to report to an Agricultural Extension work under the guidance of an Agricultural Extension agent. A plan of the work to be observed and practiced, and where it is to be carried out, must be approved by the student's counselor. Evaluation will be done by the counselor, in close coordination with the County Agent and the District Supervisor, whenever possible.

EXAG 4008. SPECIAL PROBLEMS IN EXTENSION. One to three credit hours. One to three research periods per week. Prerequisite: EXAG 4005.

The student selects and studies an area of extension of his interest, and reports the findings.

EXAG 4009. SEMINAR IN EXTENSION EDUCATION. One credit hour. One hour of lecture per week. Prerequisite: EXAG 4005.

Discussions of problems related to Program Planning Development, Rural Development, Farm Home Development, or other phases of Extension work. Areas to be discussed are selected at the beginning of the course.

EXAG 4015. INTRODUCTION TO AGRICULTURAL COMMUNICATION. Three credit hours. Three hours of lecture per week.

Principles and practices in communications; skills and knowledge for person to person, group, and mass communication; panel and group discussions. Practical exercises.

EXAG 4016. GROUP DYNAMICS AND LEADERSHIP. Three credit hours. Three hours of lecture per week.

Discussion of the research and theory in the study of small groups with emphasis on motivational forces involved, and the leadership function in the attainment of the group goals.

**DEPARTMENT OF  
AGRICULTURAL AND  
BIOSYSTEMS ENGINEERING**

The program of Mechanical Technology in Agriculture, administered by the Agricultural and Biosystems Engineering Department for students of agriculture emphasizes the practical application of engineering principles to the problems encountered in modern farming. In pursuing this objective, all main divisions of the agricultural engineering field are considered: farm power and machinery, soils and water management, farm structures and environmental control, rural electrification, and agricultural products processing.

The first year of Mechanical Technology in Agriculture Curriculum is the same as that prescribed in most of the other undergraduate curricula in the College of Agricultural Sciences; specialization gradually begins during the second year. The student, in consultation with his advisor, selects 12 credits of professional electives during the last two years of his program. Professional electives are chosen from the Agricultural and Biosystems Engineering Department's course offerings. The student also selects 12 credits of free electives to refine curricular balance in accordance with his particular interests. During the summer, between the third and fourth year, the student participates in a summer field practice which is administered in cooperation with various government agencies and private industries.

Most of the agricultural activities in Puerto Rico need to be effectively mechanized in order to be economically viable and profitable. As a result of a continuing process of agricultural mechanization, there has been an increasing demand for graduates of the Mechanical Technology in Agriculture program.

**PROGRAM OF STUDY**

**MECHANICAL AGRICULTURAL  
TECHNOLOGY CURRICULUM**

**FIRST YEAR**

First Semester

Number	Course	Credits
*INGL 3---	First year course in English	3
*ESPA 3101	Basic Course in Spanish	3
*MATE 3171	Pre-Calculus I	3
QUIM 3001	General Chemistry	4
BIOL 3435	Elementary Botany	4
EDAG 3005	Agricultural Orientation	<u>1</u>
		18

Second Semester

*INGL 3---	First year course in English	3
*ESPA 3102	Basic Course in Spanish	3
*MATE 3172	Pre-Calculus II	3
QUIM 3002	General Chemistry	4
BIOL 4015	General Zoology	3
EDFI ----	Physical Education Elective	<u>1</u>
		17

**SECOND YEAR**

First Semester

INGL 3---	Second year course in English	3
ECON 3021	Principles of Economics I	3
MATE 3049	Mathematical Analysis for Management Sciences	3
INGE 3011	Engineering Graphics I	2
CFIT 3005	Fundamentals of Crop Production	4
ELECTIVES	**Elective	<u>3</u>
		18

Second Semester

INGL 3---	Second year course in English	3
COMP 3057	Computer Fundamentals	3
FISI 3091	Elements of Physics	3
FISI 3092	Elements of Physics Laboratory	1
INPE 3005	Fundamentals of Animal Science	4
AGRO 3005	General Soils	<u>3</u>
		17

**THIRD YEAR**

First Semester

ECAG 4019	Introduction to Farm Management	3
TMAG 4009	Agricultural Power	3
CISO ----	***Elective course in Social Sciences	3
CFIT 4005	Physiological Principles of Crop Production	3
INCI 4005	Agricultural Surveying	3
ECAG 4007	Marketing of Agricultural Products	3
		<u>18</u>

Second Semester

TMAG 4015	Agricultural Machinery I	3
TMAG 4005	Farm Electrification	3
CISO ----	***Elective course in Social Sciences	3
TMAG 4028	Farm Service Buildings	3
ELECTIVES	**Electives	6
		<u>18</u>

**SUMMER SESSION**

TMAG 4008	Summer Field Practice	3
Or		
TMAG 4990	Supervised Professional Occupational Experience for Coop Students	

**FOURTH YEAR**

First Semester

TMAG 4029	Agricultural Products Processing	3
TMAG 4035	Soil and Water Management	4
TMAG 4036	Seminar in Mechanized Agriculture	1
HUMA ----	***Elective course in Humanities	3
EDFI ----	Physical Education Elective	1
ELECTIVES	**Electives	6
		<u>18</u>

Second Semester

ECAG 4028	Agricultural Finance	3
TMAG 4037	Seminar in Mechanized Agriculture	1
HUMA ----	***Elective course in Humanities	3
ELECTIVES	**Electives	9
		<u>16</u>

**Total credits required for this program: 143**

\* Refer to the Academic Regulations section for information on Advanced Placement.

\*\* The Program in Mechanical Technology in Agriculture requires a minimum of 24 credits in elective courses. It includes twelve credits in Professional electives selected from the offerings of the Department of Agricultural Engineering and related areas and with the authorization of the Director of the Agricultural Engineering Department. The other twelve credits are free electives.

\*\*\* The electives in Social Sciences and Humanities require authorization of the Director of the Agricultural Engineering Department.

**DEPARTMENTAL FACULTY**

**RAFAEL DAVILA**, *Extension Specialist*, Ph.D., 1984, Cornell University.

**CARMEN GONZALEZ**, *Extension Assistant Specialist*, M.S.C., 1985, Michigan State University.

**ERIC HARMSSEN**, *Associate Professor*, Ph.D., 1989, University of Wisconsin-Madison.

**CAROL HARPER**, *Associate Professor*, Ph.D., 1991, Colorado State University.

**JAVIER HUERTAS**, *Assistant Researcher*, M.S. Ch.E., 1996, University of Puerto Rico at Mayagüez.

**HECTOR O. LOPEZ**, *Extension Assistant Specialist*, M.E.M., 1998, Texas A & M.

**FRANCISCO MONROIG**, *Instructor*, M.S., 1998, University of Puerto Rico at Mayagüez.

**LUIS R. PEREZ-ALEGRIA**, *Professor*, Ph.D., 1987, Pennsylvania State University.

**EDWIN RIOS-VILLANUEVA**, *Instructor*, M.S. 2000. University of Puerto Rico at Mayagüez.

**FELIX R. RIVERA-NEGRON**, *Associate Researcher*, M.S.C., 1976, Purdue University.

**YOUSEF SHAHABASI**, *Professor*, Ph.D., 1979, Michigan State University.

## **COURSES OF INSTRUCTION**

### **DEPARTMENT OF AGRICULTURAL ENGINEERING**

#### **UNDERGRADUATE COURSES**

INAG 4990. **SELECTED TOPICS.** One to three credit hours. One to three hours of lecture per week.

Selected topics in Agricultural Engineering. Topics will vary according to the needs and interests of the students and the faculty.

INAG 4996. **AGRICULTURAL ENGINEERING PROJECTS.** Two to four credit hours.

Supervised projects in areas of agricultural engineering. A written report is required.

TMAG 4005. **FARM ELECTRIFICATION.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: FISI 3172, or FISI 3152, or FISI 3091.

Application of electrical energy to agricultural production and rural living. Fundamentals of selection, installation, operation, and maintenance of electrical farm equipment; safety rules and regulations.

TMAG 4007. **METALWORKING AND WELDING.** Two credit hours. One hour of lecture and one three-hour laboratory per week.

Shop skills including hot metal work, soldering and sheet metal work, electric arc welding, and oxyacetylene welding and cutting; organization and management of the farm shop.

TMAG 4008. **SUMMER FIELD PRACTICE.** Three credit hours. Six weeks duration. Prerequisite: Consent of the Director of the Department.

Practical field experience in agricultural engineering activities, covering a minimum of six weeks during the Summer Session at the end of the student's Junior year. The course will be administered in cooperation with appropriate government agencies and organizations of private industry. A satisfactory written report will be required.

TMAG 4009. **AGRICULTURAL POWER.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: FISI 3171, or FISI 3151, or FISI 3091.

Sources, measurement, transmission, and economic application of mechanical power on the farm; principles of construction and operation of various types of farm power units, with particular emphasis on internal combustion engines; classification, selection, operation, and maintenance of farm tractors.

TMAG 4015. **AGRICULTURAL MACHINERY I.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: FISI 3171, or FISI 3151, or FISI 3091.

Principles of construction and operation, maintenance procedures, power relationships, and economic utilization of the main tillage, planting, cultivating, and other related agricultural machinery.

TMAG 4017. **SAFETY IN AGRICULTURE.** Two credit hours. Two hours of lecture per week.

Principles of personnel and property protection as applied to agricultural operations and use of agricultural machinery, with emphasis on the development of a philosophy of safety as a basis for effective accident prevention; a critical review and analysis of agricultural accidents in Puerto Rico.

TMAG 4018. **COMPUTER PROGRAMMING IN AGRICULTURE.** Two credit hours. Two hours of lecture per week. Prerequisite: MATE 3172.

Introductory course to computer technology and programming using BASIC language, with emphasis on applications to agriculture.

TMAG 4019. **FARM DRAINAGE AND IRRIGATION.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: AGRO 3005.

Principles of irrigation and drainage of farm lands. Drainage systems, sources of water supply, water quality. Irrigation distribution systems: through gravity, sprinkler or trickle.

TMAG 4025. **AGRICULTURAL MACHINERY II.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: TMAG 4009 and TMAG 4015.

Further study of agricultural machinery, covering fertilizing, pest control, harvesting, feed processing, and other agricultural machines, including those recently developed; principles of construction and operation, power relationships, maintenance procedures, and economic utilization.

TMAG 4026. DAIRY MECHANICS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INPE 3005 and (FISI 3171, or FISI 3151, or FISI 3091).

Construction, installation, operation, and management of mechanical equipment used in dairy enterprises.

TMAG 4028. FARM SERVICE BUILDINGS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: INPE 3005 and INGE 3011 and (FISI 3091 or FISI 3151 or FISI 3171).

Functional requirements and planning; materials of construction; construction principles and procedures, with particular reference to the major types of farm service building.

TMAG 4029. AGRICULTURAL PRODUCTS PROCESSING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: FISI 3091 or FISI 3151 or FISI 3171.

Unit operations, equipment, techniques, and processes used in handling and preparing farm products for marketing, utilization, or storage.

TMAG 4035. SOIL AND WATER MANAGEMENT. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisites: AGRO 3005 and INCI 4005.

Soil-water plant relationships: principles and practice of irrigation and drainage of farm lands; land improvement by means of mechanical procedures, or structures for soil and water management and conservation.

TMAG 4036-4037. SEMINAR IN MECHANIZED AGRICULTURE. One credit hour per semester. One meeting per week each semester. Prerequisite: TMAG 4008 or consent of the Director of the Department.

Oral reports and discussion concerning experiences and observations gathered during the summer field practice. During the second semester, emphasis will be on a review and discussion of current developments, in the field of Agricultural Engineering.

TMAG 4038. AGRICULTURAL HYDROLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: FISI 3171, or FISI 3151, or FISI 3091.

The hydrologic cycle, including weather elements and climate, precipitation, evaporation, transpiration, infiltration, and run-off as related to soil and water management and control.

TMAG 4039. AGRICULTURAL WASTE MANAGEMENT. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: AGRO 3005.

Characteristics of agricultural wastes; environmental impact, biological processes; pollution problems and controls; agricultural wastes management systems; legal and economic aspects.

TMAG 4045. HYDRAULIC AND PNEUMATIC SYSTEMS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: MATE 3172.

The study of the hydraulic and pneumatic commonly used for agricultural processes and machinery. Principles of operation, power relationships and economics will be discussed to help in equipment selection.

TMAG 4990. SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR COOP STUDENTS. Three to six credit hours. A minimum of two practice periods is required, one of them in a semester. Prerequisite: Consent of the Director of the Department and to be a Coop program student.

Practical experience in Mechanical Technology in Agriculture 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. Written reports will be required upon completion of each work period.

TMAG 4991. SPECIAL PROBLEMS. One to three credit hours. One to three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Problems pertaining to the applied and technical aspects of Agricultural Engineering related to the agriculture of Puerto Rico. Conferences, library research, laboratories, of field trips will be assigned on an individual basis.

TMAG 4992. SPECIAL PROBLEMS. One to three credit hours. One to three hours of lecture per week.

Problems pertaining to the applied and technical aspects of Agricultural Engineering related to the



agriculture of Puerto Rico. Conferences, library studies, laboratories or field trips will be assigned on an individual basis.

### **ADVANCED UNDERGRADUATE AND GRADUATE COURSES**

INAG 5990. SELECTED TOPICS. One to three credit hours. One to three hours of lecture per week.

Selected topics in Agricultural Engineering. Topics will vary according to the needs and interest of the students and the faculty.

TMAG 5005. EQUIPMENT FOR APPLICATION OF AGRICULTURAL CHEMICALS. Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A detailed study of modern techniques and equipment for the application of chemicals for pest control and other uses in agriculture.

TMAG 5006. PLANNING AND MANAGEMENT FOR POWER FARMING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: TMAG 4009 and TMAG 4015.

General principles of agricultural mechanization, with particular reference to the economic and managerial aspects of the application of power and machinery to modern farming; farm work simplification in agricultural systems.

TMAG 5007. ADVANCED SOIL AND WATER MANAGEMENT. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: TMAG 4035.

Advanced topics and special problems in the field of soil and water management and control, with particular reference to drainage, irrigation, and watershed management.

TMAG 5015. DRIP IRRIGATION: PRINCIPLES AND MANAGEMENT. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: AGRO 3005 or consent of the Director of the Department.

Principles of drip irrigation, system and components, soil and water relations, tensiometer principle and installation, chemigation, clogging and filtration, system layouts, automation, problem shooting, and field evaluation.

TMAG 5017. AGROCLIMATOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: fifth year student, or graduate, and consent of the Director of the Department.

Climatology related to environmental conservation and sustainable agricultural production in precipitation, evaporation, evapotranspiration, photosynthesis, crop production, irrigation and drainage, crop protection, agronomy, animal science, agricultural technology, and remote data acquisition systems.

TMAG 5991. SELECTED TOPICS. One to three credit hours. One to three hours of lecture per week.

Selected topics in Agricultural Engineering. Topics will vary according to the needs and interests of the students and the faculty.

TMAG 5995. PROBLEMS IN MECHANIZED AGRICULTURE. One to three credit hours. One to three research periods per week.

Problems pertaining to the applied and less technical aspects of Agricultural Engineering as related to the agriculture of Puerto Rico. Conferences, library laboratory and/or field work on an assigned problem, on an individual basis, with complete written report required.

## DEPARTMENT OF AGRONOMY AND SOILS

The Agronomy and Soils Department offers academic programs leading to the degree of Bachelor of Science in Agriculture with a major in Agronomy and Soil Sciences. The Department is the academic and administrative unit of the College of Agricultural Sciences dealing with teaching and research in the areas of crop management, crop physiology, mineral nutrition, plant breeding, forage and pasture management, soil fertility, soil chemistry, soil microbiology, soil classification, soil physics and soil conservation.

The first two years of studies are similar in content for all students in the Agronomy and Soil Sciences programs. During their junior year, students begin taking professional electives pertinent to their major. The Agronomy major requires 15 credits of professional electives, while the Soil Sciences major only requires 6 credits. Both majors require a three-credit summer practicum. The Department also offers a study program leading to a Master's Degree in Science with majors in Agronomy and Soils Sciences (see UPRM Graduate Catalog of Information).

### PROGRAMS OF STUDY

#### CURRICULUM IN AGRONOMY

##### FIRST YEAR

###### First Semester

Number	Course	Credits
*INGL 3---	First year course in English	3
*ESPA 3101	Basic Course in Spanish	3
*MATE 3171	Pre-Calculus I	3
QUIM 3001	General Chemistry	4
CFIT 3005	Fundamentals of Crop Production	4
INPE 3005	Fundamentals of Animal Science	4
EDFI ----	Basic Course in Physical Education	$\frac{1}{18}$

###### Second Semester

*INGL 3---	First year course in English	3
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*ESPA 3102	Basic Course in Spanish	3
*MATE 3172	Pre-Calculus II	3
QUIM 3002	General Chemistry	4
INPE 3005	Fundamentals of Animal Science	4
CFIT 3005	Fundamentals of Crop Production	4
EDFI ----	Basic Course in Physical Education	$\frac{1}{18}$

##### SECOND YEAR

###### First Semester

INGL 3---	Second year course in English	3
BIOL 3435	Elementary Botany	4
QUIM 3061	Fundamentals of Organic Chemistry and Biochemistry I	4
AGRO 3005	General Soils	3
ECON 3021	Principles of Economics I	$\frac{3}{17}$

###### Second Semester

INGL 3---	Second year course in English	3
FISI 3091	Elements of Physics	3
FISI 3092	Elements of Physics Laboratory	1
QUIM 3062	Fundamentals of Organic Chemistry and Biochemistry II	4
BIOL 4015	General Zoology	3
EDAG 3005	Agricultural Orientation	1
ELECTIVES	**Electives	$\frac{3}{18}$

##### THIRD YEAR

###### First Semester

BIOL 3300	Genetics	3
HUMA ----	***Elective course in Humanities	3
CFIT 4005	Physiological Principles of Crop Production	3
AGRO 4037	Soil Fertility and Fertilizers	3
ELECTIVES	**Electives	$\frac{6}{18}$

###### Second Semester

BIOL 3770	General Microbiology	3
TMAG 4015	Agricultural Machinery I	3
ECAG 4019	Introduction to Farm Management	3
AGRO 4045	Mineral Nutrition in Plants	3
HUMA ----	***Elective course in Humanities	3
ELECTIVES	**Electives	$\frac{3}{18}$

**SUMMER SESSION**

AGRO 4038	Summer Practicum	3
Or		
AGRO 4995	Supervised Professional Occupational Experience for Coop Students	

CFIT 3005	Fundamentals of Crop Production	
	or	
INPE 3005	Fundamentals of Animal Science	4
EDFI ----	Basic Course in Physical Education	<u>1</u>
		18

**FOURTH YEAR**

First Semester

CISO ----	***Elective course in Social Sciences	3
PROC 4006	Tropical Plant Pathology	3
PROC 4017	Weed Control	3
AGRO 4019	Seminar	1
ELECTIVES	**Electives	<u>6</u>
		16

Second Semester

*INGL 3---	First year course in English	3
*ESPA 3102	Basic Course in Spanish	3
*MATE 3172	Pre-Calculus II	3
QUIM 3002	General Chemistry	4
INPE 3005	Fundamentals of Animal Science	
	or	
CFIT 3005	Fundamentals of Crop Production	4
EDFI ----	Basic Course in Physical Education	<u>1</u>
		18

Second Semester

CISO ----	***Elective course in Social Sciences	3
PROC 4008	Agricultural Entomology	3
AGRO 4025	Seminar	1
ELECTIVES	**Electives	<u>2</u>
		16

**SECOND YEAR**

First Semester

INGL 3---	Second year course in English	3
BIOL 3435	Elementary Botany	4
QUIM 3061	Fundamentals of Organic Chemistry and Biochemistry I	4
AGRO 3005	General Soils	3
ECON 3021	Principles of Economics I	<u>3</u>
		17

**Total credits required for program: 142**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*Minimum requirements in electives. The Agronomy major requires a minimum of 27 credits in elective courses. At least 15 of these credits be in professional electives chosen with the authorization of the Director of the Department of Agronomy and Soils. These should be from the departmental offerings or related areas. The remaining 12 credits are free electives.

\*\*\*Elective courses in Social Sciences and Humanities require authorization of the Director of the Agronomy and Soils Department.

Second Semester

INGL 3---	Second year course in English	3
FISI 3091	Elements of Physics	3
FISI 3092	Elements of Physics Laboratory	1
QUIM 3062	Fundamentals of Organic Chemistry and Biochemistry II	4
BIOL 4015	General Zoology	3
EDAG 3005	Agricultural Orientation	1
ELECTIVES	**Electives	<u>3</u>
		18

**CURRICULUM IN SOIL SCIENCES**

**FIRST YEAR**

First Semester

Number	Course	Credits
*INGL 3---	First year course in English	3
*ESPA 3101	Basic Course in Spanish	3
*MATE 3171	Pre-Calculus I	3
QUIM 3001	General Chemistry	4

**THIRD YEAR**

First Semester

BIOL 3300	Genetics	3
HUMA ----	***Elective course in Humanities	3
CFIT 4005	Physiological Principles of Crop Production	3
AGRO 4037	Soil Fertility and Fertilizers	3
AGRO 4018	Physical and Chemical Properties of Soils	3

ELECTIVES	**Electives	<u>3</u>
		18
Second Semester		
BIOL 3770	General Microbiology	3
TMAG 4015	Agricultural Machinery I	3
ECAG 4019	Introduction to Farm Management	3
AGRO 4045	Mineral Nutrition in Plants	3
HUMA ----	***Elective course in Humanities	3
ELECTIVES	**Electives	<u>3</u>
		18

**SUMMER SESSION**

AGRO 4038	Summer Practicum	3
Or		
AGRO 4995	Supervised Professional Occupational Experience for Coop Students	

**FOURTH YEAR**

First Semester		
CISO ----	***Elective course in Social Sciences	3
PROC 4006	Tropical Plant Pathology	3
PROC 4017	Weed Control	3
AGRO 4019	Seminar	1
AGRO 5006	Genesis, Morphology and Classification of Soils	3
ELECTIVES	**Electives	<u>3</u>
		16
Second Semester		
AGRO 4058	Soil Survey	3
CISO ----	***Elective course in Social Sciences	3
PROC 4008	Agricultural Entomology	3
AGRO 4025	Seminar	1
ELECTIVES	**Electives	<u>6</u>
		16

**Total credits required for program: 142**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*Minimum requirements in electives. The Soil Science major requires a minimum of 18 credits in elective courses. At least 6 of these credits be in professional electives chosen with the authorization of the Director of the Department of Agronomy and Soils. These should be from the departmental offerings or related areas. The remaining 12 credits are free electives.

\*\*\*Elective courses in Social Sciences and Humanities require authorization of the Director of the Agronomy and Soils Department.

**DEPARTMENTAL FACULTY**

**MYRNA Z. ALAMEDA**, *Associate Researcher*, M.S., 1977, University of Puerto Rico, Mayagüez Campus.

**JAMES S. BEAVER**, *Researcher*, Ph.D., 1980, University of Illinois.

**LINDA W. BEAVER**, *Professor*, Ph.D., 1981, University of Illinois.

**FRIEDRICH H. BEINROTH**, *Professor*, Ph.D., 1965, University of Stuttgart, West Germany.

**WINSTON DE LA TORRE**, *Associate Professor*, Ph.D., 1988, North Carolina State University.

**RICARDO GOENAGA**, *Ad-Honorem*, Ph.D., 1986, North Carolina State University.

**MIGUEL A. LUGO-LOPEZ**, *Emeritus Professor*, Ph.D., 1950, Cornell University.

**RAUL E. MACCHIAVELLI**, *Professor*, Ph.D., 1992, The Pennsylvania State University.

**GUSTAVO A. MARTINEZ**, *Associate Researcher*, Ph.D., 1995, Ohio State University.

**EDWIN MAS**, *Ad-Honorem*, M.S., 1986, North Carolina St. University.

**MIGUEL MUÑOZ**, *Associate Researcher*, Ph.D., 1988, Ohio State University.

**JULIA O'HALLORANS**, *Assistant Researcher*, Ph.D., 2001, New Mexico State University.

**RAFAEL OLMEDA**, *Extension Specialist*, M.S., University of Puerto Rico, Mayagüez Campus.

**CARLOS E. ORTIZ-MALAVE**, *Associate Researcher*, Ph.D., 1992, University of Arkansas.

**JUAN G. PEREZ-BOLIVAR**, *Assistant Professor*, Ph.D., 2000, University of Florida.

**YAMIL QUIJANO**, *Associate Extension Specialist*, M.S., 1989, University of Puerto Rico, Mayagüez Campus

**EDUARDO C. SCHRODER**, *Professor*, Ph.D., 1980, North Carolina State University.

**VICTOR A. SNYDER**, *Researcher*, Ph.D. 1980, Cornell University.

**DAVID SOTOMAYOR-RAMIREZ**, *Associate Professor*, Ph.D., 1995, Kansas State University.

**ELVIN ROMAN-PAOLI**, *Associate Researcher*, Ph.D., 1997, Kansas State University.

**RAMON I. TORRES-LOPEZ**, *Associate Professor*, Ph.D., 1993, Texas A&M University.

**JOSE VILLARRUBIA-CRUZ**, *Professor*, Ph.D., 1980, North Carolina State University.

**ELIDE VALENCIA**, *Associate Researcher*, 1991, University of Florida.

**VICTOR SNYDER**, *Researcher*, Ph.D., 1980, Cornell University.

## COURSES OF INSTRUCTION

### DEPARTMENT OF AGRONOMY AND SOILS

#### UNDERGRADUATE COURSES

AGRO 3005. GENERAL SOILS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: QUIM 3002.

A general course dealing with the origin, classification, and the physical, chemical and biological properties of mineral and organic soils; the soils as a medium for plant growth. Special emphasis will be given to the principal soil management problems in the tropics.

AGRO 4005. SOIL CONSERVATION. Three credit hours. Two hours of lecture and one three-hour field or laboratory period per week. Prerequisite: AGRO 3005.

The use of vegetation, plant barriers, terraces, mechanical structures, crop rotations, and other practices for soil and water conservation; forest and wildlife conservation; conservation problems, adjustments, and programs in Puerto Rico. Field trips.

AGRO 4008. TROPICAL CEREALS AND LEGUMES. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: CFIT 3005 and AGRO 3005.

Adaptation, botany distribution, varieties, culture, crop improvement, harvesting and marketing of corn, rice, cotton and sweet potatoes. Field trips.

AGRO 4010 SILVICULTURE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: CFIT 3005 or BIOL 3435 or BIOL 3051.

Study of the establishment, management and conservation of forest resources with economical, ecological and recreational purposes.

AGRO 4015-4016. SPECIAL PROBLEMS. One to three credit hours. One to three research periods per week. Prerequisite: consent of the Director of the Department.

Problems in the production, improvement and genetics of crop plants will be assigned, or may be selected, subject to the approval of the professor in charge.

AGRO 4018. PHYSICAL AND CHEMICAL PROPERTIES OF SOILS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: AGRO 3005.

An advanced course in the physical and chemical processes of soils, with emphasis on their practical application and significance. Laboratory practice in the use of physical and physicochemical techniques used in soil investigations.

AGRO 4019. SEMINAR. One credit hour per semester. One hour of lecture per week each semester. Prerequisite: Consent of the Director of the Department.

Reports and discussions of observations and problems in farm practices and recent crop investigations.

AGRO 4025. SEMINAR. One credit hour per semester. One hour of lecture per week each semester. Prerequisite: Consent of the Director of the Department.

Reports and discussions of observations and problems in farm practices and recent crop investigations.

AGRO 4026. CROP ECOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: CFIT 3005 and AGRO 3005.

Study of the environmental conditions which determine the adaptation, distribution and productivity of crops.

AGRO 4029. MANAGEMENT OF TROPICAL SOILS. Three credit hours. Three hours of lecture per week. Prerequisite: AGRO 3005.

Application of the principles of soil science and crop science, in the evaluation of management practices in tropical soils.

AGRO 4037. SOIL FERTILITY AND FERTILIZERS. Three credit hours. Three hours of lecture per week. Prerequisites: CFIT 3005 and AGRO 3005.

Fundamental principles underlying the maintenance of soil productivity; sources, manufacture, and utilization of fertilizer materials and mixed fertilizers, and their effect on the plant and on the soil.

AGRO 4038. SUMMER PRACTICUM. Three credit hours. Six weeks duration. Prerequisite: Consent of the Director of the Department.

Practical field experience and scientific work in soils, crops, and farm practice, covering a period of six or more weeks during the Summer, at the end of the student's Junior year. The work will be carried out under the supervision of various agricultural agencies, such as experiment stations, extension farms, Soil Conservation Service, sugar cane mills, and others. Required for students majoring in Plant Science.

AGRO 4045. MINERAL NUTRITION IN PLANTS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: AGRO 3005 and CFIT 4005.

The basic processes and principles of mineral nutrition of higher plants will be covered. Special emphasis will be given to the factors that affect absorption and translocation as well as the function of essential elements in higher plants.

AGRO 4046. AGROSTOLOGY AND FORAGE AND PASTURE MANAGEMENT. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: CFIT 3005 and AGRO 3005.

A fundamental study of grasses, especially those of economic importance in the Caribbean area: the main characteristic of various genera and species of grasses, their identification, distribution, propagation, and economic uses. Will also include knowledge on the adaptation, management, and nutritive value of cultivated and native pasture plants, with special emphasis on the establishment, management, and improvement of temporary and permanent pastures. Required field trips.

AGRO 4995. SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR COOP STUDENTS. Three to six credit hours. A minimum of two practice periods is required, one of them in a semester. Prerequisite: Consent of the

Director of the Department and to be a Coop program student.

Practical experience in agronomy or soil sciences 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. Written reports will be required upon completion of each work period.

#### ADVANCED UNDERGRADUATE AND GRADUATE COURSES

AGRO 5005. AGRICULTURAL BIOMETRICS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: Advanced undergraduate, or graduate student.

Introduction to the fundamental concepts of the application of biometrical methods to agricultural problems; graphical presentation of data; concepts of randomness and probability; frequency distribution and sampling; Chi-square and t-test; measures of dispersion and relationships; and analysis of variance.

AGRO 5006. GENESIS, MORPHOLOGY AND CLASSIFICATION OF SOILS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: AGRO 3005.

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. Three credit hours. Two hours of lecture 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. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: AGRO 5006.

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 non-agricultural uses.



Representative soil profiles are studied during field trips.

**AGRO 5015. CONSERVATION, MANAGEMENT AND DEVELOPMENT OF NATURAL RESOURCES.** Three credit hours. Three hours of lecture per week. Prerequisite: AGRO 4035 or consent 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 5016. ADVANCED SOIL FERTILITY.** Three credit hours. Three hours of lecture per week. Prerequisite: AGRO 4037.

A detailed discussion of the soil properties affecting crop growth; tilt, soil structure, soil water, soil reaction, ionic exchange, absorption, soil organic matter and soil microorganisms; review of recent literature on the subject; laboratory methods of recent literature on the subject; laboratory methods of assessing soil fertility.

**AGRO 5501. AGRICULTURAL BIOTECHNOLOGY.** Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 3062, (BIOL 3015 or BIOL 3300), and either BIOL 3770 or PROC 4016.

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.** One credit hour. One three-hour laboratory per week. Co-requisite: 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.

## **PLANT SCIENCE COURSES**

**CFIT 3005. FUNDAMENTALS OF CROP PRODUCTION.** Four credit hours. Three hours of lecture and one three-hour laboratory per week.

Fundamental principles of the growth and propagation of agronomic and horticultural plants; the relation of environment to the distribution, adaptation and utilization of crops; fundamentals of soil management, tillage, rotation, plant improvement, pest control, and other practices related to the production and management of crops.

**CFIT 4005. PHYSIOLOGICAL PRINCIPLES OF CROP PRODUCTION.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: BIOL 3435 and QUIM 3002.

Principles of the vital processes of crops: growth, differentiation and development. Mineral nutrition, plant-water relationships, photosynthesis, respiration, photoperiodism and plant hormones.

**CFIT 4007. PLANT BREEDING.** Three credit hours. Three hours of lecture per week. Prerequisite: BIOL 3015 or BIOL 3300.

The improvement of crop plants by hybridization, selection and induced mutations; methods and techniques applicable to sexually and asexually reproduced plants.

**DEPARTMENT OF ANIMAL  
INDUSTRY**

The Animal Industry program design allows students to acquire knowledge and develop abilities and experience in the areas of the animal sciences related to domestic animal production, including species such as beef and dairy cattle, poultry, swine, small ruminants, horses and rabbits. Apiculture (beekeeping and honey production) is also included in the program. Students enrolled in the program take courses in both the basic sciences and applied subjects, such as feeding and nutrition, breeding and reproduction, prevention and control of common diseases and product (milk, meat, eggs, honey) processing and technology. Upon completion of all requirements, students are awarded the degree of Bachelor of Science in Agriculture (BSA) with a major in Animal Industry.

The Animal Industry Program prepares students for work in a number of specialized occupations such as management of dairy, beef, swine or poultry farms; sales of feed, veterinary products and farm machinery and equipment; management of milk or meat processing plants or as private consultants to the Agricultural Extension Service or to other governmental agencies. During the course of their studies, students are also encouraged to venture as private entrepreneurs.

The Pre-Veterinary Program is designed to prepare students wishing to complete a degree as Doctor of Veterinary Medicine (DVM), with all the course work in the sciences that are usually required for admission to the accredited schools of Veterinary Medicine in the United States. This is a three-year, non-degree program. Upon program completion, students receive a Certificate. Those students who do not gain admission to a school of veterinary medicine may easily transfer to the Animal Industry Program and obtain a BSA upon completing all requirements.

The Animal Industry Department also offers a graduate study program leading to the degree of Master of Science in Animal Industry.

**PROGRAMS OF STUDY  
ANIMAL INDUSTRY CURRICULUM**

**FIRST YEAR**

First Semester		
Number	Course	Credits
*INGL 3---	First year course in English	3
*ESPA 3101	Basic Course in Spanish	3
*MATE 3171	Pre-Calculus I	3
QUIM 3001	General Chemistry	4
CFIT 3005	Fundamentals of Crop Production	
	or	
INPE 3005	Fundamentals of Animal Science	4
EDFI ----	Elective Course in Physical Education	$\frac{1}{18}$

Second Semester		
*INGL 3---	First year course in English	3
*ESPA 3102	Basic Course in Spanish	3
*MATE 3172	Pre-Calculus II	3
QUIM 3002	General Chemistry	4
INPE 3005	Fundamentals of Animal Science	
	or	
CFIT 3005	Fundamentals of Crop Production	4
EDFI ----	Elective Course in Physical Education	$\frac{1}{18}$

**SECOND YEAR**

First Semester		
INGL 3---	Second year course in English	3
BIOL 3435	Elementary Botany	4
QUIM 3061	Fundamentals of Organic Chemistry and Biochemistry I	4
BIOL 4015	General Zoology	3
ECON 3021	Principles of Economics I	3
EDAG 3005	Agricultural Orientation	$\frac{1}{18}$

Second Semester		
INGL 3---	Second year course in English	3
FISI 3091	Elements of Physics	3
FISI 3092	Elements of Physics Laboratory	1
QUIM 3062	Fundamentals of Organic Chemistry and Biochemistry II	4

INPE 4005	Veterinary Physiology	3
AGRO 3005	General Soils	<u>3</u>
		17

Electives selected from those offered by Department (INPE code) or closely related areas, which require approval from the Director of the Department of Animal Industry. The remaining 12 credits are free electives.

**THIRD YEAR**

First Semester

BIOL 3770	General Microbiology	3
BIOL 3300	Genetics	3
CISO ----	***Elective course in Social Sciences	3
INPE 4010	Animal Feeding and Nutrition	4
ELECTIVES	**Electives	<u>3</u>
		16

\*\*\*The courses taken as electives in Social Sciences and Humanities must be approved by the Director of the Department of Animal Industry.

**PRE-VETERINARY CURRICULUM**

**FIRST YEAR**

First Semester

Number	Course	Credits
*INGL 3---	First year course in English	3
MATE 3171	Pre-Calculus I	3
QUIM 3001	General Chemistry	4
BIOL 3021	Animal Biology	3
INPE 3005	Fundamentals of Animal Science	4
EDFI ----	Course in Physical Education	<u>1</u>
		18

Second Semester

*INGL 3---	First year course in English	3
*MATE 3172	Pre-Calculus II	3
QUIM 3002	General Chemistry	4
BIOL 3022	Animal Biology	3
ECON 3021	Principles of Economics I	3
EDFI ----	Course in Physical Education	<u>1</u>
		17

**SECOND YEAR**

First Semester

INGL 3---	Second year course in English	3
MATE 3021	Introductory Calculus	3
BIOL 3435	Elementary Botany	4
QUIM 3461 and QUIM 3462	Organic Chemistry	4
INPE 4005	Veterinary Physiology	3
INPE 4037	Seminar	<u>1</u>
		18

Second Semester

INGL 3---	Second year course in English	3
MATE 3022	Introductory Calculus	3
INPE 4010	Animal Feeding and Nutrition	4

**SUMMER SESSION**

INPE 4007	Summer Practicum	3
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**FOURTH YEAR**

First Semester

HUMA ----	***Elective course in Humanities	3
INPE 4037	Seminar	1
ELECTIVES	**Electives	<u>12</u>
		16

Second Semester

HUMA ----	***Elective course in Humanities	3
INPE 4038	Seminar	1
ELECTIVES	**Electives	8
INPE 4019	Animal Breeding	3
TMAG 4015	Agricultural Machinery I	<u>3</u>
		18

**Total credits required for program: 142**

\*Refer to the Academic Regulations section of this Bulletin for information about advanced placement.

\*\*The program in Animal Industry has 26 credits in elective courses. Of these, 14 are Professional

QUIM 3463 and QUIM 3464	Organic Chemistry	4
FISI 3151	Modern College Physics	3
FISI 3153	Modern College Physics Laboratory	$\frac{1}{18}$

**THIRD YEAR**

First Semester

*ESPA 3101	Basic Course in Spanish	3
INGL 3236	Technical Report Writing	3
INPE 4025	Dairy Cattle and Milk Production	
	or	
INPE 4017	Introduction to Poultry Production	3
HUMA ----	**Elective course in Humanities	3
FISI 3152	Modern College Physics	3
FISI 3154	Modern College Physics Laboratory	1
CISO ----	**Elective course in Social Sciences	$\frac{3}{19}$

Second Semester

*ESPA 3102	Basic Course in Spanish	3
BIOL 3770	General Microbiology	3
QUIM 5071	General Biochemistry	3
BIOL 3300	Genetics	3
BIOL 4027	Introduction to Vertebrate Embryology	3
CISO ----	**Elective course in Social Sciences	$\frac{3}{18}$

**Total credits required for program: 108**

\* Refer to the Academic Regulations section of this Bulletin for information about advanced placement.

\*\* The program in Animal Industry has 26 credits in elective courses. Of these, 14 are Professional Electives selected from those offered by the Department (INPE code) or closely related areas, which require approval from the Department Director. The remaining 12 credits are electives.

\*\*\* The courses taken as electives in Social Sciences and Humanities must be approved by the Director of the Animal Industry Department.

**DEPARTMENTAL FACULTY**

**AMERICO CASAS-GUERNICA**, *Assistant Researcher*, M.S., 1984, University of Puerto Rico.

**DANILO S. CIANZIO-MUJICA**, *Professor*, Ph.D., 1980, Iowa State University.

**ANGEL A. CUSTODIO-GONZALEZ**, *Associate Professor*, Ph.D., 1983, Texas A&M University.

**JOHN A. FERNANDEZ-VANCLEVE**, *Professor*, Ph.D., 1986, University of Kentucky.

**JORGE GONZALEZ-ORTIZ**, *Extension Specialist*, M.S., 1986, University of Puerto Rico.

**JOSE R. LATORRE-ACEVEDO**, *Professor*, Ph.D., 1986, University of Arkansas.

**CARLOS NAZARIO-PAGAN**, *Assistant Extension Specialist*, M.S., 1988, North Carolina State University.

**JOSE PANTOJA-LOPEZ**, *Extension Specialist*, Ph.D., 1994, Ohio State University.

**DANIEL G. PESANTE-ARMSTRONG**, *Professor*, Ph.D., 1985, Louisiana State University.

**LEYDA PONCE DE LEON-GONZALEZ**, *Assistant Professor*, Ph.D., 1999, University of Wisconsin-Madison.

**ARIEL RAMIREZ-RAMIREZ**, *Extension Specialist*, M.S., 1983, Louisiana State University.

**PAUL RANDEL-FOLLING**, *Researcher*, Ph.D., 1963, Louisiana State University.

**ERNESTO O. RIQUELME-VILLAGRAN**, *Professor*, Ph.D., 1975, Washington State University.

**EDGARDO R. RIVERA-COLON**, *Associate Professor*, D.V.M., 1984, Tuskegee University.

**BENJAMIN RIVERA-HERNANDEZ**, *Assistant Professor*, D.V.M., 1975, Michigan State University.

**AIXA RIVERA-SERRANO**, *Assistant Specialist*, M.S., 1985, University of Puerto Rico.

**ABNER RODRIGUEZ-CARIAS**, *Associate Professor*, Ph.D., 1996, Michigan State University.

**HECTOR RODRIGUEZ-PASTRANA**, *Associate Specialist*, M.S., 1987, University of Puerto Rico.

**TEODORO RUIZ-LOPEZ**, *Assistant Researcher*, Ph.D., 1993, University of Florida.

**CARMEN SANTANA-NIEVES**, *Associate Professor*, Ph.D., 1993, University of Illinois.

**HECTOR L. SANTIAGO-ANADON**, *Assistant Researcher*, Ph.D., 2002, Virginia Polytechnic Institute and State University.

**VICTOR SIBERIO-TORRES**, *Professor*, Ph.D., 1996, Michigan State University.

**SAUL WISCOVITCH-TERUEL**, *Extension Specialist*, M.S., 1985, University of Puerto Rico.

## **COURSES OF INSTRUCTION**

### **DEPARTMENT OF ANIMAL INDUSTRY**

#### **UNDERGRADUATE COURSES**

**INPE 3005. FUNDAMENTALS OF ANIMAL SCIENCE.** Four credit hours. Three hours of lecture and one three-hour laboratory per week.

An introductory course in the raising of the most important farm livestock in Puerto Rico.

**INPE 3017. RABBIT PRODUCTION.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INPE 3005.

Theoretical basis and management practices involved in commercial rabbit production, including breeds; reproductive, feeding and sanitary management; genetic improvement; and processing and marketing of the final product.

**INPE 4005. VETERINARY PHYSIOLOGY.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: INPE 3005 and (BIOL 4015, or BIOL 3021, or BIOL 3052).

The physiology of farm animals, comprising the digestive, nervous, vascular, excretory, respiratory, and endocrine system.

**INPE 4006. REPRODUCTION OF FARM ANIMALS.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INPE 3005 and INPE 4005.

The anatomy, physiology and pathology of the reproductive system of farm animals, including artificial insemination.

**INPE 4007. SUMMER PRACTICUM.** Three credit hours. Six weeks duration. Prerequisites: A

minimum of ten credit hours in Animal Industry courses.

The work will consist of practical experience in livestock farming or milk plant practices, covering a period of six weeks during the Summer at the end of the junior year. The student will be under the supervision of the owner or manager of the farm or plant, and of a member of the animal industry staff.

**INPE 4008. MILK AND MILK PRODUCTS.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INPE 3005.

A general course covering the composition and properties of milk, and the manufacture of dairy products.

**INPE 4009. MARKET MILK.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INPE 4008.

Processing and distribution of market milk and related products. Field trips required.

**INPE 4010. ANIMAL FEEDING AND NUTRITION.** Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: INPE 3005.

Definitions and general concepts of feeding and nutrition. Relationship between human and animal nutrition. Anatomy and physiology of the digestive tract. Nutrient digestion and absorption and excretion of waste products. Chemical composition and feed evaluation. The nutrients and their metabolism. Feedstuffs used in animal rations. Voluntary feed intake. Feeding standards for domestic animals. Ration formulation. Applied aspects of feeding dairy cattle, beef cattle, sheep, goats, horses, poultry, swine, and rabbits.

**INPE 4016. BEEKEEPING.** Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Breeds and behavior of bees, management and apiculture production techniques. Field trips required.

**INPE 4017. POULTRY PRODUCTION.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INPE 3005.

The principles and practices of poultry breeding, feeding, incubation, brooding, rearing, housing, and sanitation.

INPE 4018. INTRODUCTION TO RESEARCH IN ANIMAL SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisite: INPE 3005 and (MATE 3172 or its equivalent).

Measure of Central Tendency and Variation. Construction and interpretation of tables and graphs. Binomial and normal distribution. Introduction to methods of domestic animal experimentation.

INPE 4019. ANIMAL BREEDING. Three credit hours. Three hours of lecture per week. Prerequisite: INPE 3005 and either BIOL 3015 or BIOL 3300.

The application of genetics to the problems and methods of livestock's improvement.

INPE 4020. ARTIFICIAL INSEMINATION IN DOMESTIC ANIMALS. Three credit hours. One hour of lecture and one six-hour laboratory per week. Prerequisite: INPE 4006.

Theory and intensive practice of artificial insemination in domestic animals.

INPE 4025. DAIRY CATTLE AND MILK PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INPE 3005.

A study of the various phases of dairy cattle and milk production.

INPE 4026-4027. SPECIAL PROBLEMS. One to three credit hours each semester. One to three research periods per week per semester. Prerequisite: consent of the Director of the Department.

Research problems in livestock feeding and nutrition, poultry feeding and nutrition, livestock management, dairy technology, animal breeding, and animal diseases.

INPE 4028. INTRODUCTION TO HORSE PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INPE 3005.

Fundamental principles involved in the care and management of horses with emphasis on racing and the "Paso Fino". Field trips to horse farms and stables required.

INPE 4029. SWINE AND PORK PRODUCTION. Three credit hours. Two hours of lecture and one

three-hour laboratory per week. Prerequisite: INPE 3005.

A study of the various phases of swine production, including butchering, cutting and curing of pork.

INPE 4035. BEEF PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INPE 3005.

A study of the various phases of beef cattle production, including butchering, cutting and curing of beef.

INPE 4036. DISEASES OF FARM ANIMALS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INPE 4005.

The most common diseases of farm animals in Puerto Rico; their prevention, treatment, and sanitary measure.

INPE 4037. SEMINAR. One credit hour. One meeting per week. Prerequisite: Twelve credits in Animal Industry.

Studies and discussions of research work and other topics of interest in Animal Industry.

INPE 4038. SEMINAR. One credit hour. One meeting per week. Prerequisite: INPE 4037.

Studies and discussions of research work and other topics of interest in Animal Industry.

INPE 4040. BEHAVIOR OF FARM ANIMALS. Three credit hours. Three hours of lecture per week. Prerequisite: INPE 4005.

Study of the behavior of farm animals; the influence of genetic, and the environment on the animals conduct and the physiological aspects related to these.

INPE 4997. SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR COOP STUDENTS. From three to six credit hours. A maximum of two practice periods, one of which has to be in a semester. Prerequisites: consent of the Director of the Department and to be a COOP student.

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.

**ADVANCED UNDERGRADUATE AND GRADUATE COURSES**

INPE 5346. DAIRY BY-PRODUCTS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INPE 4008.

The manufacture of ice cream, cheese, and butter.

INPE 5347. VETERINARY PARASITOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: INPE 3005 and (BIOL 4015 or BIOL 3022 or BIOL 3052).

Morphology, life cycle, and control of farm animals' parasites.

INPE 5355. ADVANCED BEEKEEPING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INPE 4016.

Commercial Management of Apiaries. The course includes the production of queen bees, and the various methods used to obtain honey and to extract the wax.

INPE 5357. SCIENCE AND TECHNOLOGY OF FRESH MEATS. Three credit hours. Two hours of lecture and one four-hour laboratory per week. Prerequisite: INPE 4005 or Consent of the Director of the Department.

Principles and practices in the handling, processing and preservation of beef, pork, and poultry meats.

**DEPARTMENT OF CROP PROTECTION**

The Department of Crop Protection offers a program of instruction leading to a degree in Agriculture with specialization in Crop Protection. The Department of Crop Protection emphasizes the effective use and application of agricultural technology in the fields of crop protection. It integrates the function of resident instruction, research and extension in the disciplines of entomology, nematology, phytopathology, and weed science in a global approach aimed at protecting crop plant health.

The first year of study in crop protection is similar in requirements as other undergraduate curricula in Agricultural Sciences. Specialization gradually begins during the sophomore year. A student, in consultation with an academic advisor, selects 12 credits of professional electives and 12 of free electives. Professional electives are chosen mainly from Crop Protection Department course offerings.

During the summer, between the third and fourth year, students participate in a three-credit summer field practicum emphasizing some aspects of crop protection. The Department also offers a study program leading to the degree of Master of Science with specialization in Crop Protection .

**PROGRAM OF STUDY CURRICULUM IN CROP PROTECTION**

<b>FIRST YEAR</b>		
First Semester		
Number	Course	Credits
*ESPA 3101	Basic Course in Spanish	3
*INGL 3---	First year course in English	3
QUIM 3001	General Chemistry	4
*MATE 3171	Pre-Calculus I	3
CFIT 3005	Fundamentals of Crop Production	
	or	
INPE 3005	Fundamentals of Animal Science	4

EDFI ----	Basic Course in Physical Education	<u>1</u>
		18
Second Semester		
*ESPA 3102	Basic Course in Spanish	3
*INGL 3---	First year course in English	3
QUIM 3002	General Chemistry	4
*MATE 3172	Pre-Calculus II	3
INPE 3005	Fundamentals of Animal Science	
	or	
CFIT 3005	Fundamentals of Crop Production	4
EDFI ----	Basic Course in Physical Education	<u>1</u>
		18
<b>SECOND YEAR</b>		
First Semester		
INGL 3---	Second year course in English	3
QUIM 3061	Fundamentals of Organic Chemistry and Biochemistry I	4
AGRO 3005	General Soils	3
FISI 3091	Elements of Physics	3
FISI 3092	Elements of Physics Laboratory	1
BIOL 3435	Elementary Botany	<u>4</u>
		18
Second Semester		
INGL 3---	Second year course in English	3
QUIM 3062	Fundamentals of Organic Chemistry and Biochemistry II	4
ECON 3021	Principles of Economics I	3
BIOL 4015	General Zoology	3
AGRO 4026	Crop Ecology	3
EDAG 3005	Agricultural Orientation	<u>1</u>
		17
<b>THIRD YEAR</b>		
First Semester		
PROC 4016	Agricultural Bacteriology	3
PROC 4006	Tropical Phytopathology	3
BIOL 3300	Genetics	3
CFIT 4005	Physiological Principles of Crop Production	3
CISO ----	***Elective course in Social Sciences	3
ELECTIVES	**Free electives	<u>3</u>
		18
Second Semester		
PROC 4008	Agricultural Entomology	3

ECAG 4019	Introduction to Farm Management	3
TMAG 4015	Agricultural Machinery I	3
CISO ----	***Elective course in Social Sciences	3
ELECTIVES	**Professional Electives	<u>6</u>
		18

**SUMMER SESSION**

PROC 4025	Summer Practicum	3
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**FOURTH YEAR**

First Semester

PROC 4017	Weed Control	3
PROC 4018	Introduction to Agronomy	3
PROC 4019	Pesticides and Their Use in Agriculture	3
HUMA ----	***Elective course in Humanities	3
ELECTIVES	**Professional Electives	<u>6</u>
		18

Second Semester

CFIT 4007	Plant Breeding	3
PROC 4026	Seminar	1
HUMA ----	***Elective course in Humanities	3
ELECTIVES	**Free Electives	<u>2</u>
		16

**Total credits required for program: 144**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*Minimum requirements in electives. The Crop Protection Program requires a minimum of 24 credits in elective courses. At least twelve of these courses could be in professional electives selected from those offered by the Department or related areas, and with the prior approval of the Head of Crop Protection Department. The remaining 12 credits are considered free electives.

\*\*\*Electives in Humanities and Social Sciences to be selected from offerings from the respective Department with approval of the Crop Protection Department Director.

## DEPARTMENTAL FACULTY

**ARISTIDES M. ARMSTRONG**, *Associate Researcher*, M.S., 1981, University of Puerto Rico, Mayagüez Campus.

**JULIO BIRD-PIÑERO**, *Emeritus Professor*, Ph.D., 1957, University of Minnesota.

**JOSE ANDRES CHAVARRIA-CARVAJAL**, *Associate Researcher*, Ph.D., 1997, Auburn University.

**ROSA A. FRANQUI-RIVERA**, *Associate Researcher*, University of Wisconsin.

**FERNANDO GALLARDO**, *Associate Researcher*, Ph.D., 1990, Louisiana State University.

**ANGEL L. GONZALEZ**, *Associate Professor*, Ph.D., 1997, University of Illinois.

**RAFAEL INGLES-CASANOVA**, *Researcher*, M.S., 1991, University of Puerto Rico - Mayagüez Campus.

**LYDIA I. RIVERA-VARGAS**, *Professor*, Ph.D., 1994, Ohio State University.

**PEDRO RODRIGUEZ-DOMINGUEZ**, *Extension Specialist*, M.S., 1982, University of Puerto Rico, Mayagüez Campus.

**RITA L. RODRIGUEZ**, *Researcher*, Ph.D., 1993, Cornell University.

**JESSE ROMAN-TORO**, *Emeritus Professor*, Ph.D., 1968, North Carolina State University.

**CARLOS ROSARIO-PEREZ**, *Professor*, Ph.D., 1988, Pennsylvania State University.

**NELSON SEMIDEY**, *Researcher*, Ph.D., 1992, University of Arkansas.

**ROBERTO VARGAS**, *Associate Professor*, Ph.D., 1995, Auburn University.

**NYDIA E. VICENTE-CARBONELL**, *Associate Researcher*, M.S., 1983, University of Puerto Rico, Mayagüez Campus.

**MILDRED ZAPATA**, *Researcher*, Ph.D., 1989, University of Nebraska.

## COURSES OF INSTRUCTION

### DEPARTMENT OF CROP PROTECTION

#### UNDERGRADUATE COURSES

PROC 4006. TROPICAL PHYTOPATHOLOGY. Three credit hours. Two hours of lecture and one

three-hour laboratory per week. Prerequisite: BIOL 3435 or BIOL 3417.

Study of diseases of main tropical plants, including the host range, symptoms and signs, etiology, cycles, epiphytology, distribution, economic importance and control.

PROC 4008. AGRICULTURAL ENTOMOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 4015.

Entomological study from the agricultural viewpoint, including insects taxonomy, economic importance, control, methods of collecting, mounting and preserving insects. A collection of insects of economic importance is required.

PROC 4016. AGRICULTURAL BACTERIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: QUIM 3002 and CFIT 3005.

The study of the chemical, physical and biological characteristics of bacteria, associated with agricultural crops, with emphasis on the basic techniques employed for isolation, culturing, identification and control.

PROC 4017. WEED CONTROL. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: CFIT 3005 and QUIM 3002.

Classification and identification of weeds of economic importance, discussion of physiological principles related to weed control, and eradication, commercial herbicides usage and other control methods.

PROC 4018. INTRODUCTION TO AGRO-NEMATOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 4015.

History, morphology, classification, and life cycles of nematodes, with emphasis on phytoparasitic extraction from soil and plant tissues.

PROC 4019. PESTICIDES AND THEIR USE IN AGRICULTURE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: QUIM 3061.

Studies of pesticides including their chemical composition, their effects as environmental contaminants, their mode of action, toxicity and determination of their residues. Orientation will be

given on management and disposal, methods of protecting personnel and pertinent federal and state legislation regarding pesticides usage.

PROC 4025. SUMMER PRACTICUM. Three credit hours. Thirty hours per week during six weeks. Prerequisite: Consent of the Director of the Department.

Field experience supervised by the Departmental staff with the collaboration of farmers, private agricultural industries and governmental agricultural agencies. A written report will be required.

PROC 4026. SEMINAR. One credit hour. One-hour meeting per week.

Review and discussion of the recent literature in crop protection.

PROC 4995-4996. SPECIAL PROBLEMS. One to three credit hours per semester. One to three study and research periods per week. Prerequisite: Consent of the Director of the Department.

Study and investigation of a specific problem in the field of crop protection.

PROC 4997. SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR COOP STUDENTS. Three to six credit hours. A minimum of two practice periods is required, one of them in a semester. Prerequisites: consent of the Director of the Department and to be a Coop Program student.

Practical experience in Crop Protection 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.

#### ADVANCED UNDERGRADUATE AND GRADUATE COURSES

PROC 5005. PHYTOPATHOGENIC FUNGI. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: PROC 4006 or consent 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 lecture and one three-hour laboratory per week. Prerequisite: PROC 4008 or CFIT 4008.

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.

## DEPARTMENT OF HORTICULTURE

The Department of Horticulture offers a program of instruction leading to a degree in Agriculture with specialization in Horticulture. The Department of Horticulture is the academic and administrative unit of the College of Agricultural Sciences dealing with teaching and research related to coffee, starchy food crops, tropical fruits, vegetables, ornamentals and food science. Teaching includes courses in plant propagation, production, management, physiology, marketing and food technology of various horticultural commodities.

Horticultural products have a very high economic potential for Puerto Rico and neighboring countries. Production of horticultural crops as well as processing has significantly increased in the past years. The potential for horticultural activities is shown by the fact that Puerto Rico is importing a high percentage of horticultural products which could be produced on the island. The Department also offers a study program leading to the degree of Master of Science in Horticulture.

### PROGRAM OF STUDY

#### CURRICULUM IN HORTICULTURE

##### FIRST YEAR

First Semester

Number	Course	Credits
*INGL 3---	First year course in English	3
*ESPA 3101	Basic Course in Spanish	3
*MATE 3171	Pre-Calculus I	3
QUIM 3001	General Chemistry	4
BIOL 3435	Elementary Botany	4
EDAG 3005	Agricultural Orientation	1
		18

Second Semester		
*INGL 3---	First year course in English	3
*ESPA 3102	Basic Course in Spanish	3
*MATE 3172	Pre-Calculus II	3
QUIM 3002	General Chemistry	4
CFIT 3005	Fundamentals of Crop Production	4
EDFI ----	Basic course in Physical Education	$\frac{1}{18}$

**SECOND YEAR**

First Semester		
INGL 3---	Second year course in English	3
QUIM 3061	Fundamentals of Organic Chemistry and Biochemistry I	4
AGRO 3005	General Soils	3
BIOL 4015	General Zoology	3
HORT 3005	Plant Propagation	3
EDFI ----	Basic course in Physical Education	$\frac{1}{17}$

Second Semester		
INGL 3---	Second year course in English	3
FISI 3091	Elements of Physics	3
FISI 3092	Elements of Physics Laboratory	1
QUIM 3062	Fundamentals of Organic Chemistry and Biochemistry II	4
HORT 4005	Ornamental Horticulture	3
INPE 3005	Fundamentals of Animal Science	$\frac{4}{18}$

**THIRD YEAR**

First Semester		
BIOL 3300	Genetics	3
CFIT 4005	Physiological Principles of Crop Production	3
TMAG 4015	Agricultural Machinery I	3
PROC 4006	Tropical Plant Pathology	3
CISO ----	***Elective course in Social Sciences	3
ELECTIVES	**Electives	$\frac{3}{18}$

Second Semester		
BIOL 3770	General Microbiology	3
PROC 4008	Agricultural Entomology	3
ECON 3021	Principles of Economics I	3

CISO ----	***Elective course in Social Sciences	3
ELECTIVES	**Electives	$\frac{6}{18}$

**SUMMER SESSION**

HORT 4006	Summer Practicum	3
Or		
HORT 4995	Supervised Professional Occupational Experience for Coop Students	

**FOURTH YEAR**

First Semester		
HORT 4015	Tropical Fruit Culture I	3
HORT 4029	Coffee	3
HUMA ----	***Elective course in Humanities	3
ELECTIVES	**Electives	$\frac{8}{17}$

Second Semester		
HORT 4045	Starchy Crops	4
HORT 4028	Seminar	1
ECAG 4019	Introduction to Farm Management	3
HORT 4008	Vegetable Crops	3
HUMA ----	***Elective course in Humanities	3
ELECTIVES	**Electives	$\frac{3}{17}$

**Total credits required for program: 144**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*Minimum requirements in electives. The Horticulture Department requires a minimum of 20 credits in electives courses. At least 8 should be in professional electives chosen with the consent of the Horticulture Department Director from the Department offering or from related areas. The remaining 12 credits are free electives.

\*\*\*Elective courses in Social Sciences and Humanities require consent of the Horticulture Department Director.

**DEPARTMENTAL FACULTY**

**LUCAS N. AVILES-RODRIGUEZ**, *Assistant Researcher*, M.S., 1988, University of Florida, Gainesville.

**BRYAN BRUNNER-FULTON**, *Researcher*, Ph.D., 1992, Michigan State University.

**FEIKO H. FERWERDA**, *Assistant Researcher*, Ph.D., 2001, University of Florida.

**CARLOS A. FIERRO-BERWART**, *Professor*, Ph.D., 1972, Rutgers University.

**JOHN M. GILL**, *Associate Professor*, Ph.D., 1994, Rutgers University.

**LIZZETTE GONZALEZ-GILL**, *Associate Professor*, Ph.D., 1996, Rutgers University.

**SALLY GONZALEZ-MIRANDA**, *Associate Specialist of Extension*, MLA, 1987, Ball State University, Indiana.

**MARIA DEL C. LIBRAN-SALAS**, *Associate Professor*, Ph.D., 1996, University of Illinois.

**MIGUEL MONROIG-INGLES**, *Specialist of Extension*, M.S., 1983, University of Puerto Rico, Mayagüez Campus.

**EDNA NEGRON-DE BRAVO**, *Professor*, Ph.D., 1987, University of Pennsylvania.

**SALVADOR SALAS-QUINTANA**, *Professor*, Ph.D., 1988, Rutgers University.

**JOSE ZAMORA-ECHEVARRIA**, *Assistant Specialist of Extension*, M.S., 1991, University of Puerto Rico, Mayagüez Campus.

**COURSES OF INSTRUCTION**

**DEPARTMENT OF HORTICULTURE**

**UNDERGRADUATE COURSES**

**HORT 3005. PLANT PROPAGATION.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Principles and practices followed in the propagation of plants. A study of seeds, cuttings, grafting, budding, transplanting and modified organs used in the propagation of plants. Green houses, propagators, seedbeds and other structures will be discussed.

**HORT 3015. COMMERCIAL PRODUCTION OF HERBACEOUS ORNAMENTALS.** Three credit hours per semester. Three hours of lecture per week. Prerequisite: CFIT 3005.

Theory and practice of the commercial production of herbaceous ornamental plants with potential for Puerto Rico and their landscape use.

**HORT 4005. ORNAMENTAL HORTICULTURE.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Theory and practice of the major fields of ornamental horticulture: floriculture, nursery production, turf grass management, and landscaping. Overview of the ornamental horticulture industry, including marketing, sales, design, and public relations. Field trips required.

**HORT 4006. SUMMER PRACTICUM.** Three credit hours. Six weeks duration. Prerequisites: A minimum of 6 credits approved in Horticulture and consent of the Director of the Department.

Practical field experience, or its equivalent, and scientific work in fruits, vegetables or ornamentals. The work will cover a period of six weeks or more during the Summer at the end of the student's Junior year. It will be carried out under the close supervision of either anyone of the recognized agricultural agencies or institution in Puerto Rico or abroad, or of manager of private enterprises.

**HORT 4008. VEGETABLE CROPS.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Study and practice of vegetables growing; varieties, planting, cultivation, and insect and disease problems of the common vegetables; handling for local markets and for shipping. Field trips required.

**HORT 4009. HORTICULTURAL CROPS.** Three credit hours. Three hours of lecture per week. Prerequisite: CFIT 3005.

A survey course covering some important horticultural enterprises on the island. Coffee, bananas, vegetable crops, and ornamentals will be discussed. Field trips required.

**HORT 4014. PLANTS FOR THE LANDSCAPE.** Three credit hours. Three hours of lecture per week.

Study of plants as material for landscaping design in Puerto Rico, their identification by scientific and



common name, and by aesthetic and botanical characteristics. Emphasis in the selection of plants according to the design needs, uses, and management.

HORT 4015. TROPICAL FRUIT CULTURE I. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Study of the most important fruits in Puerto Rico, including pineapple, citrus, avocados, and bananas. Field trips required.

HORT 4016. PRINCIPLES OF LANDSCAPE DESIGN. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: CFIT 3005 or consent of the Director of the Department.

Principles and techniques of landscape design; preparation of plans for small areas.

HORT 4018-4019. SPECIAL PROBLEMS. One to three credit hours per semester. One to three research periods per semester. Prerequisite: consent of the Director of the Department.

Research problems in horticulture selected by the student and the professor. A written report is required.

HORT 4025. FLORICULTURE. Two credit hours. One hour of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Identification, cultural practices and management of annuals, biennials, perennials, and bulbous cut-flower plants, used for commercial purposes.

HORT 4026. NURSERY MANAGEMENT. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Principles covering the establishment of nurseries for commercial purposes; the preparation of layout plants both for retail and wholesale nurseries, structures, equipment, operation, and marketing will be discussed. Field trips required.

HORT 4027. FLOWER ARRANGEMENT. Two credit hours. One hour of lecture and one three-hour laboratory per week.

Principles of flower arranging. The management of a flower shop, the handling of plants and flowers, preparation of wreaths, sprays, corsages, etc., floral arrangements for special occasions such as

banquets, funeral celebrations, and other events. Visits to flower shop required.

HORT 4028. SEMINAR. One credit hour. One meeting per week. Prerequisite: A minimum of 9 credits approved in Horticulture.

Reports and discussions of assigned or selected readings of investigation related to horticulture problems.

HORT 4029. COFFEE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

The commercial production of coffee (with special consideration given to conditions prevailing in Puerto Rico). The selection of varieties, propagation, planting, fertilization and management. Field trips required.

HORT 4035. TROPICAL FRUITS CULTURE II. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Study of the origin, botany, varieties and production practices of tropical fruits with economic potential in Puerto Rico, such as: papaya, mango, and passion fruit.

HORT 4037. PRINCIPLES OF FRUIT AND VEGETABLE PRESERVATION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: QUIM 3002.

The common commercial methods of preserving fruits and vegetables. Fundamental principles of food spoilage, decomposition and changes, methods employed in preserving fruits and vegetables; freezing, canning and dehydration. Field trips required.

HORT 4045. STARCHY CROPS. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: CFIT 3005.

Management and production of starchy crops like plantains, bananas, yams, sweet potatoes, cassava, taro, root celery, and others with economic potential in Puerto Rico. Special attention will be given to the origin, economic situation and perspectives, botanic classification, climatic requisites, crop improvement, propagation, cultural practices, pest and disease control, harvesting, storage, processing, distribution, and marketing.

HORT 4047. PLANT MICROPROPAGATION. Three credit hours. Two hours of lecture and one

three-hour laboratory per week. Prerequisite: CFIT 3005 or BIOL 3052.

Use of tissue culture as a tool in the propagation of plants of economic importance to Puerto Rico such as ornamental plants, starchy crops, fruits, vegetables and aromatic plants.

HORT 4055. AROMATIC PLANTS. Three credit hours. Three hours of lecture per week. Prerequisite: CFIT 3005.

Production and handling of aromatic plants; medicinal, culinary, ornamental and landscape uses.

HORT 4995. SUPERVISED PROFESSIONAL OCCUPATIONAL EXPERIENCE FOR COOP STUDENTS. Three to six credit hours. A maximum of two practice period, one of which has to be in a semester. Prerequisites: Consent of the Director of the Department and to be a Coop student.

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 4996. SELECTED TOPICS I. One to three credit hours. One to three hours of lecture per week.

Selected topics in ornamentals, starch and tubers, vegetables, fruits, tissue culture and other related areas.

HORT 4997. SELECTED TOPICS II. One to three credit hours. One to three hours of lecture per week.

Selected topics in ornamentals, starch and tubers, vegetables, fruits, tissue culture and other related areas.

#### ADVANCED UNDERGRADUATE AND GRADUATE COURSES

HORT 5005. ADVANCED FLORICULTURE. 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. 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.

## COLLEGE OF ARTS AND SCIENCES

the Commonwealth of Puerto Rico and  
the world.

### Organization

The College of Arts and Sciences was established in 1959 when the School of Science and the Division of General Studies were merged into one administrative unit named College of Arts and Sciences.

The main mission of the College is to liberate and broaden the mind in order to produce men and women with vision and perspective as well as specific practical skills and knowledge. The College of Arts and Sciences also encourages the intellectual development of both students and professors. Quality research supports the educational program by introducing students to the challenge and excitement of original discovery and provides a source of knowledge and understanding needed for a better society. Teaching, research and community service are all integral parts of the mission of the College of Arts and Sciences.

In fulfilling its mission, the College of Arts and Sciences adopts the following specific goals:

1. To develop a diverse faculty which is nationally and internationally recognized for excellence in both teaching and research.
2. To provide a challenging undergraduate program with a liberal arts and sciences curriculum which encourages creativity, independent thought and intellectual depth, scope and curiosity.
3. To offer high quality graduate and professional programs that prepare students for intellectual, professional and public leadership.
4. To develop in its students an appreciation for the human condition, a concern for public welfare and a lifelong commitment to learning.
5. To use the scholarship and skills of its faculty and students to further human knowledge and understanding and to address specific problems confronting

### Degrees Offered

The **Bachelor of Science** degree is offered in the areas of Biology, Industrial Microbiology, Industrial Biotechnology, Chemistry, Geology, Pure Mathematics, Nursing, Physical Sciences, Pre-Medical Studies, Theoretical Physics, Computer Science, and Mathematics Education. The College of Arts and Sciences provides students in these programs with an opportunity to acquire one or more of the following:

1. Specialized training for practical work in science.
2. Preparation for research in pure or applied science.
3. Preparation for the teaching of science.
4. Training in a branch of science preparatory for graduate work.
5. Preparation for admission to a professional school.
6. Preparation for the first professional degree in Nursing.

The **Bachelor of Arts** degree is offered in English, Hispanic Studies, French Language and Literature, Philosophy, Comparative Literature, Plastic Arts, Theory of Art, History, General Social Sciences, Sociology, Political Science, Psychology, Economics, and Physical Education. A student enrolled in one of these programs enjoys the following opportunities:

- Preparation for teaching liberal arts subjects at the elementary or secondary school level.
- Acquisition of the necessary background for continuing graduate studies or seeking admission to professional schools.
- Preparation which will enable the student to work for agencies concerned with public welfare or government service.
- Development of a broad perspective and perceptive insight in matters pertaining to human nature, achievement, and culture.
- Preparation for technical practice in Nursing.

The College of Arts and Sciences also 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 English Education. The **Doctor of Philosophy** degree is offered in Marine Sciences. Additional information concerning graduate programs may be obtained by consulting the Graduate Catalogue.

### Graduation Requirements

The current number of semester hours required for graduation in each major field is indicated according to each individual curriculum. In order to graduate, a student must have a minimum general 2.00 GPA and a minimum 2.2 GPA in the main area of specialization.

### Professional Societies

**The American Chemical Society**, which has been selected as outstanding for about two decades, has had a student affiliate chapter at UPRM since 1948. Students and teachers meet to conduct scientific and social activities. The chapter sponsors trips and visits to chemical and related industries and attends scientific meetings on the island.

**The American Association of Physics Teachers** has a Regional (Puerto Rico) Section with its nucleus in the Physics Department at UPRM. A joint meeting with the American Physical Society is held annually in New York City. Regional Section's objectives include improvement in the teaching of physics and enhancement in the appreciation of its cultural value. Members meet regularly to discuss scientific topics.

The Mayagüez student chapter of the **Political Science Association of Puerto Rico** not only fosters research and discussion within campus, but also provides a link with political science majors on other campuses.

**The Student Nurses Association of the Commonwealth of Puerto Rico** aims to promote interaction and leadership among UPRM Nursing students and other chapters on the island.

**Phi Alpha Delta** has had a very active and outstanding pre-legal chapter at UPRM since the 1980's.

### Department-Sponsored Student Organizations

On May 27, 1945, Beta Beta Beta, an honorary society for biology majors, organized the Zeta Alpha Chapter at UPRM. Juniors and seniors with a minimum grade point average of 3.00, who have shown ability and interest in biological research are eligible for active membership.

There are other active student associations in the Departments of Biology, Economics, English, Geology, Humanities, Mathematics, Physics and Social Sciences, such as the Pre-medical Student's Circle, the Psychology Student Association, the University Philosophy Club, the History Student Association, the Eugenio María de Hostos Hispanic Circle, the College Drama Club, the Dancer's CAAMpany, the Sociology Student Union, the Environmental Student Association, and the Physical Education Student Association.

### Advanced Placement

Incoming students may receive advanced placement in Spanish, English and mathematics courses if they score a 4 or 5 in the Advanced Placement Examination. Students should contact the Associate Dean of Academic and Student Affairs at the College of Arts and Sciences for any information related to advanced placement.

## BACHELOR OF SCIENCE IN INDUSTRIAL BIOTECHNOLOGY

### FIRST YEAR

#### First Semester

<b>*MATE 3005</b>	
Pre-Calculus	5
<b>QUIM 3041</b>	
General Chemistry	4
<b>BIOL 3051</b>	
General Biology I	4
<b>*INGL 3---</b>	
First Year Course in English	3
<b>*ESPA 3101</b>	
Basic Course in Spanish	<u>3</u>
	19

**Second Semester**

<b>MATE 3031</b>	
Calculus I	4
<b>QUIM 3042</b>	
General Chemistry	4
<b>BIOL 3052</b>	
General Biology II	4
* <b>INGL 3---</b>	
First Year Course in English	3
* <b>ESPA 3102</b>	
Basic Course in Spanish	3
<b>EDFI 3---</b>	
Course in Physical Education	$\frac{1}{19}$

**SECOND YEAR**

**First Semester**

<b>MATE 3032</b>	
Calculus II	4
<b>QUIM 3450</b>	
Fundamentals of Organic Chemistry	5
<b>FISI 3151</b>	
Modern College Physics	3
<b>FISI 3153</b>	
Modern College Physics Laboratory	1
<b>INGL 3---</b> or <b>4---</b>	
Second Year Course in English	3
<b>EDFI 3---</b>	
Course in Physical Education	$\frac{1}{17}$

**Second Semester**

<b>MATE 3048</b>	
Mathematical Analysis	4
<b>QUIM 3055</b>	
Analytical Chemistry	4
<b>FISI 3152</b>	
Modern College Physics	3
<b>FISI 3154</b>	
Modern College Physics Laboratory	1
<b>INGL 3---</b> or <b>4---</b>	
Second Year Course in English	3
<b>INGE 3016</b>	
Algorithms and Computer Programming	$\frac{3}{18}$

**THIRD YEAR**

**First Semester**

<b>INQU 4005</b>	
Materials and Energy Balances	4

<b>BIOL 3300</b>	
Genetics	3
<b>BIOL 3770</b>	
General Microbiology	3
<b>ESPA 3---</b> or <b>4---</b>	
Second Year Course in Spanish	3
<b>QUIM 4041</b>	
Physical Chemistry	3
<b>ELECTIVE</b>	
Elective	$\frac{3}{19}$

**Second Semester**

<b>INQU 5006</b>	
Mathematical Topics in Chemical Engineering	3
<b>QUIM 4042</b>	
Physical Chemistry	3
<b>QUIM 4101</b>	
Physical Chemistry Laboratory	1
<b>BIOL 4368</b>	
Microbial Physiology	3
<b>INQU 4003</b>	
Unit Operations III	4
<b>ESPA 3---</b> or <b>4---</b>	
Second Year Course in Spanish	$\frac{3}{17}$

**FOURTH YEAR**

**First Semester**

<b>QUIM 5071</b>	
General Biochemistry	3
<b>CISO 3121</b>	
An Introduction to the Study of the Social Sciences	3
<b>HUMA 3111</b>	
Introduction to Western Culture I	3
<b>ECON 3021</b>	
Principles of Economics I	3
<b>INQU 4011</b>	
Chemical Engineering Thermodynamics I	3
<b>INQU 4004</b>	
Unit Operations Lab. III	$\frac{1}{16}$

**Second Semester**

<b>BIOL 4925</b>	
Seminar	1
<b>BIOL 4367</b>	
Industrial Microbiology	3
<b>QUIM 5072</b>	
General Biochemistry	3

**CISO 3122**

An Introduction to the Study  
of the Social Sciences 3

**HUMA 3112**

Introduction to Western  
Culture II 3

**INQU 4012**

Chemical Engineering  
Thermodynamics II 3

**ELECTIVE**  $\frac{3}{19}$

**FIFTH YEAR**

**First Semester**

**BIND 4905**

Practicum in Industrial  
Biotechnology  $\frac{6}{6}$

**Second Semester**

**BIND 5005**

Project in Industrial  
Biotechnology 2

**INQU 5035**

Biochemical Engineering 3

**ELECTIVE**

Recommended Elective 3

**ELECTIVE**  $\frac{6}{14}$

**Total credits required 164**

\* Refer to the Academic Regulations section for  
information on Advanced Placement.

**RECOMMENDED ELECTIVES**

**BIOL 5395 -**

Molecular Genetics 3

**BIOL 5745 -**

Introduction to Biophysics 3

**BIOL 4008 -**

Immunology 3

**INDUSTRIAL BIOTECHNOLOGY**

**UNDERGRADUATE COURSE**

**BIND 4905. PRACTICUM IN INDUSTRIAL BIOTECHNOLOGY.** Six credit hours. Thirty-five hours of supervised practice per week. Prerequisite: Consent of the Program Coordinator.

Practical experience in a field of industrial biotechnology to be jointly supervised by a faculty member and an appropriate official of the cooperating organization. Written and oral reports will be required.

**ADVANCED UNDERGRADUATE COURSE**

**BIND 5005. PROJECT IN INDUSTRIAL BIOTECHNOLOGY.** Two credit hours. Two four to eight-hour laboratory or independent study periods per week.

Undergraduate research in a field of industrial biotechnology. A written report is required.



## DEPARTMENT OF BIOLOGY

The Department of Biology offers programs in Biology, Industrial Microbiology and Pre-medical Studies. The principal objective of the Program in Biology is to guide students towards an understanding of the basic and unifying principles of biology. The graduates of this program find employment primarily in education, in pharmaceutical or related industries, and in government agencies.

**The Industrial Microbiology Program** trains students who can serve as specialists in the pharmaceutical or food industries. The program emphasizes one of the most important aspects of industrial work: quality control.

The program in **Pre-medical Studies** prepares students for admission to professional, medical or dentistry schools, medical technology, or other health science programs.

The Department of Biology offers a graduate program leading to a **Master of Science** degree in Biology.

### BACHELOR OF SCIENCE IN BIOLOGY

#### Summary of Credits in Program

Faculty requirements	56
Departmental requirements	
Major area	33
Non-major area	32
Recommended electives	8
Free electives	<u>12</u>
<b>Total required credits</b>	<b>141</b>

#### FIRST YEAR

##### First Semester

<b>BIOL 3051</b>	
General Biology I	4
<b>QUIM 3001</b>	
General Chemistry	4
* <b>INGL 3---</b>	
First year course in English	3
* <b>ESPA 3101</b>	
Basic Course in Spanish	3
* <b>MATE 3171</b>	
Pre-Calculus I	3
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	18

##### Second Semester

<b>BIOL 3052</b>	
General Biology II	4
<b>QUIM 3002</b>	
General Chemistry	4
* <b>INGL 3---</b>	
First year course in English	3
* <b>ESPA 3102</b>	
Basic Course in Spanish	3
* <b>MATE 3172</b>	
Pre-Calculus II	3
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	18

#### SECOND YEAR

##### First Semester

<b>BIOL 3425</b>	
Animal Organismal Biology	
or	
<b>BIOL 3417</b>	
Plant Organismal Biology	4
<b>QUIM 3461 AND QUIM 3462</b>	
Organic Chemistry	4
<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>MATE 3021</b>	
Introductory Calculus	<u>3</u>
	17

##### Second Semester

<b>BIOL 3125</b>	
Principles of Ecology	3
<b>QUIM 3463 AND QUIM 3464</b>	
Organic Chemistry	4
<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>MATE 3022</b>	
Introductory Calculus	3
<b>ELECTIVES</b>	
Departmental Biology Course Electives	<u>3</u>
	19

#### THIRD YEAR

##### First Semester

<b>BIOL 3300</b>	
Genetics	3
<b>BIOL 4505</b>	
Human Physiology	4
or	
<b>BIOL 4556</b>	
Comparative Vertebrate	

Physiology and <b>BIOL 4557</b> Comparative Vertebrate Physiology Laboratory <b>CISO 3121</b> Intro. to the Study of the Social Sciences	3
<b>HUMA 3111</b> Intro. to Western Culture I	3
<b>FISI 3151</b> Modern College Physics	3
<b>FISI 3153</b> Modern College Physics Laboratory	$\frac{1}{17}$

**Second Semester**

<b>BIOL 3010</b> Cell Physiology	3
<b>CISO 3122</b> Intro. to the Study of the Social Sciences	3
<b>HUMA 3112</b> Intro. to Western Culture II	3
<b>FISI 3152</b> Modern College Physics	3
<b>FISI 3154</b> Modern College Physics Laboratory	1
<b>BIOL 4925</b> Seminar	1
<b>ELECTIVES</b> **Recommended Elective	$\frac{3}{17}$

**FOURTH YEAR**

**First Semester**

<b>BIOL 4335</b> Evolution	3
<b>ELECTIVES</b> Departmental Biology Course Electives	3
<b>ELECTIVES</b> Socio Humanistic Electives	3
<b>ELECTIVES</b> **Recommended Electives	3
<b>ELECTIVES</b> Free Electives	$\frac{6}{18}$

**Second Semester**

<b>ELECTIVES</b> Departmental Biology Course Electives	6
<b>ELECTIVES</b> Socio Humanistic Electives	3
<b>ELECTIVES</b> **Recommended Electives	2
<b>ELECTIVES</b>	

Free Electives	$\frac{6}{17}$
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\*Refer to the Academic Regulations section for information on Advanced Placement.  
\*\*To be selected from the list recommended electives.

NOTE: A student may take BIOL 3770 (Microbiology) in lieu of BIOL 3425 or BIOL 3417, and BIOL 5018 (Plant Physiology) in lieu of BIOL 4505 or BIOL 4556-4557. The resulting deficiency in credits should be satisfied with credits in recommended electives.

**RECOMMENDED ELECTIVES**

(For the Bachelor of Science in Biology)

<b>EDFU 3001</b> Human Growth and Development I	3
<b>EDFU 3002</b> Human Growth and Development II	3
<b>EDFU 3007</b> Social Foundations of Education	3
<b>EDFU 3008</b> Educational Implications of the Social and Economic Problems of Puerto Rico	3
<b>EDFU 4019</b> Philosophical Foundations of Education	3
<b>EDFU 3055</b> Legal Foundations of Education	3
<b>EDFU 3115</b> Philosophy of Health Education	3
<b>EDFU 4008</b> The Role of the Teacher in Guidance	3
<b>EDFU 4006</b> The Child and His Social Milieu	3
<b>EDFU 4025</b> School Health Education	3
<b>ALEM 3041</b> (Elementary German I ) Recommended: 1year	3
<b>ALEM 3042</b> (Elementary German II) Free Elective-one semester	3
<b>ANTR 3015</b> Introduction to Physical Anthropology	3
<b>ARTE 3276</b> Art Appreciation	3
<b>CIPO 3011</b> Principles of Political Science	3
<b>ECON 3021</b> Principles of Economics I	3
<b>ECON 3022</b> Principles of Economics II	3

**Spanish** - Course in Spanish above the basic level (in addition to the 6 credits required by the curriculum)

<b>FILO 3157</b>	
Introduction to Logic	3
<b>FILO 4025</b>	
Medical Ethics	3
<b>FILO 4027</b>	
Bioethics	3
<b>FRAN 3141</b>	
(Elementary French I)	
Recommended-one year	3
<b>FRAN 3142</b>	
(Elementary French II)	
one semester.-Free Elective	3
<b>GEOL 3025</b>	
Earth Sciences	3
<b>GEOL 3026</b>	
Life in the Past	3
<b>GEOL 3027</b>	
Geol. Aspects of the Environmental Sciences	3
<b>HIST 3241</b>	
History of Puerto Rico I	3
<b>HIST 3242</b>	
History of Puerto Rico II	3
<b>ITAL 3071</b>	
(Elementary Italian I)	
1 year-Recommended	3
<b>ITAL 3072</b>	
(Elementary Italian II)	
one semester-Free Elective	3
<b>INGL 3236</b>	
Technical Report Writing	3
<b>COMP 3057</b>	
Computer Fundamentals	3
<b>ESMA 3101</b>	
Applied Statistics I	3
<b>MUSI 3135</b>	
Music Appreciation	3
<b>PSIC 3015</b>	
Theories of Personality	3
<b>PSIC 3027</b>	
Childhood Psychology	3
<b>PSIC 3028</b>	
Psychology of Adulthood	3
<b>PSIC 3035</b>	
Applied Psychology	3
<b>PSIC 3039</b>	
Psychology of Adolescence	3
<b>PSIC 3045</b>	
Mental Hygiene	3
<b>QUIM 5071</b>	
General Biochemistry	3
<b>QUIM 3025</b>	
Analytical Chemistry I	4
<b>QUIM 3055</b>	
Analytical Chemistry	4
<b>QUIM 3065</b>	
Analytical Chemistry II	4

Note: Any course offered by the Department of Biology which is neither required by the curriculum nor a service course to other departments will be accepted as a recommended elective.

Note: Other courses which the Department of Biology considers acceptable may also be accepted as recommended electives.

**BACHELOR OF SCIENCE IN INDUSTRIAL MICROBIOLOGY**

**Curriculum requirements**

Faculty requirements	50
Departmental requirements	
Major area	36-37
Non-major area	30
Recommended electives	6
Free electives	12
Electives in Zoology, Botany, or Biology	3
Electives in Social Sciences or Humanities	3
	<b>140-141</b>

**FIRST YEAR**

**First Semester**

<b>BIOL 3051</b>	
General Biology I	4
<b>QUIM 3001</b>	
General Chemistry	4
<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3101</b>	
Basic Course in Spanish	3
<b>*MATE 3171</b>	
Pre-Calculus I	3
<b>EDFI ----</b>	
Course in Physical Education	1
	18

**Second Semester**

<b>BIOL 3052</b>	
General Biology II	4
<b>QUIM 3002</b>	
General Chemistry	4
<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3102</b>	
Basic Course in Spanish	3
<b>*MATE 3172</b>	
Pre-Calculus II	3
<b>EDFI ----</b>	
Course in Physical Education	1
	18

**SECOND YEAR**

**First Semester**

<b>BIOL 3770</b> General Microbiology	3
<b>QUIM 3461 AND QUIM 3462</b> Organic Chemistry	4
<b>INGL 3---</b> Second year course in English	3
<b>ESPA 3---</b> Course above level of basic Spanish	3
<b>MATE 3021</b> Introductory Calculus	<u>3</u> 16

**Second Semester**

<b>BIOL 3300</b> Genetics	3
<b>BIOL 4746</b> Economic Mycology or <b>BIOL 3745</b> Introduction to Medical Mycology	3
<b>QUIM 3463 AND QUIM 3464</b> Organic Chemistry	4
<b>INGL 3---</b> Second year course in English	3
<b>ESPA 3---</b> Course above level of basic Spanish	3
<b>MATE 3022</b> Introductory Calculus	<u>3</u> 19

**THIRD YEAR**

**First Semester**

<b>BIOL 4505</b> Human Physiology or <b>BIOL 4556</b> Comparative Vertebrate Physiology or <b>BIOL 5018</b> Plant Physiology	4
<b>ESMA 3101</b> Applied Statistics I	3
<b>CISO 3121</b> Intro. to the Study of the Social Sciences	3
<b>HUMA 3111</b> Intro. to Western Culture I	3
<b>FISI 3151</b> Modern College Physics	3

**FISI 3153**

Modern College Physics Laboratory	<u>1</u> 16-17
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**Second Semester**

<b>BIOL 3125</b> Principles of Ecology	3
<b>CISO 3122</b> Intro. to the Study of the Social Sciences	3
<b>HUMA 3112</b> Intro. to Western Culture II	3
<b>FISI 3152</b> Modern College Physics	3
<b>FISI 3154</b> Modern College Physics Laboratory	1
<b>BIOL 4368</b> Microbial Physiology	3
<b>ELECTIVES</b>	<u>2</u> 18

**FOURTH YEAR**

**First Semester**

<b>QUIM 5071</b> General Biochemistry	3
<b>ELECTIVES</b> Electives in Social Sciences or Humanities	3
<b>ELECTIVES</b>	4
<b>ELECTIVES***</b>	3
<b>BIOL 4365</b> Microbial Ecology	3
<b>BIOL 4925</b> Seminar (Microbiology)	<u>1</u> 17

**Second Semester**

<b>ELECTIVES**</b> Electives in Biology, Botany or Zoology	3
<b>ELECTIVES***</b>	3
<b>ELECTIVES</b>	6
<b>BIOL 4335</b> Evolution	3
<b>BIOL 4367</b> Industrial Microbiology or <b>BIOL 4375</b> Clinical Microbiology	<u>3</u> 18

**Total credits required:140-141**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*To be selected from the list of courses in Biology, Botany, or Zoology.

\*\*\*To be selected from the list of recommended electives.

**RECOMMENDED ELECTIVES IN BIOLOGY, BOTANY, OR ZOOLOGY**

<b>BIOL 3055</b> Bibliography and Library Research in Biological Sciences	1
<b>BIOL 3417</b> Plant Organismal Biology	4
<b>BIOL 3425</b> Plant Organismal Biology	4
<b>BIOL 3745</b> An Introduction to Medical Mycology	3
<b>BIOL 4005</b> History of Biology	3
<b>BIOL 4008</b> Immunology	3
<b>BIOL 4025</b> Man and the Ecosystem	3
<b>BIOL 4366</b> Food Microbiology	3
<b>BIOL 4367</b> Industrial Microbiology	3
<b>BIOL 4369</b> Practice in Industrial Microbiology	2
<b>BIOL 4375</b> Clinical Microbiology	3
<b>BIOL 4376</b> Freshwater Biology	3
<b>BIOL 4426</b> Animal Parasitology	3
<b>BIOL 4735</b> Microbiology of Water and Sewage	3
<b>BIOL 4746</b> Economic Mycology	3
<b>BIOL 4778</b> Dairy Bacteriology	3
<b>BIOL 4993</b> Special Topics in Biology I	1-3
<b>BIOL 4994</b> Special Topics in Biology II	1-3
<b>BIOL 5008</b> Sanitary Bacteriology	3
<b>BIOL 5397</b> Eukaryotic Molecular Genetics	4
<b>BIOL 5585</b> Medical and Veterinary Entomology	3
<b>BIOL 5755</b> Virology	3
<b>BIOL 5758</b> Bacterial Genetics	2
<b>BIOL 5765</b> Mycology	3
<b>BOTA 4995-4996</b> Special Problems in Botany	1-3

NOTE: Other courses that the Department of Biology considers acceptable may also be accepted as electives in Biology, Botany, or Zoology.

**RECOMMENDED ELECTIVES**

<b>BIOL 3055</b> Bibliography and Library Research in Biological Sciences	1
<b>BIOL 3745</b> An Introduction to Medical Mycology	3
<b>BIOL 4008</b> Immunology	3
<b>BIOL 4366</b> Food Microbiology	3
<b>BIOL 4367</b> Industrial Microbiology	3
<b>BIOL 4369</b> Practice in Industrial Microbiology	2
<b>BIOL 4375</b> Clinical Microbiology	3
<b>BIOL 4376</b> Freshwater Biology	3
<b>BIOL 4426</b> Animal Parasitology	3
<b>BIOL 4735</b> Microbiology of Water and Sewage	3
<b>BIOL 4746</b> Economic Mycology	3
<b>BIOL 4765</b> Mycology	3
<b>BIOL 4778</b> Dairy Bacteriology	3
<b>BIOL 4901-4902</b> Special Problems in Zoology	1-3
<b>BIOL 4998</b> Co-op Practice	3-6
<b>BIOL 5008</b> Sanitary Bacteriology	3
<b>BIOL 5755</b> Virology	3
<b>BIOL 5765</b> Mycology	3
<b>BOTA 4995-4996</b> Special Problems of Botany	1-3
<b>QUIM 3025</b> Analytical Chemistry I	4
<b>QUIM 3065</b> Analytical Chemistry II	4
<b>QUIM 4998</b> Undergraduate Research I	1-3
<b>QUIM 4999</b> Undergraduate Research II	1-3
<b>QUIM 5072</b> General Biochemistry II	3

<b>QUIM 5073</b>	
General Biochemistry Laboratory I	1
<b>QUIM 5074</b>	
General Biochemistry Laboratory II	1
<b>COMP 3010</b>	
Introduction to Computer Programming I	3
<b>COMP 3057</b>	
Computer Fundamentals	3
<b>ECON 3021</b>	
Principles of Economics I	3
<b>EDFU 3001-3002</b>	
Human Growth and Development I and II	6
<b>EDFU 3007</b>	
Social Foundations of Education	3
<b>EDFU 3008</b>	3
Educational Implications of the Social and Economic Problems of Puerto Rico	
<b>EDFU 4019</b>	3
Philosophical Foundations of Education	
<b>EDFU 3055</b>	3
Legal Foundations of Education	
<b>EDFU 3115</b>	3
Philosophy of Health Education	
<b>EDFU 4008</b>	3
The Role of the Teacher in Guidance	
<b>EDFU 4006</b>	3
The Child and His Social Milieu	
<b>EDFU 4025</b>	3
School Health Education	
<b>GEOL 3025</b>	
Earth Sciences	3
<b>GEOL 3026</b>	
History of Life	3
<b>GEOL 3027</b>	
Geological Aspects of the Environmental Sciences	3
<b>ESOR 4006</b>	
Introduction to Organizations	3
<b>ESOR 4007</b>	
Organizational Theory	3
<b>ESOR 4008</b>	
Introduction to Personnel Administration and Industrial Relations	3
<b>ESOR 4016</b>	
Industrial Relations	3
<b>PSIC 4009</b>	
Industrial/ Organizational Psychology	3

Note: Other courses that the Department of Biology considers acceptable may also be accepted as recommended electives.

**BACHELOR OF SCIENCE IN  
PRE-MEDICAL STUDIES**

**SUMMARY OF CREDITS IN PROGRAM**

Faculty requirements	50
Departmental requirements	
Major area	19
Non-major area	43
Recommended electives	15
Free electives	12
Electives in Soc. Sciences	
Humanities or Geology	<u>3</u>
	<b>142</b>

**FIRST YEAR**

**First Semester**

<b>BIOL 3051</b>	
General Biology I	4
<b>QUIM 3001</b>	
General Chemistry	4
<b>*MATE 3171</b>	
Pre-Calculus I	3
<b>*ESPA 3101</b>	
Basic Course in Spanish	3
<b>*INGL 3---</b>	
First year course in English	<u>3</u>
	17

**Second Semester**

<b>BIOL 3052</b>	
General Biology II	4
<b>QUIM 3002</b>	
General Chemistry	4
<b>*MATE 3172</b>	
Pre-Calculus I	3
<b>*ESPA 3102</b>	
Basic Course in Spanish	3
<b>*INGL 3---</b>	
First year course in English	<u>3</u>
	17

**SECOND YEAR**

**First Semester**

<b>INGL ----</b>	
Second year course in English	3
<b>MATE 3021</b>	
Introductory Calculus	3
<b>QUIM 3461 AND QUIM 3462</b>	
Organic Chemistry	4
<b>BIOL 3300</b>	
Genetics	3
<b>ESPA 3211</b>	
Introduction to Spanish Literature	
or	
<b>ESPA 3295</b>	
Spanish Grammar	3



**EDFI ----**  
 Course in Physical Education                     $\frac{1}{17}$

**Second Semester**

**INGL ----**  
 Second year course in English                3  
**MATE 3022**  
 Introductory Calculus                            3  
**QUIM 3463 and 3464**  
 Organic Chemistry                                4  
**\*\*\*ELECTIVE**                                        3  
**ESPA 3212**  
 Introduction to Spanish  
 Literature  
 or  
**ESPA 3208**  
 Composition                                        3  
**EDFI ----**  
 Elective in Physical  
 Education     $\frac{1}{17}$

**THIRD YEAR**

**First Semester**

**HUMA 3111**  
 Intro. to Western Culture I                    3  
**CISO 3121**  
 Intro. to the Study of the  
 Social Sciences                                    3  
**FISI 3151**  
 Modern College Physics                        3  
**FISI 3153**  
 Modern College Physics  
 Laboratory                                        1  
**PSIC 3001**  
 Principles of Psychology I                      3  
**INGL 3231**  
 English Expository Writing  
 or  
**INGL 3236**  
 Technical Report Writing                      3  
**BIOL 3010**  
 Cell Physiology                                     $\frac{3}{19}$

**Second Semester**

**HUMA 3112**  
 Intro. to Western Culture II                    3  
**CISO 3122**  
 Intro. to the Study of the  
 Social Sciences                                    3  
**FISI 3152**  
 Modern College Physics                        3  
**FISI 3154**  
 Modern College Physics  
 Laboratory                                        1  
**BIOL 4505**  
 Human Physiology                                4  
**ELECTIVE**  
 Elective in Biology                                3

**BIOL 4925**  
 Seminar     $\frac{1}{18}$

**FOURTH YEAR**

**First Semester**

**FILO 4025**  
 Medical Ethics                                    3  
**QUIM 3025**  
 Analytical Chemistry                            4  
**ESMA 3101**  
 Applied Statistics I                                3  
**ELECTIVE**  
 Recommended Elective in  
 Biology    3  
**ELECTIVES**  
 Free Electives                                     $\frac{6}{19}$

**Second Semester**

**HIST ----**  
 Course in Modern History  
 of P.R.    3  
**MUSI 3135**  
 Music Appreciation  
 or  
**ARTE 3276**  
 Art Appreciation                                3  
**ELECTIVES**  
 Electives in Biology                            6  
**ELECTIVES**  
 Free Electives                                     $\frac{6}{18}$

**Total credits required: 142**

\*Refer to the Academic Regulations section for information on Advanced Placement.

Note: The University of Puerto Rico at Mayagüez does not guarantee that a student will be admitted to a Medical School. Application for admission to a Medical School is the student's responsibility. The University will offer orientation and help in the process.

**RECOMMENDED ELECTIVES**

**BIOL 3125**  
 Principles of Ecology                            3  
**BIOL 3425**  
 Animal Organismal Biology                    4  
**BIOL 3745**  
 An Introduction to Medical  
 Mycology                                        3  
**BIOL 3770**  
 General Microbiology                            3  
**BIOL 4008**  
 Immunology                                      3  
**BIOL 4016**  
 Histology                                         3  
**BIOL 4027**

Introduction to Vertebrate Embryology	3
<b>BIOL 4335</b>	
Evolution	3
<b>BIOL 4355</b>	
Human Genetics	2
<b>BIOL 4375</b>	
Clinical Microbiology	3
<b>BIOL 4426</b>	
Animal Parasitology	3
<b>BIOL 4761</b>	
Human Anatomy I	4
<b>BIOL 4762</b>	
Human Anatomy II	4
<b>BIOL 5395</b>	
Molecular Genetics	3
<b>BIOL 5755</b>	
Virology	3
<b>BIOL 5786</b>	
Pathologic Human Biology	3
<b>EDFU 3001-3002</b>	
Human Growth and Development I and II	6
<b>EDFU 3007</b>	
Social Foundations of Education	3
<b>EDFU 3008</b>	3
Educational Implications of the Social and Economic Problems of Puerto Rico	3
<b>EDFU 4019</b>	3
Philosophical Foundations of Education	3
<b>EDFU 3055</b>	3
Legal Foundations of Education	3
<b>EDFU 3115</b>	3
Philosophy of Health Education	3
<b>EDFU 4008</b>	3
The Role of the Teacher in Guidance	3
<b>EDFU 4006</b>	3
The Child and His Social Milieu	3
<b>EDFU 4025</b>	3
School Health Education	

Students who intend to apply for admission to a medicine or dentistry school that requires the Bachelor of Science degree should complete the pre-medical program.

The program in Pre-Medical Studies prepares students for admission to professional dentistry, medicine schools, medical technology and other Science programs.

The fourth year of the Bachelor of Science degree cannot be substituted for the first year of study in a professional school.

## DEPARTMENTAL FACULTY

**DIMARIS ACOSTA**, *Instructor*, M.S., 1996, University of Puerto Rico.

**JAIME ACOSTA**, *Assistant Professor*, Ph.D., 1995, Virginia Polytechnic Institute and State University.

**MONICA ALFARO**, *Assistant Professor*, Ph.D., 2002, University of Puerto Rico.

**ROBERT F. BARD**, *Professor*, Ph.D., 1977, Miami University, Oxford, Ohio.

**ANGEL BERRIOS**, *Professor*, Ph.D., 1975, University of Illinois, Urbana, Illinois.

**CARLOS BETANCOURT**, *Professor*, Ph.D., 1981, Iowa State University.

**DORIS BETANCOURT**, *Associate Professor*, Ph.D., 2002, North Carolina State University.

**FERNANDO J. BIRD**, *Associate Professor*, Ph.D., 1994, University of Kansas.

**SONIA BORGES**, *Professor*, D.Sc., 1988, Universidad Complutense de Madrid.

**GARY BRECKON**, *Professor*, Ph.D., 1975, University of California, Davis.

**LUCY BUNKLEY-WILLIAMS**, *Associate Professor*, Ph.D., 1984, Auburn University.

**ROSA J. BUXEDA**, *Professor*, Ph.D., 1993, Rutgers University, New Brunswick.

**CARLOS J. CASTILLO**, *Professor*, Ph.D., 1973, University of Pennsylvania, Philadelphia.

**MIRIAM CASTRO**, *Associate Professor*, M.S., 1974, University of Puerto Rico.

**MILDRED CHAPARRO**, *Professor*, Ph.D., 1985, Texas A&M University.

**JESÚS D. CHINEA**, *Assistant Professor*, Ph.D., 1992, Cornell University.

**CARLOS DELANNOY**, *Professor*, Ph.D., 1984, University of Colorado.

**NANETTE DIFFOOT-CARLO**, *Professor*, Ph.D., 1992, Virginia Polytechnic Institute and State University.

**DUANE A. KOLTERMAN**, *Professor*, Ph.D., 1982, University of Wisconsin-Madison.

**ALLEN R. LEWIS**, *Professor*, Ph.D., 1979, University of Rochester.

**SANDRA LEE MALDONADO**, *Assistant Professor*, Ph.D., 2001, Cornell University.

**JOSE A. MARI-MUTT**, *Professor*, Ph.D., 1978, University of Illinois.

**JUAN C. MARTINEZ-CRUZADO**, *Professor*, Ph.D., 1988, Harvard University.

**ARTURO MASSOL**, *Professor*, Ph.D., 1994, Michigan State University.

**RAFAEL R. MONTALVO**, *Instructor*, Ph.D., 2003, University of Nebraska.

**VIVIAN NAVAS**, *Professor*, Ph.D., 1990, University of Illinois at Urbana, Illinois.

**CARLOS A. PEREZ-MUÑOZ**, *Professor*, Ph.D., 1991, University of California, Davis.

**CARMEN T. PORRATA**, *Professor*, M.S., 1972, University of Puerto Rico.

**CARLOS RÍOS-VELÁZQUEZ**, *Assistant Professor*, Ph.D., 2000, University of Wisconsin, Madison.

**ILEANA RIVERA**, *Associate Professor*, M.S., 1974, University of Puerto Rico.

**JUAN A. RIVERO**, *Distinguished Professor*, Ph.D., 1953, Harvard University.

**ALEJANDRO RUIZ-ACEVEDO**, *Professor*, Ph.D., 1981, University of Oklahoma.

**ROSA J. SANTIAGO**, *Professor*, M.S., 1963, University of Puerto Rico.

**CARLOS J. SANTOS**, *Assistant Professor*, Ph.D., 2001, University of Wisconsin, Madison.

**INES SASTRE-DE JESUS**, *Professor*, Ph.D., 1987, City University of New York.

**RICHARD D. SQUIRE**, *Professor*, Ph.D., 1969, North Carolina State University.

**JOHN M. USCIAN**, *Associate Professor*, Ph.D., 1994, University of Nebraska-Lincoln.

**MARIA M. VARGAS**, *Associate Professor*, Ph.D. 1997, Arizona State University.

**ANA V. VELEZ**, *Instructor*, M.S., 1994, University of Puerto Rico.

## **COURSES OF INSTRUCTION**

### **UNDERGRADUATE COURSES**

**CIBI 3031. INTRODUCTION TO THE BIOLOGICAL SCIENCES I.** Three credit hours. Two hours of lecture and one two-hour laboratory per week.

Fundamental biological principles as inferred by studying the varieties of living organisms and their relationships. Topics include: the scientific method; the chemistry, structure, and function of cells; the processes of digestion, circulation, immunological response, respiration, and excretion.

**CIBI 3032. INTRODUCTION TO THE BIOLOGICAL SCIENCES II.** Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: CIBI 3001 or CIBI 3031.

Fundamental biological principles as inferred by studying the varieties of living organisms and their relationships. Topics include: the nervous system and the senses, the muscular system, the skeletal system, hormones, reproduction and development, genetics, and evolution.

**BIOL 3010. CELL PHYSIOLOGY.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: QUIM 3031 or QUIM 3461.

Study of the structure and function of life molecules at the cell level, and the interactions among them.

**BIOL 3021-3022. ANIMAL BIOLOGY.** Three credit hours per semester. Two hours of lecture and one three-hour laboratory per week each semester.

A survey of the animal kingdom, fundamental principles of animal biology, and the uses of the microscope. Structure, functions, habitat, and economic importance of representative groups of animals will be studied in detail. First semester: the nonchordate animals; Second semester: the chordates.

**BIOL 3051-3052. GENERAL BIOLOGY I-II.** Four credit hours per semester. Three hours of lecture and one three-hour laboratory per week.

Study of the diversity of organisms, the relationships between them and their environment, the fundamental aspects of their structure and function, and the processes that regulate the perpetuation of life.

BIOL 3055. BIBLIOGRAPHY AND LIBRARY RESEARCH IN BIOLOGICAL SCIENCES. One credit hour. One hour of lecture per week.

Introduction to the use of the library: the card catalogue, periodical indices, abstracts, encyclopedias, dictionaries, monographs, and other reference resources in the biological sciences.

BIOL 3125. PRINCIPLES OF ECOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: CIBI 3002 or BIOL 3052 or (BIOL 3043 and BIOL 3044).

The general principles of the interrelation between organisms and their environment.

BIOL 3146. ECONOMIC BOTANY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3052 or BIOL 3435 or (CIBI 3002 or CIBI 3032).

Origin, classification, characteristics, and human utilization of plants and their products. Field trips are required.

BIOL 3206. PRINCIPLES OF MICROSCOPY. Two credit hours. One hour of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3052.

History, types, and use of microscopes. Construction, parts, and functions of the compound microscope; techniques to obtain its maximum resolution. Preparation of drawings with the "camera lucida". Basic photomicrography techniques.

BIOL 3225. BIOLOGY OF SEX. Two credit hours. Two hours of lecture per week. Prerequisite: BIOL 3052 or consent of the Director of the Department.

Comparative study of the sexual processes in animals and humans emphasizing the sociobiological and evolutionary aspects.

BIOL 3300. GENETICS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3022 or BIOL 3052 or BIOL 3435 or BIOL 4015 or (CIBI 3032 or CIBI 3002).

Study of nuclear and non-nuclear organisms; their nature and the transmission and mode of action of genetic material.

BIOL 3417. PLANT ORGANISMAL BIOLOGY. Four credit hours. Three lectures and one three-hour laboratory per week. Prerequisite: CIBI 3002 or (BIOL 3043 and BIOL 3044) or BIOL 3052.

An introductory study of the structure and physiology of the flowering plants. A general survey of the plant kingdom, with emphasis on classification, evolution of vegetative and reproductive structures, and the study of selected life cycles.

BIOL 3425. ANIMAL ORGANISMAL BIOLOGY. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: (CIBI 3002 or CIBI 3032) or BIOL 3052.

A survey of the different phyla of the animal kingdom. A general account of the morphology, physiology, ecology and evolution of the different groups, with references to their importance to human welfare.

BIOL 3435. ELEMENTARY BOTANY. Four credit hours. Three hours of lecture and one three-hour laboratory per week.

An introductory study of the structure and function of the flowering plants, and a brief survey of the plant kingdom.

BIOL 3715. ANATOMY AND PHYSIOLOGY. Three credit hours. Three hours of lecture per week.

A study of the structure and function of man with emphasis on the physiological principles.

BIOL 3716. ANATOMY AND PHYSIOLOGY LABORATORY. One credit hour. Three hours laboratory per week. Prerequisite or corequisite: BIOL 3715.

Laboratory experiments with emphasis on the study of the structure of the human body.

BIOL 3725. MICROBIOLOGY. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Not equivalent to BIOL 3770.

A survey of the basic principles of microbiology, with emphasis on the study of microorganisms in relation to human health and disease.

BIOL 3745. AN INTRODUCTION TO MEDICAL MYCOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: (CIBI 3002 or CIBI 3032) or BIOL 3052.

A study of fungi, with special emphasis on human pathogens. Practice is given in the isolation and identification of the most prevalent fungi.

BIOL 3770. GENERAL MICROBIOLOGY. Three credit hours. Two lectures and one three-hour laboratory per week. Prerequisite: (BIOL 3052 and QUIM 3002 or QUIM 3042) or (CIBI 3002 or CIBI 3032 and QUIM 3002 or QUIM 3042) or (BIOL 3435 and QUIM 3002 or QUIM 3042).

The structure, metabolism, growth, genetics, inhibition and death, pathogenicity, taxonomy, and applied considerations of microorganisms.

BIOL 4005. HISTORY OF BIOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: Consent of the Director of the Department or BIOL 3052 or CIBI 3032.

Historical development of the principal concepts and theories in biology from its beginnings to the present. A term paper will be required.

BIOL 4008. IMMUNOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: CIBI 3002 or CIBI 3032 or BIOL 3052 or (BIOL 3043 and BIOL 3044) and QUIM 3031.

Humoral and cellular mechanisms of the immune response; applications in medicine and biochemistry; laboratory exercises designed to demonstrate antibody production and specificity.

BIOL 4015. GENERAL ZOOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week.

A study of modern principles and problems of animal classification, physiology, ecology and evolution. Presented by means of laboratory exercises, demonstrations, and class discussions. For agricultural students other than those taking the Agricultural Sciences Curriculum.

BIOL 4016. HISTOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3022 or BIOL 3425.

The microscopic structure of the fundamental tissues of the animal body, with special attention to the vertebrates.

BIOL 4025. MAN AND THE ECOSYSTEM. Three credit hours. Three hours of lecture per week. Prerequisite: BIOL 3125.

Analysis of the ecological problems of the contemporary world and possible alternative solutions.

BIOL 4027. INTRODUCTION TO VERTEBRATE EMBRYOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: Nine credit hours in Zoology.

Elementary principles and fundamental details of the development processes as illustrated by vertebrates. Cell division, germ cell maturation and production, fertilization, cleavage, germ layers, tissue and organ formation. Particular study is made of organogenesis in chick and pig.

BIOL 4335. EVOLUTION. Three credit hours. Three hours of lecture per week. Prerequisite: Consent of the Director of the Department or BIOL 3052 or CIBI 3032.

Mechanisms, processes, and consequences of evolution: factors which cause genetic changes in populations; speciation; population genetics; coevolution, evolution, and the inheritance of animal behavior.

BIOL 4355. HUMAN GENETICS. Two credit hours. Two hours of lecture per week. Prerequisite: BIOL 3015 or BIOL 3300.

A study of inheritance in man. Effects of mutation, selection and racial mixture; the application of genetics to medical problems.

BIOL 4365. MICROBIAL ECOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770.

Physical, chemical and biological factors involved in the development and behavior of microorganisms; their interaction with other organisms in nature, and their role in the environment.

BIOL 4366. FOOD MICROBIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770.

Study of microorganisms in processed and non-processed foods.

BIOL 4367. INDUSTRIAL MICROBIOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: BIOL 3770.

The biological activities of microorganisms; their importance in the pharmaceutical, food industries, and related areas.

BIOL 4368. MICROBIAL PHYSIOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: BIOL 3770.

Chemical and structural composition of microorganisms. Emphasis will be given to their physiological and genetical properties and mechanisms valuable to mankind.

BIOL 4369. PRACTICE IN INDUSTRIAL MICROBIOLOGY. Two credit hours. Four to six hours of practice per week. Prerequisites: BIOL 3770 and BIOL 4367.

Practical experience in Industrial Microbiology in cooperation with private industries or with government.

BIOL 4375. CLINICAL MICROBIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770.

Etiology, pathogenicity, epidemiology, and laboratory analysis for the diagnosis of diseases caused by microorganisms. Emphasis will be placed on those diseases of high incidence in Puerto Rico.

BIOL 4376. FRESHWATER BIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: BIOL 3770 and BIOL 3125.

Analysis of the freshwater ecosystem and its importance to human life. Field work is required.

BIOL 4426. ANIMAL PARASITOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: CIBI 3002 or BIOL 3022 or BIOL 4015 or BIOL 3043 and BIOL 3044 or BIOL 3052.

General principles and origin of parasitism. Study of the principal pathogenic protozoas and helminths,

their life cycles, host relationships and control measures.

BIOL 4428. GENERAL ORNITHOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3022 or BIOL 3425.

Introduction to the study of birds, their structure, classification, ecological relations, and economic status. Considerable field work is done, and practice is given in the methods of collection and preparation of study skins.

BIOL 4446. INTRODUCTION TO ENTOMOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3022 or BIOL 3425 or BIOL 4015.

An introduction to entomology based on the study of the biology of insects. Students are required to make an insect collection, and practice is given in the determination and recognition of the most important orders and families.

BIOL 4465. TAXONOMY OF VASCULAR PLANTS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3435 or BIOL 3417 or BIOL 3052.

The principles of taxonomy and their application. A general survey of the groups of vascular plants, with the identification and classification of representatives of the local flora. Field trips.

BIOL 4467. COMPARATIVE VERTEBRATE ANATOMY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3022 or BIOL 3425.

Comparative anatomy of typical vertebrates; interrelation of organ systems of various groups of vertebrates.

BIOL 4505. HUMAN PHYSIOLOGY. Four credit hours. Three hours of lecture, and one three-hour laboratory per week. Prerequisites: (BIOL 3052 and QUIM 3031 or QUIM 3461) or (CIBI 3002 or CIBI 3032 and QUIM 3031).

Physiological principles of the human body.

BIOL 4556. COMPARATIVE VERTEBRATE PHYSIOLOGY. Three credit hours. Three lectures per week. Prerequisite: QUIM 251 or QUIM 260 or (QUIM 3031 or QUIM 3071).



Study of the fundamental physiological principles of the vertebrate body.

BIOL 4557. COMPARATIVE VERTEBRATE PHYSIOLOGY LABORATORY. One credit hour. One three-hour laboratory per week. Prerequisite or corequisite: BIOL 4556.

Laboratory experiments involving fundamental physiological principles of the vertebrate body.

BIOL 4607. MARINE ECOSYSTEMS OF PUERTO RICO. Three credit hours. Two hours of lecture and one three-hour laboratory and/or field trips per week. Prerequisites: BIOL 3125 and BIOL 3425.

Ecology of shallow marine ecosystems of Puerto Rico: predominant flora and fauna, population fluctuations, effects of physical factors, life strategies, and environmental disturbances.

BIOL 4725. MICROTECHNIQUE. Two credit hours. Two three-hour laboratories per week. Prerequisite: BIOL 3410 or BIOL 3435 or BIOL 3022 or BIOL 3425.

The making of histological preparations of both plant and animal materials, including: (1) use of the aceto-carmin and other smear techniques, (2) the preparation of plant materials by use of the sliding microtome, and (3) the paraffin method, including killing, fixing, embedding, sectioning, staining and mounting of plant and animal tissues for microscopic examination.

BIOL 4735. MICROBIOLOGY OF WATER AND SEWAGE. Three credit hours. Two hours of lecture and one three-hour laboratory per week.

The fundamental principles of microbiology as they affect engineering problems encountered in connection with water supplies and sewage. Primarily for students in Civil Engineering.

BIOL 4746. ECONOMIC MYCOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: (CIBI 3002 or CIBI 3032) or BIOL 3052.

A study of fungi, with emphasis on their economic importance. Fungi will be studied as they relate to food production, industrial processes, agriculture, medicine and also as a food source.

BIOL 4761. HUMAN ANATOMY I. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: Third or fourth year student.

Human anatomy, including neuroanatomy and osteology of the head, the neck, and the extremities.

BIOL 4762. HUMAN ANATOMY II. Four credit hours. Three hours of lecture and one three-hour laboratory per week.

Human anatomy, including the great body cavities (thoracic, abdominal, pelvic) and their parities.

BIOL 4778. DAIRY BACTERIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770.

The relation of microorganisms to milk and milk products from the standpoint of economic dairy bacteriology, and also of milk hygiene and sanitary control.

BIOL 4901-4902. SPECIAL PROBLEMS IN ZOOLOGY. One to three credit hours per semester. Prerequisite: twelve credit hours in Zoology.

Short research problems will be assigned or may be selected, subject to approval by the instructor. A written report is required upon the completion of the work assigned or selected.

BIOL 4925. SEMINAR. One credit hour. Two hours of lecture per week.

Discussion of recent literature in biology and related fields.

BIOL 4991. SPECIAL TOPICS IN BIOLOGY: LABORATORY. One to four credit hours. One to four two-to four-hour laboratories per week. Prerequisite: Consent of the Director of the Department.

Laboratory practice of selected topics in biology, botany, microbiology, and zoology.

BIOL 4993. SPECIAL TOPICS IN BIOLOGY I. One to four credit hours. One to four hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Selected topics in biology, botany, microbiology, and zoology.

BIOL 4994. SPECIAL TOPICS IN BIOLOGY II. One to four credit hours. One to four hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Selected topics in biology, botany, microbiology, and zoology.

BIOL 4998. CO-OP PRACTICE. Three to six credit hours. Supervised practice in private industry or government. Prerequisite: Consent of the Director of the Department.

Practical experience in Biology in cooperation with the private industry or government to be jointly supervised by the academic department, the CO-OP program coordinator, and an official from the cooperating organization.

### ADVANCED UNDERGRADUATE AND GRADUATE COURSES

BIOL 5005. ELEMENTARY PLANT ANATOMY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3435 or BIOL 3417.

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. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3435 or BIOL 3417.

The general principles of plant morphology, including evolutionary tendencies, phylogenetic lines and the life cycles of the principal groups of plants.

BIOL 5009. PTERIDOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3417 or BIOL 3435.

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. Two credit hours. Two hours of lecture per week. Prerequisite: BIOL 3435 or BIOL 3417.

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. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3417 or consent 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 are required.

BIOL 5018. PLANT PHYSIOLOGY. Four credit hours. Three hours of lecture and one laboratory of three hours per week. Prerequisites: BIOL 3417 or BIOL 3435. Corequisite: QUIM 3032 or QUIM 3062 or QUIM 3072 or QUIM 3463.

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: consent 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.

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. 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. 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.** 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.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770.

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 and BIOL 3770.

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.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770.

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.** 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.** Three credit hours. One hour of lecture and two three-hour laboratory periods per week. Prerequisite: BIOL 3125.

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.** One to three credit hours. Thirty to sixty hours of workshop/practice per credit. Prerequisite: Consent 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.

## **BOTANY**

### **UNDERGRADUATE COURSE**

**BOTA 4995-4996. SPECIAL PROBLEMS IN BOTANY.** One to three credit hours per semester. One to three research classes per week each semester. Prerequisite: Consent of the Department Director.

Designed for students prepared to undertake special problems or investigations. A written report is required upon completion of the course.

## **ZOOLOGY**

### **ADVANCED UNDERGRADUATE AND GRADUATE COURSE**

**ZOOL 5005. INVERTEBRATES OF PUERTO RICO.** 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.

## DEPARTMENT OF CHEMISTRY

The Department of Chemistry was founded in 1948. It offers a **Bachelor of Science** degree in Chemistry, which has been fully accredited by the American Chemical Society since 1978. It also offers a graduate program leading to the **Master of Science** degree in Chemistry established in 1959 (see Graduate Catalogue) and collaborates in the interdisciplinary Master of Science in Food Technology and the Bachelor of Science in Biotechnology programs in conjunction with the chemical engineering, biology and agriculture faculties. It is the largest service department offering courses that include a laboratory within the University of Puerto Rico System. The American Chemical Society's Department of Educational Activities has selected the Chemistry Department's Student Affiliate Chapter as outstanding in numerous occasions.

The mission of the department is to offer students a program of excellence in chemistry by means of formal education, research and community service, enabling them to develop as professionals in the various fields of chemistry. Students completing the program will be conscious of the problems that affect the Puerto Rican and international communities and of their responsibilities and opportunities as human beings and scientists in areas such as education, industry, government, and scientific research.

The department is housed in a four-story building (185,000 square feet) with modern facilities for teaching and research featuring 36 research and 22 teaching laboratories as well as 10 classrooms, a computer center and a cold room. Research facilities include a large variety of sophisticated instrumentation, such as a state of the art femtochemistry (laser) system, two NMR spectrometers (300 and 500 MHz), a visualization center with workstations and instrumentation for chromatography, spectroscopy and electrochemistry.

## BACHELOR OF SCIENCE IN CHEMISTRY

### SUMMARY OF CREDITS IN PROGRAM

Faculty requirements	44
Departmental requirements	
Major area	47
Non-major area	27
Recommended electives	9
Free electives	<u>12</u>
<b>Total</b>	<b>139</b>

### FIRST YEAR

#### First Semester

<b>QUIM 3041</b>	
General Chemistry	4
<b>*MATE 3005</b>	
Pre-Calculus	5
<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3101</b>	
Basic Course in Spanish	3
<b>CIBI 3031</b>	
Intro. to the Biological Sciences I	<u>3</u>
	18

#### Second Semester

<b>QUIM 3042</b>	
General Chemistry	4
<b>MATE 3031</b>	
Calculus I	4
<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3102</b>	
Basic Course in Spanish	3
<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	<u>3</u>
	17

### SECOND YEAR

#### First Semester

<b>QUIM 3025</b>	
Analytical Chemistry I	4
<b>QUIM 3071</b>	
Organic Chemistry	4
<b>MATE 3032</b>	
Calculus II	4
<b>FISI 3151</b>	
Modern College Physics	3
<b>INGL 3---</b>	
Second year course in English	<u>3</u>
	18

**Second Semester**

<b>QUIM 3065</b> Analytical Chemistry II	4
<b>QUIM 3072</b> Organic Chemistry	4
<b>MATE 3063</b> Calculus III	3
<b>FISI 3152</b> Modern College Physics	3
<b>INGL 3---</b> Second year course in English	3
<b>FISI 3153</b> General Physics Laboratory	$\frac{1}{18}$

**THIRD YEAR**

**First Semester**

<b>QUIM 4041</b> Physical Chemistry	3
<b>MATE 4009</b> Differential Equations	3
<b>FISI 3154</b> General Physics Laboratory	1
<b>ELECTIVE</b> Recommended Elective	3
<b>CISO 3121</b> Intro. to the Study of the Social Sciences	3
<b>ESPA 3---</b> Course above level of basic Spanish	3
<b>EDFI ----</b> Course in Physical Education	$\frac{1}{17}$

**Second Semester**

<b>QUIM 4042</b> Physical Chemistry	3
<b>QUIM 4101</b> Physical Chemistry Laboratory	1
<b>EDFI ----</b> Course in Physical Education	1
<b>ELECTIVE</b> Recommended Elective	3
<b>CISO 3122</b> Intro. to the Study of the Social Sciences	3
<b>ESPA 3---</b> Course above level of basic Spanish	3
<b>QUIM 4000</b> Intermediate Inorganic Chemistry	$\frac{3}{17}$

**FOURTH YEAR**

**First Semester**

<b>QUIM 4102</b> Physical Chemistry Laboratory	1
<b>QUIM 4125</b> Bibliography and Seminar in Chemistry	2
<b>HUMA 3111</b> Intro. to Western Culture I	3
<b>ELECTIVE</b> Recommended Elective	3
<b>QUIM ----</b> Elective Course in Chemistry	3
<b>ELECTIVE</b> Free Elective	3
<b>ELECTIVE</b> Free Elective	$\frac{3}{18}$

**Second Semester**

<b>QUIM 4015</b> Instrumental Methods of Analysis	4
<b>ELECTIVE</b> Free Elective	3
<b>HUMA 3112</b> Intro. to Western Culture II	3
<b>QUIM ----</b> Elective Course in Chemistry	3
<b>ELECTIVE</b> Free Elective	$\frac{3}{16}$

**Total credits required: 139**

\*Refer to the Academic Regulations section for information on Advanced Placement.

**DEPARTMENTAL FACULTY**

**MARIA A. APONTE-HUERTAS**, *Professor*, Ph.D., 1982, University of Florida.

**MAYRA E. CADIZ-GARCIA**, *Professor*, Ph.D., 1985, University of Puerto Rico.

**ARNALDO CARRASQUILLO**, *Associate Professor*, Ph.D., 1995, Texas A&M University.

**ILEANA CASANOVA-DE BRAS**, *Professor*, M.S., 1969, University of Puerto Rico.

**MIGUEL E. CASTRO**, *Professor*, Ph.D., 1991, University of Texas.

**JOSE E. CORTES**, *Professor*, Ph.D., 1989, University of North Texas.

**ASTRID J. CRUZ**, *Professor*, Ph.D., 1993, University of Massachusetts.

**MARCO A. DE JESUS**, *Instructor*, M.S., 1997, University of Puerto Rico

**MARITZA DE JESUS-ECHEVARRIA**, *Associate Professor*, M.S., 1984, University of Puerto Rico.

**SARA DELGADO**, *Assistant Professor*, M.S., 1981, University of Puerto Rico.

**EMILIO DIAZ-MORALES**, *Professor*, Ph.D., 1986, University of Wisconsin.

**MARIA GUNTIN-BURGOS**, *Assistant Professor*, M.S., 1991, University of Puerto Rico.

**SAMUEL P. HERNANDEZ-RIVERA**, *Professor*, Ph.D., 1986, Johns Hopkins University.

**AIDALU DE LOS A. JOUBERT-CASTRO**, *Associate Professor*, Ph.D., 1998, Washington State University.

**JORGE LABOY**, *Associate Professor*, Ph.D., 1993, University of Cincinnati.

**CARMEN S. LECUMBERRY-VELEZ**, *Professor*, M.S., 1968, University of Puerto Rico.

**GUSTAVO LOPEZ**, *Professor*, Ph.D., 1992, University of Massachusetts at Amherst.

**JUAN LOPEZ-GARRIGA**, *Professor*, Ph.D., 1986, Michigan State University.

**JOSE L. MARTINEZ-PICO**, *Emeritus Professor*, Ph.D., 1962, Carnegie Institute of Technology.

**ENRIQUE MELENDEZ**, *Professor*, Ph.D., 1990, University of Utah.

**NAIRMEN MINA-CAMILDE**, *Associate Professor*, Ph.D., 1996, Baylor University.

**LUIS A. MORELL**, *Associate Professor*, Ph.D., 1993, University of California.

**YLDEFONSO MUÑOZ-SOLA**, *Professor*, M.S., 1982, Purdue University.

**IVELISSE M. PADILLA-VARGAS**, *Associate Professor*, M.S., 1988, University of Puerto Rico.

**JOSE I. PADOVANI-PADILLA**, *Professor*, M.S., 1972, University of Puerto Rico.

**ELSIE PARES**, *Assistant Professor*, Ph.D., 2000, Purdue University.

**BELINDA PASTRANA**, *Associate Professor*, Ph.D., 1995, Rutgers University.

**FRANCIS B. PATRON-GEOGHEGAN**, *Associate Professor*, Ph.D., 1997, Purdue University.

**DORIS RAMIREZ-SOTO**, *Professor*, Ph.D., 1989, Rutgers University.

**CESAR REYES-ZAMORA**, *Professor*, Ph.D., 1969, Ottawa University, Canada.

**JORGE RIOS**, *Associate Professor*, Ph.D., 1991, University of Puerto Rico, Río Piedras.

**ROBERT RIOS**, *Associate Professor*, Ph.D., 1995, Rutgers University.

**LUIS RIVERA**, *Researcher*, Ph.D., 1990, University of Puerto Rico.

**CYNTHIA ROBLEDO-LUIGGI**, *Professor*, Ph.D., 1981, University of Florida.

**LOLITA DE LOS A. RODRIGUEZ**, *Professor*, M.S., 1986, University of Puerto Rico.

**FELIX ROMAN**, *Professor*, Ph.D., 1989, University of Nebraska.

**RODOLFO ROMAÑACH**, *Associate Professor*, Ph.D., 1986, University of Georgia.

**VERONICA SANCHEZ**, *Assistant Professor*, M.S., 1995, University of Puerto Rico.

**ISMAEL SCOTT**, *Professor*, Ph.D., 1986, University of Florida.

**LUZ N. SOLIS**, *Associate Professor*, M.S., 1975, University of Puerto Rico.

**FERNANDO A. SOUTO**, *Professor*, Ph.D., 1978, University of Alberta.

**CARMEN A. VEGA-OLIVENCIA**, *Professor*, Ph.D., 1975, University of Florida.

**MARISOL VERA**, *Professor*, Ph.D., 1986, Purdue University.

**RENE S. VIETA-RIVERA**, *Professor*, Ph.D., 1984, Texas A&M University.



## COURSES OF INSTRUCTION

### UNDERGRADUATE COURSES

QUIM 2001-2002. ELEMENTARY CHEMISTRY. Four credit hours per semester. Three hours of lecture and one two-hour laboratory per week each semester.

A general course covering the fundamental principles of General Chemistry, and special topics of Organic Chemistry and Biochemistry. This course is intended for students not required to take additional chemistry courses, and is largely descriptive in nature.

QUIM 3001. GENERAL CHEMISTRY I. Four credit hours. Three hours of lecture and one three-hour laboratory per week.

Basic principles of chemistry: composition, properties, and changes of matter. Topics include: atomic structure, chemical reactions, periodic properties of the elements, stoichiometry, chemical bonding, and thermochemistry.

QUIM 3002. GENERAL CHEMISTRY II. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: QUIM 3001.

Basic principles of chemistry: composition, properties, and changes of matter. Topics include: the states of matter, solutions, acid and bases, kinetics, chemical equilibrium, and electrochemistry.

QUIM 3025. ANALYTICAL CHEMISTRY I. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: QUIM 3002 or QUIM 3042.

General concepts of quantitative chemical analysis with emphasis on classical methods including volumetric and gravimetric analysis and chemical equilibria.

QUIM 3031-3032. ORGANIC CHEMISTRY. Four credit hours per semester. Three hours of lecture and one four-hour laboratory per week each semester. Prerequisite: QUIM 3002 or QUIM 3042.

A study of the reaction and synthesis of organic compounds. Theories of structure and mechanism related to these reactions are presented from a modern point of view.

QUIM 3041. GENERAL CHEMISTRY I. Four credit hours. Three hours of lecture and one three-hour laboratory per week.

Qualitative and quantitative aspects of fundamental chemical principles, emphasizing the relationship between the relationship between the chemical behavior of matter and its atomic and molecular structure. Topics include dimensional analysis, atomic theory, and stoichiometry.

QUIM 3042. GENERAL CHEMISTRY II. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: QUIM 3041.

Qualitative and quantitative aspects of fundamental chemical principles, emphasizing the relationship between the chemical behavior of matter and its atomic and molecular structure. Topics include colligative properties, chemical kinetics, and chemical equilibrium.

QUIM 3055. ANALYTICAL CHEMISTRY. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: QUIM 3002 or QUIM 3042.

A study of fundamental topics in analytical chemistry. Emphasis will be given to both theory and practice of current instrumental methods of analysis.

QUIM 3061. FUNDAMENTALS OF ORGANIC CHEMISTRY AND BIOCHEMISTRY I. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: QUIM 3002 or QUIM 3042.

Principles of organic chemistry; the chemistry of organic functional groups and reaction mechanisms, emphasizing their importance in biochemistry.

QUIM 3062. FUNDAMENTALS OF ORGANIC CHEMISTRY AND BIOCHEMISTRY II. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: QUIM 3061.

Fundamental concepts of biochemistry; the nature and properties of compounds of biochemical interest.

QUIM 3065. ANALYTICAL CHEMISTRY II. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: QUIM 3025.

Theory and practice of optical spectroscopy, electroanalytical methods, and modern separation techniques.

QUIM 3071-3072. ORGANIC CHEMISTRY. Four credit hours. Three hours of lecture and one four-hour laboratory per week per semester. Prerequisite: QUIM 3042 or QUIM 3002. For chemistry majors.

A study of the reactions, methods of preparation and theories on structure of organic compounds, with emphasis on the mechanisms of organic reactions.

QUIM 3085. ENVIRONMENTAL CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3002 or QUIM 3042.

Effect of man's activities upon the biosphere, with particular emphasis on the chemistry of the processes involved.

QUIM 3086. ENVIRONMENTAL CHEMISTRY LABORATORY. One credit hour. One four-hour laboratory per week. Prerequisite: QUIM 3055 or QUIM 3065. Corequisite: QUIM 3085.

Environmental chemical analysis providing practical experience in spectrophotometric, titrimetric, potentiometric, and chromatographic procedures used in water, air, and soil analysis. Field trips are required.

QUIM 3141. PRINCIPLES OF GENERAL, ORGANIC AND BIOLOGICAL CHEMISTRY I. Four credit hours. Three hours of lecture and one two-hour laboratory per week.

Principles of general and organic chemistry with emphasis on biological applications in such topics as: atoms, molecules, states of matter, solutions, and organic functional groups.

QUIM 3142. PRINCIPLES OF GENERAL, ORGANIC AND BIOLOGICAL CHEMISTRY II. Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisite: QUIM 3141.

Principles of general and organic chemistry with emphasis on biological applications in such topics as: isomerism, carbohydrates, lipids, proteins, nucleic acids, metabolism.

QUIM 3335. INTRODUCTION TO FOOD CHEMISTRY. Three credit hours. Three hours of

lecture per week. Prerequisites: QUIM 3002 or QUIM 3042.

Basic aspects of the relationships of food chemistry to health, nutrition, and industry.

QUIM 3450. FUNDAMENTALS OF ORGANIC CHEMISTRY. Five credit hours. Four hours of lecture and one four-hour laboratory per week. Prerequisite: QUIM 3002 or QUIM 3042.

Properties, reactions, synthesis, and reaction mechanisms of organic compounds.

QUIM 3461. ORGANIC CHEMISTRY I. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3002

Nomenclature, structure, preparation, and reactions of non-aromatic and alkyl halides.

QUIM 3462. ORGANIC CHEMISTRY LABORATORY I. One credit hour. One four-hour laboratory per week. Corequisite: QUIM 3461.

Experimental techniques in organic chemistry: separation; purification; reactions of nonaromatic hydrocarbons and alkyl halides; polarimetry.

QUIM 3463. ORGANIC CHEMISTRY II. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3461.

Nomenclature, structure, preparation, and reactions of aromatic hydrocarbons, alcohols, ethers, carbonyl compounds, carboxylic acids, amines, and related compounds; biological compounds.

QUIM 3464. ORGANIC CHEMISTRY LABORATORY II. One credit hour. One four-hour laboratory per week. Prerequisite: QUIM 3462. Corequisite: QUIM 3463.

Experimental techniques in organic chemistry: identification and preparation of organic compounds; spectroscopy.

QUIM 4000. INTERMEDIATE INORGANIC CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 4041.

A study of the elements and their inorganic compounds based on modern concepts of atomic and molecular structure.

QUIM 4007. INORGANIC CHEMISTRY LABORATORY. One credit hour. Four hours of laboratory per week. Corequisite: QUIM 4000.

Inorganic chemistry laboratory including synthesis of inorganic compounds and the study of their spectroscopic properties.

QUIM 4015. INSTRUMENTAL METHODS OF ANALYSIS. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: QUIM 3065.

Theory and practice of atomic and molecular spectroscopic methods, mass spectrometry, ion and surface science techniques, and current topics in instrumental analytical chemistry.

QUIM 4026. HISTORY OF CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3002 or QUIM 3042.

The development of Chemistry from antiquity to the present time with an emphasis on the critical analysis of its concepts.

QUIM 4041. PHYSICAL CHEMISTRY I. Three credit hours. Three hours of lecture per week. Prerequisites: (QUIM 3002 or QUIM 3042) and (FISI 3151 or FISI 3171). Corequisite: MATE 3063 or MATE 3048.

Fundamentals and laws of classical thermodynamics applied to ideal and real gases, phase equilibrium, chemical equilibrium, heterogeneous equilibrium of binary systems, and solutions.

QUIM 4042. PHYSICAL CHEMISTRY II. Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 4041 and (MATE 3063 or MATE 3048).

Chemical kinetics, molecular kinetic theory of gases, introduction to quantum mechanics and its application to vibrational, rotational, and electronic spectroscopy.

QUIM 4101. PHYSICAL CHEMISTRY LABORATORY II. One credit hour. One four-hour laboratory per week. Prerequisites: QUIM4041 and (QUIM3055 or QUIM3025).

Experimental determination of thermodynamic properties such as vapor pressure, partial molar volume, enthalpy of reaction, heat capacity, eutectic composition, and equilibrium constants.

QUIM 4102. PHYSICAL CHEMISTRY LABORATORY II. One credit hour. One four-hour laboratory per week. Prerequisite: QUIM4041. Corequisite: QUIM 4042.

Use of spectroscopic, kinetic, electrochemical, surface, polarimetric, and computational methods to determine physical and chemical properties.

QUIM 4115. PRACTICE TEACHING IN THE CHEMISTRY LABORATORY. One credit hour. Four hours of workshop per week. Prerequisites: Consent of the Department Director for those students who have approved the following courses: QUIM 3072 or QUIM 3032 or QUIM 3450, and either QUIM 3025 or QUIM 3055.

Training in the teaching of chemistry, organization of a laboratory, handling of chemicals, care of equipment, safety rules and supervision of experimental and written work.

QUIM 4125. BIBLIOGRAPHY AND SEMINAR IN CHEMISTRY. Two credit hours. Two ninety-minute periods per week. Prerequisite: twenty credit hours of chemistry.

Techniques of searching the chemical literature. The student will give a short oral presentation on a recently published paper, and prepare and discuss a review paper on a topic selected by him and approved by the instructor.

QUIM 4137. INDUSTRIAL CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3032 or QUIM 3072 or QUIM 3450 or QUIM 3062.

Chemical principles related to industrial processes, especially those being carried out in Puerto Rico. Field trips required.

QUIM 4145. PRACTICE IN INDUSTRIAL CHEMISTRY. One credit hour. One laboratory of four to six hours per week. Prerequisite: Consent of the Director of the Department.

Practical experience in Industrial Chemistry in cooperation with private industry or government.

QUIM 4399. SELECTED TOPICS IN CHEMISTRY. One to three credit hours. One to three hours of lecture per week. Prerequisite: Third or fourth year student in Chemistry, or consent of the Director of the Department.

Selected topics in Biochemistry, Organic Chemistry, Analytical Chemistry, Inorganic Chemistry, Physical Chemistry, and related areas.

QUIM 4997. CO-OP PRACTICE. Three to six credit hours. Prerequisite: Consent of the Director of the Department.

Practical experience in chemistry in cooperation with industry or government agencies, jointly supervised by the Department, the COOP Program Coordinator, and an official from the cooperating organization.

QUIM 4998. UNDERGRADUATE RESEARCH I. One to three credit hours. Three to nine hours of research per week. Prerequisite: Consent of the Director of the Department.

Introduction to chemical research under the supervision of professors of the department.

QUIM 4999. UNDERGRADUATE RESEARCH II. One to three credit hours. Three to nine hours of research per week. Prerequisite: three credits in QUIM 4998.

A research project under the supervision of professors of the department.

**ADVANCED UNDERGRADUATE AND GRADUATE COURSES**

QUIM 5005. INTERMEDIATE ORGANIC CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 3032 or QUIM 3072 or QUIM 3450.

Modern structural organic chemistry at the intermediate level. Nomenclature of polyfunctional compounds; stereochemistry; reaction mechanisms; synthesis.

QUIM 5065. CHEMISTRY OF SYNTHETIC DRUGS. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3072 or QUIM 3032 or QUIM 3450.

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. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3032 or QUIM 3072 or QUIM 3450 or QUIM 3062.

Chemical properties, reactions, origin, and the 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.

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.

CHEM 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. Four credit hours. Three hours of lecture and one four-hour laboratory per week.

A study of the chemistry of the principal food resources and food additives, their role in nutrition, and the effect of processing treatments on their chemical composition.

QUIM 5095. NUCLEAR CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisites: (QUIM 3002 or QUIM 3042) and (MATE 3183 or MATE 3031 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 to chemistry and other related fields.

QUIM 5105. PRINCIPLES OF QUANTUM CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM4042.

Conceptual development, postulates, and models of quantum mechanics. Approximation methods to the solution of the time-independent Schrödinger equation.

QUIM 5125. CHEMICAL THERMODYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 4042.

Systematic analysis of the fundamental concepts of chemical thermodynamics and their applications.

QUIM 5135. PHYSICAL ORGANIC CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 4042 and QUIM 3032 or QUIM 3072 or QUIM 3450.

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. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3072 or QUIM 3032 or QUIM 3450.

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. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3032 or QUIM 3072 or QUIM 3450.

Elucidation of the structure of organic compounds by spectroscopic methods, including infrared, ultraviolet, nuclear magnetic resonance, and mass spectrometry techniques.

QUIM 5165. POLYMER CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3072 or QUIM 3032 or QUIM 3450.

Structure, properties, synthesis, 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, and either QUIM 3065 or QUIM 3055.

General aspects, chemical and physical properties, and analytical techniques for the detection and analysis of explosives.

**DEPARTMENT OF  
ECONOMICS**

The Department of Economics is engaged in the dual function of providing professional training to students majoring in Economics and rendering teaching services to students of other departments on the Mayagüez Campus of the University of Puerto Rico. Student professional training is offered through an academic program which emphasizes the development of quantitative methods and techniques necessary for economic analysis. Upon successful completion of this program, students are awarded a **Bachelor of Arts** degree with a concentration in Economics. Teaching services, on the other hand, are designed for students who take introductory and intermediate economics courses as requirements and/or electives within their major field of study.

The common purpose of both functions is to develop students' ability to think clearly and objectively in dealing with economic decisions and problems. Students are trained specifically to replace value judgments and prejudices with sound economic reasoning based on an objective and rational analysis. Besides these two functions, socio-economic research and the promotion of economic education are two integral elements within the Department.

**Ceteris Paribus: Economic Review of Puerto Rico** is the first online professional journal of economics published in Puerto Rico. It is responsible for the diffusion of research results, and other academic activities pursued by faculty members, students, scholars and economists. It provides online links to data sources, to other professional journals in Puerto Rico and to the Caribbean, research in process, research proposals, and professional activities. Faculty members also participate in the Economic Education Program directed to enhance economic education among the local citizenry through various workshops, conferences, and printed materials.

A Microcomputer Laboratory with state-of-the-art technology provides services to the whole university community. The laboratory is also integrated to several courses and provides the essential tools for economic research.

**BACHELOR OF ARTS IN ECONOMICS  
SUMMARY OF CREDITS IN PROGRAM**

Institutional requirements	2
Faculty requirements	54
Departmental requirements	
Major area	39
Non-major area	9
Recommended electives	18
Free electives	<u>12</u>
<b>Total</b>	<b>134</b>

**FIRST YEAR**

**First Semester**

<b>*ESPA 3101</b>	
Basic Course in Spanish	3
<b>*INGL 3---</b>	
First year course in English	3
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>*MATE 3171</b>	
Pre-Calculus I	3
<b>ECON 3021</b>	
Principles of Economics: Microeconomics	3
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	16

**Second Semester**

<b>*ESPA 3102</b>	
Basic Course in Spanish	3
<b>*INGL ----</b>	
First year course in English	3
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>MATE 3000</b>	
Finite Mathematics	3
<b>ECON 3022</b>	
Principles of Economics: Macroeconomics	3
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	16

**SECOND YEAR**

**First Semester**

<b>INGL 3---</b>	
Second year course in English	3



<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>MATE 3049</b>	
Mathematical Analysis for Management Sciences	3
<b>ECON 3091</b>	
Micro Economic Theory	3
<b>ECON ----</b>	
Elective in Economics	3
<b>ESMA 3101</b>	
Applied Statistics I	<u>3</u>
	18

**Second Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>ECON 3085</b>	
Economic and Social Development of Puerto Rico	3
<b>ECON 3092</b>	
Macro Economic Theory	3
<b>ECON ----</b>	
Elective in Economics	3
<b>ESMA 3102</b>	
Applied Statistics II	<u>3</u>
	18

**THIRD YEAR**

**First Semester**

<b>ESPA 3---</b>	
Course above level of Basic Spanish	3
<b>CIFI, QUIM or GEOL</b>	
Electives	3
<b>CIBI 3031</b>	
Intro. to the Biological Sciences I	3
<b>ECON 4017</b>	
Econometrics	3
<b>ELECTIVE</b>	
Free Elective	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	18

**Second Semester**

<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>CIFI, QUIM, GEOL</b>	
Elective in Physics, Chemistry Or Geology	3
<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	3
<b>ECON 3---</b>	
Elective in Economics	3
<b>ELECTIVE</b>	

Free Elective	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	18

**FOURTH YEAR**

**First Semester**

<b>ECON 4395</b>	
Research Methods in Economics I	3
<b>ECON ----</b>	
Elective in Economics	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>ELECTIVE</b>	
Recommended Elective	<u>3</u>
	15

**Second Semester**

<b>ECON 4405</b>	
Analysis of Contemporary Economic Problems	3
<b>ECON ----</b>	
Elective in Economics	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>ELECTIVE</b>	
Recommended Elective	<u>3</u>
	15

**Total credits required: 134**

\*Refer to the Academic Regulations section for information on Advanced Placement.

**DEPARTMENTAL FACULTY**

**JOSE I. ALAMEDA-LOZADA**, *Professor*, Ph.D., 1996, University of Wales at Aberystwyth, United Kingdom.

**LEANDRO COLON-ALICEA**, *Professor*, Ph.D., 1993, University of Wales at Aberystwyth, United Kingdom.

**OLBEN DELGADO-MENDEZ**, *Professor*, Ph.D., 1996, New York University.

**IVONNE DEL C. DIAZ-RODRIGUEZ**, *Assistant Professor*, Ph.D., 2000, Ohio State University.

**EDWIN IRIZARRY-MORA**, *Professor*, Ph.D., 1989, University of Sussex, United Kingdom.

**EDUARDO KICINSKI-MARTIN**, *Professor*, Ph.D., 1990, University of Wisconsin - Madison.

**ROBERT A. MOSHEIM**, *Associate Professor*, Ph.D., 1999, University of North Carolina at Chapel Hill.

**ORLANDO SOTOMAYOR-RODRIGUEZ**, *Associate Professor*, Ph.D., 1994, Cornell University.

**JEFFREY VALENTÍN-MARI**, *Assistant Professor*, Ph.D., 1999, University of Wisconsin-Madison.

**NILSA A. VELAZQUEZ-MATOS**, *Associate Professor*, J.D., 1994, Pontifical Catholic University of Puerto Rico.

## COURSES OF INSTRUCTION

### UNDERGRADUATE COURSES

**ECON 3021. PRINCIPLES OF ECONOMICS MICROECONOMICS.** Three credit hours. Three hours of lecture per week.

Introduction to microeconomics emphasizing supply and demand, cost of production, and price and output determination under different market structures.

**ECON 3022. PRINCIPLES OF ECONOMICS MACROECONOMICS.** Three credit hours. Three hours of lecture per week.

Introduction to macroeconomics, emphasizing social accounting, equilibrium, income and output determination, unemployment, inflation, the financial system, and economic policy.

**ECON 3085. ECONOMIC AND SOCIAL DEVELOPMENT OF PUERTO RICO.** Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

The evolution of the economic system of Puerto Rico; an analysis of its history, structural development, and fundamental problems.

**ECON 3086. CONTEMPORARY PROBLEMS OF THE PUERTO RICAN ECONOMY.** Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3085.

Analysis of the contemporary Puerto Rican economy and its problems.

**ECON 3091. MICRO-ECONOMIC THEORY.** Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021.

A study of modern micro-economic theory; an analysis of price determination under different market structures.

**ECON 3092. MACRO-ECONOMIC THEORY.** Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3022.

An analysis of the economic determinants of the level, change and growth of production and employment. Special emphasis is given to modern theories and their policy implications.

**ECON 3095. SECURITIES MARKETS.** Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Nature and function of operations, and regulation of the securities' markets.

**ECON 4006. BUSINESS CYCLES.** Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Economic factors that affect fluctuations in income, production, employment, and prices; theories that explain this phenomenon; counter-cyclical policy.

**ECON 4007. QUANTITATIVE METHODS IN ECONOMICS.** Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021, ECON 3022 and ESMA 3101 or MATE 3101.

Application of the concepts and techniques of quantitative analysis to the field of economics; quantitative aspects of demand-supply analysis, production functions, design of economic models, and other topics.

**ECON 4015. ECONOMIC DEVELOPMENT.** Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

A study of the common characteristics of underdeveloped countries, with emphasis on the economic theories explaining the factors that determine economic development; an examination of economic policies designed to foster development.

**ECON 4016. MANAGERIAL ECONOMICS.** Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3091.

Economic techniques necessary for directing and operating business enterprises including mathematical programming, marginal economic

analysis, capital budgeting, and evaluation of potential investments under conditions of risk.

ECON 4017. **ECONOMETRICS.** Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3091 and ECON 3092 and MATE 3049 and (MATE 3102 or ESMA 3102).

Statistical analysis applied to economic questions: model building, hypothesis testing, estimation techniques, and data problems.

ECON 4025. **MONEY AND BANKING.** Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

The origin and development of money and banking with emphasis on the functions of the monetary and banking systems, central banking, especially the Federal Reserve System, domestic and international monetary institutions, and the present banking laws in Puerto Rico.

ECON 4027. **TRANSPORTATION ECONOMICS.** Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Analysis of the economic structure of the transportation system and its significance in competition, monopoly, and economic organization.

ECON 4028. **ECONOMICS OF NATURAL RESOURCES.** Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Economic analysis of natural resources: their valuation, conservation, and sustainable development.

ECON 4037. **URBAN ECONOMICS.** Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021.

Urban issues in a microeconomic framework with emphasis on Puerto Rico. Topics include market forces and the development of cities, urban land-use patterns, transportation, and poverty.

ECON 4045. **COMPARATIVE ECONOMIC SYSTEMS.** Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

A comparative study of the different economic systems such as capitalism, socialism, communism and fascism. Emphasis is placed on the different

methods used by each system to solve the fundamental economic problems.

ECON 4046. **INPUT-OUTPUT ANALYSIS.** Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021, ECON 3022 and MATE 3000.

Theoretical foundations, methods, techniques, and applications of economic analysis using the Input-Output model.

ECON 4055. **HISTORY OF ECONOMIC THOUGHT.** Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

The course studies the beginning and growth of Economics as a scientific study, and shows the relationship between economic beliefs, historical circumstances and the life of the thinker. The different economic schools of thought, up to and including the more recent economic ideas are considered.

ECON 4056. **ENVIRONMENTAL ECONOMICS.** Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021.

Impact of economic development and population growth on environmental quality; the economic analysis of pollution; the role of government in environmental deterioration; and the international environmental issues.

ECON 4065. **ECONOMICS OF THE PUBLIC SECTOR AND FISCAL POLICY.** Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Analysis of government income and expenditures and the impact of fiscal policy on output, employment, prices, and other economic variables.

ECON 4085. **INTERNATIONAL ECONOMICS.** Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

A study of the fundamental aspects of international economic theory; an examination of the current international economic framework and tendency towards economic integration; a brief analysis of the aspects and problems of the international monetary system.

ECON 4185. **ECONOMIC PROBLEMS OF LATIN AMERICA.** Three credit hours. Three

hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Economic problems of Latin America; critical evaluation of the institutions and economic factors that retard or foster their solution; the role of the State in promoting economic development.

ECON 4196. ECONOMICS OF INDUSTRIAL ORGANIZATION. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Conduct, performance and use of price theory in the determination of industrial structure. Economic aspects of market structure, mergers and innovations, models of economic behavior, and the role of advertising.

ECON 4225. LABOR ECONOMICS. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

Theory of labor market behavior and its applications to public policy. Topics include labor supply and demand, human capital theory, migration, unemployment, unions, and discrimination.

ECON 4307. PROJECT EVALUATION. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3022 and ECON 3091.

Evaluation of public investment projects emphasizing cost-benefit analysis and its application.

ECON 4395. RESEARCH METHODS IN ECONOMICS I. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3091 and ECON 3092 and (MATE 3102 or ESMA 3102).

Discussion of the research process in the study of economic problems with emphasis on the scientific method, research design, measurement concepts and other analytical approaches.

ECON 4405. ANALYSIS OF CONTEMPORARY ECONOMIC PROBLEMS. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3091 and ECON 3092 and (MATE 3102 or ESMA 3102).

A study of the fundamental economic problems of our time, such as production, employment, trade, consumption, inflation, and others.

ECON 4425. SPECIAL TOPICS. One to three credit hours. One to three hours of lecture or seminar per week. Prerequisite: Consent of the Director of the Department.

Authors, topics, and trends in the field of economics.

ECON 4995. SPECIAL PROBLEMS. One to three credit hours. Three to nine hours of research per week. Prerequisite: Consent of the Director of the Department.

Research under the supervision of a professor of the Department.

## DEPARTMENT OF ENGLISH

The Department of English provides various courses of instruction for all students attending the Mayagüez Campus.

With regards to the general requirement in English, three separate 12 credit-hour sequences exist within the Department of English.

A. **The Basic Sequence:** INGL 3101, 3102, 3201, 3202

B. **The Intermediate Sequence:** INGL 3103, 3104 and six additional credit-hours in English Department courses to be chosen from an approved list of courses provided by the English Department

C. **The Honors Sequence:** Six credit-hours are granted to students by means of Advanced Placement. Students must then take INGL 3211 and 3212 to complete their requirement. Note that although these two courses carry 3000-level numbers, they are actually second year courses.

Note that students who start in one sequence may not take courses in one of the other sequences to satisfy the university's English requirement. For example, students in the "Intermediate Sequence" may not take either INGL 3201-3202 or INGL 3211-3212 to satisfy their second year requirement.

Students who score below 570\*\* on the ESLAT (English as a Second Language Achievement Test) will be placed in the basic sequence of courses: INGL 3101, INGL 3102, INGL 3201, INGL 3202.

The intermediate sequence of courses, starting with INGL 3103 and INGL 3104, is for entering students at UPR/Mayagüez who have scored above 570\*\* on the ESLAT (English as a Second Language Achievement Test), but who have either not taken the Advanced Level Test in English or not qualified for advanced placement in the Honors Program of the English Department by obtaining a score of 4 or 5 on that test. Since the placement of students with scores of 3 on the Advanced Level Test is at the discretion of the English Department, these students will be placed in INGL 3103. Students who successfully pass INGL 3103 and INGL 3104 must take six more credit-hours in English

Department courses in order to satisfy the university requirement in English.

Academic Senate Certification 88-24 stipulates that ONLY a score of 4 or 5 on the Advanced Level Test of the College Board may be used to place entering first year students directly into second year courses by granting them six credit-hours of advanced placement.

The English Department also offers additional course work in the areas of conversational English, public speaking, advanced composition, creative writing, technical writing, literature, and linguistics. All students have an opportunity to take such additional courses in English to meet their particular needs.

For those students who desire to major in English, the department offers a two-track program leading to the degree of **Bachelor of Arts** in English. All students are required to take a common core of courses which includes: "Introduction to Linguistics," "Phonetics," "Survey of English Literature" (two semesters), "Survey of American Literature" (two semesters), and "English Expository Writing." Beyond these required core courses, students choose to emphasize coursework in the area of literature or linguistics.

The department also administers an English Institute for foreign graduate students who have only minimal competence in English.

The English Department offers a graduate program leading to the degree of **Master of Arts** in English Education (M.A.E.E.). This program is grounded in the areas of linguistics, literature, and pedagogy. Although students may ultimately concentrate in one of these areas, they are required to take designated courses from each area. The program is designed for classroom teachers at all levels of instruction. Please refer to the latest Graduate Catalogue for additional information.

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\*\* Test scores used for placement are reviewed by the English Department on a regular basis. These numbers may vary slightly becoming either higher or lower over a given set of years.

**BACHELOR OF ARTS IN ENGLISH**

**SUMMARY OF CREDITS IN PROGRAM**

Faculty requirements	56
Departmental requirements	
Track courses	33
Core courses	21
Recommended electives	12
Free electives	<u>12</u>
<b>Total</b>	<b>134</b>

**FIRST YEAR**

**First Semester**

<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3101</b>	
Basic Course in Spanish	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>*MATE 3171</b>	
Pre-Calculus I	3
<b>EDFI ----</b>	
Course in Physical Education	1
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	16

**Second Semester**

<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3102</b>	
Basic Course in Spanish	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>MATE 3---</b>	3
<b>EDFI ----</b>	
Course in Physical Education	1
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	16

**SECOND YEAR**

**First Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>INGL 3225</b>	
Intro. to Linguistics	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	3

**CIBI 3031**

Intro. to the Biological Sciences I	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	18

**Second Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>INGL 3227</b>	
Phonetics of English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	18

**TRACK I: LITERATURE**

**THIRD YEAR**

**First Semester**

<b>INGL 3351</b>	
American Literature to 1860	3
<b>INGL 3321</b>	
Survey of English Literature to 1660	3
<b>INGL 3231</b>	
Expository Writing in English	3
<b>INGL 3---</b>	
English Elective	3
<b>FISI, QUIM or GEOL</b>	
Electives	3
<b>ELECTIVE</b>	
Recommended Electives	<u>3</u>
	18

**Second Semester**

<b>INGL 3352</b>	
American Lit. from 1860 to the Modern Period	3
<b>INGL 3322</b>	
Survey of English Lit. from 1660 to the Modern Period	3
<b>INGL 4025</b>	
Shakespeare	3
<b>INGL 3---</b>	
English Elective	3
<b>FISI, QUIM or GEOL</b>	
Electives	3



<b>ELECTIVE</b>	
Recommended Electives	<u>3</u>
	18

**FOURTH YEAR**

**First Semester**

<b>INGL 4030</b>	
Research and Writing in Literature	3
<b>INGL ----</b>	
English Electives	9
<b>ELECTIVE</b>	
Recommended Elective	<u>3</u>
	15

**Second Semester**

<b>INGL ----</b>	
English Electives	12
<b>ELECTIVE</b>	
Recommended Elective	<u>3</u>
	15

**Total credits required: 134**

**TRACK II: LINGUISTICS**

**THIRD YEAR**

**First Semester**

<b>INGL 3351</b>	
American Literature to 1860	3
<b>INGL 3321</b>	
Survey of English Lit. to 1660	3
<b>INGL 3231</b>	
Expository Writing in English	3
<b>INGL 4206</b>	
The Structure of English	3
<b>FISI, QUIM or GEOL</b>	
Electives	3
<b>ELECTIVE</b>	
Recommended Elective	<u>3</u>
	18

**Second Semester**

<b>INGL 3352</b>	
American Lit. from 1860 to the Modern Period	3
<b>INGL 3322</b>	
Survey of Eng. Lit. from 1660 to the Modern Period	3
<b>INGL 4075</b>	
Psycholinguistics	3
<b>INGL ----</b>	
English Electives	3
<b>FISI, QUIM or GEOL</b>	
Electives	3
<b>ELECTIVE</b>	

Recommended Elective	<u>3</u>
	18

**FOURTH YEAR**

**First Semester**

<b>INGL 4028</b>	
Research and Writing in Lang. and Linguistics	3
<b>INGL ----</b>	
English Electives	9
<b>ELECTIVE</b>	
Recommended	<u>3</u>
	15

**Second Semester**

<b>INGL 4208</b>	
History of the English Language	3
<b>INGL ----</b>	
English Electives	9
<b>ELECTIVE</b>	
Recommended	<u>3</u>
	15

**Total credits required: 134**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*To be chosen from the alternatives defined by the Department.

**DEPARTMENTAL FACULTY**

**MARUJA ACEVEDO-TOLEDO**, *Assistant Professor*, M.A., 1986, Interamerican University of Puerto Rico.

**OSWALDO AYMAT**, *Professor*, Ph.D., 1988, University of Texas-Austin.

**JOAN BAKER-DE GONZALEZ**, *Professor*, M.S., 1965, University of Wisconsin-Madison.

**NANDITA BATRA**, *Professor*, Ph.D., 1986, University of Rochester-New York.

**EILEEN K. BLAU**, *Professor*, Ph.D., 1980, University of Florida.

**ANITA R. CHAMBERLAIN-SOLORZANO**, *Associate Professor*, M.A., 1976, University of Puerto Rico.

**ROSS L. CROW**, *Associate Professor*, M.A., 1963, George Washington University.

**ELIZABETH P. DAYTON**, *Professor*, Ph.D., 1996, University of Pennsylvania.

**KATHLEEN FERRACANE**, *Professor*, Ph.D., 1987, State University of New York at Buffalo.

**LEONARDO FLORES**, *Assistant Professor*, M.A., 1994, Bowling Green University.

**NICKOLAS A. HAYDOCK**, *Associate Professor*, Ph.D., 1994, University of Iowa.

**JOSE M. IRIZARRY-RODRIGUEZ**, *Associate Professor*, Ph.D., 1999, Indiana University of Pennsylvania.

**RAYMOND KNIGHT**, *Assistant Professor*, M.A., 1986, Interamerican University.

**MARY LEONARD**, *Assistant Professor*, M.A., 1986, Columbia University.

**ROBERTO LOPEZ-OLIVO**, *Professor*, M.A., 1972, University of Southwestern Louisiana.

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**BETSY MORALES-CARO**, *Associate Professor*, Ph.D., 1999, University of Texas at Austin.

**BEVERLY H. NIEVES**, *Associate Professor*, M.A., 1952, New York University.

**MABEL ORTIZ-GONZALEZ**, *Instructor*, M.A., 1974, State University of New York at Fredonia.

**DARNYD W. ORTIZ-SEDA**, *Professor*, Ph.D., 1990, Florida State University.

**MARIA L. PIÑEIRO**, *Assistant Professor*, M.A., 1979, Boston College.

**ELLEN PRATT-RIOS**, *Associate Professor*, Ph.D., 1999, Indiana University of Pennsylvania.

**SANDRA RIOS**, *Assistant Professor*, M.A.E.E., 1987, University of Puerto Rico.

**MYRNA RIVERA-MONTIJO**, *Assistant Professor*, M.A.E.E., 1995, University of Puerto Rico.

**ISMAEL RIVERA-RODRIGUEZ**, *Professor*, Ph.D., 1995, Pennsylvania State University.

**LINDA RODRIGUEZ**, *Associate Professor*, Ph.D., 1994, University of Michigan.

**ROSA I. ROMAN**, *Instructor*, M.A.E.E., 1999, University of Puerto Rico.

**ROBERT T. SHERWIN**, *Professor*, Ph.D., 1975, The Pennsylvania State University.

**GEORGIA SMYRNIUO**, *Associate Professor*, Ph.D., 1994, University of Illinois.

**NIDIA TIRU**, *Associate Professor*, M.A., 1971, Ohio State University.

**IRIS TORO-MANZANO**, *Instructor*, M.A.E.E., 1997, University of Puerto Rico.

**BILLY WOODALL**, *Assistant Professor*, Ph.D., 2000, University of Washington.

## COURSES OF INSTRUCTION

### UNDERGRADUATE COURSES

INGL 0066. PRE-BASIC ENGLISH. Remedial course without credit. Three hours of lecture per week.

Intensive training in basic language for students requiring remedial work in English.

INGL 3101-3102. BASIC COURSE IN ENGLISH. Three credit hours per semester. Three hours of lecture per week, supplemented by work in the language laboratory, each semester. Prerequisite: Placement by examination or INGL 0066.

This course is designed to meet the student's immediate needs, and to give him or her a command of the fundamental structure of the English language. The oral approach is used. Skills in reading and writing are developed. Students will be grouped according to their ability to use the language, and arrangements will be made to give additional help to those students who show poor preparation in English.

INGL 3103. INTERMEDIATE ENGLISH I. Three credit hours. Three hours of lecture per week. Prerequisite: Placement by examination.

Analysis of selected readings, such as essays, fiction, poetry or drama, and practice in writing compositions with attention given as needed to grammar and idiomatic expressions.

INGL 3104. INTERMEDIATE ENGLISH II. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3103.

Analysis of selected readings, such as essays, fiction, poetry or drama, and practice in writing compositions with attention given as needed to grammar and idiomatic expression.

INGL 3191. CONVERSATIONAL ENGLISH. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202.

Development of naturalness, correctness and clarity in conversational English; analysis and correction of individual faults in speech delivery; application of phonetics to problems of pronunciation and articulation in North American English.

INGL 3195. PROFESSIONAL CONVERSATION. One credit hour. One hour of lecture and one one-hour laboratory per week. Prerequisite: INGL 3012 or INGL 3202 or Consent of the Director of the Department.

An introductory communication course with emphasis on interpersonal conversation in business and professional settings.

INGL 3196. GROUP COMMUNICATION. One credit hour. One hour of lecture per week. Prerequisite: INGL 3012 or INGL 3202 or Consent of the Director of the Department.

An introductory communication course with emphasis in developing small group communication skills in business and professional settings.

INGL 3197. PROFESSIONAL PRESENTATIONS. One credit hour. One hour of lecture per week and one-hour laboratory per week. Prerequisite: Consent of the Director of the Department.

An introductory course with emphasis on developing skills for presentations in business and professional settings.

INGL 3198. PROFESSIONAL INTERVIEWS. One credit hour. One hour of lecture per week. Prerequisite: INGL 3012 or INGL 3202 or Consent of the Director of the Department.

An introductory communication course with emphasis on developing job interviews skills in business and professional settings.

INGL 3201-3202. ENGLISH COMPOSITION AND READING. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: INGL 3102 or placement by examination.

Practice in writing compositions and making oral reports upon selected readings, including essays, short stories, poems, dramas and novels. Attention will be given as needed to grammar and idiomatic

expressions. This course or its equivalent is a requisite for graduation.

INGL 3211. ADVANCED ENGLISH I. Three credit hours. Three hours of lecture per week. Prerequisite: placement by College Board Achievement Exam.

Development of reading, discussion, and writing skills through the experience, interpretation, and evaluation of short story, modern drama, poetry, and the essay. Introduction to library skills related to literary study.

INGL 3212. ADVANCED ENGLISH II. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3211 or INGL 3011.

Development of reading, discussion, and writing skills through the experience, interpretation, and evaluation of the novel, Shakespearean drama, and the complex texture of poetry. A research paper related to literary study will be required.

INGL 3225. INTRODUCTION TO LINGUISTICS. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

An introductory survey of linguistics with special attention to the English language, emphasizing phonology, morphology, syntax, semantics, historical change, and social and regional variations.

INGL 3227. PHONETICS OF ENGLISH. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3212 or INGL 3104 or INGL 3012.

Articulation, rhythm, and intonation of English, including its phonetic description, transcription, and oral practice in the laboratory.

INGL 3231. ENGLISH EXPOSITORY WRITING. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

Practice in the various forms of expository writing. Detailed class criticism of diction, phrasing, and sentence structure. A research paper will be required.

INGL 3236. TECHNICAL REPORT WRITING. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

Supervised writing, with emphasis on clearness, correctness, conciseness, completeness, and appropriate tone; practice in organizing paragraphing, sentence structure, word choice, grammar, and punctuation.

INGL 3238. CREATIVE WRITING. Three credit hours. Three hours of lecture per week. Prerequisite: (INGL 3202 or INGL 3104 or INGL 3212) and consent of the Director of the Department.

Theory and practice in the writing of fiction, poetry, and drama. Detailed class criticism of students' works.

INGL 3250. PUBLIC SPEAKING. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3212 or INGL 3104.

Principles and practice of oral presentations, their preparation, composition, and delivery, including formal, informal, and impromptu speech.

INGL 3268. WRITING FOR THE COMMUNICATIONS MEDIA. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3202 or INGL 3104 or INGL 3212.

Theory and practice in writing to broadcast information to an audience through the communications media.

INGL 3300. STUDIES IN LITERATURE AND LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

Study of a special topic directed by an instructor in whose particular field of specialization the content of the course falls.

INGL 3305. MODERN AMERICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

Major American writers of the present century with particular attention to the development of prose fiction and modern cultural attitudes.

INGL 3306. MODERN BRITISH LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

Major British writers of the present century with particular attention to the development of prose, fiction and modern cultural attitudes.

INGL 3312. THE NOVEL IN ENGLISH LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

Discussion of the works of the major English novelists from the eighteenth century to the present.

INGL 3317. THE NOVEL IN AMERICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

Discussion of the major American novelists of the nineteenth and twentieth centuries.

INGL 3318. LITERATURE OF THE ENGLISH-SPEAKING CARIBBEAN. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

Caribbean novelists, short story writers, poets, and playwrights of the 20th century who write in English.

INGL 3321. ENGLISH LITERATURE TO 1798. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

Representative authors and major movements from the beginnings of English literature to the end of the Neoclassical period.

INGL 3322. ENGLISH LITERATURE FROM 1798 TO MODERN PERIOD. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

Representative authors and major movements in English literature from the beginnings of the Romantic Period to the Modern Era.

INGL 3323. MODERN DRAMA IN ENGLISH SINCE 1890. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

A survey of modern drama in England, Ireland, and the United States including such figures as Wilde, Shaw, O'Casey, O'Neill, Miller, Albee, and Pinter.

INGL 3325. MODERN POETRY. Three credit hours. Three hours of lecture per week.

Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

Lecture on the beginning of modern poetry, the imagist movement, and the chief lines of development throughout the Thirties and Forties to the contemporary period. Special attention will be given to the major work of William Butler Yeats, Robert Frost, Wallace Stevens, William Carlos Williams, Ezra Pound, T.S. Elliot, and Dylan Thomas.

INGL 3326. LITERATURE OF MINORITIES IN THE UNITED STATES. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

English-language literature of minorities in the United States, with particular attention to African American, Asian American, Native American, and Latino works.

INGL 3345. TOPICS IN CINEMA. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3102 or INGL 3104 or INGL 3202.

Introduction to English language cinema in the context of linguistic and literary analysis: history, theory, selective genres, cinematic analysis and criticism, aesthetic response, and semiotics.

INGL 3351. AMERICAN LITERATURE TO 1860. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

Major works of the literature of the United States from the colonial period to the onset of the Civil War.

INGL 3352. AMERICAN LITERATURE FROM 1860 TO THE EARLY MODERN PERIOD. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3202 or INGL 3104 or INGL 3212.

Major works of the literature of the United States from the Civil War up to the nearly modern period.

INGL 4000. ENGLISH LITERATURE OF THE 17TH CENTURY. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or consent of the Director of the Department.

Major poetic and intellectual traditions in the seventeenth century as represented in the works of

Donne, Johnson, Herbert, Marvell, and others, with special emphasis given to the work of John Milton.

INGL 4009. LITERATURE OF THE ENGLISH RENAISSANCE. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or consent of the Director of the Department.

Exploration of the major literary traditions and figures of the English Renaissance including More, Wyatt, Surrey, Spencer, Sidney, Marlowe, and Shakespeare.

INGL 4017. THE ROMANTIC MOVEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or consent of the Director of the Department.

A study of the works of the principal poets of the Romantic Movement, with reading and interpretation of the chief poems of Wordsworth, Coleridge, Byron, Shelly, and Keats.

INGL 4025. SHAKESPEARE. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or consent of the Director of the Department.

Shakespeare's dramatic craftsmanship, poetry, humor characterization, psychology, and modern pertinence, as illustrated in representative tragedies, comedies, and history plays.

INGL 4026. SOCIOLINGUISTICS. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3225 or consent of the Director of the Department.

Language as a means of social interaction; linguistic variations and their relation to sociological, economic geographic, and cultural factors with reference to bilingual areas such as Puerto Rico.

INGL 4027. OLD AND MIDDLE ENGLISH LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or consent of the Director of the Department.

Development of English literature from Anglo-Saxon times through the medieval period with special emphasis given to the work of Chaucer.

INGL 4028. RESEARCH AND WRITING IN LANGUAGE AND LINGUISTICS. Three credit hours. Three hours of lecture per week. Prerequisites: INGL 3231 and six credit hours in linguistics.

A course in the methods of research, including the use of bibliographies and other reference works. Students will do individual work based upon assigned topics in language and linguistics, and will prepare a paper to be read and defended before the class.

INGL 4030. RESEARCH AND WRITING IN LITERATURE. Three credit hours. Three hours of seminar per week. Prerequisites: INGL 3231 and six credit hours in English Literature.

A course in the methods of research, including the use of bibliographies and other reference works. Students will do individual work based upon assigned topics in literature and will prepare papers to be read and defended in class.

INGL 4047. ENGLISH PHONOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: (INGL 3225 and INGL 3227) or consent of the Director of the Department.

An examination of the systematic use of sounds in English and other languages; methods and techniques of analysis; theory and history of phonology.

INGL 4075. PSYCHOLINGUISTICS. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3225 or consent of the Director of the Department.

Psychology and language learning; analysis of the process of first and second language acquisition; introduction to research and theory of language acquisition, and its application to the teaching of English as a second language.

INGL 4095. THE VICTORIAN PERIOD. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or consent of the Director of the Department.

The major works of the Victorian period in poetry, criticism, and thought, with particular attention to cultural interchange with the European continent.

INGL 4097. ENGLISH LITERATURE OF THE 18TH CENTURY. Three credit hours. Three hours of lecture per week. Prerequisite: One

literature course at the level of INGL 33-- or higher, or consent of the Director of the Department.

Literature of the Restoration and eighteenth century with emphasis given to the work of Dryden, Swift, Pope, and Samuel Johnson.

INGL 4107. RHETORICAL THEORY. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3231 or consent of the Director of the Department.

The interrelation of classical and modern rhetorical theory including the nature of persuasion, the rhetorical situation, and the structure of discourse.

INGL 4108. ADVANCED TECHNICAL COMMUNICATION. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3236 or consent of the Director of the Department.

Principles and practice of writing and presenting technical communications.

INGL 4125. INTRODUCTION TO SEMANTICS. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3225 or consent of the Director of the Department.

The semantics of English from the perspective of linguistics: relation of syntactic form to meaning, the analysis of presupposition, word meaning, strategies for establishing meaning in the context of discourse, and semantic universals.

INGL 4205. MORPHOLOGY AND SYNTAX. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3225.

Theory of language structure, primarily from the viewpoint of transformational-generative grammar.

INGL 4206. THE STRUCTURE OF ENGLISH. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3225 or consent of the Director of the Department.

Advanced grammar course, especially in syntax.

INGL 4208. HISTORY OF THE ENGLISH LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: INGL 3225 or consent of the Department Director.

The English language from its Anglo-Saxon origins to modern times.



INGL 4316. AMERICAN ROMANTICISM. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or consent of the Director of the Department.

Exploration of the literary traditions of the Romantic Period in the United States through a study of its major authors: Emerson, Hawthorne, Poe, Thoreau, Melville, and Whitman.

INGL 4317. AMERICAN REALISM AND NATURALISM. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of INGL 33-- or higher, or consent of the Director of the Department.

Development of fictional techniques in the United States during the late nineteenth and early twentieth centuries with readings from the following authors: Mark Twain, Howells, James, Garland, Norris, Crane and Dreiser.

### **ADVANCED UNDERGRADUATE AND GRADUATE COURSES**

INGL 5007. ORAL COMMUNICATION. Three credit hours. Three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Communication theory and speaking techniques, including enunciation, intonation, phrasing, projecting the voice, and holding audience attention. Varieties of formal oral interpretation are studied and practiced, including drama and poetry reading, public speaking, and debate.

INGL 5009. CONTRASTIVE GRAMMAR. Three credit hours. Three hours of lecture per week. Prerequisite: Consent 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. Three credit hours. Three hours of lecture per week. Prerequisite: Consent 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. Three credit hours. Three hours of lecture per week. Prerequisite: Consent 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. Three credit hours. Three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Recent developments in linguistic theory and their application to related issues.

## DEPARTMENT OF GEOLOGY

The Department of Geology offers a program leading to a **Bachelor of Science** degree in Geology. As part of degree requirements, majors have to conduct a supervised research project in their final year. The Department also offers advanced undergraduate courses for qualified students in the graduate programs in Biology, Physics, Marine Sciences and Civil Engineering. The principal objective of the Geology Program is to prepare students for professional positions in industry and government, and for careers in academic research and teaching.

The Department operates a microseismic network, laboratories with analytical instruments including an electron microprobe, x-ray fluorescence and x-ray diffraction spectrometers, and a mass spectrometer, as well as geochemical, remote sensing and geophysical laboratories.

### BACHELOR OF SCIENCE IN GEOLOGY

#### Summary of Credits in Program

Faculty requirements	50
Departmental requirements	
Major area	46
Non-major area	24
Recommended electives	9
Free electives	<u>12</u>
<b>Total</b>	<b>141</b>

#### FIRST YEAR

##### First Semester

<b>*INGL 3---</b>	
First year course in English	3
<b>*MATE 3171</b>	
Pre-Calculus I	3
<b>CIBI 3031</b>	
Intro. to the Biological Sciences I	3
<b>GEOL 3025</b>	
Earth Sciences	3
<b>*ESPA 3101</b>	
Basic Course in Spanish	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	<u>3</u>
	18

##### Second Semester

<b>*INGL 3---</b>	
First year course in English	3
<b>*MATE 3172</b>	
Pre-Calculus II	3
<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	3
<b>GEOL 3026</b>	
History of Life	3
<b>GEOL 3047</b>	
Introductory Geology Laboratory	1
<b>*ESPA 3102</b>	
Basic Course in Spanish	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	<u>3</u>
	19

#### SECOND YEAR

##### First Semester

<b>MATE 3031</b>	
Calculus I	4
<b>QUIM 3001</b>	
General Chemistry	4
<b>INGL 3---</b>	
Second year course in English	3
<b>GEOL 4017</b>	
Elementary Geomorphology	3
<b>GEOL 3055</b>	
Morphological and Optical Crystallography	<u>3</u>
	17

##### Second Semester

<b>MATE 3032</b>	
Calculus II	4
<b>QUIM 3002</b>	
General Chemistry	4
<b>INGL 3---</b>	
Second year course in English	3
<b>GEOL 4006</b>	
Structural Geology	3
<b>GEOL 3056</b>	
Crystal Chemistry and Geochemistry of Mineral Systems	<u>3</u>
	17

#### THIRD YEAR

##### First Semester

<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>FISI 3151</b>	
Modern College Physics I	3

**FISI 3153**

Modern College Physics  
Lab. I 1

**COMP ----**  
Elective in Computer Science 3

**GEOL 4045**  
Petrogenesis of Crystalline  
Rocks 3

**GEOL 4046**  
Sedimentary Environments and  
Lithogenesis 3

**EDFI ----**  
Course in Physical Education  $\frac{1}{17}$

**Second Semester**

**ESPA 3---**  
Course above level of basic  
Spanish 3

**FISI 3152**  
Modern College Physics II 3

**FISI 3154**  
Modern College Physics  
Lab. II 1

**GEOL 4009**  
Stratigraphy 3

**ELECTIVES**  
Free Electives 6

**EDFI ----**  
Course in Physical Education  $\frac{1}{17}$

**SUMMER BETWEEN THIRD AND  
FOURTH YEAR**

**GEOL 4018**  
Field Geology 6

**FOURTH YEAR**

**First Semester**

**GEOL 4049**  
Undergraduate Research I 2

**GEOL 4011**  
Undergraduate Seminar 1

**GEOL ----**  
Geology Electives 3

**ELECTIVE**  
Recommended Elective in  
Science (not Geology),  
Mathematics, Engineering,  
Economics and/or  
Agronomy 3

**ELECTIVE**  
Free 3

**CISO 3121**  
Intro. to the Study of the  
Social Sciences  $\frac{3}{15}$

**Second Semester**

**GEOL 4055**  
Undergraduate Research II 2

**GEOL 4012**  
Undergraduate Seminar 1

**GEOL ----**  
Geology Elective 3

**ELECTIVE**  
Recommended Elective in Science  
(not Geology), Mathematics,  
Engineering, Economics and/or  
Agronomy 3

**ELECTIVE**  
Free Elective 3

**CISO 3122**  
Intro. to the Study of the  
Social Sciences  $\frac{3}{15}$

**Total credits required: 141**

\*Refer to the Academic Regulations section for  
information on Advanced Placement.

**DEPARTMENTAL FACULTY**

**EUGENIO ASECIO**, *Assistant Professor*, Ph.D.,  
2002, University of South Carolina.

**FERNANDO GILBES**, *Assistant Professor*, Ph.D.,  
1996, University of South Florida.

**JAMES JOYCE**, *Professor*, Ph.D., 1985,  
Northwestern University at Evanston, Illinois.

**THOMAS MILLER**, *Associate Professor*, Ph.D.,  
1982, McMaster University.

**WILSON RAMIREZ**, *Assistant Professor*, Ph.D.,  
2000, Tulane University.

**ROBERT RIPPERDAN**, *Associate Professor*, Ph.D.,  
1990, California Institute of Technology.

**HERNAN SANTOS**, *Associate Professor*, Ph.D.,  
1999, University of Colorado.

**JOHANNES SCHELLEKENS**, *Professor*, Ph.D.,  
1993, Syracuse University, New York.

**CHRISTA VON HILLEBRANDT**, *Assistant  
Researcher*, MS, 1989, Escuela Politécnica Nacional,  
Quito, Ecuador.

**COURSES OF INSTRUCTION**

**DEPARTMENT OF GEOLOGY**

**UNDERGRADUATE COURSES**

GEOL 3025. EARTH SCIENCES. Three credit hours. Three hours of lecture per week.

Introduction to the study of the earth. The structure, composition, and tectonics of the lithosphere; the interaction of the hydrosphere and atmosphere with the lithosphere, the earth in relation to the solar system. Field trips are required.

GEOL 3026. LIFE IN THE PAST. Three credit hours. Three hours of lecture per week.

Introduction to the evolution and the ecological significance of life in the course of geological time. Field trips are required.

GEOL 3027. GEOLOGICAL ASPECTS OF THE ENVIRONMENTAL SCIENCES. Three credit hours. Three hours of lecture per week.

Human activities that degrade the earth and those terrestrial phenomena actually or potentially harmful to man.

GEOL 3045. PLANETARY GEOLOGY. Three credit hours. Three hours of lecture per week.

Introduction to earth and planetary sciences through the study of the composition, structure, and dynamic processes of the earth and other planets.

GEOL 3046. EARTH RESOURCES. Three credit hours. Three hours of lecture per week.

A general introduction to the occurrence and exploitation of earth resources; metallic ores, non-metallic minerals, construction materials, energy, and water.

GEOL 3047. INTRODUCTORY GEOLOGY LABORATORY. One credit hour. One three-hour laboratory per week. Corequisite: GEOL 3025.

Introduction to the use and interpretation of topographic and geologic maps, and aerial photographs; identification of common minerals, rocks, and fossils; interpretation of geologic structures. Field trips required.

GEOL 3055. MORPHOLOGICAL AND OPTICAL CRYSTALLOGRAPHY. Three credit

hours. Two hours of lecture and one three-hour laboratory per week. Corequisite: GEOL 3025.

Internal structure and morphological characteristics of the thirty two crystal classes. Optical crystallography.

GEOL 3056. CRYSTAL CHEMISTRY AND GEOCHEMISTRY OF MINERAL SYSTEMS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: GEOL 3055.

Occurrence, geochemistry, and physical properties of rock-forming and economic minerals. Macroscopic and microscopic identification of minerals.

GEOL 3067. VOLCANOES. Three credit hours. Three hours of lecture per week.

Volcanoes, their products, and their effects on the environment and human beings.

GEOL 3105. IMAGES OF PLANET EARTH. Three credit hours. Three hours of lecture per week.

The use of images of our planet Earth for the study of earth systems science with emphasis on global change; the interactions among the lithosphere, asthenosphere, hydrosphere, cryosphere, atmosphere, and biosphere; the Earth as a planet within the solar system.

GEOL 4001. TOPICS IN GEOLOGY. One to three credit hours. One to three hours of lecture per week. Prerequisite: Senior standing in Geology.

Special topics in geology based on review of literature, and on field and/or laboratory experiences.

GEOL 4002. TOPICS IN GEOLOGY. One to three credit hours. One to three hours of lecture per week. Prerequisite: Senior standing in Geology.

Special topics in geology based on review of literature, and on field and/or laboratory experiences.

GEOL 4005. ELEMENTARY PALEONTOLOGY. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: GEOL 3026.

Principles of stratigraphical paleontology; invertebrate, vertebrate and plant fossils; practical applications. Representative examples of each group will be studied in the laboratory.

GEOL 4006. ELEMENTARY STRUCTURAL GEOLOGY. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: GEOL 3025.

The study of major and minor rock structures. The general structure of the Earth, and deformation of its crust. Practical interpretation of geological maps.

GEOL 4009. STRATIGRAPHY. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: GEOL 4046.

Survey of fundamental stratigraphic principles applicable to the analysis and interpretation of stratified rocks, their contained fossils, and their relations in space and time. Systematic account of the stratigraphic systems in selected regions, and interpretation of their broader relations in the Earth's crust.

GEOL 4011. SEMINAR IN GEOLOGY. One credit hour. One hour of seminar per week. Prerequisite: Senior standing in Geology.

Class presentation and discussion of selected topics in geology.

GEOL 4012. SEMINAR IN GEOLOGY. One credit hour. One hour of seminar per week. Prerequisite: GEOL 4011.

Class presentation and discussion of selected topics in geology.

GEOL 4015. GEOLOGY FOR ENGINEERS. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: QUIM 3001.

General principles of geology, with special emphasis on those aspects pertaining to engineering problems; study of common minerals and rocks; structural geology and geomorphology.

GEOL 4016. ENGINEERING GEOLOGY. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: GEOL 4006 or GEOL 4015.

Study of the specific application of geological principles to engineering problems, such as foundations, road location, water supply, dam and reservoir sites, construction materials, and beach erosion.

GEOL 4017. ELEMENTARY GEOMORPHOLOGY. Three credit hours. Two

hours of lecture and one two-hour laboratory per week. Prerequisite: GEOL 4015 or INCI 4001. Corequisite: GEOL 3025.

Study of the development of landforms; interpretation of topography and topographic maps.

GEOL 4018. FIELD GEOLOGY. Six credit hours. Six weeks in field camp during the summer. Prerequisite: GEOL 4009.

Introduction to geological field methods; preparation of geological maps using plane table, pace-and-compass and other techniques; construction of structural cross sections.

GEOL 4019. ECONOMIC GEOLOGY. Three credit hours. Two hours of lecture and one four-hour laboratory per week. Prerequisite: GEOL 4045.

The nature, occurrence, origin, and host rocks of commercially important mineral deposits. Identification, classification, and textural analysis of ore minerals. Field trips are required.

GEOL 4037. VOLCANOES AND THEIR HAZARDS. Three credit hours. Three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Hazards associated with volcanic activity; monitoring of volcanoes, and long and short term forecasting of eruptions; effects of volcanic eruptions on humans, infrastructure, and agriculture; impact of volcanic crises on society. Analysis of case studies.

GEOL 4045. PETROGENESIS OF CRYSTALLINE ROCKS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: GEOL 3056.

The study of igneous and metamorphic rocks, emphasizing field identification. Introduction to microscopic petrography of common rocks.

GEOL 4046. SEDIMENTARY ENVIRONMENTS AND LITHOGENESIS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: GEOL 3056.

Introduction to the processes of sedimentary rock formation, including the weathering of rocks and the transportation, deposition, and lithification of sediments. Emphasis on the field study of diverse modern sedimentary environments and

classification of sedimentary rocks based on petrographic analysis.

GEOL 4047. INTRODUCTION TO GEOCHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 3002. Corequisites: GEOL 4045.

Chemical principles applied to geological processes. Topics include: thermodynamic properties of geological materials; gaseous and ionic behavior in aqueous media under dynamic and equilibrium environmental conditions; geochemical methods to study changes in the earth's surface.

GEOL 4048. GEOLOGICAL APPLICATIONS OF REMOTE SENSING. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: GEOL 4009 or consent of the Director of the Department.

Theory and techniques of remote sensing applied to the geosciences, including interpretation of images of the surface of the Earth and other planets.

GEOL 4049. UNDERGRADUATE RESEARCH I. Two credit hours. Six hours of practice and/or laboratory per week. Prerequisite: 28 credits in Geology.

Research in geology, supervised by a faculty member, stressing the student's initiative. Work will be field or laboratory oriented.

GEOL 4055. UNDERGRADUATE RESEARCH II. Two credit hours. Six hours of practice and/or laboratory per week. Prerequisite: GEOL4049.

Research in geology, supervised by a faculty member, stressing the student's initiative. Work will be field or laboratory oriented.

GEOL 4057. ENVIRONMENTAL GEOPHYSICS. Three credit hours. Two hours of lecture and one four-hour laboratory per week. Prerequisites: (GEOL 3025 or GEOL 4015) and (FISI 3152 or FISI 3162 or FISI 3172) and (MATE 3032 or MATE 3184).

The application of geophysical methods such as: seismic reflection/refraction, gravity, electrical, magnetic, and ground-penetrating radar. Environmental problems in Puerto Rico will be emphasized. Field trips are required.

GEOL 4059. PHYSICAL VOLCANOLOGY. Three credit hours. Two hours of lecture and one

three-hour laboratory per week. Prerequisite: Consent of the Director of the Department.

Physical volcanology including properties of magmas, subaerial and submarine volcanic processes, effusive and explosive products, volcanic edifices, effects of volcanism on climate, and extraterrestrial volcanism. Analysis of case studies. Field trips required.

GEOL 4060. GEOLOGICAL APPLICATIONS OF CARTOGRAPHY AND GEODESY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: GEOL 4009.

Techniques of cartography and geodesy in map-making and surveying for the geosciences with an emphasis on EDM, laser-ranging, geodetic GPS surveying, and the generation of hypsometric data from airborne and satellite platforms. Examples of environmental, geological and natural hazard mitigation applications from the Caribbean.

#### ADVANCED UNDERGRADUATE AND GRADUATE COURSES

GEOL 5005. MARINE GEOLOGY. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: Consent of the Director of the Department.

Discussion of the broad morphotectonic features of the sea floor and of coastal zones. Sediments, their origin, mode of formation, methods of study and interpretation. Reefs. Sea bottom topography and geomorphology. Study of changes of the level of the sea. Emphasis on the Caribbean region.

GEOL 5006. SEDIMENTATION. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: GEOL 4046.

Erosion, transportation, and deposition of sediments; classification of sediments; sedimentary environment; sedimentary history of depositional sites; significance of grain size in the sedimentary environment.

GEOL 5011. PRINCIPLES OF PALEONTOLOGY I. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: Consent of the Director of the Department.

Morphology and classification of fossils with emphasis on the invertebrates. General



stratigraphic distribution. The most significant fossil groups will be studied in the laboratory.

GEOL 5015. OPTICAL MINERALOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: GEOL 3056.

Optical crystallography, detailed microscopic study of rock forming minerals.

GEOL 5020. GEOPHYSICS. Three credit hours. Three hours of lecture per week.

The principal physical processes related to the dynamics and evolution of the Earth, including energetic activity, gravitational and magnetic fields, heat flow, tectonics, and convection.

GEOL 5025. GEOLOGY OF THE CARIBBEAN. Three credit hours. Three hours of lecture per week. Prerequisite: GEOL 4009 or consent of the Director of the Department.

The geological and geophysical history and evolution of the Caribbean region, with special emphasis on Puerto Rico; mineral resources; geological hazards; relation of the region to global tectonics.

GEOL 5026. TECTONICS. Three credit hours. Three hours of lecture per week. Prerequisite: GEOL 4009 or Consent of the Director of the Department.

Theory of global plate tectonics as a synthesis of diverse geological themes, with emphasis on the Caribbean region.

GEOL 5027. METALLOGENESIS AND GLOBAL TECTONICS. Three credit hours. Three hours of lecture per week.

The relationship of the genesis and distribution of ore deposits to the tectonic environments.

GEOL 5565. SEISMOLOGY. Three credit hours. Three hours of lecture per week.

The use of local and global networks to determine the location, magnitude, and source parameters of earthquakes; global seismicity; theory of wave propagation; point sources; inversion of the Earth's structure; source properties.

GEOL 5605. GEOLOGICAL HAZARDS. Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Mechanisms, distribution, and mitigation of geological hazards, including earthquakes, surface fault ruptures, volcanoes, landslides, floods, and ground subsidence. Analysis of case histories. Field trips are required.

GEOL 5994. SPECIAL TOPICS IN PALEONTOLOGY WITH LABORATORY. One to three credit hours. Zero to two hours of lecture per week. One to three laboratory periods of two to four hours per week. Prerequisite: Consent of the Director of the Department.

Special topics in paleontology. Field trips required.

## DEPARTMENT OF HISPANIC STUDIES

The Department of Hispanics Studies, established in 1956 as the Spanish Department, offers a **Bachelor of Arts** in Hispanic Studies. It provides courses of instruction for all students on campus, as well as courses which are required by other academic programs.

The Department of Hispanic Studies offers a program which emphasizes the dual aspects of language and literature. It offers specialized courses in Spanish Language, Hispanic Philology, as well as Spanish, Latin-American, and Puerto Rican literatures. The Department also offers a graduate program leading to the degree of **Master of Arts** in Hispanic Studies. (See the Graduate Catalogue.)

### BACHELOR OF ARTS IN HISPANIC STUDIES

#### Summary of Credits in Program

Faculty requirements	56
Departmental requirements	
Major area	32
Non-major area	24
Recommended electives	12
Free electives	<u>12</u>
<b>Total</b>	<b>136</b>

#### FIRST YEAR

##### First Semester

<b>*ESPA 3101</b>	
Basic Course in Spanish I	3
<b>*INGL 3---</b>	
First year course in English	3
<b>CIBI 3031</b>	
Intro. to the Biological Sciences I	3
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>*MATE 3171</b>	
Pre-Calculus I	3
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	16

##### Second Semester

<b>*ESPA 3102</b>	
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Basic Course in Spanish II	3
<b>*INGL 3---</b>	
First year course in English	3
<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	3
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>MATE 3---</b>	
**Recommended Course in Mathematics	3
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	16

#### SECOND YEAR

##### First Semester

<b>ESPA 3211</b>	
Intro. to Spanish Literature I	3
<b>INGL 3---</b>	
Second year course in English	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>LATI 3011</b>	
Elementary Latin	3
<b>HIST 3141</b>	
History of Spain	3
<b>FISI, QUIM or GEOL</b>	
Elective in Physics, Chemistry or Geology	<u>3</u>
	18

##### Second Semester

<b>ESPA 3212</b>	
Intro. to Spanish Literature II	3
<b>INGL 3---</b>	
Second year course in English	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>LATI 3012</b>	
Elementary Latin	3
<b>HIST 3142</b>	
History of Spain	3
<b>FISI, QUIM or GEOL</b>	
Elective in Physics, Chemistry or Geology	<u>3</u>
	18

#### THIRD YEAR

##### First Semester

<b>ESPA 4201</b>	
Intro. to Linguistics I	3
<b>ESPA 4221</b>	
Spanish-American Literature I	3

<b>ESPA 4251</b>	
The Golden Age	3
<b>HIST 3241</b>	
History of Puerto Rico	3
<b>ELECTIVE</b>	
Romance Language elective	3
<b>ESPA ----</b>	
Electives in Spanish	<u>3</u>
	18
<b>Second Semester</b>	
<b>ESPA 4202</b>	
Intro. to Linguistics II	3
<b>ESPA 4222</b>	
Spanish-American Literature II	3
<b>ESPA 4252</b>	
The Golden Age	3
<b>HIST 3242</b>	
History of Puerto Rico	3
<b>ELECTIVE</b>	
Romance Language Elective	3
<b>ESPA ----</b>	
Electives in Spanish	<u>3</u>
	18
<b>FOURTH YEAR</b>	
<b>First Semester</b>	
<b>ESPA 4011</b>	
Diachrony of the Spanish Language	3
<b>ESPA 4231</b>	
Puerto Rican Literature I	3
<b>ESPA 4491</b>	
Seminar	1
<b>ESPA ----</b>	
Electives in Spanish	3
<b>ELECTIVES</b>	
Electives	<u>6</u>
	16
<b>Second Semester</b>	
<b>ESPA 4012</b>	
The Spanish Language in America	3
<b>ESPA 4232</b>	
Puerto Rican Literature II	3
<b>ESPA 4492</b>	
Seminar	1
<b>ESPA ----</b>	
Elective in Spanish	3
<b>ELECTIVE</b>	
Electives	<u>6</u>
	16
<b>Total credits required: 136</b>	

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*To be chosen from the alternatives defined by the Department.

**DEPARTMENTAL FACULTY**

**ELSA R. ARROYO-VAZQUEZ**, *Professor*, Ph.D., 1989, Rutgers University. Research and Teaching Interests: Spanish American Literature with emphasis on Puerto Rico and the Caribbean, Literary Theory, studies of the Female Gender in Literature. Essay writer.

**AMARILIS CARRERO-PEÑA**, *Assistant Professor*, Ph.D., 2001, University of Puerto Rico, Mayagüez Campus. Research and Teaching Interests: Latin American Literature, Brazilian Literature, Spanish Literature (17th Century - Golden Age). Studies in short story, poetry and novel.

**AIDA L. CARRERO-VELEZ**, *Assistant Professor*, M.A., 1990, State University of New York at Albany. Research and Teaching Interests: Spanish American and Hispanic Caribbean Literatures. Short story, poetry.

**RAFAEL COLON-OLIVIERI**, *Professor*, Ph.D., 1990, New York University. Research and Teaching Interests: Puerto Rican Literature, Modernism. Poet.

**KATZMIN FELICIANO-CRUZ**, *Assistant Professor*, M.A., 1991, University of Puerto Rico. Research and Teaching Interests: Spanish Literature.

**ROBERTO FERNANDEZ-VALLEDOR**, *Professor*, Ph.D., 1986, University of Puerto Rico. Research and Teaching Interests: Spanish- American and Antillian Literature, Essay, Novel. Essay and Short Story Writer.

**MANUEL FIGUEROA-MELENDEZ**, *Associate Professor*, Ph.D., 1997, University of Puerto Rico. Research and Teaching Interests: Spanish Literature, Novel, Poetry, Love in Literature, Theatre. Poet.

**FRANCISCO GARCIA MORENO-BARCO**, *Professor*, Ph.D., 1992, Michigan State University. Research and Teaching Interests: Spanish Literature; Narrative and Writing.

**JACQUELINE GIRON-ALVARADO**, *Associate Professor*, Ph.D., 1993, The Pennsylvania State University. Research and Teaching Interests: Spanish American Poetry and Theater (20th Century). Puerto Rican Literature, Feminist Literature Criticism, Short Story writer, Poet, Literature Critic.

**MIRIAM GONZALEZ-HERNANDEZ**, *Associate Professor*, Ph.D., 1994, Florida State University. Research and Teaching Interests: Puerto Rican and Spanish American Literature, and Writing. Short story writer.

**MAGDA GRANELA-RODRIGUEZ**, *Professor*, Ph.D. 1987, University of Illinois, Urbana. Research and Teaching interests: Spanish American and Mexican Literature, Critical Theory of Literature, Novel, Writing.

**RAQUEL LLOREDA-DIAZ**, *Assistant Professor*, M.A., 1990, University of Puerto Rico. Research and Teaching Interests: Spanish American Literature.

**DORIS MARTINEZ-VIZCARRONDO**, *Assistant Professor*, Ph.D., 1998, Universidad Autónoma de Madrid. Research and Teaching Interests: Linguistics.

**ALFREDO MORALES-NIEVES**, *Professor*, Ph.D., 1987, University of California at Irvine. Research and Teaching Interests: Spanish American and Hispanic Caribbean Literature; XIX Century, Essay, Philosophy and Studies of Nationhood, Race, Gender in Literature, Writing. Poet and Short Story Writer.

**CATALINA OLIVER-PREFASI**, *Professor*, Ph.D., 1982, New York University, N.Y. Research and Teaching Interests: Spanish Literature (19th Century, 17th Century-Cervantes Novel-Theatre, Golden Age Drama).

**AMPARO ORTIZ-ACOSTA**, *Associate Professor*, Ph.D. 1989, University of Puerto Rico, Research and Teaching Interests: Hispanic Linguistics, syntax, writing.

**JULIA CRISTINA ORTIZ-LUGO**, *Professor*, Ph.D., 1989, Tulane University. Research and Teaching Interests: Spanish American and Puerto Rican Literature, Modernism, Oral Literature and Writing. Essay Writer.

**DAVID L. QUIÑONES-ROMAN**, *Professor*, Ph.D., 1988, University of Massachusetts at Amherst. Research and Teaching Interests: Spanish Literature (17th Century-Golden Age Fiction-Cervantes), Spanish Literature (Medieval Period), Spanish American Literature (from Colonial Period to Modernism), Poet.

**JOSEFINA RIVERA-DE ALVAREZ**, *Emeritus Professor*, Ph.D., 1954, Universidad Central de Madrid. Research and Teaching Interest: Puerto Rican Literature.

**VICTOR J. RIVERA-DIAZ**, *Associate Professor*, Ph.D., 1997, University of Illinois-Urbana. Research and Teaching Interests: Knowledge Presentation and Advertising, Memory Processes and Media, Communication and Mass Communication Theory, Business Communication, Journalism Writing.

**AURA N. ROMAN-LOPEZ**, *Professor*, Ph.D., 1981, Tulane University. Research and Teaching Interests: Spanish American Literature, Folklore. Poet.

**JORGE MA. RUSCALLEDA-BERCEDONIZ**, *Professor*, Ph.D., 1988, Universidad Nacional Autónoma de México. Research and Teaching Interests: Poetry, Novel, Essay, Spanish American and Puerto Rican Literature. Poet and Novelist.

**EVELYN SANABRIA-LUGO**, *Associate Professor*, M.A., 1972, University of Puerto Rico. Research and Teaching Interest: Spanish Literature.

**PATRICIA TRIGO-TIO**, *Associate Professor*, M.A., 1985, University of Puerto Rico, Mayagüez Campus. Research and Teaching Interests: Puerto Rican Literature and Spanish Grammar.

## COURSES OF INSTRUCTION

### DEPARTMENT OF HISPANIC STUDIES

#### UNDERGRADUATE COURSES

ESPA 0041-0042. SPANISH FOR BEGINNERS. No credit. Three hours of lecture per week.

A practical course in conversation for students whose native language is not Spanish, including the basic elements of the language, and the acquisition of a working vocabulary.

ESPA 3021. MASTERPIECES OF SPANISH AMERICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Study of masterpieces of Spanish American Literature from the sixteenth century to the nineteenth century, including examples of Puerto Rican literature.

ESPA 3022. MASTERPIECES OF SPANISH AMERICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Study of some of the outstanding works of Spanish American literature from the nineteenth century to the present, including examples of Puerto Rican literature.

ESPA 3101. BASIC COURSE IN SPANISH I. Three credit hours. Three hours of lecture per week.

Practice in the critical reading of literary texts, the writing and editing of narrative texts; effective oral communication in Spanish.

ESPA 3102. BASIC COURSE IN SPANISH II. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3101.

Practice in the critical reading of essays, poetry, and drama; the writing and editing of expository texts; effective oral communication in Spanish.

ESPA 3208. COMPOSITION. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Theory of grammar applied to the written language; comparison among languages of diverse literary genres; elements of semantic and stylistics.

ESPA 3211-3212. INTRODUCTION TO SPANISH LITERATURE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 3102.

Designed primarily to develop the student's literary appreciation and to initiate him or her in the study of Spanish literature, through the reading and explanation of the major literary works in the Spanish language from its beginning to the present.

ESPA 3215. EXPRESSION AND COMMUNICATION. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102 and students of Business Administration College.

Development of skills for efficient language use, both oral and written. Special attention will be given to written communication forms: letters, memoranda, summaries, reports, etc. The principles of logic and psychology basic to the efficient writing of these forms will be presented and intense practice in their preparation will be given.

ESPA 3295. SPANISH GRAMMAR. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

A study of phonetic, orthography, morphology and syntax. Emphasis on written and oral compositions.

ESPA 3305. CINEMA AND HISPANIC LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

A comparative analysis of literary and cinematic codes in Hispanic texts and the films based on them.

ESPA 3315. WOMEN AND WRITING IN HISPANIC AMERICA. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Identity, intimacy, and social struggle of Hispanic American women in representative texts written by women; diverse readings from a gender perspective.

ESPA 4007. FICTION IN PUERTO RICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

History and appreciation of the novel and short story in the literature of Puerto Rico from the 19th Century to the present. Text analysis, reports and lectures.

ESPA 4011. DIACHRONY OF THE SPANISH LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: (ESPA 4201 and ESPA 4202) or INGL 3225.

Phonological, morpho-syntactic and lexico-semantic evolution of the Spanish language from Latin.

ESPA 4012. THE SPANISH LANGUAGE IN HISPANIC AMERICA. Three credit hours. Three hours of lecture per week. Prerequisite: (ESPA 4201 and ESPA 4202) or INGL 3225.

Analysis of Hispanic American Spanish from the perspectives of linguistic geography, dialectology, and sociolinguistics.

ESPA 4021-4022. CERVANTES. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 3212.

Lectures on the works of Cervantes accompanied by critical analysis. Study of this writer's poetry, "entremeses", novels, with special emphasis on the *Novelas Ejemplares* and *Don Quijote*, and consideration of the importance and significance of these writings in the field of Hispanic letters.

ESPA 4051. SPANISH LITERATURE OF THE NINETEENTH CENTURY. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 3212.

Study of the currents of Romanticism, Post-romanticism and Realism in Spanish literature.

ESPA 4056. MODERNISM LITERATURE IN SPANISH AMERICA. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 4222.

Lectures with textual analysis of the principal poets and prose writers produced by "modernismo" in the various countries of Spanish America: José Martí, Salvador Díaz Mirón, Julián del Casal, José Asunción Silva, Rubén Darío, Leopoldo Lugones, Julio Herrera Reissig, Guillermo Valencia, Enrique Gómez Carrillo, Amado Nervo, Enrique González Martínez, Horacio Quiroga, María Vaz Ferreira, José Vasconcelos, etc.

ESPA 4061-4062. SPANISH POETRY. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 3212.

A study of Spanish poetry since its origins in the Middle Ages up to the present time. The tendencies, authors, and poems of all periods are considered.

ESPA 4071-4072. THE SHORT STORY IN SPANISH-AMERICA. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 3212.

Lectures with textual analysis of the Spanish-American short story, from its beginnings in the 19th Century until the present. Consideration of tendencies, movements or schools, and authors.

ESPA 4105. PUERTO RICAN POETRY. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Critical study of poetic expression in Puerto Rico. Discussion and analysis of texts which exemplify diverse stages, aesthetic concerns, and movements in Puerto Rican Poetry, from its origins to the present.

ESPA 4201. INTRODUCTION TO LINGUISTICS I. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Introduction to linguistic theory with special attention to the Spanish language. Main topics include: the nature of language; the relationship between human language and communication; the history of linguistic studies up to the beginning of the 20th century; 20th century schools that have concentrated on the study of morphology, syntax or both.

ESPA 4202. INTRODUCTION TO LINGUISTICS II. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

Introduction to linguistic theory with special attention to the Spanish language. Main topics include: 20th century schools that have concentrated on the study of phonology and semantics, the relationship between language and society, linguistic change, and language acquisition.

ESPA 4221-4222. SPANISH-AMERICAN LITERATURE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 3102.

Lecture accompanied by the reading of selected works.

ESPA 4231-4232. PUERTO RICAN LITERATURE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 3102.

Lectures accompanied by the reading of selected works.

ESPA 4251-4252. THE GOLDEN AGE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ESPA 3212.

The Spanish Renaissance, Humanism, Reformation and Counter Reformation, Mysticism and Asceticism; study of lyric and epic poetry, novel, prose, writings and the drama previous to Lope de Vega; Cervante's novel and Lope de Vega's dramas; Calderón, Tirso de Molina, etc. Lectures, reports, analysis of main works.

ESPA 4405. TECHNICAL AND SCIENTIFIC WRITING. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102 and eighteen (18) credits in major specialty.

Strategies for the production of professional documents for referential objectives; practice in the writing of technical and scientific reports, letters, proposals, and papers.

ESPA 4491-4492. SEMINAR. One credit hour per semester. Two hours of lecture per week each semester.

This course will train the student in preparing and classifying a bibliography, and will give him or her an introduction to methods and problems of research and literary criticism. Required of all students majoring in Hispanic Studies.



ESPA 4995. SPECIAL TOPICS I. One to three credit hours. One to three hours of lecture per week. Prerequisite: consent of the Director of the Department.

Specific aspects of language or literature not covered in the offerings of the Department. New research areas will be included.

ESPA 4996. SPECIAL TOPICS II. One to three credit hours. One to three hours of lecture per week. Prerequisite: consent of the Director of the Department.

Specific aspects of language or literature not covered in the offerings of the Department. New research areas will be included.

### **ADVANCED UNDERGRADUATE AND GRADUATE COURSES**

ESPA 5005. POETIC GENERATION OF 1927. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3212.

A critical and stylistic study of the Poetic Generation of 1927, considering the influence of earlier Spanish writers, and the impact of European "isms".

## **DEPARTMENT OF HUMANITIES**

The Department of Humanities became a separate department in 1968 upon the division of the former Department of English and Humanities. The first degree offered by the Department was the **Bachelor of Arts** in Comparative Literature. Since 1971, it has also offered degrees in the areas of: Plastic Arts, Theory of Art, Philosophy, and French Language and Literature. In addition to courses related to these areas, the Department regularly offers courses in: Asian culture, biblical studies, classical languages and literatures, German, Italian, Latin-American culture, music, and theatre, as well as a two-semester survey course in humanities, which is a requirement for many students at UPRM.

Department facilities include an art gallery, a specialized library and study room for our majors, two computer centers, one which includes an Interactive Francophone Laboratory, a theatre workshop and an interdisciplinary research center for practical and professional ethics and the philosophy of science and technology. The Department hopes to expand its art facilities in the near future.

The mission of the Humanities Department must be understood in the context of the overall mission of the University of Puerto Rico at Mayagüez. The Department teaches our students to appreciate human culture, diversity and to value knowledge. The Department of Humanities promotes research among its faculty, and it is a key instrument in the development of educational offerings and cultural activities conducive to the intellectual, aesthetic and moral formation of well-rounded human beings.

The Department is especially interested in advancing studies in the fields of philosophy, the fine arts, literature and languages. This Department understands that knowledge and awareness brought by the study and appreciation of the liberal arts can only provide a better understanding and appreciation of ourselves and our society. It pays special attention to the formation of its cadre of majors: future artists, intellectuals, creative leaders in various professions, teachers, professors, researchers, but it also looks upon itself as responsible for providing the higher education offerings and

services by which our citizenry in general may avail itself of what is most important and enriching in our cultural heritage. The Department also promotes the exploration of other cultures and societies in order to inspire in our students a global understanding of culture and the development of humanity.

**BACHELOR OF ARTS IN COMPARATIVE LITERATURE**

**Summary of Credits in Program**

Faculty requirements	56
Departmental requirements	
Major area	38
Non-major area	18
Recommended electives	12
Free electives	<u>12</u>
<b>Total</b>	<b>136</b>

**FIRST YEAR**

**First Semester**

<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>ITAL, FRAN or ALEM</b>	
Modern Language	
(First year course)	3
<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3101</b>	
Basic Course in Spanish	3
<b>*MATE 3171</b>	
Pre-Calculus I	3
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	16

**Second Semester**

<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>ITAL, FRAN or ALEM</b>	
Modern Language	
(First year course)	3
<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3102</b>	
Basic Course in Spanish	3
<b>**MATE, COMP or ESMA</b>	
Recommended Course in Mathematics	3
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	16

**SECOND YEAR**

**First Semester**

<b>LITE 3025</b>	
Literary Theory	3
<b>LITE 3041</b>	
Intro. to Comparative Literature	3
<b>ITAL, FRAN or ALEM</b>	
Modern Language	
(Second year course)	3
<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>ELECTIVE</b>	
Free Electives	<u>3</u>
	18

**Second Semester**

<b>LITE 3035</b>	
Mythology in Western Literature	3
<b>LITE 3042</b>	
Intro. to Comparative Literature	3
<b>ITAL, FRAN or ALEM</b>	
Modern Language	
(Second year course)	3
<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>ELECTIVE</b>	
Free Electives	<u>3</u>
	18

**THIRD YEAR**

**First Semester**

<b>LITE 4011</b>	
Evolution of the Novel	3
<b>LITE 4021</b>	
Comparative Drama	3
<b>FILO 3001</b>	
Intro. to Philosophy	3
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>FISI, QUIM or GEOL</b>	
Electives	3
<b>ELECTIVE</b>	
Free Electives	<u>3</u>
	18

**Second Semester**

<b>LITE 4012</b> Evolution of the Novel	3
<b>LITE 4022</b> Comparative Drama	3
<b>FILO 3002</b> Intro. to Philosophy	3
<b>CISO 3122</b> Intro. to the Study of the Social Sciences	3
<b>FISI, QUIM or GEOL</b> Electives	3
<b>ELECTIVE</b> Free Electives	<u>3</u>
	18

**FOURTH YEAR**

**First Semester**

<b>LITE 4051</b> Comparative Poetry	3
<b>LITE 4091</b> Comparative Literature Seminar	1
<b>LITE ----</b> Elective in Comparative Literature	3
<b>CIBI 3031</b> Intro. to the Biological Sciences I	3
<b>HIST ----</b> Elective in History	3
<b>ELECTIVE</b> Elective in a National Literature	<u>3</u>
	16

**Second Semester**

<b>LITE 4052</b> Comparative Poetry	3
<b>LITE 4092</b> Comparative Literature Seminar	1
<b>LITE ----</b> Elective in Comparative Literature	3
<b>CIBI 3032</b> Intro. to the Biological Sciences II	3
<b>HIST ----</b> Elective in History	3
<b>ELECTIVE</b> Elective in a National Literature	<u>3</u>
	16

**Total credits required: 136**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*MATE 3000, MATE 3172, COMP 3010, COMP 3057, ESMA 3015 or ESMA 3101.

**BACHELOR OF ARTS IN FRENCH LANGUAGE AND LITERATURE**

**Summary of Credits in Program**

Faculty requirements	56
Departmental requirements	
Major area	44
Non-major area	12
Recommended electives	6
Recommended electives in another language or literature	6
Free electives	<u>13</u>
Total	137

**FIRST YEAR**

**First Semester**

<b>FRAN 3141</b> French I	3
<b>HUMA 3111</b> Intro. to Western Culture I	3
<b>*INGL 3---</b> First year course in English	3
<b>*ESPA 3101</b> Basic Course in Spanish	3
<b>*MATE 3171</b> Pre-Calculus I	3
<b>EDFI ----</b> Course in Physical Education	<u>1</u>
	16

**Second Semester**

<b>FRAN 3142</b> French II	3
<b>HUMA 3112</b> Intro. to Western Culture II	3
<b>*INGL 3---</b> First year course in English	3
<b>*ESPA 3102</b> Basic Course in Spanish	3
<b>MATE, COMP or ESMA---</b> **Recommended Course in Mathematics	3
<b>EDFI----</b> Course in Physical Education	<u>1</u>
	16

**SECOND YEAR**

**First Semester**

<b>FRAN 3143</b> French III	3
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<b>FRAN 3060</b>	
French Phonetics	3
<b>LATI 3011</b>	
Elementary Latin	3
<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>ELECTIVE</b>	
Free Electives	<u>3</u>
	18

**Second Semester**

<b>FRAN 3144</b>	
French IV	3
<b>FRAN 3155</b>	
Conversation I	3
<b>LATI 3012</b>	
Elementary Latin	3
<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>ELECTIVE</b>	
Free Electives	<u>3</u>
	18

**THIRD YEAR**

**First Semester**

<b>FRAN 4181</b>	
French Literature to the Revolution	3
<b>FRAN 4115</b>	
French Composition	3
<b>FRAN 4151</b>	
French Culture & Civilization	3
<b>FILO 3001</b>	
Introduction to Philosophy	3
<b>FISI, QUIM or GEOL</b>	
Electives	3
<b>ELECTIVE</b>	
Free Electives	<u>3</u>
	18

**Second Semester**

<b>FRAN 4182</b>	
French Literature to the Revolution	3
<b>FRAN 4116</b>	
Conversation II	3
<b>FRAN 4152</b>	
French Culture & Civilization	3
<b>FILO 3002</b>	
Introduction to Philosophy	3
<b>FISI, QUIM or GEOL</b>	

Electives	3
<b>ELECTIVE</b>	
Free Electives	<u>3</u>
	18

**FOURTH YEAR**

**First Semester**

<b>FRAN 4191</b>	
French Literature since the Revolution	3
<b>FRAN 4221</b>	
French Seminar	1
<b>CIBI 3031</b>	
Intro. to the Biological Sciences I	3
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>ELECTIVE</b>	
Elective in another Language or Literature	3
<b>ELECTIVE</b>	
Free Elective	<u>1</u>
	17

**Second Semester**

<b>FRAN 4192</b>	
French Literature since the Revolution	3
<b>FRAN 4222</b>	
French Seminar	1
<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	3
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>ELECTIVE</b>	
Elective in another Language or Literature	<u>3</u>
	16

**Total credits required: 137**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*MATE 3000, MATE 3172, COMP 3010, COMP 3057, ESMA 3015, or ESMA 3101.

**BACHELOR OF ARTS IN PHILOSOPHY**

**Summary of Credits in Program**

Faculty requirements	56
Departmental requirements	
Major area	44

Non-major area	18
Recommended electives	3
Free electives	<u>19</u>
Total	140

**FIRST YEAR**

**First Semester**

<b>FILO 3001</b>	
Intro. to Philosophy	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	3
* <b>INGL 3---</b>	
First year course in English	3
* <b>ESPA 3101</b>	
Basic Course in Spanish	3
* <b>MATE 3171</b>	
Pre-Calculus I	3
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	<u>3</u>
	18

**Second Semester**

<b>FILO 3002</b>	
Intro. to Philosophy	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
* <b>INGL 3---</b>	
First year course in English	3
* <b>ESPA 3102</b>	
Basic Course in Spanish	3
* <b>MATE 3172</b>	
Pre-Calculus II	3
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	<u>3</u>
	18

**SECOND YEAR**

**First Semester**

<b>FILO 3157</b>	
Introduction to Logic	3
<b>FILO 3158</b>	
Ancient Philosophy	3
<b>FRAN 3141</b>	
French I	
or	
<b>ALEM 3041</b>	
German I	3
<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>FISI, QUIM or GEOL</b>	
Electives	<u>3</u>
	18

**Second Semester**

<b>FILO 3159</b>	
Medieval Philosophy	3
<b>FRAN 3142</b>	
French II	
or	
<b>ALEM 3042</b>	
German II	3
<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>HIST 3202</b>	
Modern World History II	
or	
<b>HIST 3195</b>	
History of the Ancient World	3
<b>FISI, QUIM or GEOL</b>	
Physics, Chemistry or Geology course	<u>3</u>
	18

**THIRD YEAR**

**First Semester**

<b>FILO 3155</b>	
Introduction to Ethics	3
<b>FILO 3165</b>	
Modern Philosophy	3
<b>FRAN 3143</b>	
French III	
or	
<b>ALEM 3043</b>	
German III	
or	
<b>GRIE 3011</b>	
Elementary Greek	
or	
<b>LATI 3011</b>	
Elementary Latin	3
<b>PSIC 3001</b>	
Principles of Psychology I	3
<b>CIBI 3031</b>	
Introduction to Biological Sciences I	3
<b>ELECTIVE</b>	
Free Electives	<u>3</u>
	18

**Second Semester**

<b>FILO 3166</b>	
Contemporary Philosophy	3
<b>FRAN 3144</b>	
French IV	
or	
<b>ALEM 3044</b>	
German IV	
or	

<b>GRIE 3012</b> Elementary Greek or <b>LATI 3012</b> Elementary Latin	3
<b>PSIC 3002</b> Principles of Psychology II	3
<b>CIBI 3032</b> Introduction to Biological Sciences II	3
<b>FILO 4041</b> Metaphysics I or <b>FILO 4146</b> Epistemology I	3
<b>ELECTIVE</b> Free Electives	<u>3</u> 18
<b>FOURTH YEAR</b>	
<b>First Semester</b>	
<b>FILO 4146</b> Epistemology I or <b>FILO 4041</b> Metaphysics I	3
<b>FILO 4161</b> Philosophy Seminar	1
<b>FILO ----</b> Third or fourth level course in Philosophy	3
<b>FILO 3167</b> Symbolic Logic I	3
<b>ELECTIVE</b> Free Electives	6
<b>EDFI ----</b> Basic Course in Physical Education	<u>1</u> 17
<b>Second Semester</b>	
<b>FILO ----</b> Third or fourth level course in Philosophy	3
<b>FILO ----</b> Elective in Philosophy	3
<b>FILO 4162</b> Philosophy Seminar	1
<b>ELECTIVES</b> Free Electives	7
<b>EDFI ----</b> Basic Course in Physical Education	<u>1</u> 15

**Total credits required: 140**

\*Refer to the Academic Regulations section for information on Advanced Placement.

**BACHELOR OF ARTS IN PLASTIC ARTS**

**Summary of Credits in Programs**

Faculty requirements	56
Departmental requirements	
Major area	46
Non-major area	18
Recommended electives	6
Free electives	<u>14</u>
Total	140

**FIRST YEAR**

**First Semester**

<b>HUMA 3111</b> Intro. to Western Culture I	3
<b>*INGL 3---</b> First year course in English	3
<b>*ESPA 3101</b> Basic Course in Spanish	3
<b>CISO 3121</b> Intro. to the Study of the Social Sciences	3
<b>*MATE 3171</b> Pre-Calculus I	3
<b>EDFI ----</b> Course in Physical Education	1
<b>ELECTIVE</b> Electives	<u>2</u> 18

**Second Semester**

<b>HUMA 3112</b> Intro. to Western Culture II	3
<b>*INGL 3---</b> First year course in English	3
<b>*ESPA 3102</b> Basic Course in Spanish	3
<b>CISO 3122</b> Intro. to the Study of the Social Sciences	3
<b>MATE, COMP or ESMA</b> **Recommended Courses	3
<b>EDFI ----</b> Physical Education	1
<b>ELECTIVE</b> Electives	<u>2</u> 18

**SECOND YEAR**

**First Semester**

<b>ARTE 3121</b> Painting and Drawing Workshop	3
<b>ARTE 3151</b> Fundamentals of Art Theory	3



<b>FRAN 3141</b> French I or <b>ITAL 3071</b> Italian I	3
<b>INGL 3---</b> Second year course in English	3
<b>ESPA 3---</b> Course above level of basic Spanish	3
<b>CIBI 3031</b> Intro. to the Biological Sciences I	<u>3</u>
	18

**Second Semester**

<b>ARTE 3122</b> Painting and Drawing Workshop	3
<b>ARTE 3152</b> Fundamentals of Art Theory	3
<b>FRAN 3142</b> French II or <b>ITAL 3072</b> Italian II	3
<b>INGL 3---</b> Second year course in English	3
<b>ESPA 3---</b> Course above level of basic Spanish	3
<b>CIBI 3032</b> Intro. to the Biological Sciences II	<u>3</u>
	18

**THIRD YEAR**

**First Semester**

<b>ARTE 4251</b> Graphic Arts Workshop	3
<b>ARTE 4271</b> Art History to the Renaissance	3
<b>ARTE ----</b> Elective in Art	3
<b>FRAN 3143</b> French III or <b>ITAL 3073</b> Italian III	3
<b>FILO 3001</b> Introduction to Philosophy	3
<b>FISI, QUIM or GEOL</b> Electives	<u>3</u>
	18

**Second Semester**

<b>ARTE 4252</b> Graphic Arts Workshop	3
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<b>ARTE 4272</b> Art History to the Renaissance	3
<b>ARTE ----</b> Elective in Art	3
<b>FRAN 3144</b> French IV or <b>ITAL 3074</b> Italian IV	3
<b>FILO 3002</b> Introduction to Philosophy	3
<b>FISI, QUIM or GEOL</b> Electives	<u>3</u>
	18

**FOURTH YEAR**

**First Semester**

<b>ARTE 4291</b> Sculpture and Modeling Workshop I	3
<b>ARTE 4259</b> Modern Art	3
<b>ARTE 4321</b> Art Seminar	2
<b>HIST ----</b> Elective in History	3
<b>ELECTIVE</b> Electives	<u>5</u>
	16

**Second Semester**

<b>ARTE 4292</b> Sculpture and Modeling Workshop II	3
<b>ARTE 4335</b> Modern Art	3
<b>ARTE 4322</b> Art Seminar	2
<b>HIST ----</b> Elective in History	3
<b>ELECTIVE</b> Electives	<u>5</u>
	16

**Total credits required: 140**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*MATE 3000, MATE 3172, COMP 3010, COMP 3057, ESMA 3015 or ESMA 3101.

**BACHELOR OF ARTS IN THEORY OF ART**

**Summary of Credits in Program**

Faculty requirements	56
Departmental requirements	
Major area	40
Non-major area	24
Recommended electives	6
Free electives	<u>14</u>
<b>Total</b>	<b>140</b>

**FIRST YEAR**

**First Semester**

<b>HUMA 3111</b>	
Intro. to Western Culture I	3
* <b>INGL 3---</b>	
First year course in English	3
* <b>ESPA 3101</b>	
Basic Course in Spanish	3
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	3
* <b>MATE 3171</b>	
Pre-Calculus I	3
<b>EDFI ----</b>	
Course in Physical Education	$\frac{1}{16}$

**Second Semester**

<b>HUMA 3112</b>	
Intro. to Western Culture II	3
* <b>INGL 3---</b>	
First year course in English	3
* <b>ESPA 3102</b>	
Basic Course in Spanish	3
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>MATE, COMP or ESMA----</b>	
**Recommended Courses	3
<b>EDFI ----</b>	
Course in Physical Education	$\frac{1}{16}$

**SECOND YEAR**

**First Semester**

<b>ARTE 3151</b>	
Fundamentals of Art Theory	3
<b>FRAN 3141</b>	
French I	
or	
<b>ITAL 3071</b>	
Italian I	3
<b>FILO 3001</b>	
Introduction to Philosophy	3

<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>CIBI 3031</b>	
Intro. to the Biological Sciences I	$\frac{3}{18}$

**Second Semester**

<b>ARTE 3152</b>	
Fundamentals of Art Theory	3
<b>FRAN 3142</b>	
French II	
or	
<b>ITAL 3072</b>	
Italian II	3
<b>FILO 3002</b>	
Introduction to Philosophy	3
<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	$\frac{3}{18}$

**THIRD YEAR**

**First Semester**

<b>ARTE 4271</b>	
Art History to the Renaissance	3
<b>FILO 4051</b>	
Principles of Aesthetics	3
<b>FRAN 3143</b>	
French III	
or	
<b>ITAL 3073</b>	
Italian III	3
<b>ARTE ----</b>	
Elective in Art	3
<b>HIST ----</b>	
Elective in History	3
<b>FISI, QUIM or GEOL</b>	
Electives	$\frac{3}{18}$

**Second Semester**

<b>ARTE 4272</b>	
Art History to the Renaissance	3
<b>FILO 4052</b>	
Contemporary Aesthetics	3
<b>FRAN 3144</b>	
French IV	
or	
<b>ITAL 3074</b>	
Italian IV	3

<b>ARTE ----</b>	
Elective in Art	3
<b>HIST ----</b>	
Elective in History	3
<b>FISI, QUIM or GEOL</b>	
Electives	<u>3</u>
	18

**FOURTH YEAR**

**First Semester**

<b>ARTE 4259</b>	
Modern Art	3
<b>ARTE 4311</b>	
Art Criticism	3
<b>ARTE 4321</b>	
Art Seminar	2
<b>ARTE ----</b>	
Electives in Art	3
<b>ELECTIVES</b>	
Electives	<u>7</u>
	18

**Second Semester**

<b>ARTE 4335</b>	
Modern Art	3
<b>ARTE 4312</b>	
Art Criticism	3
<b>ARTE 4322</b>	
Art Seminar	2
<b>ARTE ----</b>	
Electives in Art	3
<b>ELECTIVES</b>	
Electives	<u>7</u>
	18

**Total credits required: 140**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*MATE 3000, MATE 3172, COMP 3010, COMP 3057, ESMA 3015 or ESMA 3101.

**DEPARTMENTAL FACULTY**

**SANDRA APONTE-ORTIZ**, *Associate Professor*, M.A., 1984, Rosary College.

**CARMEN AROCA-RUBIO**, *Professor*, M.A., 1957, Conservatorio Profesional de Música y Escuela de Arte Dramático de Córdoba.

**SERENA ANDERLINID'ONOFRIO**, *Associate Professor*, Ph.D., 1987, University of California, Riverside.

**LUIS E. BACO-RODRIGUEZ**, *Professor*, Ph.D., 1974, Universidad de Navarra.

**ANDERSON BROWN**, *Associate Professor*, Ph.D., 1996, University of Colorado at Boulder.

**YVETTE CABRERA-VEGA**, *Associate Professor*, M.F.A., 1983, Pratt Institute.

**CARLOS A. CASABLANCA**, *Professor*, Ph.D., 1979, University of La Sorbonne.

**DANA L. COLLINS**, *Assistant Professor*, Ph.D., 1998, University of Arizona, Tucson, Arizona.

**EDWIN CORDERO**, *Associate Professor*, M.F.A., 1981, Pratts Institute.

**WADED CRUZADO**, *Professor*, Ph.D., 1990, University of Texas at Arlington.

**CARLOS FAJARDO**, *Assistant Professor*, M.F.A., 1977, Instituto Allende, México.

**JULIO FERNANDEZ**, *Professor*, M.A., 1958, Universidad de Salamanca.

**GERARDO FERRACANE**, *Professor*, Ph.D., 1968, University of Florence.

**WILLIAM J. FREY**, *Professor*, Ph.D., 1986, Southern Illinois University.

**EVELYN GARCIA**, *Professor*, M.F.A., 1975, Universidad Nacional Autónoma de México.

**LYDIA M. GONZALEZ**, *Associate Professor*, Ph.D. 1996, University of Texas at Austin.

**DANIELLE GUELY**, *Professor*, Ph.D., 1977, City University of New York.

**HECTOR JOSE HUYKE**, *Professor*, Ph.D., 1987, Columbia University.

**ANTHONY IZQUIERDO**, *Professor*, M.A., 1975, Middlebury College.

**ANA KOTHE**, *Associate Professor*, Ph.D., 1996, University of Maryland, College Park.

**ROSA FERNANDA MARTINEZ-CRUZADO**, *Professor*, Ph.D., 1982, University of J.W. Goethe, Frankfurt.

**ZULMA MIURA**, *Professor*, M.A., 1973, University of Chicago.

**CORA MONROE**, *Assistant Professor*, Ph.D., 1998, Yale University.

**ROBERTA ORLANDINI**, *Professor*, Ph.D., 1988, Drew University.

**ALFREDO ORTIZ**, *Associate Professor*, M.F.A., 1985, Pratt Institute.

**STEPHANNE PILLET**, *Assistant Professor*, Ph.D., 2001, University of Illinois, Urbana Champaign.

**LISSETTE ROLON-COLLAZO**, *Associate Professor*, Ph.D., 1997, University of Iowa.

**JAMES L. RUZICKA**, *Professor*, Ph.D., 1980, University of Sri Lanka at Peradeniya.

**HALLEY D. SANCHEZ**, *Professor*, Ph.D., 1974, Pennsylvania State University.

**JUAN J. SANCHEZ**, *Associate Professor*, Ph.D., 1989, Universidad de Murcia.

**FRANCES J. SANTIAGO-TORRES**, *Associate Professor*, Ph.D., 1998, The City University of New York-Graduate Center.

**ANAYRA SANTORY-JORGE**, *Associate Professor*, Ph.D., 1994, Indiana University, Bloomington.

**ROHIT SHARMA**, *Assistant Professor*, Ph.D., 2002, Purdue University, West Lafayette, Indiana.

**DOROTHY STEGMAN**, *Assistant Professor*, Ph.D., 1999, Indiana University, Bloomington.

**TEOFILO TORRES**, *Assistant Professor*, M.F.A., 1997, Brooklyn College, N.Y.

**ALBERTO TRALDI**, *Professor*, Ph.D., 1973, Columbia University.

**FELIX ZAPATA**, *Professor*, M.F.A., 1984, Rochester Institute of Technology.

## COURSES OF INSTRUCTION

### DEPARTMENT OF HUMANITIES

#### UNDERGRADUATE COURSES

##### ART

**ARTE 3007. ARTISTIC PHOTOGRAPHY.** Three credit hours. Six hours of workshop per week.

Introduction to photographic equipment, materials and processes, with emphasis on the theory and practice of artistic photography.

**ARTE 3055.** Three credit hours. Six hours of workshop per week.

Theory and practice of ancient and modern calligraphy.

**ARTE 3121. DRAWING.** Three credit hours. Six hours of workshop per week.

Introduction to materials, concepts, and techniques of artistic drawing.

**ARTE 3122. PAINTING.** Three credit hours. Six hours of workshop per week.

Introduction to materials, concepts, and techniques of painting.

**ARTE 3131. PERSPECTIVE IN ART.** Three credit hours. Six hours of workshop per week.

A historical, theoretical, and practical introduction to the study of perspective in art.

**ARTE 3132. COLOR.** Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 3121 or ARTE 3122.

A historical, theoretical, and practical introduction to the study of color in art.

**ARTE 3141-3142. DESIGN WORKSHOP.** Three credit hours per semester. Six hours workshop per week each semester.

A study of the fundamental principles and elements of design in the structure and composition of the several plastic arts.

**ARTE 3151. FUNDAMENTALS OF ART THEORY.** Three credit hours. Three hours of lecture per week.

Study of the basic structures of works of the fine arts and of the correspondences among them, with emphasis on the plastic arts.

**ARTE 3152. THEORETICAL BASES OF MODERN ART.** Three credit hours. Three hours of lecture per week.

Theoretical bases of the principal schools and modes of modern plastic arts.

**ARTE 3161-3162. STAINED GLASS WORKSHOP.** Three credit hours per semester. Six hours of workshop per week per semester.

Theory and practice in the artistic use of glass panels.

**ARTE 3200. STUDY OF THE HUMAN FIGURE.** Three credit hours. Six hours of workshop per week. Prerequisites: ARTE 3121 and consent of the Director of the Department.

Artistic study of the human figure including anatomy, proportion and movement.

ARTE 3210. PORTRAIT STUDY. Three credit hours. Six hours of workshop per week. Prerequisites: ARTE 3121 and ARTE 3122.

Introduction to the techniques of portraiture using several media such as charcoal, pencil and oils.

ARTE 3226. HISTORY OF ART IN PUERTO RICO. Three credit hours. Three hours of lecture per week.

History of art in Puerto Rico since the period of colonization to the present.

ARTE 3235. WATERCOLOR. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 3121.

Methods, materials, and techniques of watercolor.

ARTE 3276. ART APPRECIATION. Three credit hours. Three lectures per week.

A comparative study of the arts in modern times, with reference to the historic styles of major importance; analysis, evaluation, and personal interpretation of great works of art in architecture, painting, sculpture, the lesser arts and the graphic arts. Includes also a study of artistic development in Puerto Rican culture, and the valuable contributions of our artists to all phases of the island life.

ARTE 3279. EXPERIMENTATION WITH ART MATERIALS. Three credit hours. Six hours of workshop per week.

The exploration of techniques and materials in painting, sculpture, and the graphic arts.

ARTE 3531. COMPUTERS IN VISUAL ARTS I. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: MATE 3057 or COMP 3057 or consent of the Director of the Department.

The use of the computer as a medium and as a tool in the visual arts.

ARTE 3532. COMPUTERS IN THE VISUAL ARTS II. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: ARTE 3531.

Creation of digitized three-dimensional images; computer animation.

ARTE 4021. CERAMIC. Three credit hours. Six hours of workshop per week.

An introduction to the materials and techniques used in the art of ceramics.

ARTE 4022. POTTERY. Three credit hours. Six hours of workshop per week.

Basic techniques in pottery emphasizing the use of the potter's wheel.

ARTE 4025. ADVANCED CERAMICS. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 4021 or ARTE 4022.

Advanced study of modeling in clay, with emphasis on the commercial as well as the artistic aspects of ceramics.

ARTE 4123. ILLUSTRATION I. Three credit hours. Six hours of workshop per week. Prerequisites: (ARTE 3121 and ARTE 3142) or consent of the Director of the Department.

Illustration in sciences, in education, and in commercial and industrial publicity.

ARTE 4124. ILLUSTRATION II. Three credit hours. Six hours of workshop per week. Prerequisites: ARTE 4123 or consent of the Director of the Department.

Advanced study of illustration in the sciences, education, and commercial and industrial publicity.

ARTE 4251. PRINTMAKING I. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 3121.

Creative experimentation in two printmaking techniques: relief and lithography. Analysis and interpretation of masterworks in the history of printmaking.

ARTE 4252. PRINTMAKING II. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 4251.

Creative experimentation in two printmaking techniques: intaglio and screen-printing. Analysis and interpretation of masterworks in the history of printmaking.

ARTE 4259. HISTORY OF MODERN ART. Three credit hours. Three hours of lecture per week. Prerequisite: ARTE 4272 or consent of the Director of the Department.

History of modern art from Neoclassicism to Impressionism.

ARTE 4260. METAL ENGRAVING. Three credit hours. Six hours of workshop per week. Prerequisite: consent of the Director of the Department.

Knowledge and practice of the techniques of metal engraving: etching, aquatint, mezzotint, burin, dry point, and others.

ARTE 4271. HISTORY OF ART: PALEOLITHIC TO ROMAN. Three credit hours. Three hours of lecture per week. Prerequisite: HUMA 3112.

History of art from the Paleolithic age to the Roman period with emphasis on the cultures that flourished around the Mediterranean Sea.

ARTE 4272. HISTORY OF ART: EARLY CHRISTIAN TO BAROQUE. Three credit hours. Three hours of lecture per week. Prerequisite: ARTE 4271.

History of art from the Early Christian period to the Baroque with emphasis on the cultures of Europe.

ARTE 4281-4282. INTRODUCTION TO THE FINE ARTS IN LATIN AMERICA. Three credit hours per semester. Three lectures per week each semester. Prerequisite: HUMA 3402.

An examination of selected examples of painting, architecture, and sculpture from the pre-Colonial period to the present day.

ARTE 4291. ELEMENTARY SCULPTURE. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 3121.

Introduction to methods, materials, and tools of sculpture.

ARTE 4292. INTERMEDIATE SCULPTURE. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 4291.

Materials and forms in sculpture emphasizing the conceptual aspects of tridimensional art.

ARTE 4293. ADVANCED SCULPTURE. Three credit hours. Six hours of workshop per week. Prerequisite: ARTE 4292.

Advanced techniques and methods in sculpture emphasizing the development of artistic expression.

ARTE 4301-4302. INDUSTRIAL DESIGN. Three credit hours per semester. Six hours workshop per week each semester.

Introduction to the theory of the design and elaboration, esthetic as well as functional and structural, of prototypes of possible industrial products in both two and three dimensions.

ARTE 4311. ART CRITICISM I. Three credit hours. Three hours of lecture per week. Prerequisite: twelve credits in Arts.

Art criticism with emphasis on basic concepts and methodology.

ARTE 4312. ART CRITICISM II. Three credit hours. Three hours of lecture per week. Prerequisite: ARTE 4311.

Art criticism with emphasis on the history of criticism in architecture, sculpture, and painting from the time of the ancient Greeks to present.

ARTE 4321-4322. ART SEMINAR. Two credit hours per semester. Two lectures per week each semester. Eighteen credits in Art.

This course provides for work groups to study and analyze a selected theme in conjunction with a specialist selected for the purpose.

ARTE 4331. COMPARATIVE ARTS. Three credit hours per semester. Three hours of lecture per week each semester.

Detailed explanation of given trends in the different art forms. The course will center around the question: to what extent is it possible to find common denominators of a particular movement in different media?

ARTE 4332. COMPARATIVE ARTS. Three credit hours per semester. Three hours of lecture per week each semester.

Detailed explanation of given trends in the different art forms. The course will center around the question: to what extent is it possible to find common denominators of a particular movement in different media?

ARTE 4335. HISTORY OF CONTEMPORARY ART. Three credit hours. Three hours of lecture per week. Prerequisite: ARTE 4259 or consent of the Director of the Department.



History of contemporary art from “Art Nouveau” to present.

ARTE 4525. NORTHERN EUROPEAN PAINTING OF THE RENAISSANCE. Three credit hours. Three hours of lecture per week. Prerequisite: ARTE 4272.

The paintings of the Primitive Flemish, as well as the Dutch, French and German masters of the Renaissance.

ARTE 4535. ADVANCED PAINTING. Three credit hours. Two three-hour workshops periods per week. Prerequisites: ARTE 3121 or ARTE 3122.

Advanced techniques and methods in painting with emphasis on the development of individual expression.

ARTE 4995. SPECIAL TOPICS. One to three credit hours. One to three hours of seminar per week. Zero to six hours of workshop per week. Prerequisite: Consent of the Director of the Department.

Special seminars on a chosen theme in the fine arts, or in the history and theory of art.

ARTE 4996. SPECIAL TOPICS II. From one to three credit hours. From one to three hours of lecture or from two to six hours of workshop per week. Prerequisite: consent of the Director of the Department.

Selected topics in fine arts, plastic arts, art history or art theory.

### **FRENCH**

FRAN 3060. FRENCH PHONETICS. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3141.

A study of the sounds, intonation and rhythm of the French language, with intensive laboratory practice.

FRAN 3135. SUMMER STUDY PROGRAM IN PARIS. Three credit hours. Forty hours of lecture and ten hours of practice.

A 50-hour program of summer study at the University of Paris (Sorbonne). Intensive study of French language and culture.

FRAN 3141-3142. FRENCH I-II. Three credit hours per semester. Three hours of lecture per week each semester.

Thorough training in the fundamentals of French grammar and phonetics; exercises in composition. The direct method is used as much as possible.

FRAN 3143-3144. FRENCH III-IV. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: FRAN 3142.

Review of French grammar; study of French idioms and word groups; composition; intensive and extensive readings.

FRAN 3151. BUSINESS FRENCH I. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3143.

Basic French vocabulary and style used in business and commerce.

FRAN 3155. CONVERSATION I. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3141 or consent of the Director of the Department.

Intensive oral practice in the French language. The emphasis will be on contemporary colloquial French.

FRAN 4007. ADVANCED GRAMMAR. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144.

An advanced study of French grammar by means of translations from Spanish to French.

FRAN 4008. ADVANCED COMPOSITION. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 4115.

Intensive study of the techniques of composition, with emphasis on style and editing.

FRAN 4036. BUSINESS FRENCH II. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144 or FRAN 3151.

Advanced French vocabulary and style used in business and commerce. Emphasis on written and oral reports. Offered in French.

FRAN 4115. FRENCH COMPOSITION. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144.

A study of the techniques of composition, and of the most common French idiomatic expressions. Intensive grammar review.

FRAN 4116. CONVERSATION II. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3155.

A course in advanced French conversation, with emphasis on idiomatic expressions and common phrases, and applied grammar. Translations from Spanish to French.

FRAN 4141-4142. FRENCH POETRY. Three credit hours per semester. Three lectures per week each semester. Prerequisite: FRAN 3144.

Readings and interpretations of works of the most important French poets from the Middle Ages to the present; structural elements, versification, and styles. Given in French.

FRAN 4145. THE FRENCH NOVEL. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144.

Study of five to eight outstanding novels in French Literature from the Seventeenth to the Twentieth Century, with emphasis on narrative, structural, intertextual, and socio-cultural questions. Offered in French.

FRAN 4147. MODERN FRENCH LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144.

A survey of the French novel, the poetry, and the theatre of the Twentieth Century, focusing on outstanding works and major literary movements.

FRAN 4149. FRENCH POETRY. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144.

French poetry from its origins to the present, with emphasis on the Nineteenth and Twentieth Centuries; analysis of the poem as a verbal construct and as expression of the individual and a culture. Offered in French.

FRAN 4151-4152. FRENCH CULTURE AND CIVILIZATION. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisite: FRAN 3144.

Panoramic view of the development of French culture and civilization; its contribution to all aspects of European culture. Given in French.

FRAN 4181-4182. FRENCH LITERATURE TO THE REVOLUTION. Three credit hours. Three hours of lecture per week per semester. Prerequisite: FRAN 3144.

A study of selected works representative of the chief periods of French literature from the Middle Ages to the Revolution.

FRAN 4185. HISTORY OF THE FRENCH LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144 and FRAN 3060.

A study of the development of the French language from its origins to the 18th Century by means of medieval and Renaissance literary works. Emphasis on philology.

FRAN 4191. FRENCH LITERATURE SINCE THE REVOLUTION. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144.

A study of selected works representatives of the chief periods of French literature from the Revolution to the present.

FRAN 4192. FRENCH LITERATURE SINCE THE REVOLUTION. Three credit hours. Three hours of lecture per week. Prerequisite: FRAN 3144.

A study of selected works representative of the chief periods of French literature from the Revolution to the present.

FRAN 4236. UNDERGRADUATE RESEARCH I. One credit hour. Three hours of research per week. Prerequisite: twenty four (24) credits in French.

Techniques for research in French language, literature, and culture. All work will be in French.

FRAN 4237. UNDERGRADUATE RESEARCH II. One credit hour. Three hours of research per week. Prerequisite: FRAN 4236.

Writing and presentation of a research paper in French on a topic related to French language, literature, or culture.

FRAN 4995. SPECIAL TOPICS. One to three credit hours. One to three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Special topics in French language or culture.

FRAN 4996. SPECIAL TOPICS II. One to three credit hours. One to three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Special topics in French language, literature, or culture. Taught in French.

### **GERMAN**

ALEM 3041-3042. GERMAN I-II. Three credit hours per semester. Three hours of lecture per week each semester.

The principal grammatical elements of the German language, practice in its oral use, exercises in composition, vocabulary drill.

ALEM 3043-3044. GERMAN III-IV. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ALEM 3042.

Thorough review of grammar, advanced composition, readings from German authors.

ALEM 4001-4002. GERMAN LITERATURE. Three credit hours per semester. Three hours of lecture per week per semester Prerequisite: ALEM 3044.

A study of selected readings in the prose and poetry of the Nineteenth Century from Novalis to Storm and Hauptmann.

### **GREEK**

GRIE 3011-3012. ELEMENTARY GREEK. Three credit hours per semester. Three hours of lecture per week each semester.

Studies in the fundamentals of classical Greek; phonetics, grammar, and vocabulary. Readings in elementary texts.

### **HUMANITIES**

HUMA 3087. CLASSICS OF ITALIAN LITERATURE IN TRANSLATION. Three credit hours. Three hours of lecture per week.

Study of some of the major works of Italian literature using Spanish translations. The class will be held in Spanish.

HUMA 3111. INTRODUCTION TO WESTERN CULTURE I. Three credit hours. Three hours of lecture per week.

Critical reflection on the foundational aspects of Western culture from the diverse perspectives of humanistic disciplines such as art, history, literature, philosophy, and religious thought. Analysis of the most significant original works and texts from the Greek, Roman, Hebrew and Medieval cultures and their relation to the present.

HUMA 3112. INTRODUCTION TO WESTERN CULTURE II. Three credit hours. Three hours of lecture per week. Prerequisite: HUMA 3111.

Critical reflection on the foundational aspects of Western culture from the diverse perspectives of humanistic disciplines such as art, history, literature, philosophy, and religious thought. Analysis of the most significant original works and texts from the Renaissance to the present.

HUMA 3115. EUROPEAN STUDY TOUR. Three credit hours. Fifteen hours of lecture and one trip of one month duration.

A study of several aspects of European culture including visits to museums, monuments, and other places of cultural interest. Formal written work required.

HUMA 3271. THE BIBLE AS A LITERARY AND HISTORICAL DOCUMENT: THE OLD TESTAMENT. Three credit hours. Three hours of lecture per week.

A comparative study of the Old Testament, considering the fields of history, literature, and philosophy.

HUMA 3272. THE BIBLE AS A LITERARY AND HISTORICAL DOCUMENT; THE NEW TESTAMENT. Three credit hours. Three hours of lecture per week.

A comparative study of the New Testament, considering the fields of history, literature and philosophy.

HUMA 3401-3402. LATIN AMERICAN CIVILIZATION AND CULTURE. Three credit hours per semester. Three hours of lecture per week each semester.

A panoramic view of the life and culture of the Latin American people from pre-Colombian times to the present day, with special emphasis on achievements in art, literature, and philosophy, as well as inter-American cultural relations.

HUMA 3411. INTRODUCTION TO THE CULTURE OF SOUTH ASIA. Three credit hours. Three hours of lecture per week.

Study of the culture of South Asia, especially that of India with emphasis on its philosophy, religion, literature and art.

HUMA 3412. INTRODUCTION TO THE CULTURE OF EAST ASIA. Three credit hours. Three hours of lecture per week.

Study of the culture of East Asia, especially those of China and Japan with emphasis on their respective philosophies, religions, literature and arts.

HUMA 4995. SPECIAL TOPICS. One to three credit hours. One to three hours of seminar and/or two to six hours of workshop per week. Prerequisite: Consent of the Director of the Department.

Selected topics in Humanities.

HUMA 4996. SPECIAL TOPICS. One to three credit hours. One to three hours of lecture per week. Prerequisite: consent of the Director of the Department.

Selected topics in the humanities.

### ADVANCED UNDERGRADUATE AND GRADUATE COURSES

HUMA 5991 SPECIAL TOPICS IN HUMANITIES I. One to three credit hours. One to three hours of lecture per week. Prerequisite: consent of the Director of the Department.

Selected topics in the area of the humanities.

HUMA 5992. SPECIAL TOPICS IN HUMANITIES II. One to three credit hours. One to three hours of lecture per week. Prerequisite: consent of the Director of the Department.

Selected topics in the area of the humanities.

### ITALIAN

ITAL 3031. CONVERSATION AND CULTURE. Three credit hours. Three hours of lecture per week. Prerequisite: ITAL 3072.

The study of Italian culture and civilization from its beginnings to our time. By means of prepared oral discussion, the contributions of Italy towards the

development of western thought and science will be considered. Given in Italian.

ITAL 3032. CONVERSATION AND CULTURE. Three credit hours per semester. Three hours of lecture per week. Prerequisite: ITAL 3031.

The study of Italian culture and civilization from its beginnings to our time. By means of prepared oral discussion, the contributions of Italy towards the development of western thought and science will be considered. Given in Italian.

ITAL 3071-3072. ITALIAN I-II. Three credit hours per semester. Three hours of lecture per week each semester.

The fundamentals of the Italian language; both oral and written; readings in elementary texts, and conversation stressing the most common expressions.

ITAL 3073-3074. ITALIAN III-IV. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ITAL 3072 or its equivalent.

Review of grammar; composition, readings, and oral practice.

ITAL 3085. THE ITALIAN CINEMA. Three credit hours. Three hours of lecture per week.

Post-war Italian cinema as a form of art and as a medium for conveying human, social and political messages. Offered in Spanish.

ITAL 3090. SUMMER STUDY PROGRAM IN ITALY. Three credit hours. Ten hours of lecture per week, five practice periods per week, and one one-month trip to Italy.

Intensive study of Italian language and culture in Italy.

ITAL 4011-4012. ITALIAN LITERATURE I-II. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ITAL 3074.

Great works of Italian writers of the Nineteenth Century: Manzoni, Leopardi, Carducci, Foscolo, and others.

### JAPANESE

JAPO 3111. JAPANESE I. Three credit hours. Three hours of lecture per week.

Fundamentals of Japanese language and culture with an emphasis on spoken language.

JAPO 3112. JAPANESE II. Three credit hours. Three hours of lecture per week. Prerequisite: JAPO 3111 or JAPO 3101.

Fundamentals of Japanese language and culture with an emphasis on spoken language; introduction to the written language.

JAPO 3211. JAPANESE III. Three credit hours. Three hours of lecture per week. Prerequisite: JAPO 3112 or JAPO 3102.

Intermediate study of Japanese language and culture. Practice of katakana, hiragana, and Chinese characters.

JAPO 3212. JAPANESE IV. Three credit hours. Three hours of lecture per week. Prerequisite: JAPO 3211 or JAPO 3201.

Intermediate study of Japanese language and culture with an emphasis on reading and writing.

### **LATIN**

LATI 3011-3012. ELEMENTARY LATIN. Three credit hours per semester. Three hours of lecture per week each semester.

Fundamentals of Latin grammar; elementary readings.

LATI 3013-3014. INTERMEDIATE LATIN. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisite: LATI 3012.

Latin grammar and syntax; selected readings.

### **LITERATURE**

LITE 3005. LITERATURE APPRECIATION. Three credit hours. Three hours of lecture per week.

Literature as a means of communication and aesthetic expression with particular attention to the formal elements which differentiate literary from ordinary language. Literary analysis of texts through readings from Western and non-Western societies.

LITE 3025. LITERARY THEORY. Three credit hours. Three hours of lecture per week.

A study of the principal theories of literary genres from Aristotle to the present.

LITE 3035. MYTHOLOGY IN WESTERN LITERATURE. Three credit hours. Three hours of lecture per week.

A study of the fundamental mythological themes from the Greek, Roman, German and Celtic cultures, and their manifestations in Western literature.

LITE 3041-3042. INTRODUCTION TO COMPARATIVE LITERATURE. Three credit hours per semester. Three hours of lecture per week each semester.

A comparative study of the fundamental themes of Western literature expressed in the classical, romantic and realistic terms.

LITE 4011. EVOLUTION OF THE NOVEL I. Three credit hours per semester. Three hours of lecture per week.

Characteristics, main authors, and development of the genre of the novel from its beginnings to the 18<sup>th</sup> Century.

LITE 4012. EVOLUTION OF THE NOVEL II. Three credit hours. Three hours of lecture per week.

Characteristics, main authors, and development of the genre of the novel of Romanticism, Realism, and Naturalism and its transformation into the 20<sup>th</sup> century novel.

LITE 4021 COMPARATIVE DRAMA I. Three credit hours. Three hours of lecture per week.

Representative forms of Western drama and its major authors, from the Classical to the Middle Ages.

LITE 4022. COMPARATIVE DRAMA II. Three credit hours per semester. Three hours of lecture per week each semester.

Representative forms of Western drama and its major authors, from the Renaissance to the present.

LITE 4035. MEDIEVAL EUROPEAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: LITE 3025.

A study of the literary genres cultivated in medieval Europe: the epic, the lyric, miracle plays and morality plays.

LITE 4045. RENAISSANCE LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: LITE 3025.

Consideration of the historical and cultural significance of the Renaissance as seen in representative works of Erasmus, Montaigne, Rabelais and the Italian neo-Platonists and neo-Aristotelians.

LITE 4051-4052. COMPARATIVE POETRY. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: LITE 3025.

A study of the Western lyric in its most important phases and manifestations. Original texts in Spanish and English, and translations of Provencal, French, German, Italian and Portuguese will be used.

LITE 4075. LITERARY CRITICISM. Three credit hours. Three hours of lecture per week. Prerequisites: LITE 3041 or ESPA 3212 or ESPA 3022.

A study of literary criticism and its influence on the development of Western literature from the ancients to our time.

LITE 4081-4082. ROMANTICISM IN LITERATURE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: LITE 4022; two years of language.

Analysis of the European romantic movement by means of a comparative study of its several sources and literary expressions.

LITE 4091. UNDERGRADUATE RESEARCH I. One credit hour. Three hours of research per week. Prerequisites: Twenty four (24) credits in Comparative Literature.

Research, presentation, and discussion of a specific topic in comparative literature. A written proposal is required. This course is designed for honor students.

LITE 4093. UNDERGRADUATE RESEARCH II. Two credit hours. Two three-hour periods of research per week. Prerequisite: LITE 4091.

Application of research techniques to the writing of an undergraduate thesis on a topic previously selected in LITE 4091.

LITE 4115. CULTURAL PERSPECTIVES IN LITERATURE. Three credit hours. Three hours of lecture per week.

Cultural theory as manifested in the literary text: interrelationships among the social sciences, history, and literature.

LITE 4118. THE MODERN SHORT STORY. Three credit hours. Three hours of lecture per week.

Comparative study of the theories, themes, and formal characteristics of the short story as a modern narrative genre from its origins in the 19th century to the present in Europe and the Americas.

LITE 4990. SPECIAL TOPICS IN COMPARATIVE LITERATURE. One to three credit hours. One to three hours of lecture or seminar per week. Prerequisite: Consent of the Director of the Department.

Selected topics, authors, genres, or literary movements.

LITE 4996. WORKSHOP IN COMPARATIVE LITERATURE. One to three credit hours. One to three workshop periods per week of two hours each.

Workshop on topics related to comparative literature.

### ADVANCED UNDERGRADUATE AND GRADUATE COURSES

LITE /FILO 5001. LITERATURE AND PHILOSOPHY I. Three credit hours. Three hours of lecture per week .

Critical examination of the major philosophical theories of literary genres; analysis of the epistemological, metaphysical, and ethical meaning of literary texts from the ancient Greeks to the early Spanish Golden Age.

LITE/ FILO 5002. LITERATURE AND PHILOSOPHY II. Three credit hours. Three hours of lecture per week.

Critical examination of the major philosophical theories of literary genres; analysis of the epistemological, metaphysical, and ethical meaning



of literary texts from the end of the Spanish Golden Age to the present.

LITE 5035. THEORY OF THE NOVEL. Three credit hours. Three hours of lecture per week.

The development of the novel as a literary genre, emphasizing texts from the Baroque to the present; comparative analysis of narratology theories and representative novels.

LITE 5050. CONTEMPORARY LITERARY CRITICISM. Three credit hours. Three hours of lectures per week.

Principles and methodologies of contemporary schools of criticism; analysis of critics and texts from various literatures.

LITE 5057. MAGICAL REALISM. Three credit hours. Three hours of seminar per week. Prerequisite: Consent of the Director of the Department.

Magical realism in the context of world literature. Analysis of its distinguishing characteristics in the genre of fantasy through readings of its main authors, texts, and critics.

LITE 5615. THE SYMBOLIST MOVEMENT IN LITERATURE. Three credit hours. Three hours of lecture per week.

The development of the symbolist movement and its influence in Europe and in America, with special emphasis on poetry and the theater.

LITE 5715. METHODS IN THE STUDY OF LITERARY TEXTS. Three credit hours. Three hours of lecture per week.

Analysis of the most important methods used in the study of literary texts, from rhetoric's to structuralism, with emphasis on the techniques used in comparative literature.

LITE 5995. SPECIAL TOPICS IN COMPARATIVE LITERATURE I. One to three credit hours. One to three hours of lecture per week.

Critical analysis of authors, movements, genres, or interdisciplinary topics in comparative literature.

LITE 5996. SPECIAL TOPICS IN COMPARATIVE LITERATURE II. One to three credit hours. One to three hours of lectures per week. Prerequisite: Consent of the Director of the Department.

Critical analysis of authors, movements, genres, or interdisciplinary topics in comparative literature.

## **MUSIC**

MUSI 3135. MUSIC APPRECIATION. Three credit hours. Three hours of lecture per week.

Music as a source of aesthetic pleasure, with particular emphasis on its human, philosophical and historical aspects; formal elements and their constitutions; study of the musical forms of the fugue, sonata, concerto and symphony, and of the principal tendencies in music.

MUSI 3161-3162. HISTORY OF MUSIC. Three credit hours per semester. Three hours of lecture per week each semester.

The study of musical systems as a characteristic of great cultures; Western music from its beginning to the present; formal stylistic and technical development of music and its relation to other forms of thought and culture.

MUSI 3167. INTRODUCTION TO OPERA. Three credit hours. Three hours of lecture per week.

Study of the most significant operatic works of different periods, especially those which are in repertory.

MUSI 3171. FUNDAMENTALS OF MUSIC I. Three credit hours. Three hours of lecture per week.

An introduction to basic musical theory including: musical notation, basic harmony, auditory exercises, rhythmic and melodic dictation, analysis of minor forms, and melodic composition.

MUSI 3172. FUNDAMENTALS OF MUSIC II. Three credit hours. Three hours of lecture per week. Prerequisite: MUSI 3171.

An introduction to musical theory including: chromatic harmony, simple composition for four voices and melodic composition, auditory exercises, and an introduction to the larger musical forms.

MUSI 4995. SPECIAL TOPICS. One to three credit hours. One to three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Selected topics related to the study of music.

**PHILOSOPHY**

FILO 3001. INTRODUCTION TO PHILOSOPHY: MAJOR QUESTIONS. Three credit hours. Three hours of lecture per week.

An introduction to the major questions dealt with in philosophy, such as the nature of reality, the nature of knowledge, the nature of moral and ethical behavior, the nature and purpose of government.

FILO 3002. INTRODUCTION TO PHILOSOPHY: HISTORICAL APPROACH. Three credit hours. Three hours of lecture per week.

An introduction to the major figures in the history of philosophy: Plato, Aristotle, Aquinas, Descartes, Locke, Kant, Hegel, and others.

FILO 3155. INTRODUCTION TO ETHICS. Three credit hours. Three hours of lecture per week.

Fundamentals of moral evaluation in human conduct.

FILO 3156. MODERN AND CONTEMPORARY ETHICS. Three credit hours. Three hours of lecture per week.

Modern and contemporary ethical systems, with special emphasis on Puerto Rican moral thinkers.

FILO 3157. INTRODUCTION TO LOGIC. Three credit hours. Three hours of lecture per week.

Introduction to logical thinking. Syllogisms and elementary truth functions, methods such as Venn diagrams and truth tables used to solve elementary arguments, and the nature of induction.

FILO 3158. ANCIENT PHILOSOPHY. Three credit hours. Three hours of lecture per week.

History of philosophy from the Presocratics to Plotinus.

FILO 3159. MEDIEVAL PHILOSOPHY. Three credit hours. Three hours of lecture per week. Prerequisite: FILO 3001 or FILO 3002 or FILO 3158.

History of philosophy from Saint Augustine to Francisco Suárez.

FILO 3165. MODERN PHILOSOPHY. Three credit hours. Three hours of lecture per week.

Prerequisite: FILO 3001 or FILO 3002 or FILO 3158 or FILO 3159.

History of philosophy from the Renaissance to Immanuel Kant.

FILO 3166. CONTEMPORARY PHILOSOPHY. Three credit hours. Three hours of lecture per week. Prerequisite: FILO 3001 or FILO 3002 or FILO 3165.

History of philosophy of the nineteenth and twentieth centuries.

FILO 3167. SYMBOLIC LOGIC I. Three credit hours. Three hours of lecture per week.

The method of deduction for solving truth functions; quantification; laws of deduction extended to quantified propositions.

FILO 3168. PHILOSOPHY OF SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 3171 or FISI 3161 or FISI 3151 or FISI 3091 or CIFI 3012.

Introductory philosophical exposition of the development and the fundamental assumptions of the principal concepts and theories of science, particularly of modern physics.

FILO 3169. EXISTENTIALISM. Three credit hours. Three hours of lecture per week.

Fundamental categories of human existence according to Martin Heidegger, Jean-Paul Sartre, and others.

FILO 3175. PHILOSOPHY OF HISTORY. Three credit hours. Three hours of lecture per week.

Philosophical consideration of history as a human process; principal theories.

FILO 3178. BUSINESS ETHICS. Three credit hours. Three hours of lecture per week.

Introduction to business ethics, morality in production, marketing, advertising and labor relations. Analysis of these topics in national and multinational organizations from the perspective of the Western Philosophical ethical tradition.

FILO 4025. MEDICAL ETHICS. Three credit hours. Three hours of lecture per week.

Moral values involved in medical decisions, using

as a basis the fundamental ethical theories of the history of philosophy.

FILO 4027. BIOETHICS. Three credit hours. Three hours of lecture per week.

Moral problems related to biological research and technology.

FILO 4041. METAPHYSICS I. Three credit hours. Three hours of lecture per week. Prerequisite: FILO 3001 or FILO 3002 or FILO 3158.

The concepts of being, becoming, causality, essence, form and matter, quality, quantity, relation, time and space, as they emerge in ancient Greece and are integrated into Arabic and Christian thought.

FILO 4042. METAPHYSICS II. Three credit hours. Three hours of lecture per week. Prerequisite: FILO 4041.

Metaphysical thought after the Renaissance: rationalism, critical and absolute idealism, and Heideggerian existentialism.

FILO 4045. ETHICS IN ENGINEERING. Three credit hours. Three hours of lecture per week.

Ethical responsibilities of the professional engineer in relation to colleagues, employers, and society.

FILO 4051. PRINCIPLES OF AESTHETICS. Three credit hours. Three hours of lecture per week.

The aesthetic experience of nature and the work of art from the point of view of both the beholder and the artist.

FILO 4052. CONTEMPORARY AESTHETICS. Three credit hours. Three hours of lecture per week.

Contemporary aesthetic school: experimental, hedonistic, psychological, psychoanalytical, sociological, phenomenological, existentialist, and others.

FILO 4115. PHILOSOPHY OF RELIGION. Three credit hours. Three hours of lecture per week.

Critical reflection on the nature, function and value of religious experience in its cognitive and moral dimensions.

FILO 4125. PHILOSOPHY OF LAW. Three credit hours. Three hours of lecture per week.

Philosophical analysis of the main classical and contemporary theories of the nature and function of law.

FILO 4145. SYMBOLIC LOGIC II. Three credit hours. Three hours of lecture per week. Prerequisite: FILO 3167.

The logic of relations; deductive systems; theory of classes; philosophical bases of symbolic logic.

FILO 4146. CONTEMPORARY EPISTEMOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: FILO 3165. Corequisite: FILO 3166.

Current issues in epistemology; such as foundationalism versus coherence and internalism versus externalism. Recent writings of representative figures in the field.

FILO 4147. PHILOSOPHY OF PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Philosophical presuppositions of scientific inquiry in psychology.

FILO 4148. PHILOSOPHY OF MARXISM. Three credit hours. Three hours of lecture per week.

Philosophical foundations of Marxism emphasizing the thought of Marx and his followers, and the relation of dialectical materialism to mechanistic materialism, empiricism, and positivism.

FILO 4149. SPECIAL TOPICS. Three credit hours. Three hours of lecture per week. Prerequisite: Third or fourth year student of philosophy.

Monographic study of a specific theme in philosophy or of a major philosopher.

FILO 4155. ADVANCED ETHICS. Three credit hours. Three hours of lecture per week. Prerequisite: FILO 3155.

Comparative study of selected ethical theories.

FILO 4156. EPISTEMOLOGY AND SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisite: FILO 3165.

Epistemological analysis of the nature, structure, and ontological implications of scientific theories, including their roles in the scientific enterprise.

FILO 4157. PHENOMENOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: FILO 3166.

Theory and practice of phenomenology as a system and as a philosophical method, especially through the writings of Edmond Husserl.

FILO 4158. ANALYTIC PHILOSOPHY. Three credit hours. Three hours of lecture per week. Prerequisites: FILO 3165 and FILO 3166.

Analytic and linguistic philosophy of the Twentieth Century, including logical atomism, neopositivism, and linguistic analysis.

FILO 4159. PRAGMATISM. Three credit hours. Three hours of lecture per week. Prerequisites: FILO 3165 and FILO 3166.

Pragmatism as a method, a theory of knowledge, and a theory of values.

FILO 4160. PHILOSOPHY OF TECHNOLOGY. Three credit hours. Three hours of lecture per week.

Critical study of the nature and meaning of technology. Conceptual distinctions between science, technology, technique, engineering, and art, and the metaphysical, epistemological, and ethical presuppositions that inspire the diverse cultural interpretations of technology will be considered.

FILO 4161-4162. PHILOSOPHY SEMINAR. One credit hour per semester. One hour of lecture per week each semester. Prerequisite: Fourth year student of Philosophy.

Practice in methods of philosophical investigation.

FILO 4995. SPECIAL TOPICS IN PHILOSOPHY I. From one to three credit hours. From one to three hours of lecture per week. Prerequisite: consent of the Director of the Department.

Selected topics in philosophy.

FILO 4996. SPECIAL TOPICS IN PHILOSOPHY II. From one to three credit hours. From one to three hours of lecture per week. Prerequisite: consent of the Director of the Department.

Selected topics in philosophy.

### RUSSIAN

RUSO 3011-3012. ELEMENTARY RUSSIAN. Three credit hours per semester. Three hours of lecture per week per semester.

The principal grammatical elements of the Russian language, practice in its oral use, exercises in composition and vocabulary drill.

### THEATER

TEAT 3051-3052. INTRODUCTION TO THEATER ART. Three credit hours per semester. Three hours of lecture per week each semester.

A general course in the history, theory and techniques of the drama.

TEAT 3061-3062. SCENE DESIGN I-II. Three credit hours per semester. Three hours of lecture per week each semester.

A specific course in the fundamentals of scene design. Theory and practice in the technical aspects of construction, painting, and lighting design.

TEAT 3071-3072. STAGE CRAFT. Two credit hours per semester. One hour of lecture and two hours workshop per week each semester.

Theory and practice in the technical aspects of construction, rigging, mechanical scene changing, historical background of stage craft, and the use of new materials in the theater.

TEAT 3081-3082. ACTING I-II. Three credit hours per semester. One hour of lecture and four hours workshop per week each semester.

A study of acting through a historical background of works about famous actors. The workshop emphasizes vocal exercise, body movement, memorization and reader's theater.

TEAT 3091-3092. THEATER PRODUCTION I-II. Three credit hours per semester. One hour of lecture and four hours workshop per week each semester.

A workshop to acquaint the student with the principles of theater production. Procedures of production from the reading of the play to its performance, with emphasis on props, makeup, costuming and publicity.

TEAT 4011-4012. DIRECTING I-II. Three credit hours per semester. Two hours of lecture and two hours of workshops per week each semester. Prerequisite: TEAT 3052.

History and principles of stage directing.

## DEPARTMENT OF MARINE SCIENCES

The Department of Marine Sciences (DMS) is a graduate department offering instruction leading to a **Master's** degree and **Doctor of Philosophy** degree in Marine Sciences. Several advanced undergraduate courses are available as electives to qualified students. Information concerning courses offered at DMS is available here and in the Graduate School Catalogue.

The department had its origins in the Institute of Marine Biology, established at the Mayagüez Campus in 1954 to promote and conduct research in this discipline. With expansion of both its scope and its capabilities, the Institute grew to become the Department of Marine Sciences in 1968. A Ph.D. was initiated in 1972. The Department has continued to broaden and strengthen its academic activities and research. Currently, active research and instruction programs include the fields of physical, chemical and geological oceanography, marine biology, and aquaculture. The Department comprises 20 teaching faculty and 3 researchers.

Admission requirements include undergraduate preparation in a science discipline with a bachelor's degree and a minimum of 2.8 GPA. Students in the Department specialize in Biological, Chemical, Physical and Geological Oceanography. Through core courses in each of these basic disciplines, students acquire an overall understanding of marine sciences. Graduate students are required to write and defend a thesis.

Departmental administrative offices and a specialized DMS library are located at the Mayagüez campus. The field laboratories of the Department of Marine Sciences are situated at Magueyes Island, La Parguera on the southwest coast of Puerto Rico, approximately 38 kilometers from the main campus. The island, Isla Magueyes, is 18 acres in size and is separated from the mainland by a 50 meter-wide mangrove-lined channel. Isla Magueyes is embedded within a system of small and large coral reefs and mangrove islets which extend from the shore toward the edge of the insular shelf 8 kilometers seaward. In addition to mangrove and varied littoral environments, well-developed sea grass beds, deep-water algal plains, and deep and shallow coral reef habitats

are present in the laboratory's immediate surroundings. These environments contain a high diversity of plant, invertebrate and fish life. World famous "Bahía Fosforescente" with its nearly continuous bloom of luminescent dinoflagellates lies 3.5 kilometers to the east of the Department's field facility. By boat, the marine laboratory is within 5 to 30 minutes of each of these habitat types and within 40 minutes of deep-ocean beyond the reaches of the insular shelf.

In addition to classroom-laboratory facilities, the Magueyes facility has indoor and outdoor aquaria and tanks with running seawater which holding specimens and experimentation. The department maintains three important museums containing reference collections of fish, invertebrates, and algae. Under the direction of individual faculty, there are a number of modern, well-equipped laboratories capable of sophisticated research. A number of vessels provide access to the marine environment. These include the 127' ocean-going R/V Chapman; the R/V Pezmar, a 51' Thompson trawler; the R/V Gaviota, a converted trawler, a 35' Diesel Downeast and a number of smaller outboard motor boats. Research facilities for aquaculture include tow hatcheries, earthen ponds, concrete tanks and plastic pools.

The Department maintains considerable interaction with other science departments of the UPR system. It is also an active member of the national and international marine scientific community through its numerous contributions to scientific literature. During the past five years, teaching faculty of the Department has been awarded an average of \$11.5 million annually in externally funded grants.

#### DEPARTMENTAL FACULTY

**DALLAS E. ALSTON**, *Professor*, Ph.D. 1978, Auburn University. Research and Teaching Interests: Invertebrate Aquaculture.

**NILDA E. APONTE**, *Professor*, Ph.D. 1990, University of Puerto Rico, Mayagüez Campus. Research and Teaching Interests: Marine Botany; Taxonomy, Morphology and Life History of Marine Algae.

**RICHARD S. APPELDOORN**, *Professor*, Ph.D. 1980, University of Rhode Island. Research and Teaching Interests: Fisheries Biology.

**ROY ARMSTRONG**, *Associate Professor*, Ph.D. 1990, University of Puerto Rico. Research and Teaching Interests: Remote Sensing and Water Optics.

**DAVID L. BALLANTINE**, *Professor*, Ph.D. 1977, University of Puerto Rico, Mayagüez Campus. Research and Teaching Interests: Marine Botany; Taxonomy and Ecology of Marine Algae.

**JORGE E. CORREDOR**, *Professor*, Ph.D. 1978, University of Miami. Research and Teaching Interests: Chemical Oceanography, Pollution, Marine Chemistry.

**RICARDO CORTES-MALDONADO**, *Professor*, M.S. 1976, University of Puerto Rico, Mayagüez Campus. Research and Teaching Interest: Aquaculture.

**JORGE R. GARCIA-SAIS**, *Associate Researcher*, Ph.D. 1992, University of Rhode Island. Research and Teaching Interests: Zooplankton Ecology.

**DANNIE A. HENSLEY**, *Professor*, Ph.D. 1978, University of South Florida. Research and Teaching Interests: Ichthyology Systematics and Ecology of Fishes, Fish Biogeography.

**JOHN M. KUBARYK**, *Professor*, Ph.D. 1980, Auburn University. Research and Teaching Interests: Seafood Technology, Aquaculture.

**JOSE M. LOPEZ-DIAZ**, *Professor*, Ph.D. 1976, University of Texas. Research and Teaching Interests: Water Pollution Control, Marine Ecology.

**AURELIO MERCADO-IRIZARRY**, *Professor*, M.S. 1973, University of Miami. Research and Teaching Interests: Geophysical Fluid Dynamics, Physical Oceanography.

**JULIO MORELL**, *Associate Researcher*, M.S. 1983, University of Puerto Rico. Research Interests: Biochemistry and Environmental Chemistry.

**JACK MORELOCK**, *Professor*, Ph.D., 1967, Texas A&M University. Research and Teaching Interests: Sediments, Beach and Littoral Studies, Reef Sediments and Marine Terraces, Geophysical Surveys, Geological Oceanography.

**GOVIND NADATHUR**, *Associate Professor*, Ph.D., 1982, Gujarat University of India. Research and Teaching Interests: Microbiology, Genetics and Biotechnology of Marine Organisms.

**ERNESTO OTERO-MORALES**, *Assistant Researcher*, Ph.D., 1998, University of Georgia. Research Interests: Microbial Biogeochemistry, Microbial Ecology, Biogeochemistry.



**NIKOLAOS SCHIZAS**, *Associate Professor*, Ph.D., 1999, University of Chicago. Research and Teaching Interests: Evolution of Marine Invertebrates.

**THOMAS R. TOSTESON**, *Professor*, Ph.D., 1959, University of Pennsylvania. Research and Teaching Interests: Marine Physiology and Pharmacology.

**ERNESTO WEIL**, *Associate Professor*, Ph.D., 1992, University of Texas at Austin. Research and Teaching Interests: Coral Systematics, Ecology, and Evolution, Coral Reef Ecology.

**ERNEST H. WILLIAMS**, *Professor*, Ph.D., 1974, Auburn University. Research and Teaching Interests: Systematics and Culture of Parasites of Fishes.

**AMOS WINTER**, *Professor*, Ph.D., 1981, The Hebrew University of Jerusalem. Research and Teaching Interests: Paleogeography, Marine Geology.

**PAUL YOSHIOKA**, *Professor*, Ph.D., 1973, University of California, San Diego. Research and Teaching Interests: Marine Ecology, Marine Population dynamics.

**BAQAR R. ZAIDI**, *Researcher*, Ph.D., 1983, University of Puerto Rico, Mayagüez Campus. Research Interest: Marine Physiology, Microbial Ecology.

## **COURSES OF INSTRUCTION**

### **MARINE SCIENCES**

#### **ADVANCED UNDERGRADUATE COURSES**

**CIMA 5005. INTRODUCTION TO OCEANOGRAPHY.** Three credit hours. Three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Basic knowledge, techniques, and areas of interest of the different disciplines of marine sciences. The interaction and research aims in Physical, Geological, Chemical and Biological Oceanography.

**CMOB 5006. SEAFOOD PROCESSING.** Four credit hours. Three hours of lecture and one three-hour laboratory per week.

Techniques for processing seafood products and their effects on quality and consumer acceptance.

**CMOB 5007. FUNDAMENTALS OF AQUACULTURE.** Three credit hours. Three hours of lecture per week.

The culture of animals and plants in fresh, brackish, or saline water. Field trips required.

**CMOB 5015. FISHERIES BIOLOGY.** Three credit hours. Three hours of lecture per week.

A study of the principles and methods of fisheries investigation with emphasis on the fisheries of North America and the Caribbean. Field trips.

**CMOB 5016. PHYCOLOGY.** Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Fundamental study of algae in general, with reference to the main groups: Chlorophyta, Xantophyta, Cyanophyta, Phaeophyta, Rhodophyta. Study of biology, life histories, morphogenesis, ecology, evolution, taxonomy, and commercial or industrial uses of algae, and their importance in the bio-economics of the sea and other bodies of water. Intensive use will be made of audiovisual techniques, the herbarium, the laboratory, and field trips.

**CMOB 5017. MARINE ECOLOGY AND RESOURCE MANAGEMENT.** Five credit hours. Three hours of lecture and two three-hour laboratories per week. Prerequisite: Consent of the Director of the Department.

Description of the marine environment and familiarization with the major tropical marine communities; data-gathering and biological sampling techniques; human impact on the marine environment from the standpoint of pollution, exploitation, protection, and regulation; jurisprudence in major litigation involving marine resources; management practices.

**CMOB 5018. MARINE ECOLOGY.** Six credit hours. Ten hours of lecture and eighteen hours of laboratory per week during six weeks in the Summer.

A study of marine communities and their environment, with special consideration of ecosystems in the sea.

**CMOB 5035. ENDANGERED MARINE VERTEBRATES.** Two credit hours. Two three-hour periods of practice per week.

Biology, diseases, autopsy, and care of protected and endangered marine vertebrates. Field trips are required.

CMOB 5087. AQUACULTURE AND THE ENVIRONMENT. Three credit hours. Three hours of lecture per week.

Impact of aquaculture on the environment and the mitigation of its effects. Field trips required.

CMOF 5005. COASTAL STRUCTURES. Three credit hours. Three hours of lecture per week.

Types of coastal structures; their purpose, design, construction, and environmental impact.

## DEPARTMENT OF MATHEMATICS

The Department of Mathematics offers three programs leading to the **Bachelor of Science** degree: **Pure Mathematics**, **Computer Science**, and **Mathematics Education**. The Bachelor of Science degree in Mathematics provides a solid preparation for students, enabling them to follow careers in industry, in government, in the field of education or to pursue graduate studies.

Courses in Computer Science are frequently updated to keep pace with this rapidly changing field. Statistics is emerging as an important component of the Department and a growing number of courses in this field is available.

The Department of Mathematics also offers four programs leading to a **Master of Science** degree in Pure Mathematics, Applied Mathematics, Scientific Computing, and Statistics. The Department of Mathematics participates in an Interdisciplinary Program leading to a Ph.D. degree in Computing and Information Sciences and Engineering, with the Department of Electrical and Computer Engineering. For more details, see the Graduate Catalogue.

Advanced placement tests may be used to obtain credit for one or more of the following courses: MATE 3005, MATE 3171, MATE 3172, and MATE 3031. Refer to the section of this catalogue where your program is described to determine which courses are applicable.

The Department of Mathematics requires a minimum of C in all courses which are part of the student's major field of study. Further explanation of placement criteria and other important information is provided in the Academic Regulations section.

**Facilities:** The Department of Mathematics is located in the Monzón building. These facilities include 15 classrooms and 6 student computer laboratories. The department also has 35 offices in Monzón. All computer laboratories are connected to the internet and have access to Office Suite Programs (Microsoft Office and Sun Star Office) in addition to programs like C, C++, Java, Scheme, Prolog, Matlab, Matemática. The following laboratories are exclusively reserved for our majors:

- **Open UNIX laboratory** with 24 Sun Ray terminals, 1 Sun Ultra Spar 250 2CPU with 2GB of RAM and 2 36 GB HD, and one laser printer.
- **PC laboratory** with 16 PCs using Windows XP (P4 2.4 GHZ) and one laser printer.
- **Closed UNIX laboratory** with 32 networked Sun Blade 100 workstations with connection to the laser printer in the open UNIX laboratory. This room is used for teaching computer and mathematics courses.
- **Statistics/Computer Literacy Instructional Laboratory** with 23 PC (P3 and P4) with Windows XP and one laser printer.
- **Linux Laboratory** with 16 AMD Athlon 1800 connected to a Linux network with its own Linux server used for web programming including web base database.
- **Electronic Quizzes Laboratory** this laboratory has 40 PC for the electronic quizzes offered to students taking pre-calculus and calculus courses. This laboratory will be also used for the networking courses.

In addition, the Math Department houses the following equipment:

- SUN FireV880 for mail/web server with 2 Ultra Spar III processors 4 GB RAM 6/36 GB HD for professors and graduate students.
- Sun Ultra Enterprise 450 Server with four processors (mail server and 4 Gb RAM), for research and the Ph.D.'s students.
- Windows 2000 server 2CPU P3 Zeon 4 GB RAM 3 36 GB HD (all windows PC are connected to this server).
- Linux Server 2CPU P32 with 4GB of RAM and 4 36 GB HD (for Linux Laboratory).

**BACHELOR OF SCIENCE IN MATHEMATICS  
(Program: Pure Mathematics, General)**

**FIRST YEAR**

**First Semester**

<b>*MATE 3005</b> Pre-Calculus	5
<b>QUIM 3001</b> General Chemistry	4
<b>CIBI 3031</b> Intro. to the Biological Sciences I	3
<b>*ESPA 3101</b> Basic Course in Spanish	3
<b>*INGL 3---</b> First year course in English	<u>3</u>
	18

**Second Semester**

<b>MATE 3031</b> CALCULUS I	4
<b>QUIM 3002</b> General Chemistry	4
<b>CIBI 3032</b> Intro. to the Biological Sciences II	3
<b>*ESPA 3102</b> Basic Course in Spanish	3
<b>*INGL 3---</b> First year course in English	3
<b>EDFI ----</b> Course in Physical Education	<u>1</u>
	18

**SECOND YEAR**

**First Semester**

<b>MATE 3032</b> CALCULUS II	4
<b>COMP 3010</b> INTRODUCTION TO COMPUTER PROGRAMMING I	3
<b>ESPA 3---</b> Course above level of Basic Spanish	3
<b>INGL 3---</b> Second year course in English	3
<b>MATE 3020</b> INTRODUCTION TO THE FOUNDATIONS OF MATHEMATICAS	3
<b>EDFI ----</b> Course in Physical Education	<u>1</u>
	17

**Second Semester**

<b>MATE 3063</b>	
CALCULUS III	3
<b>FISI 3171</b>	
Physics I	4
<b>FISI 3173</b>	
Physics Laboratory I	1
<b>ESPA 3---</b>	
Course above level of Basic Spanish	3
<b>INGL 3---</b>	
Second year course in English	3
<b>MATE 4031</b>	
Intro. to Linear Algebra	<u>3</u>
	17

**THIRD YEAR**

**First Semester**

<b>MATE 4009</b>	
Ordinary Differential Equations	3
<b>MATE 4008</b>	
Introduction to Algebraic Structures	3
<b>MATE ----</b>	
**Requirements in Mathematics	3
<b>FISI 3172</b>	
Physics II	4
<b>FISI 3174</b>	
Physics Laboratory II	1
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	<u>3</u>
	17

**Second Semester**

<b>ESMA 4001</b>	
Mathematical Statistics I	3
<b>MATE ----</b>	
**Requirements in Mathematics	3
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>ELECTIVES</b>	
Recommended Electives	6
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	18

**FOURTH YEAR**

**First Semester**

<b>MATE 4051</b>	
Advanced Calculus I	3
<b>MATE 4000</b>	
Elements of Topology	3
<b>HUMA 3111</b>	

Intro. to Western Culture I	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>ELECTIVE</b>	
Free Elective	<u>6</u>
	18

**Second Semester**

<b>MATE 4052</b>	
Advanced Calculus II	3
<b>MATE 4010</b>	
Intro. to Complex Variables with Applications	3
<b>MATE 4050</b>	
Undergraduate Seminar	1
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	16

**Total credits required : 139**

\*Refer to the Academic Regulations section for information on Advanced Placement.  
 \*\*To be chosen from MATE 4071, MATE 4072, MATE 3040, MATE 4007 or ESMA 4002.

**BACHELOR OF SCIENCE IN MATHEMATICS**

**(Program: Mathematics Education)**

**FIRST YEAR**

**First Semester**

<b>*MATE 3005</b>	
Pre-Calculus	5
<b>QUIM 3001</b>	
General Chemistry	4
<b>CIBI 3031</b>	
Intro. to the Biological Sciences I	3
<b>*ESPA 3101</b>	
Basic Course in Spanish	3
<b>*INGL 3---</b>	
First year course in English	<u>3</u>
	18

**Second Semester**

<b>MATE 3031</b>	
CALCULUS I	4
<b>QUIM 3002</b>	
General Chemistry	4
<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	3
<b>*ESPA 3102</b>	
Basic Course in Spanish	3

<b>*INGL 3---</b> First year course in English	3
<b>EDFI ----</b> Course in Physical Education	$\frac{1}{18}$

**SECOND YEAR**

**First Semester**

<b>MATE 3032</b> CALCULUS II	4
<b>COMP 3010</b> Introduction to Computer Programming I	3
<b>MATE 3020</b> Intro. to the Foundations of Mathematics	3
<b>ESPA 3---</b> Course above level of Basic Spanish	3
<b>INGL 3---</b> Second year course in English	3
<b>EDFI ----</b> Course in Physical Education	$\frac{1}{17}$

**Second Semester**

<b>MATE 3063</b> CALCULUS III	3
<b>MATE 4031</b> Intro. to Linear Algebra	3
<b>MATE 3030</b> Intro. to Geometry	3
<b>ESPA 3---</b> Course above level of Basic Spanish	3
<b>INGL 3---</b> Second year course in English	3
<b>EDFU 3007</b> Social Foundations of Education	$\frac{3}{18}$

**THIRD YEAR**

**First Semester**

<b>MATE 4009</b> Ordinary Differential Equations	3
<b>MATE 4008</b> Introduction to Algebraic Structures	3
<b>FISI 3171</b> Physics I	4
<b>FISI 3173</b> Physics Laboratory I	1
<b>CISO 3121</b> Intro. to the Study of the Social Sciences	3

<b>EDFU 3001</b> Human Growth and Development	$\frac{3}{17}$
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**Second Semester**

<b>ESMA 4001</b> Mathematical Statistics I	3
<b>MATE 3040</b> Theory of Numbers	3
<b>FISI 3172</b> Physics II	4
<b>FISI 3174</b> Physics Laboratory II	1
<b>CISO 3122</b> Intro. to the Study of the Social Sciences	3
<b>EDFU 3002</b> Human Growth and Development	$\frac{3}{17}$

**FOURTH YEAR**

**First Semester**

<b>MATE 4023</b> Mathematics Education I	3
<b>EDFU 4019</b> Philosophical Foundations of Education	3
<b>EDPE 4145</b> Seminar on Curriculum and Student Teaching in the Secondary School	3
<b>HUMA 3111</b> Intro. to Western Culture I	3
<b>ELECTIVES</b> Free Electives	$\frac{6}{18}$

**Second Semester**

<b>MATE 4050</b> Undergraduate Seminar	1
<b>EDPE 4146</b> Theory, Methodology and Student Teaching in the Secondary School	6
<b>ELECTIVES</b> Free Electives	6
<b>HUMA 3112</b> Intro. to Western Culture II	$\frac{3}{16}$

Note: The courses EDFU 4025, EDES 4006, and DESC 3005, three credits in History of Puerto Rico, and three credits in History of the United States are also required to obtain a teacher's license from the Puerto Rico Department of Education.

**Total credits required: 139**

\*Refer to the Academic Regulations section for information on Advanced Placement.

**BACHELOR OF SCIENCE IN MATHEMATICS**

**(Program: Computer Science)**

**FIRST YEAR**

**First Semester**

<b>*MATE 3005</b> Pre-Calculus	5
<b>QUIM 3001</b> General Chemistry	4
<b>CIBI 3031</b> Intro. to the Biological Sciences I	3
<b>*ESPA 3101</b> Basic Course in Spanish	3
<b>*INGL 3---</b> First year course in English	<u>3</u> 18

**Second Semester**

<b>MATE 3031</b> CALCULUS I	4
<b>QUIM 3002</b> General Chemistry	4
<b>CIBI 3032</b> Intro. to the Biological Sciences II	3
<b>*ESPA 3102</b> Basic Course in Spanish	3
<b>*INGL 3---</b> First year course in English	3
<b>EDFI ----</b> Course in Physical Education	<u>1</u> 18

**SECOND YEAR**

**First Semester**

<b>MATE 3032</b> CALCULUS II	4
<b>MATE 3020</b> Intro. to the Foundations of Mathematics.	3
<b>COMP 3010</b> Intro. to Computer Programming I	3
<b>ESPA 3---</b> Course above level of Basic Spanish	3
<b>INGL 3---</b> Second year course in English	3
<b>EDFI ----</b> Course in Physical Education	<u>1</u> 17

**Second Semester**

<b>MATE 3063</b> Calculus III	3
<b>MATE 4031</b> Intro. to Linear Algebra	3
<b>COMP 3110</b> INTRODUCTION TO COMPUTERS II	3
<b>ESPA 3---</b> Course above level of Basic Spanish	3
<b>INGL 3---</b> Second year course in English	3
<b>ELECTIVE</b> Free Elective	<u>3</u> 18

**THIRD YEAR**

**First Semester**

<b>MATE 4009</b> ORDINARY DIFFERENTIAL EQUATIONS	3
<b>MATE 4008</b> INTRODUCTION TO ALGEBRAIC STRUCTURES	3
<b>COMP 3075</b> INTRODUCTION TO DATA STRUCTURES	3
<b>FISI 3171</b> Physics I	4
<b>FISI 3173</b> Physics Laboratory I	1
<b>CISO 3121</b> Intro. to the Study of the Social Sciences	<u>3</u> 17

**Second Semester**

<b>ESMA 4001</b> MATHEMATICAL STATISTICS I	3
<b>COMP 3029</b> PROGRAMMING LANGUAGES	3
<b>FISI 3172</b> Physics II	4
<b>FISI 3174</b> Physics Laboratory II	1
<b>CISO 3122</b> Intro. to the Study of the Social Sciences	3
<b>ELECTIVE</b> Recommended Elective	<u>3</u> 17



**FOURTH YEAR**

**First Semester**

<b>COMP 4016</b>	
ASSEMBLY LANGUAGE PROGRAMMING	3
<b>MATE 4061</b>	
NUMERICAL ANALYSIS I	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>ELECTIVE</b>	
Recommended Elective	6
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	18

**Second Semester**

<b>COMP 4006</b>	
SYSTEMS ORGANIZATION AND PROGRAMMING	3
<b>MATE 4050</b>	
UNDERGRADUATE SEMINAR	1
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>ELECTIVE</b>	
Free Elective	<u>6</u>
	16

**Program courses in CAP letters.**

**Total credits required for program: 139**

\*Refer to the Academic Regulations section for information on Advanced Placement.

**DEPARTMENTAL FACULTY**

**ROBERT ACAR**, *Associate Professor*, Ph.D., 1987, University of Wisconsin-Madison.

**EDGAR ACUÑA-FERNANDEZ**, *Professor*, Ph.D., 1989, University of Rochester.

**LUISA ANDINO-MORENO**, *Professor*, M.S., 1984, University of Puerto Rico.

**JULIO E. BARETY-MACHIN**, *Professor*, Ph.D., 1972, University of New Mexico.

**ALVARO BOLAÑO-DE LA HOZ**, *Associate Professor*, Ph.D., 1988, University of Montana-Missoula.

**DOROTHY BOLLMAN**, *Professor*, Ph.D., 1964, University of Illinois, Urbana.

**LUIS F. CACERES-DUQUE**, *Associate Professor*, Ph.D., 1998, University of Iowa.

**GABRIELE CASTELLINI**, *Professor*, Ph.D., 1986, Kansas State University.

**DENNIS G. COLLINS**, *Professor*, Ph.D., 1975, Illinois Institute of Technology.

**ELISEO CRUZ-MEDINA**, *Professor*, Ph.D., 1963, Universidad Central Marta Abreu, Cuba, D.A., 1983, University of Miami.

**LAURA R. CUEBAS-HONORE**, *Professor*, M.S., 1961, University of Puerto Rico.

**GLADYS DI CRISTINA-YUMET**, *Associate Professor*, M.S., 1980, University of Puerto Rico.

**WIESLAW DZIOWIAK**, *Professor*, Ph.D., 1982, Wroclaw University, Poland.

**ENRIQUE GALLO-ZELEDON**, *Associate Professor*, M.S., 1967, University of Puerto Rico, M.S.I.E., 1976, University of California, Berkeley.

**ERIC GAMESS**, *Assistant Professor*, Ph.D., 2000, Universidad Central de Venezuela.

**ANA C. GONZALEZ-RIOS**, *Associate Professor*, M.S., 1988, University of Puerto Rico at Mayagüez.

**HAEDEH GOORANSARAB**, *Associate Professor*, Ph.D., 1997, Purdue University.

**DARRELL W. HAJEK**, *Professor*, Ph.D., 1971, University of Florida.

**CESAR HERRERA-ARIAS**, *Assistant Professor*, M.S., 1985, Ohio State University.

**IVETTE IRIZARRY-SANTOS**, *Associate Professor*, M.S., 1978, University of Puerto Rico.

**MIGUEL L. LAPLAZA**, *Professor*, Ph.D., 1965, Universidad de Madrid, España.

**EDGARDO LORENZO-GONZALEZ**, *Assistant Professor*, Ph.D., 2002 Wichita State University.

**RAFAEL MARTINEZ-PLANELL**, *Professor*, Ph.D., 1983, Michigan State University.

**DANIEL McGEE**, *Associate Professor*, Ph.D., 1994, University of Arizona.

**DEBORAH A. MOORE**, *Associate Professor*, Ph.D., 1995, The University of Oklahoma.

**LOURDES MORERA-BERMEDEZ**, *Professor*, M.S., 1974, Rensselaer Polytechnic Institute.

**BHALCHANDRA C. OLTIKAR**, *Professor*, Ph.D., 1977, Carleton University, Canada.

**ARTURO PORTNOY**, *Associate Professor*, Ph.D., 1997, Rensselaer Polytechnic Institute.

**JULIO C. QUINTANA-DIAZ**, *Professor*, Ph.D., 1996, University of Wales at Aberystwyth, United Kingdom.

**WILFREDO QUIÑONES-ECHEVARRIA**, *Professor*, Ph.D., 1986, University of Massachusetts.

**BETTY RAMIREZ-NIEVES**, *Professor*, Ph.D., 1990, Universidad Politécnica de Madrid, España.

**PABLO RODRIGUEZ-ROSADO**, *Professor*, M.S., 1963, University of Puerto Rico.

**YURI A. ROJAS-RAMIREZ**, *Associate Professor*, M.A., 1985, University of Maryland, Maryland.

**WOLFGANG ROLKE**, *Professor*, Ph.D., 1992, University of Southern California.

**KRZYSZTOF ROZGA**, *Professor*, Ph.D., 1976, University of Warsaw, Poland.

**TOKUJI SAITO**, *Professor*, Ph.D., 1985, Texas A&M University, Texas.

**HECTOR SALAS-OLAGUER**, *Professor*, Ph.D., 1983, University of Iowa.

**FREDDIE SANTIAGO-HERNANDEZ**, *Professor*, Ph.D., 1988, State University of New York at Stony Brook, New York.

**ROBERT W. SMITH**, *Professor*, Ph.D., 1979, University of Florida.

**LEV STEINBERG**, *Professor*, 1988, Ph.D., Institute for Mathematics and Mechanics of Academy of Sciences, Alma, USSR.

**NILSA I. TORO-RAMOS**, *Associate Professor*, M.S., 1983, University of Puerto Rico.

**PEDRO M. VASQUEZ-URBANO**, *Associate Professor*, D.Sc., 1997, The George Washington University.

**JULIO VIDAURAZAGA**, *Associate Professor*, Ph.D., 1982, Suny at Stony Brook, N.Y.

**UROYOAN R. WALKER-RAMOS**, *Assistant Professor*, Ph.D. 2001, Louisiana State University.

**PAUL K. WAYLAND**, *Professor*, Ph.D., 1979, Louisiana State University

## COURSES OF INSTRUCTION

### DEPARTMENT OF MATHEMATICS

#### UNDERGRADUATE COURSES

**MATE 3000. FINITE MATHEMATICS.** Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3171 or MATE 3173.

Counting techniques, probability, matrix algebra, linear programming, and systems of linear equations.

**MATE 3005. PRE-CALCULUS.** Five credit hours. Five hours of lecture per week.

A preparatory course for calculus including topics in relations, functions, complex numbers, linear algebra, trigonometry and analytic geometry.

**MATE 3020. INTRODUCTION TO THE FOUNDATIONS OF MATHEMATICS.** Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3031 or MATE 3183 or MATE 3144 or Consent of the Director of the Department.

An introductory course in set theory and logic. Topics include the propositional calculus and set algebra, finite and infinite sets, well-ordered sets, transfinite arithmetic, Peano's axioms, and development of the real number system.

**MATE 3021. CALCULUS FOR BIOLOGICAL SCIENCES I.** Three credit hour. Three hours of lecture per week. Prerequisite: MATE 3172.

A basic course in differential and integral calculus of one real variable with applications.

**MATE 3022. CALCULUS FOR BIOLOGICAL SCIENCES II.** Three credit hour. Three hours of lecture per week. Prerequisite: MATE 3021.

Integration techniques, topics in probability, functions of several variables, introduction to differential equations, and applications.

**MATE 3030. INTRODUCTION TO GEOMETRY.** Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3032 or MATE 3184.

Brief review of Euclidean geometry, geometric constructions, similarity of figures, geometry of the triangle and of the circle, foundations of axiomatic

geometry, and elements of non-Euclidean geometry.

MATE 3031. CALCULUS I. Four credit hours. Four hours of lecture per week. Prerequisite: MATE 3005 or MATE 3143 or MATE 3172 or MATE 3174.

Elementary differential and integral calculus of one real variable with applications.

MATE 3032. CALCULUS II. Four credit hours. Four hours of lecture per week. Prerequisite: MATE 3031 or MATE 3183 or MATE 3144.

Integration techniques, infinite series, vectors, polar coordinates, vector functions, and quadric surfaces; applications.

MATE 3040. THEORY OF NUMBERS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3032 or MATE 3184.

Divisibility, number systems, Euclid's algorithm, factorization, the distribution of primes, perfect numbers and related topics, Euler's function, indeterminate problems, diophantine problems and congruences.

MATE 3048. MATHEMATICAL ANALYSIS. Four credit hours. Four hours of lecture per week. Prerequisite: MATE 3032 or MATE 3184. Co-requisite: MATE 3010 or COMP 3010 or INGE 3016.

Theory and application of functions of several variables, vector calculus, first order differential equations, linear differential equations, the Laplace transform and numerical methods for solving or approximating solutions of differential equations.

MATE 3049. MATHEMATICAL ANALYSIS FOR MANAGEMENT SCIENCES. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3000 or MATE 3172 or MATE 3174.

Exponential functions and logarithms, the concepts of limit and continuity, differential and integral calculus of one variable, and functions of two variables with applications.

MATE 3063. CALCULUS III. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3032 or MATE 3184.

Differential and integral calculus of several variables, and an introduction to differential equations with applications.

MATE 3086. MATHEMATICAL REASONING. Three credit hours. Three hours of lecture per week.

Strategies and techniques of mathematics used in diverse areas of human endeavor: problem-solving; linear equations in one variable; proportion; linear systems of equations in two variables; basic concepts of statistics; graphical representation of data; the mathematics of finance.

MATE 3143. CALCULUS WITH PRECALCULUS I. Five credit hours. Five hours of lecture per week.

Introduction to the concepts of calculus of one variable with a simultaneous exposition of relevant pre-calculus topics.

MATE 3144. CALCULUS WITH PRECALCULUS II. Four credit hours. Four hours of lecture per week. Prerequisite: MATE 3143.

Techniques and applications of the differential and integral calculus with a simultaneous exposition of relevant pre-calculus topics.

MATE 3171. PRECALCULUS I. Three credit hours. Three hours of lecture per week. Prerequisite: placement by examination.

Properties and operations of real numbers; equations and inequalities; Cartesian coordinates and graphs; algebraic, exponential, and logarithmic functions and their graphs; trigonometry of right triangles.

MATE 3172. PRECALCULUS II. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3171 or MATE 3173.

Analytic trigonometry; complex numbers; the fundamental theorem of algebra; conic sections; systems of equations; matrices operations; sequences; and mathematical induction.

MATE 3181. DISCRETE MATHEMATICS I. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3031.

Sets, relations, and notation; algorithms; logic; graphs; trees.

MATE 3182. DISCRETE MATHEMATICS II. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3181.

Combinatorics, difference equations, relations, Boolean algebra, computational models.

MATE 4000. ELEMENTS OF TOPOLOGY. Three credit hours. Three hours of lecture per week. Co-requisite: MATE 4008

Introduction to topology including topological spaces, continuous functions and homeomorphisms, metric spaces, compact spaces, connected spaces, separation axioms, and elements of homotopy.

MATE 4003-4004. MATHEMATICS PRACTICE FOR COOP STUDENTS I-II. Three credit hours per semester. Prerequisite: Consent of the Director of the Department.

Practical experience in mathematics in cooperation with private industry or government, to be jointly supervised by the academic department, the COOP Program Coordinator, and an official from the COOP organization. A report will be required of the student and the official at the end of the semester.

MATE 4007. HIGHER GEOMETRY. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3063 or MATE 3185.

Coordinate systems in Euclidean 3-space, basic configurations, vectors and geometry of n-space, transformations, introduction to projective geometry, axioms of non-Euclidean geometries.

MATE 4008. INTRODUCTION TO ALGEBRAIC STRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3020.

Introduction to algebraic systems; sets, semigroups, groups, rings, fields.

MATE 4009. ORDINARY DIFFERENTIAL EQUATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3063 or MATE 3185.

Ordinary differential equations with applications: basic existence theorem, linear systems, the Laplace transform, series solutions, introduction to Fourier series and orthogonal functions.

MATE 4010. INTRODUCTION TO COMPLEX VARIABLES WITH APPLICATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3063 or MATE 3185.

Course designed for students who desire a working knowledge of complex variables. Topics to be covered include analytic functions, singularities,

residues, complex integration, power series, conformal mapping.

MATE 4020. PARTIAL DIFFERENTIAL EQUATIONS AND FOURIER SERIES. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 4009.

Separation of variables in the solution of partial differential equations, orthogonal expansions, Fourier series in certain function spaces, and an introduction to boundary value problems.

MATE 4021. FUNDAMENTALS OF MATHEMATICAL LOGIC. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3020 or Consent of the Director of the Department.

An introductory course to the fundamental problems of logic, such as variables, the sentential calculus, the theory of identity, the theory of classes, the theory of relations, and the deductive method.

MATE 4023. MATHEMATICS EDUCATION I. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3020.

Strategies for teaching mathematics at the elementary and secondary levels; analysis of innovative programs of instruction in mathematics; the use of computers in the teaching of mathematics.

MATE 4031. INTRODUCTION TO LINEAR ALGEBRA. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3032 or MATE 3184.

Euclidean vector spaces, matrices and linear equations, spectral decomposition of normal operators.

MATE 4050. UNDERGRADUATE SEMINAR. One credit hour. One hour of lecture per week. Prerequisite: Consent of the Department Director.

Introduction to the methods of mathematical research; application of abstract methods to concrete situations. Recommended for all students who intend to pursue graduate studies in Mathematics.

MATE 4051. ADVANCED CALCULUS I. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3063 or MATE 3185.

A rigorous treatment of the basic ideas and techniques of mathematical analysis, including such topics as point set algebra, the real number system, functions, sequences, limits, continuity, theorems and continuous functions, uniform continuity, differentiation, Riemann integration, the Riemann-Stieltjes integral, power series, uniform convergence.

MATE 4052. ADVANCED CALCULUS II. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 4051.

Continuation of a rigorous treatment of the basic ideas and techniques of mathematical analysis, including such topics as functions of several variables, implicit functions, Jacobians and transformations of multiple integrals, line and surface integrals, improper integrals, linear function spaces, Fourier series and orthogonal functions.

MATE 4061. NUMERICAL ANALYSIS I. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 3063 or MATE 3185) and (MATE 3010 or INGE 3016 or COMP 3010).

Roots of equations, interpolation and approximation procedures, numerical integration, numerical solution of initial value problems for ordinary differential equations of first and second order, direct and iterative methods for solving systems of linear equations.

MATE 4062. NUMERICAL ANALYSIS II. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 4031 and MATE 4061.

The numerical solution of Fredholm integral equations: extension of the difference calculus to functions of several variables; brief study of analytical methods for the solution of the partial differential equations of mathematical physics; the numerical solution of boundary value problems; introduction to the numerical solution of eigen value problems.

MATE 4071. INTRODUCTION TO MATHEMATICS OF MODERN SCIENCE I. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 4009.

Brief explanation of certain mathematical topics essential for science and engineering: infinite series, elliptic integrals, Fourier series, solution of equations, partial differentiation, multiple and line integrals.

MATE 4072. INTRODUCTION TO MATHEMATICS OF MODERN SCIENCE II.

Three credit hours. Three hours of lecture per week. Prerequisite: MATE 4009.

Laplace transforms; Gamma, Beta and Bessel functions; partial differential equations and boundary value problems; vector analysis; probability, empirical formulas, and curve fitting.

MATE 4088. DIFFERENTIAL GEOMETRY USING COMPUTERS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: MATE 4009 and (MATE 4031 or consent of the Director of the Department).

Introduction to differential geometry of curves and surfaces in three-dimensional Euclidean space, including computer-aided visualization, and numerical and symbolic computation of geometric properties.

MATE 4120. HISTORY OF MATHEMATICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3032 or MATE 3184.

A survey of the historical development of the elementary branches of Mathematics.

MATE 4990. UNDERGRADUATE RESEARCH. One to six credit hours. Three hours of research per credit week. Prerequisite: Consent of the Director of the Department.

A research project under the supervision of professors of the Department.

MATE 4997. SPECIAL TOPICS IN MATHEMATICS. One to three credit hours. One to three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Introduction to topics of Mathematics which are not normally covered in regular courses in the curriculum, and which would serve to stimulate further advanced studies in Mathematics.

### **ADVANCED UNDERGRADUATE AND GRADUATE COURSES**

MATE 5016. GAME THEORY. Three credit hours. Three hours of lecture per week.

Mathematical theory and solution of different classes of games, such as two-person, rectangular or matrix, and multipersonal games.

MATE 5047. INTERMEDIATE DIFFERENTIAL EQUATIONS. Three credit hours. Three hours of

lecture per week. Prerequisites: MATE 4009 and MATE 4031 or its equivalent.

Existence, continuity and differentiability of solutions; stability and Lyapunov's theorem.

MATE 5049. CALCULUS OF VARIATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 4009.

Origin and historical development of the calculus of variations; first variation of a functional; canonical forms of Euler's equations; second variation: sufficient conditions for weak and strong extremals; applications to problems in geometry, mechanisms and physics.

MATE 5055. VECTOR ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3063 or MATE 3185.

Introduction to vector analysis as a tool for mathematicians. The algebra and calculus of vectors, including gradient, divergence and curl, Stokes' and Green's theorems, curvilinear coordinates, and simple n-dimensional space. Applications in physics and geometry.

MATE 5056. TENSOR ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3063 or MATE 3185.

Cartesian tensors, Cartesian tensor fields, gradient vector, Laplacian, covariant and contravariant tensor fields, the differential line-element and the fundamental tensors, covariant differentiation and the Riemann-Christoffel tensor.

MATE 5150. LINEAR ALGEBRA. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 4008.

Study of the essentials of linear algebra, including finite dimensional vector spaces, linear equations, matrices, determinants, bilinear forms, inner products, spectral theorem for normal operators, and linear transformations.

## COMPUTER SCIENCE

### UNDERGRADUATE COURSES

COMP 3010. INTRODUCTION TO COMPUTER PROGRAMMING I. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3171 or MATE 3005 or MATE 3173.

Introduction to the components of the computer. Programming in a block-structured high-level language to solve numerical and non-numerical problems; design, coding, verification and documentation of programs emphasizing programming style.

COMP 3029. PROGRAMMING LANGUAGES. Three credit hours. Three hours of lecture per week. Prerequisite: COMP 3110 or INGE 3016.

Basic aspects of programming languages including data, operations, sequence control, data control, storage management, operational environments, syntax, and semantics.

COMP 3057. COMPUTER FUNDAMENTALS. Three credit hours. Two hours of lecture and one two-hour laboratory per week.

Historical development of computers; functions of the main hardware components and systems software; elementary concepts of programming. The laboratory will provide practical experience with some applications of the computer.

COMP 3075. INTRODUCTION TO DATA STRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisite: COMP 3110 or its equivalent.

Basic concepts of data. Linear and orthogonal lists. Representation of trees and graphs. Recovery and allocation of memory for storage. Symbol tables. Searching and sorting techniques. Data structures in programming languages. Efficiency of sorting algorithms.

COMP 3110. INTRODUCTION TO COMPUTERS II. Three credit hours. Three hours of lecture per week. Prerequisite: COMP 3010 or its equivalent.

Design, verification and testing of large programs. Programming techniques include recursion, modularity, use of pointers, and backtracking.

COMP 4006. SYSTEMS ORGANIZATION AND PROGRAMMING. Three credit hours. Three lectures per week. Prerequisite: COMP 4016.

Analysis and design of computer systems, including assembly input-output, compiling, multi-programming and multi-processor systems.

COMP 4016. ASSEMBLY LANGUAGE PROGRAMMING. Three credit hours. Three



hours of lecture per week. Prerequisite: COMP 3010 or its equivalent.

Machine language programming; assembly language programming and assembly systems; subroutines; macros.

COMP 4025. COMPUTING MODELS. Three credit hours. Three hours of lecture per week. Prerequisite: COMP 3010 or consent of the Director of the Department.

Various models for the modern use of computers, including operations research, and applications of probability and statistics.

COMP 4046. COMPUTER GRAPHICS. Three credit hours. Three hours of lecture per week. Prerequisites: COMP 3075 and MATE 4031.

Introduction to computer graphics: graphics hardware and packages, user-interface design, geometric modeling and algorithms, and image manipulation and compression.

COMP 4075. PROGRAMMING METHODOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 3075 or COMP 3075 and MATE 3020) or consent of the Director of the Department.

Methods for reasoning about programs. The use of propositional and predicate calculus for programming notation and its semantics; the discipline of developing correct programs and their proofs.

COMP 4086. COMPUTER ARCHITECTURE. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3110 or COMP 3110.

Introduction to the organization and architecture of computer systems including logic circuits, addressing and management of memory, design and organization of processors, input and output of data.

COMP 4998. TOPICS IN COMPUTER SCIENCE. One to three credit hours. One to three hours of lecture per week. Prerequisite: consent of the Director of the Department.

The course will cover one or more topics chosen from the following general areas: hardware, computer systems organization, software, data, theory of computation, computer mathematics, information systems, computing methodologies.

COMP 4999. TOPICS IN COMPUTER SCIENCE. One to three credit hours. One hour of lecture per credit hour per week. Prerequisite: Consent of the Director of the Department.

Special topics in Computer Science. The content of this course will vary according to interest and demand.

### **ADVANCED UNDERGRADUATE AND GRADUATE COURSES**

COMP 5045. AUTOMATA AND FORMAL LANGUAGES. Three credit hours. Three hours of lecture per week. Prerequisite: consent of the Director of the Department.

Finite automata and regular languages; pushdown automata and context-free languages; Turing machines and recursively enumerable sets; linearly bounded automata and context-sensitive languages; computability and the halting problem; undecidable problems.

COMP 5055. PARALLEL COMPUTATION. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 4061 and consent of the Director of the Department.

The use of supercomputers: parallel architecture, design of algorithms for scientific computation and their implementation with parallel multiprocessors, and performance analysis.

### **MATHEMATICAL STATISTICS**

#### **UNDERGRADUATE COURSES**

ESMA 3015. ELEMENTARY STATISTICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3171 or MATE 3173.

Nature and meaning of statistics; elements of probability; normal and binomial distributions; organization of data; measures of location and variability; elements of statistical inference; simple regression and correlation. Statistical analysis through computers.

ESMA 3016. STATISTICAL DATA ANALYSIS. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Pre-requisite: (MATE 3031 or MATE 3144) and COMP 3010.

Statistical data analysis including descriptive and inferential statistics and exploratory data analysis.

ESMA 3101. APPLIED STATISTICS I. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3171 or MATE 3173.

Basic concepts of methods of applied statistics. Descriptive statistics: probability; random variables; probability distribution. Statistical analysis through computers.

ESMA 3102. APPLIED STATISTICS II. Three credit hours. Three hours of lecture per week. Prerequisite: ESMA 3101.

Sampling, elements of estimation and tests of hypotheses, regression and correlation analysis, chi-square and contingency tables.

ESMA 4001. MATHEMATICAL STATISTICS I. Three credit hour. Three hours of lecture per week. Prerequisite: MATE 3032.

Nature of statistics, probability, random variables and their probability distributions, moment generating functions, sampling distributions and the central limit theorem.

ESMA 4002. MATHEMATICAL STATISTIC II. Three credit hour. Three hours of lecture per week. Prerequisite: ESMA 4001 and MATE 3063.

Multivariate probability distributions, methods of estimation, tests of hypotheses, linear models, design of experiments, analysis of variance, and contingency tables.

ESMA 4005. NON-PARAMETRIC APPLIED STATISTICS. Three credit hours. Three hours of lecture per week. Prerequisite: ESMA 3102 or ESMA 4001 or ESTA 3002.

Non-parametric statistical techniques applied to independent samples and correlated samples; independence and homogeneity of factors; computation of point estimates and confidence intervals for parameters, and the testing of hypotheses.

ESMA 4038. SAMPLING METHODS. Three credit hours. Three hours of lecture per week. Prerequisite: ESMA 3102 or ESMA 4001 or ESTA 3002.

Introduction to the theory and application of statistical sampling methods.

## ADVANCED UNDERGRADUATE AND GRADUATE COURSE

ESMA 5015. STOCHASTIC SIMULATION. Three credit hours. Three hours of lecture per week. Prerequisite: ESMA 4001.

Basic methods of simulation, modeling of complex systems, simulation languages, generation of random numbers, model validity, analysis of solutions, variance reduction techniques, and the design of experiments.

**DEPARTMENT OF NURSING**

The Department of Nursing offers a program leading to the **Bachelor of Science** in Nursing. The Program is accredited by the Council of Higher Education and by the National League for Nursing Accrediting Commission (NLNAC). Information regarding tuition, fees, and length of program is also available through the:

National League for Nursing Accrediting Commission (NLNAC);  
 61 Broadway  
 New York 10006  
 Tel. (212) 363-5555 x. 153  
 FAX (212) 812-1390  
[www.nlnal.org](http://www.nlnal.org)

The curriculum of the Bachelor's program prepares a nurse generalist to carry out the professional role of the nurse in a variety of health care settings. Course work includes lectures, simulated laboratory experiences, independent studies and clinical practice. Clinical practice is arranged under faculty direction with the cooperation of a variety of health care facilities.

The Department of Nursing sponsors the following student and professional organizations: The Nursing Student Association, the Epsilon Lambda Chapter of the Sigma Theta Tau International, Inc., Nursing Honor Society and the Nursing Alumni Association.

**BACHELOR OF SCIENCE IN NURSING**

**Summary of Credits in Program**

General Education Course	
Faculty requirements	50
Free electives	12
Core Courses	
Major Course	57
Non-major area	<u>25</u>
<b>Total</b>	<b>144</b>

**FIRST YEAR**

**First Semester**

<b>*INGL 3---</b>	
First year course in English	3
<b>CIBI 3031</b>	
Intro. to the Biological Sciences I	3

<b>PSIC 3001</b>	
Principles of Psychology I	3
<b>*MATE 3171</b>	
Pre-Calculus I	3
<b>QUIM 3141</b>	
Principles of General, Organic and Biologic Chemistry	4
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	17

**Second Semester**

<b>*INGL 3---</b>	
First year course in English	3
<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	3
<b>PSIC 3002</b>	
Principles of Psychology II	3
<b>**MATE 3---</b>	
Recommended Course in Mathematics	3
<b>QUIM 3142</b>	
Principles of General, Organic and Biological Chemistry	4
<b>ENFE 3005</b>	
Introduction to Nursing	<u>3</u>
	19

**SECOND YEAR**

**First Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>*ESPA 3101</b>	
Basic Course in Spanish	3
<b>BIOL 3715</b>	
Anatomy and Physiology	3
<b>BIOL 3716</b>	
Anatomy and Physiology Laboratory	1
<b>ENFE 3015</b>	
Interpersonal Relationships in Nursing	3
<b>ENFE 3021</b>	
Introduction to Clinical Nursing I	4
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	18

**Second Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>*ESPA 3102</b>	
Basic Course in Spanish	3
<b>ENFE 3022</b>	
Introduction to Clinical Nursing II	4
<b>ENFE 3035</b>	
Fundamentals of Nutrition	2

<b>ENFE 3045</b>	
Psychiatric Nursing	<u>6</u>
	18

**THIRD YEAR**

**First Semester**

<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>BIOL 3725</b>	
Microbiology	4
<b>ENFE 4001</b>	
Maternal and Child Nursing I	6
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	<u>3</u>
	19

**Second Semester**

<b>ESPA ----</b>	
Course above level of basic Spanish	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>ESMA 3015</b>	
Elementary Statistics	3
<b>ENFE 4002</b>	
Maternal and Child Nursing II	6
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	<u>3</u>
	18

**FOURTH YEAR**

**First Semester**

<b>ENFE 4015</b>	
Management of Nursing Services	3
<b>ENFE 4031</b>	
Medical and Surgical Nursing I	6
<b>ENFE 4041</b>	
Senior Seminar in Nursing	1
<b>ELECTIVES</b>	
Electives	<u>9</u>
	19

**Second Semester**

<b>ENFE 4025</b>	
Nursing in Community Health	6
<b>ENFE 4032</b>	
Medical and Surgical Nursing II	6
<b>ENFE 4042</b>	
Senior Seminar in Nursing	1
<b>ELECTIVES</b>	
Electives	<u>3</u>
	16

**Total credits required: 144**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*To be chosen from the following alternatives defined by the Department: MATE 3172 or COMP 3057 or COMP 3010.

**DEPARTMENTAL FACULTY**

**CELIA R. COLON-RIVERA**, *Professor*, Ph.D., 1989, University of Wisconsin - Madison.

**TERESA JIMENEZ-VEGA**, *Professor*, M.S.N., 1978, University of Puerto Rico - Medical Sciences Campus.

**ABIGAIL MATOS-PAGAN**, *Instructor*, M.S.N., 1987, Pontifical Catholic University of Puerto Rico, Adult Nurse Practitioner, 1997, State University of New York, Buffalo.

**ROSE M. MENDEZ-AVILES**, *Assistant Professor*, M.S.N., 1997, University of Puerto Rico – Medical Sciences Campus.

**MIRIAM J. NIETO-VAZQUEZ**, *Assistant Professor*, M.S.N., 1996, Pontifical Catholic University of Puerto Rico.

**NANCY ANNE ORTIZ-VAZQUEZ**, *Professor*, M.S., 1977, University of Maryland - Baltimore.

**LYDIA PEREZ-GONZALEZ**, *Professor*, M.S.N., 1980, University of Puerto Rico - Medical Sciences Campus.

**NILDA QUIÑONES-RAMOS**, *Professor*, M.S.N., 1981, University of Texas at El Paso.

**LOURDES RAMIREZ-ACEVEDO**, *Assistant Professor*, M.S.N., 1990, Pontifical Catholic University of Puerto Rico.

**HAYDEN RIOS-ITURRINO**, *Professor*, D.N.S. (Post Doctoral Fellow), 2001, University of Tennessee, Memphis, Ph.D., 1992, University of Iowa.

**ESPERANZA RIVERA**, *Associate Professor*, M.S.N., 1969, University of Puerto Rico - Medical Sciences Campus.

**LOURDES SANTIAGO**, *Associate Professor*, M.S.N., 1979, University of Puerto Rico, Medical Sciences Campus.

**MARIA SANTIAGO-GALARZA**, *Associate Professor*, M.S.N., 1992, Pontifical Catholic University of Puerto Rico.

**MARISOL SANTIAGO-SEPULVEDA**, *Assistant Professor*, M.S.N., 1993, Pontifical Catholic University of Puerto Rico.

**MARGARET E. TORO-PEREZ**, *Assistant Professor*, M.S.N., 1994, Pontifical Catholic University of Puerto Rico.

**ZAIDA L. TORRES**, *Associate Professor*, M.S.N., 1984, University of Puerto Rico, Medical Sciences Campus.

**ELBA M. VARGAS-ROSAS**, *Associate Professor*, M.S.N., 1984, University of Cincinnati.

**SONIA VAZQUEZ-VEGA**, *Associate Professor*, M.S.N., 1983, Pontifical Catholic University of Puerto Rico.

**SANDRA ZAPATA**, *Assistant Professor*, M.S.N. 1987, Pontifical Catholic University of Puerto Rico.

## **COURSES OF INSTRUCTION**

### **DEPARTMENT OF NURSING**

#### **UNDERGRADUATE COURSES**

ENFE 1005. FUNDAMENTALS OF NURSING. Five credit hours. Two hours of lecture per week. One laboratory period of six hours per week. One hour of preparatory laboratory.

Procedures and techniques commonly employed in any field or area of specialization in nursing.

ENFE 2008. MATERNAL AND CHILD CARE. Eight credit hours. Four hours of lecture and two six-hours laboratories per week. Prerequisite: ENFE 1005.

Consideration of the fundamental nursing functions in the care of the mother and child, followed by progressive introduction to the theory and practice of basic nursing skills in obstetrics and the care of the sick child.

ENFE 2011-2012. NURSING IN MENTAL AND PHYSICAL ILLNESS I-II. Eight credit hours per semester. Four hours of lecture and two six-hours laboratories per week. Prerequisite: ENFE 2008.

The fundamental nursing functions in the care of healthy adults and progressive introduction in the practice of the care of the sick through patient-centered and problem solving techniques. Independent studies are required.

ENFE 3005. INTRODUCTION TO NURSING. Three credit hours. Three hours of lecture per week.

The historical development of nursing, its evolution and current trends; introduction to the concept of professional nursing.

ENFE 3015. INTERPERSONAL RELATIONSHIPS IN NURSING. Three credit hours. Three hours of lecture per week. Prerequisite: (PSIC 3002 and ENFE 3005) or authorization of the Department Director.

Introduction to the study of nursing as a therapeutic interpersonal process.

ENFE 3021. INTRODUCTION TO CLINICAL NURSING I. Four credit hours. Two hours of lecture and one six-hour laboratory per week. Prerequisites: (ENFE 3005 and CIBI 3002 or CIBI 3032) or consent of the Director of the Department. Co-requisites: (BIOL 3715, BIOL 3716 and ENFE 3015) or consent of the Director of the Department.

Fundamental concepts, knowledge and skills necessary for the practice of professional nursing in any clinical area.

ENFE 3022. INTRODUCTION TO CLINICAL NURSING II. Four credit hours. Two hours of lecture and one six-hour laboratory per week. Prerequisite: ENFE 3021. Co-requisite: ENFE 3035.

Development of more complex clinical nursing skills.

ENFE 3035. FUNDAMENTALS OF NUTRITION. Two credit hours. Two hours of lecture per week. Co-requisite: ENFE 3022.

Basic concepts of nutrition, and its relation to health maintenance; nutritional requirements of various members of the family; psychological, cultural and economic factors which influence nutrition, with emphasis on low cost adequate nutrition; dietary problems in various illnesses.

ENFE 3045. PSYCHIATRIC NURSING. Six credit hours. Two hours of lecture and two six-hour laboratories per week. Prerequisites: ENFE 3015. Co-requisite: ENFE 3022.

Care and rehabilitation of mentally ill adults and children. Integration of in-patient care with local resources and family.

ENFE 3095. POSOLOGY AND PHARMACOLOGY FOR NURSING. Three credit hours. Two hours of lecture and two hours of computation per week. Prerequisites: Consent of the Director of the Department.

Concepts of posology and pharmacology related to Nursing, including the nature, administration, action and reaction, and dosage of common drugs.

ENFE 4001. MATERNAL AND CHILD NURSING I. Six credit hours. Two hours of lecture and two six-hour laboratories per week. Prerequisites: ENFE 3022 and ENFE 3035 and ENFE 3045. Co-requisite: BIOL 3725.

Theory and clinical experience in maternal and child care following a family-centered approach.

ENFE 4002. MATERNAL AND CHILD NURSING II. Six credit hours. Two hours of lecture and two six-hour laboratories per week. Prerequisite: ENFE 4001.

Theory and clinical experience in maternal and child care following a family-centered approach.

ENFE 4015. MANAGEMENT OF NURSING SERVICES. Three credit hours. Three hours of lecture per week. Prerequisite: ESMA 3015 and (Senior standing in Nursing (B.S.) or consent of the Director of the Department).

Identification and application of principles of management in planning and providing nursing care.

ENFE 4025. NURSING IN COMMUNITY HEALTH. Six credit hours. Two hours of lecture and two six-hour laboratories per week. Prerequisite: (ESMA 3015 and QUIM 3141 and QUIM 3142) or Senior standing in Nursing or consent of the Director of the Department.

Concepts and principles of public health nursing; major community health problems, and the significance of vital statistics and community health services; beginning skills in public health nursing.

ENFE 4026. LEGAL ASPECTS OF NURSING. Two credit hours. Two hours of lecture per week. Prerequisite: ENFE 1005 or ENFE 3021 or its equivalent.

Legal implications in nursing practice.

ENFE 4031. MEDICAL AND SURGICAL NURSING I. Six credit hours. Two hours of

lecture and two six-hour laboratories per week. Prerequisites: (ESMA 3015 and QUIM 3141 and QUIM 3142) or Senior standing in Nursing or consent of the Director of the Department.

Theories, concepts and principles which underlie nursing intervention in the care of the medical surgical patient. Emphasis is given to integration of preventive measure, psycho-social aspects of illness, and patient-centered nursing care. Laboratory experiences are designed to assist the student in identifying nursing care needs, and in planning, providing and evaluating nurse care of patients in a hospital setting.

ENFE 4032. MEDICAL AND SURGICAL NURSING II. Six credit hours. Two hours of lecture and two six-hour laboratories per week. Prerequisite: ENFE 4031.

Theories, concepts and principles which underlie nursing intervention in the care of the medical surgical patient. Emphasis is given to integration of preventive measure, psycho-social aspects of illness, and patient-centered nursing care. Laboratory experiences are designed to assist the student in identifying nursing care needs, and in planning, providing and evaluating nurse care of patients in a hospital setting.

ENFE 4041. SEMINAR IN NURSING I. One credit hour. One hour of lecture per week. Prerequisite: ESMA 3015 or Senior standing student in Nursing or consent of the Director of the Department.

Research in nursing: the application of the scientific method for the conception and definition of a research problem; its ethical and legal aspects.

ENFE 4042. SEMINAR IN NURSING II. One credit hour. One hour of lecture per week. Prerequisite: ENFE 4041.

Research in nursing: the planning and implementation phases in the research process; its application to the solution of problems in health care services. A written proposal will be required.

ENFE 4995. COOP PRACTICE. Three to six credit hours. Prerequisite: consent of the Director of the Department.

Practical experience in nursing in cooperation with private industry or government, jointly supervised by the Nursing Department, the COOP program Coordinator, and an official from the cooperating organization.



ENFE 5005. HEALTH ASSESSMENT. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: BIOL 3715 and BIOL 3716.

Directed clinical experience towards achieving competency in conducting health assessment: the physical examination, the health history, analysis of the data, and planning for care.

## **DEPARTMENT OF PHYSICAL EDUCATION**

The Department of Physical Education of the University of Puerto Rico at Mayagüez was established in 1972. The curriculum aims to develop students' capacity to think logically and critically through the study of all variables which affect the human body during physical, recreational activities and sports.

The **Bachelor of Arts** in Physical Education is designed to train and develop knowledgeable professionals into teachers, coaches and recreational leaders. Academic offerings include three well-balanced professional areas of study at the Bachelor's Degree level. The academic programs are: **Teaching Physical Education** (1303), **Coaching** (1302), and **Recreation** (1304).

**The Teaching of Physical Education Program** (1303) is designed for the student who has the desire to become a certified Physical Education teacher with a strong foundation in pedagogy. The student will also be prepared to continue graduate studies in different fields related to physical education and sports.

**The Coaching Program** (1302) is designed for a student who has the desire to become a coach or official in sports or continue graduate studies in physical education and sports related fields.

**The Recreational Program** (1304) is designed for a student who has the desire to become a provider of recreational services in different settings. This program focuses on design, organization, and implementation of diverse recreational activities. The student will be prepared to continue graduate studies within the recreational field.

The curriculum also promotes the student's professional competence through research and the study of the sciences applied to physical activities and sports. Another aspect of the program focuses on promoting student's development and maintenance of health and skill related fitness, enjoyment of leisure activities, and leadership in recreational and sports activities in their communities.

A student will be able to complete the selected program in four years without having to study

during summer session programs. According to our University's official regulations, the selected program must be completed within eight years.

The Department of Physical Education requires a student to pass each and every one of the courses which are classified within the major field of study with a minimum "C" grade.

The Puerto Rico Department of Education requires for teacher certification additional courses, 2.5 GPA, and a 2.85 GPA in the area of specialization which are all subject to change. Students are advised to continuously inquire on the new standards for teacher certification in physical education.

**BACHELOR OF ARTS IN PHYSICAL EDUCATION**

**TEACHING IN PHYSICAL EDUCATION PROGRAM**

**Summary of Credits in Program**

Faculty requirements	54-56
Departmental requirements	
Major area	34
Non-major area	29
Recommended electives	6
Free electives	<u>12</u>
<b>Total</b>	<b>135-137</b>

**FIRST YEAR**

**First Semester**

<b>INGL 3101</b>	
Basic Course in English	3
<b>ESPA 3101</b>	
Basic Course in Spanish	3
<b>CIBI 3031</b>	
Intro. to the Biological Sciences I	3
<b>MATE 3171</b>	
Pre-calculus I	3
<b>EDFI 3465</b>	
Personal and Community Health	3
<b>EDFI 3265</b>	
Weight Lifting & Weight Training for Different Sports	1
<b>EDFI ----</b>	
Physical Education Elective	<u>1</u>
	17

**Second Semester**

<b>INGL 3102</b>	
Basic Course in English	3
<b>ESPA 3102</b>	
Basic Course in Spanish	3
<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	3
<b>ESMA 3015</b>	
Elementary Statistics	3
<b>EDFI ---</b>	
Fundamentals	1
<b>EDFI ----</b>	
Physical Education Elective	1
<b>EDFI 3645</b>	
First Aid and Security	<u>2</u>
	16

**SECOND YEAR**

**First Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>EDFU 3001</b>	
Human Growth and Development I	3
<b>EDFI 3555</b>	
History and Principles of Physical Education	3
<b>EDFI ----</b>	
Fundamentals	<u>2</u>
	17

**Second Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>EDFU 3002</b>	
Human Growth and Development II	3
<b>EDES 4006</b>	
Nature and needs of Exceptional learners	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	18

**THIRD YEAR**

**First Semester**

**CIFI-QUIM**

Elective in Physics (3)

Or

Chemistry (4) 3-4

**HUMA 3111**

Intro. to Western Culture I 3

**EDFU 3007**

Social Foundation of Education 3

**EDFI 4115**

Biomechanics of Human Movement 3

**EDFI ----**

Fundamentals 1

**HIST 3241**

History of Puerto Rico 3  
16-17

**Second Semester**

**CIFI-QUIM**

Elective in Physics (3)

or

Chemistry (4) 3-4

**HUMA 3112**

Intro. to Western Culture II 3

**EDFU 4019**

Philosophical Foundation of Education 3

**EDFI 3395**

The Teaching of Physical Education for the Handicapped 3

**EDFI 4005**

Fundamentals of Motor 3

**ELECTIVE**

Free elective 3  
18-19

**FOURTH YEAR**

**First Semester**

**EDFI 4205**

Teaching Methods and Techniques in Physical Education 3

**EDFI 4105**

Physiology of Exercise 3

**EDFI 4045**

Evaluation and Research in Physical Education 3

**DESC 3005**

Oral and written Reading skills 3

**EDPE 4215**

Theory and methodology

In the teaching of Physical Education in Secondary School 3

**HIST 3111**

History of USA 3  
18

**Second Semester**

**EDPE 4216**

Student Teaching of Physical Education in Secondary School 6

**ELECTIVE**

Free Elective 3

**EDFI 4125**

Organization, Adm., and Supervision of Physical Education 3

**ELECTIVE**

Free elective 3  
15

**Total credits required: 135-137**

Note: The courses EDPE 3129, EDFU 4025, and EDFI 3665 are required if the student wants to obtain a Teacher's license from the Puerto Rico Department of Education. Students are advised to follow any changes in the required courses by the Department of Education of Puerto Rico.

**RECREATION PROGRAM**

**Summary of Credits in Program**

Faculty requirements	54-56
Departmental requirements	
Major area	31
Non-major area	29
Recommended electives	6
Free electives	<u>12</u>
<b>Total</b>	<b>132-134</b>

**FIRST YEAR**

**First Semester**

**INGL 3101**

Basic Course in English 3

**ESPA 3101**

Basic Course in Spanish 3

**CIBI 3031**

Intro. to the Biological Sciences I 3

**MATE 3171**

Pre-calculus I 3

**EDFI 3465**

Personal and Community Health 3

<b>EDFI 3265</b> Weight Lifting & Weight Training for Different Sports	1
<b>EDFI ----</b> Physical Education Elective	$\frac{1}{17}$

**Second Semester**

<b>INGL 3102</b> Basic Course in English	3
<b>ESPA 3102</b> Basic Course in Spanish	3
<b>CIBI 3032</b> Intro. to the Biological Sciences II	3
<b>ESMA 3015</b> Elementary Statistics	3
<b>EDFI 3645</b> First Aid and Security	2
<b>EDFI ----</b> Fundamentals	1
<b>EDFI ----</b> Physical Education Elective	$\frac{1}{16}$

**SECOND YEAR**

**First Semester**

<b>INGL 3---</b> Second year course in English	3
<b>ESPA 3---</b> Course above level of basic Spanish	3
<b>CISO 3121</b> Intro. to the Study of the Social Sciences	3
<b>HUMA 3111</b> Intro. to Western Culture I	3
<b>RECR 3705</b> Community Recreation	3
<b>EDFI ----</b> Fundamentals	$\frac{1}{16}$

**Second Semester**

<b>INGL 3---</b> Second year course in English	3
<b>ESPA 3---</b> Course above level of basic Spanish	3
<b>CISO 3122</b> Intro. to the Study of the Social Sciences	3
<b>HUMA 3112</b> Intro. to Western Culture II	3
<b>EDFI 4005</b> Fundamental of Motor Learning	3

<b>EDFI ----</b> Fundamentals	$\frac{1}{16}$
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**THIRD YEAR**

**First Semester**

<b>CIFI-QUIM</b> Elective in Physics (3) or Chemistry (4)	3-4
<b>EDFU 3001</b> Human Growth and Development I	3
<b>EDFU 3007</b> Social Foundation of Education	3
<b>EDFI 4115</b> Biomechanics of Human Movement	3
<b>EDFI 3665</b> Recreational Sports	2
<b>EDFI 3395</b> The Teaching of Physical Education for the Handicapped	$\frac{3}{17-18}$

**Second Semester**

<b>CIFI-QUIM</b> Elective in Physics (3) or Chemistry (4)	3-4
<b>EDFU 3002</b> Human Growth and Development II	3
<b>EDFU 4019</b> Philosophical Foundation of Education	3
<b>EDFI 4045</b> Evaluation and Research in Physical Education	3
<b>ELECTIVE</b> Recommended Elective	3
<b>EDFI ----</b> Fundamentals	$\frac{1}{16-17}$

**FOURTH YEAR**

**First Semester**

<b>RECR 4135</b> Organization of Recreation	2
<b>EDFI 4105</b> Physiology of Exercise	3
<b>EDFI 4205</b> Teaching Methods and Techniques in Physical Education	3
<b>SOCI 3261</b> Introduction to Sociology	3

<b>ELECTIVES</b>	
Free Electives	<u>6</u>
	17
<b>Second Semester</b>	
<b>RECR 4255</b>	
Seminar in Recreation	2
<b>EDFI 4190</b>	
Exercise Prescription	3
<b>EDFI 4125</b>	
Organization, Administration and Supervision of Physical Education	3
<b>ELECTIVES</b>	
Free Electives	6
<b>ELECTIVE</b>	
Recommended Elective	<u>3</u>
	17

**Total credits required: 132-134**

**COACHING PROGRAM**

**Summary of Credits in Program**

Faculty requirements	54-56
Departmental requirements	
Major area	31
Non-major area	30
Recommended electives	6
Free electives	<u>12</u>
<b>Total</b>	<b>133-135</b>

**FIRST YEAR**

**First Semester**

<b>INGL 3101</b>	
Basic Course in English	3
<b>ESPA 3101</b>	
Basic Course in Spanish	3
<b>CIBI 3031</b>	
Intro. to the Biological Sciences I	3
<b>MATE 3171</b>	
Pre-calculus I	3
<b>EDFI 3265</b>	
Weight Lifting & Weight Training for Different Sports	1
<b>EDFI 3465</b>	
Personal and Community Health	3
<b>EDFI ----</b>	
Physical Education elective	<u>1</u>
	17

**Second Semester**

<b>INGL 3102</b>	
Basic Course in English	3
<b>ESPA 3102</b>	
Basic Course in Spanish	3

<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	3
<b>ESMA 3015</b>	
Elementary Statistics	3
<b>EDFI 3645</b>	
First Aid and Security	2
<b>EDFI ----</b>	
Fundamentals	1
<b>EDFI ----</b>	
Physical Education Elective	<u>1</u>
	16

**SECOND YEAR**

**First Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>EDFI 3395</b>	
The Teaching of Physical Education for the Handicapped	3
<b>EDFI ----</b>	
Fundamentals	<u>1</u>
	16

**Second Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>EDFI 4005</b>	
Fundamentals of Motor Learning	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	18

**THIRD YEAR**

**First Semester**

<b>CIFI-QUIM</b>	
Elective in Physics (3) or Chemistry (4)	3-4
<b>EDFU 3001</b>	

Human Growth and Development I <b>EDFU 3007</b>	3
Social Foundation of Education <b>EDFI 4115</b>	3
Biomechanics of Human Movement <b>EDFI ----</b>	3
Coaching and Officiating <b>EDFI ----</b>	2
Fundamentals	<u>2</u>
	16-17

**Second Semester**

**CIFI-QUIM**

Elective in Physics (3) or Chemistry (4) <b>EDFU 3002</b>	3-4
Human Growth and Development II <b>EDFU 4019</b>	3
Philosophical Foundation of Education <b>EDFI 4045</b>	3
Evaluation and Research in Physical Education <b>EDFI ----</b>	3
Coaching and Officiating <b>EDFI ----</b>	2
Coaching and Officiating	<u>2</u>
	16-17

**FOURTH YEAR**

**First Semester**

<b>PSIC 3001</b>	
Principles of Psychology I <b>EDFI 4230</b>	3
Athletic Training <b>EDFI ----</b>	3
Coaching and Officiating <b>EDFI 4105</b>	2
Physiology of Exercise <b>EDFI 4205</b>	3
Teaching Methods and Techniques in Physical Education <b>ELECTIVE</b>	3
Free Elective	<u>3</u>
	17

**Second Semester**

<b>EDFI 4250</b>	
Seminar in Coaching and Officiating <b>EDFI 4125</b>	2
Organization, Adm., and Superv. of Physical Education	3

<b>ELECTIVES</b>	
Recommended Electives	6
<b>ELECTIVES</b>	
Free Electives	<u>6</u>
	17

**Total credits required: 133-135**

**DEPARTMENTAL FACULTY**

**DAVID E. ANTONGIORGI-QUIÑONES**, *Professor*, M.Ed., 1970, University of Virginia.

**EDMUNDO CARRERO-BAEZ**, *Instructor*, B.A., 1964, Interamerican University of Puerto Rico.

**ARNALDO R. CASTRO-VILLA**, *Professor*, M.Ed., 1968, Southwest Texas State University.

**FRANCISCO D. CINTRON-ORONA**, *Associate Professor*, M.S., 1980, University of Miami.

**LUIS O. DEL RIO-PEREZ**, *Professor*, Ph.D., 1989, University of Pittsburgh.

**CARLOS ENRIQUEZ-MARIN**, *Professor*, M.S.Ed., 1979, University of Miami.

**MARGARITA FERNANDEZ VIVO**, *Assistant Professor*, Ph.D., 2002, Florida State University.

**ISRAEL GARCIA-LUCCA**, *Professor*, M.S., 1977, George Williams College.

**FERNANDO GAZTAMBIDE-BARBOSA**, *Assistant Professor*, M.A., 1974, Interamerican University of Puerto Rico.

**EMMA Y. HOCKING-GARCIA**, *Professor*, Ed.D., 1980, Brigham Young University.

**WILFREDO MAISONAVE-ORIOI**, *Associate Professor*, M.S., 1980, University of Miami.

**EFRANK MENDOZA-MARTINEZ**, *Professor*, Ph.D., 1990, The University of New Mexico.

**MARTA MORA-ESTRELLA**, *Associate Professor*, M.S., 1979, The University of New Mexico.

**ANA ELENA MUÑIZ-OLIVARI**, *Professor*, Ph.D., 1990, University of Maryland.

**MANUEL D. RAMIREZ-FREYRE**, *Professor*, Ed.D., 1980, Brigham Young University.

**HUMBERTO RODRIGUEZ-CARMONA**, *Professor*, M.A., 1979, University of New Mexico.

**DIANA RODRIGUEZ-VEGA**, *Professor*, Ed.D., 1995, University of Columbia.



**WILLIAM RODRIGUEZ**, *Professor*, M.A., 1977, Interamerican University, M.S., 1987, University of Miami.

**EDUARDO SOLTERO-FLORES**, *Professor*, Ed.D., 1988, University of Houston.

**KAREN I. SOTO-ANDREWS**, *Professor*, Ph.D., 1982, The Pennsylvania State University.

**AIDA L. TORO-TORRES**, *Professor*, M.A., 1975, Interamerican University of Puerto Rico.

**MARIA ISABEL TORO-TORRES**, *Professor*, M.S., 1977, Indiana University.

**EMILIO ANIBAL TORRES-RODRIGUEZ**, *Professor*, Ed.D., 1977, Brigham Young University.

## **COURSES OF INSTRUCTION**

### **DEPARTMENT OF PHYSICAL EDUCATION**

#### **UNDERGRADUATE COURSES**

EDFI 3038. RECREATIONAL SWIMMING. One credit hour. One hour of lecture and one hour of practice per week. Prerequisite: EDFI 3245.

Skills and techniques of recreational aquatic games.

EDFI 3058. FUNDAMENTALS OF TRACK AND FIELD. Two credit hours. One hour of lecture and two hours of practice per week.

Theory and practice of the basic skills in track and field events.

EDFI 3075. DEVELOPMENT, TRAINING AND TECHNIQUE OF SPORTS. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: EDFI 3058.

Theory, strategy and mechanics of coaching various interscholastic and intercollegiate track and field events.

EDFI 3076. INTRODUCTION TO PHYSICAL FITNESS. One credit hour. One hour of lecture and one hour of practice per week.

Basic programs of physical fitness designed for the student's needs, using scientific knowledge and the practice of physical activities.

EDFI 3077. FUNDAMENTALS OF SOFTBALL AND BASEBALL. One credit hour. One hour of lecture and one hour of practice per week.

Theory and practice of basic skills of softball and baseball.

EDFI 3095. COACHING AND OFFICIATING BASKETBALL. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: EDFI 3215.

Theory and practice in coaching and officiating basketball.

EDFI 3205. INTRODUCTION TO GYMNASTICS. One credit hour. One hour of lecture and one hour of practice per week.

The learning and development of skills in acrobatic, rhythmic and aerobic gymnastics.

EDFI 3215. FUNDAMENTALS OF BASKETBALL. One credit hour. One hour of lecture and one hour of practice per week.

Theoretical and practical approaches to basketball.

EDFI 3225. FUNDAMENTALS OF VOLLEYBALL. One credit hour. One hour of lecture and one hour of practice per week.

Theoretical and practical approaches to volleyball.

EDFI 3235. SCOUTING. Two credit hours. Two hours of lecture per week.

History of scouting, troop organization, and problems in the organization of the different activities that characterize a progressive troop.

EDFI 3245. ELEMENTARY SWIMMING. One credit hour. One hour of lecture and one hour of practice per week.

A course for beginners, with emphasis on the various strokes.

EDFI 3246. AQUATIC SKILLS. One credit hour. One hour of lecture and one hour of practice per week. Prerequisite: EDFI 3245.

Aquatic techniques, with emphasis on recreation: water safety, lifesaving, skin diving, and underwater fishing. Field trips required.

EDFI 3255. ADVANCED SWIMMING. One credit hour. One hour of lecture and one hour of practice per week. Prerequisite: EDFI 3245.

A course for advanced swimmers with emphasis in the improvement of strokes.

EDFI 3265. WEIGHT LIFTING AND WEIGHT TRAINING FOR DIFFERENT SPORTS. One credit hour. One hour of lecture and one-hour laboratory per week.

Training techniques and development of skills in weight lifting and weight training for different sports.

EDFI 3285. AQUATIC SKILLS AND WATER SAFETY. One credit hour. One hour of lecture and one-hour laboratory per week. Prerequisite: EDFI 3245.

Training, techniques and development of skills in aquatic activities, and water safety.

EDFI 3295. ELEMENTARY TENNIS. One credit hour. One hour of lecture and one hour of practice per week.

Training, techniques, and development of skills in tennis.

EDFI 3305. FOLK DANCES. One credit hour. One hour of lecture and one hour of practice per week.

Theory and practice of different folk dances.

EDFI 3325. CURRICULUM IN PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisite: EDFU 3002, EDFU 3007 y EDFU 4019.

Philosophy, principles and major trends in curriculum design for particular grade levels.

EDFI 3380. PHYSICAL ACTIVITIES AND THE ELDERLY. Three credit hours. Three hours of lecture per week. Prerequisite: CIBI 3002 or CIBI 3032.

Development of beneficial exercises and activities for the elderly.

EDFI 3395. THE TEACHING OF PHYSICAL EDUCATION FOR THE HANDICAPPED. Three credit hours. Three hours of lecture per week.

Principles, teaching methods, and activities of a physical education program designed for different handicaps. Field trips required.

EDFI 3397. TEACHING PHYSICAL EDUCATION IN ELEMENTARY AND SECONDARY SCHOOLS. Three credit hours. Three hours of lecture per week.

Methods and activities for teaching physical education in elementary and secondary schools.

EDFI 3465. PERSONAL AND COMMUNITY HEALTH. Three credit hours. Three hours of lecture per week.

Basic knowledge of current individual and community health problems.

EDFI 3555. HISTORY AND PRINCIPLES OF PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week.

The origin, nature and development of physical education to the present time as formative experience and medium of education.

EDFI 3596. FUNDAMENTALS OF SOCCER. One credit hour. One hour of lecture and one hour of practice per week.

Theory and practice of soccer.

EDFI 3615. COACHING AND OFFICIATING SWIMMING. Two credit hours. One hour of lecture and two one-hour laboratories per week. Prerequisite: EDFI 3245.

Theory, strategy, and techniques in coaching swimming.

EDFI 3645. FIRST AID AND SECURITY. Two credit hours. Two hours of lecture per week.

Incidence, causes and prevention of injuries; adequate procedures for the prevention and treatment of emergency situations.

EDFI 3665. RECREATIONAL SPORTS. Two credit hours. Two hours of lecture per week.

Methods, materials, and techniques in teaching selected recreational activities.

EDFI 3685. FUNDAMENTALS OF HANDBALL AND RACQUETBALL. One credit hour. One hour of lecture and one hour of practice per week.

Theory and practice of handball and racquetball.

EDFI 3997. TEACHING PHYSICAL EDUCATION IN ELEMENTARY AND SECONDARY SCHOOL. Three credit hours. Three hours of lecture per week.

Methods and activities for teaching physical education in elementary and secondary schools.

EDFI 4000/SOCI 4000. SOCIOLOGICAL FUNDAMENTALS OF RECREATION AND SPORTS. Three credit hours. Three hours of lecture per week.

The interaction among society, sports, and recreation.

EDFI 4005. FUNDAMENTALS OF MOTOR LEARNING. Three credit hours. Three hours of lecture per week. Prerequisite: CIBI 3002 or CIBI 3032.

Aspects of physiology, psychology, and education that form the basis for understanding motor activity.

EDFI 4010./PSIC 4010. PSYCHOLOGICAL ASPECTS OF SPORTS. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3001.

Psychological factors involved in motor performance and in sports.

EDFI 4045. EVALUATION AND RESEARCH IN PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3015 or ESMA 3015.

Methods of evaluation and research in physical education including the use of microcomputers.

EDFI 4055. COACHING AND OFFICIATING VOLLEYBALL. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: EDFI 3225.

Theory and practice in coaching and officiating volleyball.

EDFI 4065. COACHING AND OFFICIATING SOCCER. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: EDFI 3596.

Theory and practice in coaching and officiating soccer.

EDFI 4075. COACHING AND OFFICIATING SOFTBALL AND BASEBALL. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: EDFI 3077.

Theory and practice in coaching and officiating softball and baseball.

EDFI 4105. PHYSIOLOGY OF EXERCISE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CIBI 3002 or CIBI 3032.

Scientific evaluation of the effects of muscular activities upon the human body; factors involved in physical conditioning, fatigue, and diet.

EDFI 4115. BIOMECHANICS OF HUMAN MOVEMENT. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: MATE 3171 or MATE 3173 or MATE 3086.

Application of mechanical principles to the study of human movement with an emphasis on the function of the musculoskeletal system.

EDFI 4125. ORGANIZATION, ADMINISTRATION AND SUPERVISION OF PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisite: EDFI 3555.

Organization, administration and supervision of physical education, including intramural and interscholastic sports.

EDFI 4176. MECHANICS OF MOVEMENT FOR CHILDREN. Three credit hours. Three hours of lecture per week.

General principles of the mechanics of movement applied to physical education in elementary school (K-6); the use of games and movement activities as a method of instruction.

EDFI 4179. INTRODUCTION TO MOTOR SKILL DEVELOPMENT. Three credit hours. Three hours of lecture per week. Prerequisite: (CIBI 3002 or CIBI 3032) or BIOL 3052.

Introduction to the study of the changes in the child's motor development with emphasis on the different methods of observation, instruction, and practice of motor skills.

EDFI 4186. SPECIAL TOPICS IN PHYSICAL EDUCATION. Three credit hours. Three hours of

lecture per week. Prerequisite: Consent of the Director of the Department.

Selected topics in physical education. The content will vary according to interest and demand.

EDFI 4190. EXERCISE PRESCRIPTION. Three credit hours. Three hours of lecture per week.

Concepts and procedures in the prescription of exercise for physical fitness and health.

EDFI 4195. TEACHING AND TRAINING IN TENNIS. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: EDFI 3295.

Theory and practice of teaching and training in tennis.

EDFI 4205. TEACHING METHODS AND TECHNIQUES IN PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisites: EDFU 3002, EDFU 3007 and EDFU 4019.

Philosophy, curriculum, evaluation, methods and techniques in the process of teaching physical education.

EDFI 4225. LIFEGUARDING. Three credit hours. Two hours of lecture and two hours of supervised practice per week. Prerequisite: EDFI 3285 or consent of the Director of the Department.

The duties, responsibilities, knowledge, training, lifeguarding skills and its applications in various aquatic emergencies.

EDFI 4230. ATHLETIC TRAINING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: EDFI 3645.

Prevention, treatment, and rehabilitation of injuries related to sports.

EDFI 4250. SEMINAR IN COACHING AND OFFICIATING. Two credit hours. Two hours of lecture per week. Corequisite: eight credit hours in coaching and officiating.

Discussion and analysis of the principal issues in the field of coaching and officiating sports.

EDFI 4998. UNDERGRADUATE RESEARCH. From one to three credit hours. From two to four hours of research per week per credit. Prerequisites:

EDFI 4045 and consent of the Director of the Department.

A research project in Physical Education under the supervision of a professor of the department.

EDFI 5005. BIOMECHANICS OF SPORTS. Three credit hours. Three hours of lecture per week. Prerequisites: EDFI 4115 and EDFI 4045.

The application of the laws of mechanics to the analysis of sport techniques. A research project will be required.

## RECREATION

RECR 3705. COMMUNITY RECREATION. Three credit hours. Three hours of lecture per week.

Procedures for organizing and administering school and community recreation programs, social services, and youth organizations.

RECR 4135. ORGANIZATION OF RECREATION. Two credit hours. Two hours of lecture per week.

Content and organization of school, community and outdoor recreation.

RECR 4255. SEMINAR IN RECREATION. Two credit hours. Two hours of lecture per week. Prerequisites: RECR 3705. Corequisite: RECR 4135.

Discussion and analysis of recent literature and problems in the field of recreation.

## DEPARTMENT OF PHYSICS

This Department offers the **Bachelor of Science** degree programs in Physics and Physical Sciences, and the **Master of Science** program in Physics. The curricula for the undergraduate degrees are set out in the programs that follow. Students looking for information concerning the graduate program should consult the Graduate Catalogue.

The Bachelor of Science program in Physics is the traditional program designed for students who wish to obtain a solid background in the field. It will prepare students to work in government and private laboratories, to pursue graduate work in physics or to teach physics at the secondary level if additional courses in education are taken to obtain the teacher's license required by the Department of Education. This program is recommended to students who would like to complete a career in Physics.

The Bachelor of Science Program in Physical Sciences is geared specifically to the preparation of secondary school teachers in the physical sciences. The program includes most of the courses in education required for certification by the Department of Education. However, it can also be used for other purposes. This program is recommended to any student who does not want to make a commitment to any of the traditional fields of study in the physical sciences and requires a broader preparation in general science.

A wide variety of subjects can be chosen by the students in order to fulfill free electives requirements. These include traditional choices from mathematics, chemistry, geology, computer sciences, arts and humanities and non-traditional selections from business, biology, education and engineering. Students who contemplate taking courses outside the Faculty of Arts and Sciences should consult their departmental advisor regarding the availability of such courses. Students are encouraged to choose electives wisely.

Recommended electives must be taken from the list of courses corresponding to the program of study which follows. This list is revised periodically to incorporate changes in academic offerings. Other courses might be taken only after consultation with a departmental academic advisor.

Courses with the code ASTR (Astronomy) or METE (Meteorology) are offered by the Department of Physics. Only those cases determined by the Department may be accepted as recommended electives in Physics.

### BACHELOR OF SCIENCE IN PHYSICS

#### Summary of Credits In Program

Faculty requirements	49
Departmental requirements	
Major area	43
(6 credits in recommended electives in Physics or Astronomy)	
Non-major area	31
(3 credits computer programming course)	
Recommended electives	6
Free electives	<u>12</u>
<b>Total</b>	<b>141</b>

#### FIRST YEAR

##### First Semester

<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3101</b>	
Basic Course in Spanish	3
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>QUIM 3001</b>	
General Chemistry	4
<b>*MATE 3005</b>	
Pre-Calculus	<u>5</u>
	18

##### Second Semester

<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3102</b>	
Basic Course in Spanish	3
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>QUIM 3002</b>	
General Chemistry	4
<b>MATE 3031</b>	
Calculus I	4
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	18

**SECOND YEAR**

**First Semester**

<b>INGL 3---</b> Second year course in English	3
<b>ESPA 3---</b> Course above level of basic Spanish	3
<b>CIBI 3031</b> Intro. to the Biological Sciences I	3
<b>MATE 3032</b> Calculus II	4
<b>FISI 3161</b> GENERAL PHYSICS I	4
<b>FISI 3163</b> GENERAL PHYSICS LAB. I	$\frac{1}{18}$

**Second Semester**

<b>INGL 3---</b> Second year course in English	3
<b>ESPA 3---</b> Course above level of basic Spanish	3
<b>CIBI 3032</b> Intro. to the Biological Sciences II	3
<b>FISI 3162</b> GENERAL PHYSICS II	4
<b>FISI 3164</b> GENERAL PHYSICS LAB. II	1
<b>MATE 3063</b> Calculus III	3
<b>EDFI ----</b> Course in Physical Education	$\frac{1}{18}$

**THIRD YEAR**

**First Semester**

<b>HUMA 3111</b> Intro. to Western Culture I	3
<b>FISI 4051</b> INTERMEDIATE MECHANICS	3
<b>FISI 4076</b> INTERMEDIATE LABORATORY I	2
<b>FISI 4105</b> MODERN PHYSICS	3
<b>MATE 4009</b> Ordinary Differential Equations	3
<b>**----</b>	

Computer programming course	$\frac{3}{17}$
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**Second Semester**

<b>HUMA 3112</b> Intro. to Western Culture II	3
<b>FISI 4052</b> DYNAMICS	3
<b>FISI 4068</b> ELECTROMAGNETISM	3
<b>FISI 4077</b> INTERMEDIATE LABORATORY II	2
<b>FISI 4125</b> COMPUTERS IN PHYSICS	3
<b>**FISI ---</b> RECOMMENDED ELECTIVE IN PHYSICS	$\frac{3}{17}$

**FOURTH YEAR**

**First Semester**

<b>FISI 4001</b> SEMINAR I	1
<b>FISI 4046</b> WAVE MECHANICS	3
<b>FISI 4057</b> THERMAL PHYSICS	3
<b>MATE 4071</b> Intro. to Mathematics of Modern Science I	3
<b>**ELECTIVE</b> Recommended Elective	3
<b>ELECTIVES</b> Free Electives	$\frac{6}{19}$

**Second Semester**

<b>FISI 4002</b> SEMINAR II	1
<b>**FISI ----</b> RECOMMENDED ELECTIVE IN PHYSICS	3
<b>MATE 4072</b> Intro. to Mathematics of Modern Science II	3
<b>**ELECTIVE</b> Recommended Elective	3
<b>ELECTIVES</b> Free Electives	$\frac{6}{16}$

**Total credits required: 141**

Major Area Courses appear in capitals.

\*Refer to the Academic Regulations section for information on Advanced Placement.



\*\*To be selected from the list of courses in recommended electives.

**RECOMMENDED ELECTIVES**

(For the Bachelor of Science in Physics)

**Courses in Biology**

**BIOL 5745**  
Introduction to Biophysics 3

**Courses in Chemistry**

**QUIM 3025**  
Analytical Chemistry I 4  
**QUIM 3031**  
Organic Chemistry I 4  
**QUIM 3032**  
Organic Chemistry II 4  
**QUIM 3065**  
Analytical Chemistry II 4  
**QUIM 4041**  
Physical Chemistry I 3  
**QUIM 4042**  
Physical Chemistry II 3  
**QUIM 4135**  
Industrial Chemistry 2

**Courses in Computer Sciences**

**COMP 3010**  
Introduction to Computer Programming I 3  
**INGE 3016**  
Algorithms and Computer Programming 3

**Courses in Mathematics**

**COMP 3029**  
Programming Languages 3  
**MATE 4008**  
Introduction to Algebraic Structures 3  
**MATE 4010**  
Intro. to Complex Variables with Applications 3  
**MATE 4020**  
Partial Differential Equations and Fourier Series 3  
**MATE 4021**  
Fundamentals of Mathematical Logic 3  
**MATE 4031**  
Introduction to Linear Algebra 3  
**MATE 4051**  
Advanced Calculus I 3  
**MATE 4061**

Numerical Analysis I 3

**Philosophy Courses**

**FILO 3157**  
Introduction to Logic 3  
**FILO 3167**  
Symbolic Logic I 3  
**FILO 3168**  
Philosophy of Science 3

**Electives in Astronomy or Physics**

**ASTR 4005**  
Astronomy I 3  
**ASTR 4006**  
Astronomy II 3  
**FISI 4017**  
Physical Optics 3  
**FISI 4049**  
Electronics 3  
**FISI 4116**  
Solid State Physics 3  
**FISI 4997**  
Special Problems in Physics 1-3  
**FISI 4999**  
Undergraduate Research 1-3  
**FISI 5037**  
Introduction to Solid State Physics 3  
**METE 4006**  
Meteorology 3  
**METE 4007**  
Meteorological Measurements 1  
**METE 4008**  
Physical Meteorology 3

Note: The total number of required credits of recommended electives (in Biology, Chemistry, Computer Sciences, Mathematics and Philosophy), and electives in Astronomy or Physics are distributed as follows:

Computer programming course	3
Astronomy or Physics	6
Recommended Electives	<u>6</u>
<b>TOTAL</b>	<b>15</b>

**BACHELOR OF SCIENCE IN PHYSICAL SCIENCES**

**Summary of Credits in Program**

Faculty requirements	49
Departmental requirements	
Major area	30
(9 credits from recommended electives in Physics or	

Astronomy)	
Non-major area	37
Recommended electives	14*
Free electives	<u>12</u>
<b>Total</b>	<b>142</b>

\*Includes: 8 credits in chemistry, 3 credits in computer science, and 3 credits in geology.

**FIRST YEAR**

**First Semester**

* <b>INGL 3---</b>	
First year course in English	3
* <b>ESPA 3101</b>	
Basic Course in Spanish	3
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>QUIM 3001</b>	
General Chemistry	4
* <b>MATE 3005</b>	
Pre-Calculus	<u>5</u>
	18

**Second Semester**

* <b>INGL 3---</b>	
First year course in English	3
* <b>ESPA 3102</b>	
Basic Course in Spanish	3
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>QUIM 3002</b>	
General Chemistry	4
<b>MATE 3031</b>	
Calculus I	4
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	18

**SECOND YEAR**

**First Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>CIBI 3031</b>	
Intro. to the Biological Sciences I	3
<b>MATE 3032</b>	
Calculus II	4
<b>FISI 3161</b>	
GENERAL PHYSICS I	4
<b>FISI 3163</b>	
GENERAL PHYSICS LAB. I	<u>1</u>
	18

**Second Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	3
<b>FISI 3162</b>	
GENERAL PHYSICS II	4
<b>FISI 3164</b>	
GENERAL PHYSICS LAB. II	1
<b>MATE 3063</b>	
Calculus III	3
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	18

**THIRD YEAR**

**First Semester**

<b>FISI 4076</b>	
INTERMEDIATE LABORATORY I	2
<b>FISI 4105</b>	
MODERN PHYSICS	3
** <b>ELECTIVE</b>	
Recommended elective in Computer Sciences	3
<b>EDFU 3007</b>	
Social Foundations of Education	3
<b>EDFU 3001</b>	
Human Growth and Development I	3
** <b>QUIM ----</b>	
Recommended elective in Chemistry	<u>4</u>
	18

**Second Semester**

<b>EDFU 4019</b>	
Philosophical Foundations of Education	3
<b>EDFU 3002</b>	
Human Growth and Development II	3
** <b>FISI ----</b>	
RECOMMENDED ELECTIVE IN PHYSICS	3
** <b>QUIM ----</b>	
Recommended elective in Chemistry	4
<b>GEOL 3025</b>	
Earth Sciences	<u>3</u>
	16

**FOURTH YEAR**

**First Semester**

<b>ASTR 4005</b>	
ASTRONOMY I	3
<b>**GEOL ----</b>	
Elective in Geology	3
<b>EDPE 4135</b>	
Theory and Methodology in the Teaching of Science in Secondary School	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>FISI 4049</b>	
ELECTRONICS	3
<b>ELECTIVE</b>	
Free Elective	$\frac{3}{18}$

**Second Semester**

<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>**FISI ----</b>	
RECOMMENDED ELECTIVE IN PHYSICS	3
<b>**FISI ----</b>	
RECOMMENDED ELECTIVE IN PHYSICS	
or	
<b>**ASTR ----</b>	
RECOMMENDED ELECTIVE IN ASTRONOMY	3
<b>ELECTIVES</b>	
Free Electives	$\frac{9}{18}$

**Total credits required: 142**

**Major Area Courses in CAP Letters.**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*To be selected from the list of courses in recommended electives.

**RECOMMENDED ELECTIVES**

(For the Bachelor of Sciences in Physical Sciences)

**Chemistry Courses**

<b>QUIM 3025</b>	
Analytical Chemistry I	4
<b>QUIM 3031</b>	
Organic Chemistry I	4
<b>QUIM 3032</b>	
Organic Chemistry II	4
<b>QUIM 3065</b>	
Analytical Chemistry II	4

<b>QUIM 3085</b>	
Environmental Chemistry	3

**Computer Sciences Courses**

<b>COMP 3010</b>	
Introduction to Computer Programming I	3
<b>INGE 3016</b>	
Algorithms and Computer Programming	3
<b>FISI 4125</b>	
Computers in Physics	3

**Geology Courses**

<b>GEOL 3026</b>	
Life in the Past	3
<b>GEOL 3027</b>	
Geological Aspects of the Environmental Sciences	3
<b>GEOL 3035</b>	
Mineralogy	3
<b>GEOL 3045</b>	
Planetary Geology	3

**Mathematics Courses**

<b>MATE 3030</b>	
Introduction to Geometry	3
<b>MATE 4009</b>	
Ordinary Differential Equations	3
<b>MATE 4071</b>	
Intro. to Mathematics of Modern Science I	3
<b>MATE 4120</b>	
History of Mathematics	3

**Electives in Astronomy or Physics**

<b>ASTR 4006</b>	
Astronomy II	3
<b>FISI 4001</b>	
Seminar I	1
<b>FISI 4002</b>	
Seminar II	1
<b>FISI 4017</b>	
Physical Optics	3
<b>FISI 4046</b>	
Wave Mechanics	3
<b>FISI 4051</b>	
Intermediate Mechanics	3
<b>FISI 4052</b>	
Dynamics	3
<b>FISI 4057</b>	
Thermal Physics	3
<b>FISI 4068</b>	
Electromagnetism	3
<b>FISI 4077</b>	

Intermediate Laboratory II <b>FISI 4116</b>	2
Solid State Physics <b>FISI 4125</b>	3
Computers in Physics <b>FISI 4997</b>	3
Special Problems in Physics <b>FISI 4999</b>	1-3
Undergraduate Research <b>METE 4006</b>	1-3
Meteorology <b>METE 4007</b>	3
Meteorological Measurements <b>METE 4008</b>	1
Physical Meteorology	3

Note: The total number of required credits of recommended electives (in Chemistry, Computer Sciences, Geology, and Mathematics), and electives in Astronomy or Physics are distributed as follows:

<b>Chemistry</b>	8
<b>Computer Sciences</b>	3
<b>Geology</b>	3
<b>Astronomy or Physics</b>	2
<b>TOTAL</b>	23

#### DEPARTMENTAL FACULTY

**JOSE D. ALEMAR**, *Professor*, Ph.D., 1977, Texas A&M University.

**DORIAL CASTELLANOS**, *Professor*, Ph.D., 1991, University of South Carolina.

**MARK J.-L. CHANG**, *Assistant Professor*, Ph.D., 1998, University of Durham, England.

**CARLOS CONDAT**, *Professor*, Ph.D., 1982, University of Massachusetts - Amherst.

**FELIX E. FERNANDEZ**, *Professor*, Ph.D., 1987, University of Arizona.

**JEFFREY F. FRIEDMAN**, *Professor*, Ph.D., 1992, Oklahoma University.

**ANGEL A. GAUD**, *Professor*, M.S., 1968, University of Puerto Rico, Juris Doctor, 1980, Pontifical Catholic University of Puerto Rico.

**WEIYI JIA**, *Professor*, Ph.D., 1982, The Institute of Physics, Chinese Academy of Sciences.

**HECTOR JIMENEZ-GONZALEZ**, *Associate Professor*, Ph.D., 1992, Massachusetts Institute of Technology.

**YONG-JIHM KIM**, *Assistant Professor*, Ph.D., 1989, Seoul National University.

**ALEXANDER LEYDERMAN**, *Professor*, Ph.D., 1971, Solid State Institute of Academy of Science, Chernogolovka, USSR.

**HUIMIN LIU**, *Professor*, Ph.D., 1986, Shanghai Institute of Optics and Fine Mechanics, Academia Sinica, China.

**ANGEL M. LOPEZ**, *Professor*, Ph.D., 1977, University of Massachusetts.

**JOSE R. LOPEZ**, *Professor*, Ph.D., 1983, Michigan State University.

**PABLO J. MARRERO-SOTO**, *Assistant Professor*, Ph.D., 2001, University of Massachusetts at Amherst.

**HECTOR MENDEZ**, *Assistant Professor*, Ph.D., 1990, CINVESTAV (Centro de Investigación y de Estudios Avanzados), Mexico City, Mexico.

**RUBEN A. MENDEZ-PLACIDO**, *Professor*, Ph.D., 1988, University of Florida.

**LESZEK NOWAKOWSKI**, *Professor*, Ph.D., 1983, N. Copernicus University-Torun, Poland.

**MOISES ORENGO-AVILES**, *Professor*, Ph.D., 1996, Brown University.

**CARLOS U. PABON**, *Associate Professor*, Ph.D., 1994, City College of New York.

**LUIS M. QUIÑONES-RODRIGUEZ**, *Professor*, Ph.D., 1973, Purdue University-Indiana.

**RAFAEL A. RAMOS**, *Associate Professor*, Ph.D., 1994, Boston University.

**PATRICK D. RAPP**, *Assistant Professor*, Ph.D., 1974, Columbia University.

**ERICK ROURA-DAVILA**, *Assistant Professor*, Ph.D., 2001, University of Massachusetts at Amherst.

**MAHARAJ S. TOMAR**, *Professor*, Ph.D., 1973, University of Roorkee, India.

**ESOV VELAZQUEZ**, *Associate Professor*, Ph.D., 1999, University of Puerto Rico.

#### COURSES OF INSTRUCTION

##### DEPARTMENT OF PHYSICS

##### UNDERGRADUATE COURSES

FISI 3000. ORIENTATION FOR PHYSICS MAJORS. Non-credit. One hour seminar per

week. Prerequisite: Student in the Physics Department.

Academic and professional orientation for students entering the Department of Physics.

FISI 3028. ELECTROMAGNETISM FOR TEACHERS. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: FISI 3027.

Introduction to electromagnetism for high school teachers, including teaching methodologies and techniques. Topics include Coulomb's Law, electric fields, electric potential, circuits, magnetic force, Biot-Savart's law, magnetic induction, and electromagnetic waves.

FISI 3029. MODERN PHYSICS FOR TEACHERS. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: FISI 3028.

Introduction to modern physics for high schools teachers, including methodologies and techniques. Topics include special relativity, the photoelectric effect, blackbody radiation, the Compton effect, atomic spectra, Bohr's atom, quantum mechanics, and nuclear physics.

FISI 3091. ELEMENTS OF PHYSICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3172 or MATE 3174 or MATE 3005 or MATE 3143.

Basic concepts of mechanics, thermodynamics, optics, and electromagnetism oriented specially towards agriculture.

FISI 3092. ELEMENTS OF PHYSICS LABORATORY. One credit hour. One two-hour laboratory per week. Co-requisite: FISI 3091.

Laboratory exercises and demonstrations applying the principles studied in FISI 3091.

FISI 3151-3152. MODERN COLLEGE PHYSICS. Three credit hours per semester. Two hours of lecture and one hour of discussion per week each semester. FISI 3151: Prerequisite: MATE 3021, Corequisite: MATE 3031 or MATE 3144 or MATE 3183. FISI 3152: Prerequisite: MATE 3022 or MATE 3031 or MATE 3144 or MATE 3183.

Mechanics, heat, sound, electricity, magnetism, and optics. Differential and integral calculus will be used as much as possible.

FISI 3153-3154. MODERN COLLEGE PHYSICS LABORATORY. One credit hour per semester. One two-hour laboratory per week each semester. Co-requisite: FISI 3151-3152.

This course is to supplement FISI 3151-3152.

FISI 3161. GENERAL PHYSICS I. Four credit hours. Four hours of lecture per week. Prerequisite: MATE 3031 or MATE 3183.

Principles of mechanics, acoustics, and thermodynamics, with application to classical and modern physics.

FISI 3162. GENERAL PHYSICS II. Four credit hours. Four hours of lecture per week. Prerequisite: FISI 3161 or FISI 3171.

Principles of electricity, magnetism, and optics, with application to classical and modern physics.

FISI 3163. LABORATORY OF GENERAL PHYSICS I. One credit hour. One two-hour laboratory per week. Co-requisite: FISI 3161 or FISI 3171.

Experiments in mechanics, waves, and thermodynamics to complement FISI 3161.

FISI 3164. LABORATORY OF GENERAL PHYSICS II. One credit hour. One two-hour laboratory per week. Prerequisite: FISI 3163 or FISI 3173. Co-requisite: FISI 3162 or FISI 3172.

Experiments in electricity, magnetism, and optics to complement FISI 3162.

FISI 3171. PHYSICS I. Four credit hours. Four hours of lecture per week. Prerequisite: MATE 3031 or MATE 3183 or MATE 3144.

Principles of mechanics, waves, and thermodynamics for engineering and physical sciences.

FISI 3172. PHYSICS II. Four credit hours. Four hours of lecture per week. Prerequisite: FISI 3171 or FISI 3161.

Principles of electricity, magnetism, optics, and modern physics for engineering and the physical sciences.

FISI 3173. PHYSICS LABORATORY I. One credit hour. A two-hour laboratory per week. Co-requisite: FISI 3171 or FISI 3161.

Experiments in mechanics, waves, and optics to complement the PHYSICS I course.

FISI 3174. PHYSICS LABORATORY II. One credit hour. A two-hour laboratory per week. Prerequisite: FISI 3173 or FISI 3163. Co-requisite: FISI 3172 or FISI 3162.

Experiments in electricity, magnetism, and modern physics to complement the PHYSICS II course.

FISI 4001-4002. SEMINAR. One credit hour per semester. Two hours of lecture per week each semester.

Discussion and reports of special topics in Physics.

FISI 4007. PHOTOGRAPHY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: Consent of the Director of the Department.

Study of lens systems, basic photochemistry, composition, light and color balance; laboratory practices and techniques of the darkroom; appropriate use of natural and artificial light.

FISI 4017. PHYSICAL OPTICS. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 3162 or FISI 3172.

Interference, diffraction and polarization phenomena; wave surfaces, resolving power of optical instruments, magneto-optical phenomena.

FISI 4046. WAVE MECHANICS. Three credit hours. Three lectures per week. Prerequisites: FISI 4052 and MATE 4009, or consent of the Director of the Department.

An introduction to wave mechanics: the study of the Shroedinger equation, and its application to the solution of problems in one and three dimensions; elementary techniques of perturbation theory.

FISI 4049. ELECTRONICS. Three credit hours. Two lectures and one three-hour laboratory per week. Prerequisites: (FISI 3164 or FISI 3174 or FISI 3154) and (FISI 3162 or FISI 3172 or FISI 3152).

Discussion of AC circuits theory, vacuum tubes, transistors, power supplies, amplifiers, oscillations, servo systems, operational amplifiers, electronic switching and other electronic circuits. Laboratory exercises are designed so that students develop a practical knowledge of electronic circuits.

FISI 4051. INTERMEDIATE MECHANICS. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 3162 or FISI 3172 and MATE 3063 or MATE 3185.

A study of kinematics, dynamics, gravitation, and motion of rigid bodies; elasticity, hydrostatics and hydrodynamics; vibration and wave motion.

FISI 4052. DYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 4051.

Dynamics of particles and rigid bodies. Lagrange and Hamilton's equations of motion and related matters.

FISI 4057. THERMAL PHYSICS. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 3162 or FISI 3172 or FISI 3012 and MATE 3063 or MATE 3185.

A study of the three laws of thermodynamics, equations of state, phase transitions, and thermodynamics potentials, with an introduction of classical and quantum statistics and applications of the distribution functions of Boltzman, Bose-Einstein, and Fermi-Dirac.

FISI 4068. ELECTROMAGNETISM. Three credit hours. Three hours of lecture per week. Prerequisite: (FISI 3162 or FISI 3172) and (MATE 3063 or MATE 3185).

An introductory study of electric theory, electrostatics, electric and magnetic field, theory of linear circuits, and electromagnetic radiation.

FISI 4076. INTERMEDIATE LABORATORY I. Two credit hours. Two three-hour laboratories per week. Prerequisite: FISI 3164 or FISI 3174 or FISI 4049.

Includes intermediate laboratory experiments in mechanics, electricity, magnetism, and modern physics, stressing the importance of precision measurements and appropriate experimental techniques.

FISI 4077. INTERMEDIATE LABORATORY II. Two credit hours. Two three-hour laboratories per week. Prerequisite: FISI 3164 or FISI 3174 or FISI 4049.

Includes intermediate laboratory experiments in wave phenomena, solid state, atomic, nuclear, and molecular physics. The student will acquire general research laboratory techniques in



spectroscopy, electric and magnetic measurements, vacuum systems, and low temperatures.

FISI 4105. MODERN PHYSICS. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 3162 or FISI 3172.

A study of topics of twentieth century physics, including Relativity theory, Radiation theory, atomic structure of hydrogen like atoms, introduction to Schrodinger's equation, radioactive and selected topics in nuclear and solid state physics.

FISI 4125. COMPUTERS IN PHYSICS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INGE 3025 or MATE 3010 or COMP 3010 or consent of the Director of the Department.

Introduction to computer techniques and their applications to physics.

FISI 4135. APPLIED OPTICS. Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisite: FISI 4017.

Current topics in applied optics including: radiometry and photometry, light detectors, optical fibers and wave guides, Fourier optics and optical image processing, holography, electro-optics, and integrated optics.

FISI 4996. COOP PRACTICE. Three to six credit hours. Prerequisite: Consent of the Director of the Department.

Practical experience in physics in cooperation with private industry or government to be jointly supervised by the academic department, the COOP Program Coordinator, and an official from the cooperating organization.

FISI 4997. SPECIAL PROBLEMS IN PHYSICS. One to six credit hours. Prerequisite: Consent of the Director of the Department.

Short research problems, assigned or selected, subject to approval by the instructor. A written report is required.

FISI 4999. UNDERGRADUATE RESEARCH. One to three credit hours. Prerequisite: Consent of the Director of the Department.

A research project in either basic or applied physics to be supervised by a member of the Department.

## **ADVANCED UNDERGRADUATE AND GRADUATE COURSES**

FISI 5037-5025. INTRODUCTION TO SOLID STATE PHYSICS. Three credit hours per semester. Three hours of lecture per week each semester.

An introduction to X-ray diffraction, crystal structures, elastic constant of crystals, lattice energy and vibrations; thermal properties of solids, dielectric properties, ferroelectric crystals; diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism; free electron model of metals, superconductivity, excitons, photoconductivity and luminescence.

FISI 5047. LASER PHYSICS. Three credit hours. Three hours of lecture per week. Prerequisites: FISI 4105 and FISI 4068.

Semi-classical theory of laser operation. Analysis of laser light characteristics, interaction of radiation with matter, optical resonators, pumping schemes, common laser systems, and non-linear optics.

## **ASTRONOMY**

ASTR 3005. DESCRIPTIVE ASTRONOMY. Three credit hours. Three hours of lecture per week. Open only to non-science or non-engineering majors.

A descriptive treatment of the structure of the universe beginning with naked-eye astronomical observations and progressing to telescopic observations and simple interpretations. Topics to be covered include the solar system, stars, stellar systems and galaxies. Occasional observation periods at night or early morning, as determined by the professor.

ASTR 4005. ASTRONOMY I. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 3151 or FISI 3011 or FISI 3161 or FISI 3171.

A descriptive course covering facts and theories pertaining to the solar system and the sidereal universe.

ASTR 4006. ASTRONOMY II. Three credit hours. Three hours of lecture per week. Prerequisite: ASTR 4005.

A continuation of ASTR 4005, including an introduction to celestial mechanics and astrophysics.

ASTR 5005. FORMATION AND EVOLUTION OF GALAXIES. Three credit hours. Three hours of lecture per week.

Formation, types, structures, evolution, and interactions of galaxies.

ASTR 5007. PLANETARY ASTRONOMY. Three credit hours of lecture per week. Prerequisite: ASTR 4005 or consent of the Director of the Department.

The study of the properties, physical formation, and evolution of the planets and solar system.

### **METEOROLOGY**

METE 4006. METEOROLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 3152 or FISI 3012 or FISI 3162 or FISI 3172.

An elementary treatment of general meteorology.

METE 4007. METEOROLOGICAL MEASUREMENTS. One credit hour. One three-hour laboratory per week. Prerequisite: METE 4006.

Laboratory exercises in measurement of meteorological variables. Meteorological instruments.

METE 4008. PHYSICAL METEOROLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: FISI 4051 and METE 4007.

Radiation, radiation measurements, meteorological optics, atmospheric electricity, and dynamics of the atmosphere.

### **PHYSICAL SCIENCE**

CIFI 3011-3012. PHYSICAL SCIENCE. Three credit hours per semester. Three hours of lecture per week per semester. Co-requisite: MATE 3171 or MATE 3173 or MATE 3086 or consent of the Director of the Department.

To introduce the students to the major concepts which science has formed of the natural world and to provide a balanced and coherent presentation of the more important theories of physical science; to give students an acquaintance with scientific methods, and to show the relationship of science to other fields of knowledge. The major areas cover the solar system, matter, energy, the structure of matter, elementary concepts of geology, and elements of weather. The lectures are supplemented with demonstrations, slides, films, filmstrips, and field trips.

## DEPARTMENT OF SOCIAL SCIENCES

The Department of Social Sciences was established in 1960 as a result of the merging of the School of Sciences and the Division of General Studies into the College of Arts and Sciences.

As a unit within the College of Arts and Sciences, the Department collaborates in the academic preparation of individuals in making independent choices and participating effectively in public decisions which affect the community and society as a whole.

In order to achieve these goals, the Department provides programs leading to a **Bachelor of Arts** degree in several areas in the social sciences for persons who will enter public service or will pursue graduate studies. It also offers courses which are required by the curricula of other academic programs on campus.

This dual goal is accomplished through the common objectives of its academic program in General Social Sciences, History, Political Science, Psychology and Sociology and through the specific objectives of each of these academic disciplines.

These common objectives are:

- to introduce the student to the principles and techniques of social science research.
- to direct the student in the acquisition of relevant knowledge about political, sociological, psychological and historical aspects of the contemporary world.
- to lead the student to an understanding of and a concern for the role of science and technology in the development of society.

## BACHELOR OF ARTS IN PSYCHOLOGY

### Summary of Credits in Program

Faculty requirements	56 or 58
Departmental requirements	
Major area	35
Non-major area	18
Recommended electives	12
Free electives	<u>12</u>
<b>Total</b>	<b>133 or 135</b>

### FIRST YEAR

#### First Semester

<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3101</b>	
Basic Course in Spanish I	3
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>PSIC 3001</b>	
Principles of Psychology I	3
<b>*MATE 3171</b>	
Pre-Calculus I	3
<b>EDFI ----</b>	
Course in Physical Education	1
<b>PSIC 3050</b>	
Psychology as a Profession	<u>1</u>
	17

#### Second Semester

<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3102</b>	
Basic Course in Spanish II	3
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>PSIC 3002</b>	
Principles of Psychology II	3
<b>ESMA 3101</b>	
Applied Statistics I	3
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	16

### SECOND YEAR

#### First Semester

<b>INGL 3--- or INGL 4---</b>	
Second year course in English	3
<b>ESPA 3--- or ESPA 4---</b>	
Second year course in Spanish	3
<b>PSIC 3006</b>	
Social Psychology	3
<b>CISO 3145</b>	
Bibliography and Library	3

Research in the Social Sciences <b>ESMA 3102</b>	
Applied Statistics II <b>CIBI 3031</b>	3
Intro. to the Biological Sciences I	<u>3</u>
	18
<b>Second Semester</b>	
<b>INGL 3---</b> or <b>INGL 4---</b>	
Second year course in English	3
<b>ESPA 3---</b> or <b>ESPA 4---</b>	
Second year course in Spanish	3
<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	3
<b>PSIC ----</b>	
Elective in Psychology	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	15

**THIRD YEAR**

**First Semester**

<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>CIFI 3011</b>	
Physical Science	
or	
<b>QUIM 3001</b>	
General Chemistry	3 or 4
<b>PSIC 3018</b>	
Physiological Psychology	3
<b>PSIC ----</b>	
Elective in Psychology	3
<b>PSIC 4006</b>	
Experimental Methods in Psychology	<u>4</u>
	16 or 17

**Second Semester**

<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>CIFI 3012</b>	
Physical Science	
or	
<b>QUIM 3002</b>	
General Chemistry	3 or 4
<b>PSIC ----</b>	
Elective in Psychology	3
<b>PSIC ----</b>	
Elective in Psychology	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	15 or 16

**FOURTH YEAR**

**First Semester**

<b>FILO 3001</b>	
Intro. To Philosophy: Major or Questions	
or	
<b>FILO 3002</b>	
Intro. To Philosophy: Historical Approach	3
<b>HIST 3241</b>	
History of Puerto Rico	3
<b>PSIC 4065</b>	
Seminar on Psychological Research	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	18

**Second Semester**

<b>HIST 3242</b>	
History of Puerto Rico	3
<b>FILO 3155 or FILO 3156 or FILO 3168 or FILO 3169 or FILO 4147</b>	
Elective Course in Philosophy	3
<b>PSIC ----</b>	
Elective in Psychology	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	18

**Total credits required: 133 or 135**

\*Refer to the Academic Regulations section for information on Advanced Placement.

**BACHELOR OF ARTS IN SOCIAL SCIENCES**

**Summary of Credits in Program**

Faculty requirements	56
Departmental requirements	
Major area	48
Non-major area	3
Recommended electives	15
Free electives	<u>12</u>
Total	134

**FIRST YEAR**

**First Semester**

<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3101</b>	
Basic Course in Spanish	3
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>CIBI 3031</b>	
Intro. to the Biological Sciences I	3
<b>*MATE 3171</b>	
Pre-Calculus I	3
<b>EDFI ----</b>	
Course in Physical Education	$\frac{1}{16}$

**Second Semester**

<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3102</b>	
Basic Course in Spanish	3
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	3
<b>MATE 3---</b>	
**Recommended Course in Mathematics	3
<b>EDFI ----</b>	
Course in Physical Education	$\frac{1}{16}$

**SECOND YEAR**

**First Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>HIST 3201</b>	
History of the Modern World I	3
<b>CISO 3145</b>	
Bibliography & Library Research in the Social Sciences	3
<b>ELECTIVE</b>	
Introductory Course in any of the Social Sciences	$\frac{3}{18}$

**Second Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>HIST 3202</b>	
Modern World History II	3
<b>ESMA 3015</b>	
Elementary Statistics	3
<b>ELECTIVE</b>	
Introductory Course in any of the Social Sciences	$\frac{3}{18}$

**THIRD YEAR**

**First Semester**

<b>SOCI 3265</b>	
Research Methods in the Social Sciences	3
<b>FISI, QUIM or GEOL</b>	
Elective in Physics, Chemistry or Geology	3
<b>ELECTIVE</b>	
Introductory Course in any of the Social Sciences	3
<b>ELECTIVE</b>	
Elective in any of the 3000 level Social Sciences	3
<b>ELECTIVES</b>	
Recommended Electives	3
<b>ELECTIVES</b>	
Electives	$\frac{3}{18}$

**Second Semester**

<b>FISI, QUIM or GEOL</b>	
Elective in Physics, Chemistry or Geology	3
<b>ELECTIVE</b>	
Introductory Course in any of the Social Sciences	3
<b>ELECTIVES</b>	
Electives in any of the 3000 level Social Sciences	6
<b>ELECTIVES</b>	
Recommended Electives	3
<b>ELECTIVES</b>	
Electives	$\frac{3}{18}$

**FOURTH YEAR**

**First Semester**

<b>HIST 3241</b>	
History of Puerto Rico	3
<b>ELECTIVES</b>	
Electives in any of the 4000	

level Social Sciences	6
<b>ELECTIVES</b>	
Recommended Electives	3
<b>ELECTIVES</b>	
Electives	<u>3</u>
	15

**Second Semester**

**HIST 3242**

History of Puerto Rico	3
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**ELECTIVE**

Elective in any of the 4000	
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level Social Sciences	3
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**ELECTIVES**

Recommended Electives	6
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**ELECTIVES**

Electives	<u>3</u>
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	15
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**Total credits required: 134**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*To be chosen from the alternatives defined by the Department.

**BACHELOR OF ARTS IN POLITICAL SCIENCE**

**Summary of Credits in Program**

Faculty requirements	56
Departmental requirements	
Major area	39
Non-major area	15
Recommended electives	12
Free electives	<u>12</u>
<b>Total</b>	<b>134</b>

**FIRST YEAR**

**First Semester**

**\*INGL ----**

First year course in English	3
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**\*ESPA 3101**

Basic Course in Spanish	3
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**CISO 3121**

Intro. to the Study of the Social Sciences	3
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**CIPO 3011**

Principles of Political Science	3
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**\*MATE 3171**

Pre-Calculus I	3
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**EDFI ----**

Course in Physical Education	<u>1</u>
	16

**Second Semester**

**\*INGL 3---**

First year course in English	3
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**\*ESPA 3102**

Basic Course in Spanish	3
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**CISO 3122**

Intro. to the Study of the Social Sciences	3
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**CIPO 3025**

Government of the United States of America	3
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**MATE 3---**

**Recommended Course in Mathematics	3
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**EDFI ----**

Course in Physical Education	<u>1</u>
	16

**SECOND YEAR**

**First Semester**

**INGL 3---**

Second year course in English	3
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**ESPA 3---**

Course above level of basic Spanish	3
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**HUMA 3111**

Intro. to Western Culture I	3
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**CIBI 3031**

Intro. to the Biological Sciences I	3
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**CIPO 3035**

Government of Puerto Rico	3
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**HIST 3201**

History of the Modern World I	<u>3</u>
	18

**Second Semester**

**INGL 3---**

Second year course in English	3
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**ESPA 3---**

Course above level of basic Spanish	3
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**HUMA 3112**

Intro. to Western Culture II	3
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**CIBI 3032**

Intro. to the Biological Sciences II	3
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**CISO 3145**

Bibliography and Library Research in Social Science	3
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**HIST 3202**

Modern World History II	<u>3</u>
	18



**THIRD YEAR**

**First Semester**

<b>CIPO 4015</b> Comparative Government and Politics or <b>CIPO 3065</b> International Relations	3
<b>CIPO 4051</b> Political Theory	3
<b>ESMA 3015</b> Elementary Statistics	3
<b>FISI, QUIM or GEOL</b> Electives	3
<b>ELECTIVES</b> Electives in any of the Social Sciences	3
<b>ELECTIVES</b> Electives	<u>3</u> 18

**Second Semester**

<b>CIPO 4052</b> Political Theory	3
<b>FISI, QUIM or GEOL</b> Electives	3
<b>ELECTIVES</b> Electives in Political Science	6
<b>ELECTIVES</b> Electives in Economics, Sociology, or Psychology	3
<b>ELECTIVES</b> Electives	<u>3</u> 18

**FOURTH YEAR**

**First Semester**

<b>CIPO 4155</b> Analysis of Political Science	3
<b>HIST 3241</b> History of Puerto Rico	3
<b>CIPO ----</b> Elective in Political Science	3
<b>ELECTIVES</b> Recommended Electives	3
<b>ELECTIVES</b> Electives	<u>3</u> 15

**Second Semester**

<b>HIST 3242</b> History of Puerto Rico	3
<b>CIPO ----</b> Electives in Political Science	6
<b>ELECTIVES</b> Recommended Electives	3
<b>ELECTIVES</b>	

Electives	<u>3</u> 15
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**Total credits required: 134**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*To be chosen from the alternatives defined by the Department.

**BACHELOR OF ARTS IN SOCIOLOGY**

**Summary of Credits in Program**

Faculty requirements	56
Departmental requirements	
Major area	36
Non-major area	30
Recommended electives	--
Free electives	<u>12</u>
<b>Total</b>	<b>134</b>

**FIRST YEAR**

**First Semester**

<b>*INGL 3---</b> First year course in English	3
<b>*ESPA 3101</b> Basic Course in Spanish	3
<b>CISO 3121</b> Intro. to the Study of the Social Sciences	3
<b>SOCI 3261</b> Introduction to Sociology	3
<b>*MATE 3171</b> Pre-Calculus I	3
<b>EDFI ----</b> Course in Physical Education	<u>1</u> 16

**Second Semester**

<b>*INGL 3---</b> First year course in English	3
<b>*ESPA 3102</b> Basic Course in Spanish	3
<b>CISO 3122</b> Intro. to the Study of the Social Sciences	3
<b>SOCI 3262</b> Introduction to Sociology	3
<b>MATE 3---</b> **Recommended Course in Mathematics	3
<b>EDFI ----</b> Course in Physical Education	<u>1</u> 16

**SECOND YEAR**

**First Semester**

<b>INGL 3---</b> Second year course in English	3
<b>ESPA 3---</b> Course above level of basic Spanish	3
<b>CIBI 3031</b> Intro. to the Biological Sciences I	3
<b>HIST 3201</b> History of the Modern World I	3
<b>ESMA 3015</b> Elementary Statistics	3
<b>GEOG 3155</b> Human Geography or <b>ANTR 3015</b> Introduction to Physical Anthropology	<u>3</u> 18

**Second Semester**

<b>INGL 3---</b> Second year course in English	3
<b>ESPA 3---</b> Course above level of basic Spanish	3
<b>CIBI 3032</b> Intro. to the Biological Sciences II	3
<b>HIST 3202</b> Modern World History II	3
<b>CISO 3145</b> Bibliography & Library Research in the Social Sciences	3
<b>GEOG ----</b> 3000-4000 level course in Geography or <b>ANTR 3005</b> Introduction to Cultural Anthropology	<u>3</u> 18

**THIRD YEAR**

**First Semester**

<b>PSIC 3001</b> Principles of Psychology I	3
<b>HUMA 3111</b> Intro. to Western Culture I	3
<b>SOCI 3295</b> History of Social Thought	3
<b>SOCI 3265</b> Research Methods in the Social Sciences	3

**FISI, QUIM or GEOL**

Electives	3
<b>ELECTIVES</b>	
Electives	<u>3</u> 18

**Second Semester**

<b>PSIC 3002</b> Principles of Psychology II	3
<b>HUMA 3112</b> Intro. to Western Culture II	3
<b>SOCI 4115</b> Contemporary Social Theory	3
<b>FISI, QUIM or GEOL</b>	
Electives	3
<b>SOCI ----</b> Elective in Sociology	3
<b>ELECTIVES</b>	
Electives	<u>3</u> 18

**FOURTH YEAR**

**First Semester**

<b>HIST 3241</b> History of Puerto Rico	3
<b>SOCI 4135</b> Comparative Sociology	3
<b>SOCI 4165</b> Social Problems in the Contemporary World	3
<b>SOCI ----</b> Electives in Sociology	3
<b>ELECTIVES</b>	
Electives	<u>3</u> 15

**Second Semester**

<b>HIST 3242</b> History of Puerto Rico	3
<b>SOCI 4125</b> Structure of Society in Puerto Rico	3
<b>SOCI 4155</b> Social and Cultural Change	3
<b>SOCI ----</b> Elective in Sociology	3
<b>ELECTIVES</b>	
Electives	<u>3</u> 15

**Total credits required: 134**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*To be chosen from the alternatives defined by the Department.

**BACHELOR OF ARTS IN HISTORY**

**Summary of Credits in Program**

Faculty requirements	56
Departmental requirements	
Major area	48
Non-major area	12
Recommended electives	6
Free electives	<u>12</u>
<b>Total</b>	<b>134</b>

**FIRST YEAR**

**First Semester**

<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3101</b>	
Basic Course in Spanish	3
<b>CIBI 3031</b>	
Intro. to the Biological Sciences I	3
<b>CISO 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>HIST 3201</b>	
History of the Modern World I	3
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	16

**Second Semester**

<b>*INGL 3---</b>	
First year course in English	3
<b>*ESPA 3102</b>	
Basic Course in Spanish	3
<b>CIBI 3032</b>	
Intro. to the Biological Sciences II	3
<b>CISO 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>HIST 3202</b>	
Modern World History II	3
<b>EDFI ----</b>	
Course in Physical Education	<u>1</u>
	16

**SECOND YEAR**

**First Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>*MATE 3171</b>	
Pre-Calculus I	3
<b>HUMA 3111</b>	

Intro. to Western Culture I	3
<b>HIST 3241</b>	
History of Puerto Rico	3
<b>HIST 3195</b>	
History of the Ancient World	<u>3</u>
	18

**Second Semester**

<b>INGL 3---</b>	
Second year course in English	3
<b>ESPA 3---</b>	
Course above level of basic Spanish	3
<b>MATE ----</b>	
**Recommended Course in Mathematics	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>HIST 3242</b>	
History of Puerto Rico	3
<b>HIST 3185</b>	
The Medieval World	<u>3</u>
	18

**THIRD YEAR**

**First Semester**

<b>HIST 3141</b>	
History of Spain I	3
<b>FISI, QUIM or GEOL</b>	
Electives	3
<b>ECON 3021</b>	
Principles of Economics I	3
<b>HIST 4221</b>	
Historiography and Approaches to History	3
<b>CISO 3145</b>	
Bibliography & Library Research in the Social Sciences	3
<b>ELECTIVES</b>	
Elective in European History	<u>3</u>
	18

**Second Semester**

<b>HIST 3142</b>	
History of Spain II	3
<b>FISI, QUIM or GEOL</b>	
Electives	3
<b>ECON 3022</b>	
Principles of Economics II	3
<b>HIST 4222</b>	
Historiography and Approaches to History	3
<b>CIPO 3011</b>	
Principles of Political Sciences	3
<b>ELECTIVE</b>	
Elective in European History	<u>3</u>
	18

**FOURTH YEAR**

**First Semester**

<b>HIST 4226</b>	
Historical Research	3
<b>ELECTIVE</b>	
Elective in History of Americas	3
<b>ELECTIVE</b>	
Free Electives	6
<b>ELECTIVE</b>	
**Recommended Elective	<u>3</u>
	15

**Second Semester**

<b>HIST 4228</b>	
Themes in History	3
<b>ELECTIVE</b>	
Elective in History of Americas	3
<b>ELECTIVE</b>	
Free Electives	6
<b>ELECTIVE</b>	
**Recommended Elective	<u>3</u>
	15

**Total credits required: 134**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*To be chosen from the alternatives defined by the Department.

**DEPARTMENTAL FACULTY**

**JOSEPH AGÜERO**, *Professor*, Ph.D., 1982, Purdue University.

**WALDEMAR ARROYO-ROJAS**, *Assistant Professor*, Ph.D. 2000, Universidad Complutense de Madrid.

**LUIS A. AVILES**, *Assistant Professor*, Ph.D., 1998, John Hopkins University, Baltimore.

**MARIA I. BARBOT**, *Associate Professor*, M.A., 1974, State University of New York.

**JANET BONILLA-MUJICA**, *Associate Professor*, Ph.D., University of Puerto Rico, Río Piedras Campus, 1997.

**MARIO CANCEL**, *Associate Professor*, M.A. 1989, Centro de Estudios Avanzados de Puerto Rico y el Caribe.

**WALTER DIAZ-RODRIGUEZ**, *Associate Professor*, Ph.D., 1998, University of Michigan.

**MILAGRITOS GONZALEZ**, *Professor*, Ph.D., 1992, Michigan State University.

**JOSE F. GONZALEZ-PABON**, *Professor*, Ph.D., 1971, Rutgers University.

**LUISA GUILLEMARD**, *Assistant Professor*, Ph.D., 1999, Texas A & M University.

**JAIME GUTIERREZ-SANCHEZ**, *Professor*, Ph.D., 1971, University of Missouri.

**EDDIE MARRERO**, *Associate Professor*, Ph.D. 1998, University of Puerto Rico, Río Piedras.

**ILEANA MATIAS-DEL TORO**, *Associate Professor*, M.A., 1987, George Washington University.

**MARIA D. MULERO**, *Assistant Professor*, Ph.D., 2000, Temple University.

**ANA NIEVES**, *Assistant Professor*, Ph.D. 2001, University of Puerto Rico, Río Piedras.

**MARIO A. NUÑEZ-MOLINA**, *Professor*, Ed.D., 1987, Harvard University.

**LIZZETTE M. OCASIO-CRUZ**, *Assistant Professor*, Ph.D., 1989, University of Wisconsin.

**EDGAR ORTIZ-RIVERA**, *Associate Professor*, M.A., 1967, University of New Mexico.

**MARIE J. PAOLETTI**, *Professor*, Ph.D., 1990, Université de Provence Aix.

**ERIC PHOEBUS**, *Professor*, Ph.D., 1977, University of California.

**JULIA QUIÑONES**, *Assistant Professor*, M.A., 1986, Center for Puerto Rican Studies.

**ANIBAL RAMIREZ-PEREZ**, *Associate Professor*, M.A., 1986, University of Texas.

**GILBERTO RIOS**, *Associate Professor*, Ed.D., 1990, University of Massachusetts.

**HAVIDAN RODRIGUEZ-RIVERA**, *Professor*, Ph.D., 1991, University of Wisconsin.

**VIRGILIO RODRIGUEZ-RIVERA**, *Professor*, Ph.D., 1995, Southwestern Medical Center, Texas.

**ANGEL R. ROSA-RODRIGUEZ**, *Assistant Professor*, Ph.D., 1998, Boston University.

**SONIA RUIZ**, *Professor*, Ph.D., 1974, Michigan State University.

**DOUGLAS SANTOS-SANCHEZ**, *Associate Professor*, Ph.D., 1996, University of Puerto Rico, Rio Piedras.

**JORGE SCHMIDT-NIETO**, *Assistant Professor*, Ph.D., 2000, Rutgers University, New Brunswick, New Jersey.

**LUIS N. TOMASSINI-GUERRA**, *Associate Professor*, M.A., 1975, University of Michigan.

**MANUEL VALDES-PIZZINI**, *Professor*, Ph.D., 1985, State University of New York.

**NELLY VAZQUEZ-SOTILLO**, *Associate Professor*, Ph.D., 1995, Universidad de Valladolid.

**EFRAIN F. VICENTY-BARBOSA**, *Associate Professor*, M.A., 1963, New School for Social Research, M.L.S., 1967, Pratt Institute.

## **COURSES OF INSTRUCTION**

### **DEPARTMENT OF SOCIAL SCIENCES**

#### **UNDERGRADUATE COURSES**

##### **ANTHROPOLOGY**

ANTR 3005. INTRODUCTION TO CULTURAL ANTHROPOLOGY. Three credit hours. Three hours of lecture per week.

The concept of culture: socio-cultural evolution, language technology, economy, social stratification, types of association, law, magic, religion, art, social change. The role of applied anthropology.

ANTR 3015. INTRODUCTION TO PHYSICAL ANTHROPOLOGY. Three credit hours. Three hours of lecture per week.

Concepts of biological and cultural evolution, mechanisms of evolution, the evolutionary history of the human being, the fossil record, socioeconomic adaptations in prehistory.

ANTR/CISO 4066. POLITICAL AND CULTURAL ASPECTS OF INDIGENOUS PEOPLES OF LATIN AMERICA. Three credit hours. Three hours of lecture per week. Prerequisite: CISO 3121 o ANTR 3005.

Indigenous peoples of Latin America: culture areas; history; "indigenismo" and identity; political, economic, and civil rights.

##### **GEOGRAPHY**

GEOG 3155. HUMAN GEOGRAPHY. Three credit hours. Three hours of lecture per week.

The study of human society in its natural environmental background throughout the world.

GEOG 3185. PHYSICAL GEOGRAPHY. Three credit hours. Three hours of lecture per week.

Study of the earth as a planet; mountain building, erosion and other characteristic natural processes which produce its surface features; study of the factors which produce weather, and of the various types of climate found on the earth.

##### **HISTORY**

HIST 3091. HISTORY OF FRANCE. Three credit hours. Three hours of lecture per week.

An intensive study of the history of France from its origins to 1789 with special emphasis on the religious wars, the Enlightenment, and the French Revolution.

HIST 3092. HISTORY OF FRANCE. Three credit hours. Three hours of lecture per week.

The political, economic and constitutional history of France from 1789 to the present with emphasis on the effects of the French Revolution upon the history of the country; origins and fall of the Third Republic; Charles De Gaulle's regime.

HIST 3111. HISTORY OF THE UNITED STATES OF AMERICA. Three credit hours. Three hours of lecture per week.

Historical development of the United States of America from the colonial period to the Civil War.

HIST 3112. HISTORY OF THE UNITED STATES OF AMERICA. Three credit hours. Three hours of lecture per week.

Historical development of the United States of America from the reconstruction period to the present, with emphasis on the impact of economic and social forces on national policies.

HIST 3121-3122. HISTORY OF THE FOREIGN POLICY OF THE UNITED STATES OF AMERICA. Three credit hours per semester. Three hours of lecture per week each semester.

The development of American foreign policy from 1775 to the present, within the context of the

changing patterns of American interests and those of the world, as foreign relations grow in complexity and significance.

HIST 3141. HISTORY OF SPAIN I. Three credit hours. Three hours of lecture per week.

Cultural influence of the various people that settled the Iberian Peninsula on the history and civilization of the different Spanish Kingdoms from the beginning to the period of national unity under Ferdinand and Isabella.

HIST 3142. HISTORY OF SPAIN II. Three credit hours. Three hours of lecture per week.

The evolution of the Spanish Empire and the causes leading to its downfall; analysis of the cultural, social and political development of Spain from the 16th Century to the present.

HIST 3155. HISTORY OF NINETEENTH CENTURY EUROPE. Three credit hours. Three hours of lecture per week.

Development of the major European countries, and their international relations within Europe. Emphasis will be given to nationalism, imperialism, and their impact upon Europe and the non-European world.

HIST 3158. HISTORY OF TWENTIETH CENTURY EUROPE. Three credit hours. Three hours of lecture per week.

Development of the major European countries, and their international relations within Europe. Emphasis will be given to the First World War, the Peace Conferences, the rise of Fascism and National Socialism, the Second World War, and the Reconstruction of Europe.

HIST 3165. HISTORY OF THE RENAISSANCE. Three credit hours. Three hours of lecture per week.

A study of the transition from medieval times to modern civilization in Western Europe; origin and development of the Renaissance; the Protestant and Catholic reformations.

HIST 3185. THE MEDIEVAL WORLD. Three credit hours. Three hours of lecture per week.

The history of Europe from the collapse of the Roman Empire in the West to the Renaissance.

HIST 3195. HISTORY OF THE ANCIENT WORLD. Three credit hours. Three hours of lecture per week.

The origins of mankind; the civilization of the Near East, India and China; the rise and decline of the Greek and Roman cultures.

HIST 3201. HISTORY OF THE MODERN WORLD I. Three credit hours. Three hours of lecture per week.

Study of the political, socio-cultural, economic and religious development of the World from 1500 to 1815.

HIST 3202. MODERN WORLD HISTORY II. Three credit hours. Three hours of lecture per week.

The contemporary world from the Congress of Vienna to the present, with emphasis on the First and Second World Wars, the Cold War and the Third World.

HIST 3211. HISTORY OF LATIN AMERICA. Three credit hours. Three hours of lecture per week.

The historical development of Latin America from its origins to the wars of independence, with emphasis on the Spanish Conquest and the development of the colonial society.

HIST 3212. HISTORY OF LATIN AMERICA. Three credit hours. Three hours of lecture per week.

History of Latin America from the national period to the present, with emphasis on its economic, social and political development.

HIST 3221. HISTORY OF THE ANTILLES. Three credit hours. Three hours of lecture per week.

A comparative study of the historical development in the Antilles of Spanish, English, French and Dutch colonial institutions through the 18th century.

HIST 3222. HISTORY OF THE ANTILLES. Three credit hours. Three hours of lecture per week.

A comparative study of the social, economic and political development of the Antilles in the 19th and 20th centuries.



HIST 3241. HISTORY OF PUERTO RICO. Three credit hours. Three hours of lecture per week.

History of Puerto Rico from the discovery and colonization to the middle of the nineteenth century.

HIST 3242. HISTORY OF PUERTO RICO. Three credit hours. Three hours of lecture per week.

History of Puerto Rico from the second half of the nineteenth century to the present.

HIST 4005. HISTORY OF MEXICO. Three credit hours. Three hours of lecture per week.

History of Mexico from Pre-Colombian times to the present; the political, social, cultural, and economic development of the country.

HIST 4055. THEMES IN EUROPEAN HISTORY. Three credit hours. Three hours of lecture per week. Prerequisite: HIST 4222.

Advanced study of the most significant movements in modern European History. Readings, research, and report writing.

HIST 4066. THEMES IN THE HISTORY OF THE AMERICAS. Three credit hours. Three hours of lecture per week. Prerequisite: HIST 4222.

Advanced study of the most significant movements in the historical development of the Americas. Readings, research, and report writing.

HIST 4075. SPECIAL PROBLEMS. Three credit hours. Three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Under the guidance of a member of the staff, the student will be required to organize and carry out a project of historical research.

HIST 4111-4112. SOCIAL HISTORY OF THE UNITED STATES OF AMERICA. Three credit hours per semester. Three hours of lecture per week each semester.

A history of the development of the American people from early colonial days to the present. The expansion and changes in the general patterns of living, thinking and culture will be covered, with emphasis on economic and political factors.

HIST 4117. HISTORY OF LABOR IN THE UNITED STATES OF AMERICA. Three credit hours. Three hours of lecture per week.

The development of the patterns and institutions of labor in the United States of America from colonial times to the present, with emphasis on the post-Civil War period. Includes discussions on indentured servitude, slavery and the development of free labor, the origins and development of unionism, and the labor-oriented theories of social reform.

HIST 4165. HISTORY OF BRAZIL. Three credit hours. Three hours of lecture per week.

A historical survey of Brazil through the colonial and national periods, with special attention to economic, social and political development, cultural conflicts, and foreign relations.

HIST 4171. HISTORY OF RUSSIA. Three credit hours. Three hours of lecture per week.

Study of Russian history from its origins to the reign of Peter the Great.

HIST 4172. HISTORY OF RUSSIA. Three credit hours. Three hours of lecture per week.

Study of Imperial Russia with emphasis on the controversy of slavophiles and westernizers and the revolutionary movement of the nineteenth century.

HIST 4220. HISTORY OF GERMANY SINCE 1871. Three credit hours. Three hours of lecture per week.

History of Germany emphasizing the period from its unification in 1871 to the present.

HIST 4221-4222. HISTORIOGRAPHY AND APPROACHES TO HISTORY. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: HIST 3202.

A study of the methods and techniques of historical research; a survey of the development of History as a discipline; and an analysis of the theories, approaches and contributions of the most noted modern historians.

HIST 4226. HISTORICAL RESEARCH. Three credit hours. Three hours of lecture per week. Prerequisite: Twelve credit hours in History and consent of the Director of the Department.

A study of the methods in historical research and of the most important historical currents, with the

purpose of preparing the student to make intensive studies in his major field.

HIST 4228. THEMES IN HISTORY. Three credit hours. Three hours of lecture per week. Prerequisite: HIST 4226.

Lectures and directed readings on selected topics.

HIST 4235. REVOLUTIONS IN TWENTIETH CENTURY LATIN AMERICA. Three credit hours. Three hours of lecture per week.

Comparative historical analysis of the origins and development of Latin American revolutions in the 20th Century, with emphasis on the nature and direction of social change attendant to revolutions in Mexico, Bolivia, Cuba and Chile.

HIST 4345. TWENTIETH CENTURY PUERTO RICAN HISTORY. Three credit hours. Three hours of lecture per week.

The historical development of Puerto Rico in the twentieth century: constitutional history, political movements, economic development, and socio-cultural changes.

### POLITICAL SCIENCES

CIPO 3011. PRINCIPLES OF POLITICAL SCIENCE. Three credits hours. Three lectures per week.

Concept of politics, ideological assumptions, basic problems of politics, general types of national and international political organization.

CIPO 3025. GOVERNMENT OF THE UNITED STATES OF AMERICA. Three credit hours. Three hours of lecture per week.

Development of political institutions in the United States of America; a survey of the structure and processes of these institutions.

CIPO 3035. GOVERNMENT OF PUERTO RICO. Three credit hours. Three hours of lecture per week.

Historical and analytical survey of the Government of Puerto Rico from 1898 to the present; governmental institutions developed during United States rule, 1898-1952; the Constitution of the Commonwealth of Puerto Rico; the political process in Puerto Rico; the Legislature, the Executive, the Judiciary, local governments, and

relations between Puerto Rico and the United States of America.

CIPO 3045. INTERNATIONAL ORGANIZATION AND ADMINISTRATION. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

A study and analysis of the functional as well as the constitutional bases of international organization and administration, with emphasis on the dynamics and functions of the United Nations.

CIPO 3065. INTERNATIONAL RELATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

The nature of international relations; nationalism, militarism, armaments, history of international relations; foreign policies, functions of democracy; international organizations.

CIPO 3095. MUNICIPAL GOVERNMENT. Three credit hours. Three hours of lecture per week.

Historical and legal background, organization, and functions of the municipal system. Emphasis on the municipal governments of Puerto Rico.

CIPO 3175. INTRODUCTION TO LAW. Three credit hours. Three hours of lecture per week.

Principal theories and rules in Law including those of the United States and Puerto Rico. History of Law and the most common research methods in the field.

CIPO 4005. CONSTITUTIONAL LAW. Three credit hours. Three hours of lecture per week. Prerequisites: CIPO 3011.

The functions of the Supreme Court of the United States of America; case studies of constitutional decisions, including cases involving constitutional relations between Puerto Rico and the United States of America.

CIPO 4015. COMPARATIVE GOVERNMENT AND POLITICS. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

A study of various major political systems; discussion of current theoretical approaches to comparative political analysis. Designed to give the student a general picture of the political process and governmental institutions.

CIPO 4016. GOVERNMENT AND POLITICS OF THE MIDDLE EAST. Three credit hours. Three hours of lecture per week.

Historical and analytical study of the constitutional and political development of the countries of the Middle East. Includes Arab and non-Arab states from Iran and Pakistan in the east, to the countries of North Africa.

CIPO 4025. PUBLIC OPINION. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

The nature of public opinion and propaganda in modern society, and the study of its determinants; such as group membership, mass media, and others.

CIPO 4035. POLITICAL PARTIES. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

The nature and functions of political parties: origin, development, structure, economics and composition, internal management and controls; the relation of political parties and pressure groups to legislation and administration.

CIPO 4036. GOVERNMENT AND POLITICS OF COMMUNIST STATES. Three credit hours. Three hours of lecture per week.

Development of governmental and political institutions of communist states; the structure and processes of these institutions, specially in the Soviet Union and China.

CIPO 4045. ELEMENTS OF PUBLIC ADMINISTRATION. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3035 or CIPO 3025.

The role of public administration in modern society; principles of organization, budgeting, management techniques, the public service, and the control of administration.

CIPO 4046. SPECIAL TOPICS IN POLITICAL SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Research of selected topics in Political Science.

CIPO 4051-4052. POLITICAL THEORY. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisite: CIPO 3011.

Systematic and critical exposition of political thought from the beginning of history to modern times. Political doctrines such as democracy, liberalism, socialism and communism will be analyzed. Emphasis will be given to comparison of different political beliefs, and also to the relationships between the different theories, considered as historic heritage which contribute to contemporary circumstances.

CIPO 4065. INTERNATIONAL LAW. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

Descriptive and systematic analysis from a juridical point of view of the basic concepts, principles, and problems of the relations between national political units.

CIPO 4075. THE POLITICS OF THE DEVELOPING AREAS. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

Comparative analysis of the political systems of selected world areas in which racial, social, and political changes are actually taking place.

CIPO 4085. AMERICAN FOREIGN POLICY. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3025.

An outline of the modern policy of the United States of America; how it is formulated; the relationship between the American democratic processes and the demands of a global foreign policy; and the basic factors shaping it.

CIPO 4095. GOVERNMENT AND POLITICS OF THE CARIBBEAN. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

Study and analysis of the government, political processes and political groups in the Caribbean area, including their relations with outside countries.

CIPO 4105. LATIN AMERICAN GOVERNMENT AND POLITICS. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3011.

Latin American parties and politics; governmental activities and problems, the structure of government. Emphasis is placed on political realities rather than on formal constitutional provisions.

CIPO 4115. LATIN AMERICAN INTERNATIONAL RELATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 3065 or CIPO 4105.

A survey of the evolution and present status of the relations of the Latin American countries with one another, and with Anglo-American and the rest of the world.

CIPO 4125. COMMUNIST IDEOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: CIPO 4052.

A critical historical analysis of the Marxist movement and ideology, including the social and philosophical origins of Marxism; the major economic and political theories of Marx and Engels; the development of Marxism in Tzarist Russia; the theoretical contributions of Lenin and Trotsky, the rise of the Stalinist state, and the interpretations of Tito, Mao Tse-Tung, Khrushchev, Castro and others.

CIPO 4127. GLOBALIZATION AND WORLD POLITICS. Three credit hours. Three hours of lecture per week.

The impact of globalization on contemporary world politics. Topics include, among others: the crisis of the capitalist state, the Great Depression, imperialism, regional blocks, and the new economic world order.

CIPO 4145. RESEARCH IN POLITICAL SCIENCE. Three credit hours. Two hours of lecture and at least four hours of research per week. Prerequisite: 12 credit hours in Political Science.

Current methods of research in political sciences; trends in methodology and research interests here and abroad; bibliography of political science. Individual work, oral and written reports.

CIPO 4155. ANALYSIS OF POLITICAL SCIENCE. Three credit hours. Two hours of lecture and at least four hours of research per week. Prerequisite: 12 credit hours in Political Science.

The area of political science as a discipline; its problems and methods; the nature of political science; the state, its origin, scope, and relationship to authority; the bases of political action, leadership, groups public opinion, elections, parties and pressure groups, governmental organizations, liberty and authority. Oral reports and final individual written project required.

CIPO 4236. REVOLUTIONS IN TWENTIETH CENTURY LATIN AMERICA. Three credit hours. Three hours of lecture per week.

Comparative historical analysis of the origins and development of Latin American revolutions in the 20th Century, with emphasis on the nature and direction of social change attendant to revolutions in Mexico, Bolivia, Cuba and Chile.

CIPO 4735. UNITED NATIONS MODEL. Three credit hours. Three hours of lecture per week and a trip to the United Nations Organization. Prerequisite: Consent of the Director of the Department.

Study of and participation in the National Model United Nations held every year in New York City sponsored by the National Model United Nations and the United Nations Organization.

CIPO/PSIC/SOCI 4991. INDEPENDENT STUDY I. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: 12 credit hours in psychology or sociology or political science, respectively, and consent of the Director of the Department.

Research project under the supervision of a faculty member.

CIPO/PSIC/SOCI 4992. INDEPENDENT STUDY II. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: PSIC 4991 or SOCI 4991 or CIPO 4991, respectively, and consent of the Director of the Department.

Research project under the supervision of a faculty member.

## PSYCHOLOGY

PSIC 3001. PRINCIPLES OF PSYCHOLOGY I. Three credit hours. Three hours of lecture per week.

Principles of human behavior, including topics such as: biological bases of behavior, sensation, perception, memory, and learning.

PSIC. 3002. PRINCIPLES OF PSYCHOLOGY II. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3001.

Principles of human behavior, including topics such as: personality, stress, psychological disorders, and social behavior.

PSIC 3006. SOCIAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

A conceptual and empirical analysis of the behavior, thought, and emotion of individuals in social contexts, including topics such as: social perception, attitudes, and leadership.

PSIC 3015. THEORIES OF PERSONALITY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Personality analyzed from various psychological perspectives, including psychoanalytic, behavioristic, humanistic, cognitive, and trait theories.

PSIC 3016. ABNORMAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Principal theories and recent research in abnormal psychology; incidence, causes, formation, development, and manifestations of emotional disorders; therapeutic approaches; diagnostic classification. Field trips required.

PSIC 3017. INTRODUCTION TO PSYCHOLOGICAL ASSESSMENT. Three credit hours. Three hours of lecture per week. Prerequisites: PSIC 3002 and ESMA 3102 or MATE 3102.

Principles and techniques in the construction, selection, administration, and interpretation of major psychological tests, including ethical and social considerations.

PSIC 3018. PHYSIOLOGICAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: PSIC 3002 and (CIBI 3002 or CIBI 3032)

Introduction to the neuro-physiological bases of behavior: the structure, function, and neurochemistry of human and animal models of sensation, perception, motivation, emotion, learning, reproduction, and psychopathology.

PSIC 3027. CHILDHOOD PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Physical and psychosocial development of the individual from the prenatal period to puberty, with special interest in the child's healthy development.

PSIC 3028. PSYCHOLOGY OF ADULTHOOD. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Physical and psychosocial development of the individual in adulthood.

PSIC 3035. APPLIED PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Application of psychological knowledge to the solution of problems, emphasizing the following areas: health psychology, legal psychology, environmental psychology, consumer psychology, and sport psychology.

PSIC 3036. EDUCATIONAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Principles of human learning and thinking as applied to the educational environment. Analysis of educational objectives, student characteristics, teaching methods, and learning assessment.

PSIC 3039. PSYCHOLOGY OF ADOLESCENCE. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Physical and psychosocial development of the individual from puberty to adulthood.

PSIC 3040. PERSONAL DEVELOPMENT. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Psychological perspectives that facilitate the awareness of the individual's capacity to cope with day-to-day events and challenges.

PSIC 3046. HISTORY AND SYSTEMS OF PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

History of psychology emphasizing the development of its various systems.

PSIC 3047. COUNSELING PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: PSIC 3002.

The function of the helping professional as a facilitator of personal growth, the educational process, and vocational development.

PSIC 3050. PSYCHOLOGY AS A PROFESSION. One credit hour. One hour of lecture per week. Prerequisite: student of the Psychology Program.

Study of the different alternatives related to the professional development in psychology.

PSIC 3060. ENVIRONMENTAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

The interrelationship between the behavior of the individual and the natural and anthropogenic environment.

PSIC 3070. INTRODUCTION TO COGNITIVE PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Psychological foundations of information processing by the individual.

PSIC 3117. FOLK HEALING SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002 or consent of the Director of the Department.

Analysis of Caribbean folk healing systems in terms of their functions, therapeutic elements and antitherapeutic dimensions.

PSIC 3185. PSYCHOSOCIAL ASPECTS OF THE HIV/AIDS EPIDEMIC. Three credit hours. Three hours of lecture per week.

The social and psychological impact of the HIV/AIDS epidemic.

PSIC 4006. EXPERIMENTAL METHODS IN PSYCHOLOGY. Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisites: PSIC 3006 and (ESMA 3102 or MATE 3015).

Application of experimental and quasi-experimental methods to the problems of psychology, including the design, implementation, analysis, and presentation of a research project.

PSIC 4009. INDUSTRIAL/ ORGANIZATIONAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Identification and analysis of the individual, group and organizational variables which help to explain and predict human behavior in the work setting.

PSIC 4010./EDFI 4010. PSYCHOLOGICAL ASPECTS OF SPORTS. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3001.

Psychological factors involved in motor performance and in sports.

PSIC 4065. SEMINAR ON PSYCHOLOGICAL RESEARCH. Three credit hours. Three hours of seminar per week. Prerequisite: PSIC 4006.

Planning, design, and implementation of an empirical investigation. An oral presentation and a written report are required.

PSIC 4070. QUALITATIVE RESEARCH IN PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3006.

Procedures for planning, conducting, and analyzing qualitative research in psychology such as: interviews, observation, case studies, life-stories, and content analysis.

PSIC 4086. PRACTICUM IN PSYCHOLOGY. Four credit hours. Two hours of lecture and two two-hour workshops per week. Prerequisite: 15 credits in psychology.

Supervised experiences in service agencies and other community organizations. Field trips required.

PSIC 4088. SPECIAL TOPICS IN PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Selected topics in Psychology.

PSIC 4116. PSYCHOLOGY OF HUMAN SEXUALITY. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3002.

Human sexuality from a psychosocial perspective.

PSIC 4455. SEMINAR ON PSYCHOLOGICAL RESEARCH. Three credit hours. Three hours of seminar per week. Prerequisite: PSIC 4006.

Planning, design, and implementation of an empirical investigation. An oral presentation and a written report are required.

PSIC/SOCI/CIPO 4991. INDEPENDENT STUDY I. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: 12 credit hours in psychology or sociology or political science, respectively, and consent of the Director of the Department.



Research project under the supervision of a faculty member.

PSIC/SOCI/CIPO 4992. INDEPENDENT STUDY II. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: PSIC 4991 or SOCI 4991 or CIPO 4991, respectively, and consent of the Director of the Department.

Research project under the supervision of a faculty member.

#### **ADVANCED UNDERGRADUATE COURSE**

PSIC 5016. ANALYTICAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: 12 credit hours in psychology or consent of the Director of the Department.

Fundamental concepts of Jungian psychology applied to personality, psychotherapy, and religion.

#### **SOCIAL SCIENCES**

##### **UNDERGRADUATE COURSES**

CISO 3121-3122. AN INTRODUCTION TO THE STUDY OF THE SOCIAL SCIENCES. Three credit hours per semester. Three hours of lecture per week each semester.

This course is directed toward a better understanding of the social forces that have produced the world in which we live. It introduces the student to the basic problems of man in contemporary society, such as the incorporation of the individual in society, population pressure, wealth and freedom.

CISO 3145. BIBLIOGRAPHY AND LIBRARY RESEARCH IN THE SOCIAL SCIENCES. Three credit hours. Three hours of lecture per week.

Introduction to the uses of the library: the card catalogue, periodical, indexes, encyclopedias, dictionaries, and other reference reports, and term papers in the social sciences.

CISO 4056. PSYCHO-SOCIAL ASPECTS OF GENDER. Three credit hours. Three hours of lecture per week. Prerequisite: PSIC 3001 and CISO 3121.

Psycho-social aspects of behavior in women and men in response to the changing perception of their roles.

CISO/ANTR 4066. POLITICAL AND CULTURAL ASPECTS OF INDIGENOUS.

Three credit hours. Three hours of lecture per week. Prerequisite: CISO 3121 or ANTR 3005.

Indigenous peoples of Latin America: culture areas; history, "indigenismo," and identity; political, economic, and civil rights.

#### **SOCIOLOGY**

SOCI 3016. SOCIOLOGY OF HEALTH. Three credit hours. Three hours of lecture per week.

Social problems and variables related to health delivery systems; structure and functions of health services.

SOCI 3047. SOCIOLOGY OF RELIGION. Three credit hours. Three hours of lecture per week.

Bases of the religious phenomenon; social functions; organizational phases; religion in preliterate and civilized societies.

SOCI 3261. INTRODUCTION TO SOCIOLOGY I. Three credit hours. Three hours of lecture per week.

Methods and basic concepts in sociology. Relations of the individual with society; social inequality.

SOCI 3262. INTRODUCTION TO SOCIOLOGY II. Three credit hours. Three hours of lecture per week. Prerequisite: SOCI 3261.

Study of basic social institutions, processes of social change, and collective behavior.

SOCI 3265. RESEARCH METHODS IN THE SOCIAL SCIENCES. Three credit hours. Three hours of lecture per week. Prerequisite: SOCI 3262 or PSIC 3002 or CIPO 3011 or CISO 3122 or ANTR 3015 or ECON 3021.

Critical analysis of the principles and techniques of research in the fields of the various social sciences; discussion of the historical development of these up to the present time; practical application of basic research methods in field work; tabulation, analysis and report writing.

SOCI 3285. SOCIAL DYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisite: CISO 3122 or SOCI 3262 or PSIC 3002 or CIPO 3011 or ANTR 3015 or ECON 3021.

Analysis of the social interaction between personalities and the group which they form.

SOCI 3295. HISTORY OF SOCIAL THOUGHT. Three credit hours. Three hours of lecture per week.

Detailed analysis of the history of social thought from antiquity to 19th Century Europe.

SOCI 3305. PRINCIPLES OF POPULATION. Three credit hours. Three hours of lecture per week. Prerequisite: SOCI 3262 or PSIC 3002 or CISO 3122.

An introduction to theories, concepts, and aspects related to population.

SOCI 3315. MARRIAGE AND THE FAMILY. Three credit hours. Three hours of lecture per week.

The development of the family from primitive to modern times. Special attention is given to the problems confronting the modern family, including those of the Puerto Rican family.

SOCI 3325. URBAN SOCIOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: CISO 3122 or SOCI 3262 or PSIC 3002.

Study of the theoretical formulation of urban life, with emphasis on the process of urban growth; discussion of topics such as social structure and function of the modern city, ecology, integration between city and country, urban personality, and social aspects of urban renewal.

SOCI 3337. JUVENILE DELINQUENCY. Three credit hours. Three hours of lecture per week. Prerequisite: CISO 3121 or SOCI 3261.

Juvenile delinquency as a social phenomenon: its nature, causes, prevention, and treatment. The role of government and community agencies.

SOCI /EDFI 4000. SOCIOLOGICAL FUNDAMENTALS OF RECREATION AND SPORTS. Three credit hours. Three hours of lecture per week.

The interaction among society, sports, and recreation.

SOCI 4095. PRINCIPLES OF SOCIAL WORK. Three credit hours. Three hours of lecture per week. Prerequisite: CISO 3122.

Presentation of the basic principles of social work as they are illustrated in case studies of groups and of the community. The student will become

acquainted with the work of the social service agencies in Puerto Rico.

SOCI 4101. CRIMINOLOGY. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: CISO 3122 or SOCI 3262 or PSIC 3002.

Basic terminology; the legal, sociological and cultural aspects of criminality; factors determining delinquency; psychological and psychophysical aspects of crime; classification of crimes, and penology.

SOCI 4115. CONTEMPORARY SOCIAL THEORY. Three credit hours. Three hours of lecture per week. Prerequisite: SOCI 3262.

Consideration of major themes in theory and methodology of selected areas of specialization within sociology and related disciplines.

SOCI 4125. STRUCTURE OF SOCIETY IN PUERTO RICO. Three credit hours. Three hours of lecture per week. Prerequisite: SOCI 3262 or PSIC 3002 or CIPO 3011 or ANTR 3015.

A survey of Puerto Rico's institutions. Attention is given both to the structure of each institution and to the problems which each of them faces today.

SOCI 4145. SOCIAL PLANNING. Three credit hours. Three hours of lecture per week.

A comprehensive analysis of the principles of social planning and the special problems inherent to planning in a democratic society.

SOCI 4155. SOCIAL AND CULTURAL CHANGE. Three credit hours. Three hours of lecture per week. Prerequisite: SOCI 3262 or PSIC 3002 or CIPO 3011 or ANTR 3015.

An examination of the basic sociological principles of social change. The major points of view will be presented, and data will be used from the fields of anthropology, sociology, psychology and history. Special attention will be given to problems of cultural contact and several specific areas of change which involve fundamental social institutions.

SOCI 4165. SOCIAL PROBLEMS IN THE CONTEMPORARY WORLD. Three credit hours. Three hours of lecture per week. Prerequisite: SOCI 3265.

Discussion and special reports on theoretical and methodological approaches to human group behavior, with emphasis on acquainting the student

with the work of social agencies. Participation in an original research project is required.

SOCI/PSIC/CIPO 4991. INDEPENDENT STUDY I. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: 12 credit hours in psychology or sociology or political science, respectively, and consent of the Director of the Department.

Research project under the supervision of a faculty member.

SOCI/PSIC/CIPO 4992. INDEPENDENT STUDY II. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: PSIC 4991 or SOCI 4991 or CIPO 4991, respectively, and consent of the Director of the Department.

Research project under the supervision of a faculty member.

**ADVANCED UNDERGRADUATE COURSE**

SOCI 5005. SOCIAL ORGANIZATION IN LATIN AMERICA. Three credit hours. Three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Sociological processes in Latin America; the racial, ethnic and cultural elements and their fusion; characteristics and trends of Latin American population; European colonization in America; the structure and functioning of social institutions.

## COLLEGE OF BUSINESS ADMINISTRATION

### History and Objectives

The College of Business Administration (CBA) of the University of Puerto Rico at Mayagüez was established by the Council of Higher Education in 1970. The College pursues as its first objective the development of leaders in the field of business. With this objective in mind, it directs its efforts toward the following goals:

1. Familiarize students with the study of mankind through the arts and sciences.
2. Instill among students a desire for the search of truth.
3. Strengthen the democratic form of government by emphasizing the need for businesspersons to participate in governmental affairs.
4. Develop business problem solving skills among students, while making them familiar with the operation of business enterprises.

The second objective applies to business management. The CBA hopes to provide business enterprises as well as government agencies with new techniques in the field. There exists a favorable disposition to cooperate with the Government of Puerto Rico and private industry in the development of research projects which pursue these goals.

The College of Business Administration is interested in developing academic programs which are relevant to the needs of Puerto Rico. It is continuously taking steps to maintain good relations with business firms and governmental agencies in order to determine their need for human resources so that new as well as existing programs may be aligned to these needs.

### Academic Programs

The College offers a program of studies leading to a **Bachelor of Science** degree in Business Administration with options in the fields of **Accounting, Computerized Information Systems, Finance, Industrial Management, Marketing, and Organizational Studies (Human Resources)**. It also offers a Bachelor's degree in **Office Administration**.

The curriculum is divided into three areas: general education, core courses in business administration and the professional recommended electives. The first two areas are applicable to most business majors while the last group aims to provide students with an in-depth study in the particular area of specialization.

The program is designed around the basic idea that at the undergraduate level it is necessary to expose the student to as many areas of business knowledge as possible. Following this philosophy, the program requires between 65 and 68 credits in business core subjects.

Each program in the College of Business Administration offers a core of advanced subjects so that students may become proficient in their area of specialization.

### ACCOUNTING

This program instills in the student knowledge of procedures and principles for recording business transactions, preparing State and Federal income tax returns, auditing, planning and cost control. The program is focused on training professionals in public and private accounting. The program provides adequate training towards CPA certification.

#### Curriculum Requirements

	Credits
General Education Courses	59
Business Core Courses	50
Major Courses	23
Elective Courses	<u>12</u>
	<b>144</b>

**COMPUTERIZED INFORMATION SYSTEMS**

This program provides students with basic understanding of operational systems and control languages, knowledge of actual business data processing applications, high level languages for program codification, algorithms and systems design, office automation design, management of information resources, and understanding of decision systems. It seeks to prepare an individual capable of developing and managing a computerized information system oriented towards the needs of any organization. It also provides the opportunity to specialize in other areas such as computer systems, auditing, consulting, sales and marketing of hardware and software, and users' training.

**Curriculum Requirements**

	Credits
General Education Courses	59
Business Core Courses	50
Major Courses	17
Recommended Electives	6
Elective Courses	<u>12</u>
	<b>144</b>

**FINANCE**

Students who choose this program will learn financial analysis techniques, international financial mechanisms, the role of financial institutions, sound investments decisions, the public sector's impact on business firms, current financial trends, and corporate financial management. This program is designed for students pursuing a career in banking, government, corporate finance or brokerage firms.

**Curriculum Requirements**

	Credits
General Education Courses	59
Business Core Courses	53
Major Courses	15
Recommended Electives	6
Elective Courses	<u>12</u>
	<b>145</b>

**INDUSTRIAL MANAGEMENT**

This program stresses planning, organizing and supervising operational activities in production environments. Skills in decision-making, production-planning and scheduling, inventory control, allocation of resources, and systems analysis are emphasized. It qualifies a student to manage operations in manufacturing or service environments.

**Curriculum Requirements**

	Credits
General Education Courses	59
Business Core Courses	50
Major Courses	18
Recommended Electives	3
Elective Courses	<u>12</u>
	<b>142</b>

**MARKETING**

Marketing students acquire basic knowledge of techniques, policies and procedures required for working with the distribution of products and services in manufacturing and commercial institutions as well as profit and non-profit organizations. Students develop skills needed for selling, planning and controlling inventories, understanding consumer behavior and concepts within the international markets, and the basic principles of personnel and physical distribution.

**Curriculum Requirements**

	Credits
General Education Courses	59
Business Core Courses	53
Major Courses	12
Recommended Electives	<u>12</u>
	<b>142</b>

**HUMAN RESOURCES MANAGEMENT**

In this program, students develop a knowledge of managerial functions, types of organizations and styles of management; human resources administration and industrial relations skills; development and management of compensation systems; and an understanding of local and federal statutes affecting employees and businesses. Students learn skills needed to work

in the management of human resources in a business or government environment.

**Curriculum Requirements**

	Credits
General Education Courses	59
Business Core Courses	53
Major Courses	15
Recommended Electives	6
Elective Courses	<u>12</u>
	<b>145</b>

**BACHELOR IN OFFICE ADMINISTRATION**

Students will acquire knowledge of accurate administrative procedures, master the use of technology in a modern office and experience a hands-on approach in an office environment. This degree prepares students to perform required tasks in private and business offices, as well as, in government agencies.

**Curriculum Requirements**

	Credits
General Education Courses	44
Core Courses in Business	19
Concentration Courses	31
Professional Electives	12
Recommended Electives	6
General Electives	<u>12</u>
	<b>124</b>

**ACADEMIC REGULATIONS**

The College of Business Administration requires a minimum of “C” in each and every one of the courses taken by the student which are classified within a student’s major.

**COOPERATIVE EDUCATION PROGRAM**

The Cooperative Education Program is a way of combining classroom work and job experience. Each year a selected group of students is allowed to participate in this program. Students selected are employed by different firms or government agencies in Puerto Rico and in the United States. This enables students to obtain work experience as they complete their academic degree.

Through this program, a student has the opportunity to apply concepts learned at the university in practical business situations.

Students who wish to participate must fulfill the following requirements:

- a. have completed three years of studies
- b. achieve a minimum 2.50 GPA
- c. fulfill required prerequisites
- d. receive authorization from the Dean of Business Administration.

Students selected will be required to comply with the following conditions:

- a. work at the especially assigned firm for a particular period of time.
- b. be enrolled at the University in the cooperative education course assigned.

**INTERNSHIP PROGRAM**

The Internship Program provides each student with supervised work experience in a business enterprise or government agency under the supervision of a faculty member in coordination with an immediate supervisor at the work site. Students receive academic credit and the opportunity to apply acquired knowledge.

To participate in this program, a student must fulfill the following requirements:

- a. work a minimum of 4 hours per week, per credit, during 15 weeks.
- b. register in the course more than once up to a maximum of 6 credits.
- c. take additional courses at the University considering time availability.
- d. meet the required prerequisites of the specific academic program.
- e. obtain authorization from the Dean of Business Administration.



- f. have completed the first three years of study.
- g. obtain a minimum 2.50 GPA.

**PROGRAMS OF STUDY**

**CURRICULUM IN ACCOUNTING**

**FIRST YEAR**

**First Semester**

Number	Course	Credits
CISO 3121	Intro. to the Study of the Social Sciences	3
*MATE 3171	Pre-Calculus I	3
*ESPA 3101	Basic Course in Spanish	3
*INGL ----	First year course in English	3
CONT 3005	ELEMENTARY ACCOUNTING I	4
EDFI ----	Physical Education Elective	<u>1</u>
		17

**Second Semester**

CISO 3122	Intro. to the Study of the Social Sciences	3
MATE 3000	Finite Mathematics	3
*ESPA 3102	Basic Course in Spanish	3
*INGL ----	First year course in English	3
CONT 3006	ELEMENTARY ACCOUNTING II	4
ADMI 3007	Intro. to Computer Data Processing	<u>3</u>
		19

**SECOND YEAR**

**First Semester**

*INGL ----	Second year course in English	3
ESTA 3001	Business Statistics I	3
ECON 3021	Principles of Economics I	3
MATE 3049	Mathematical Analysis for Management Sciences	3
CONT 4018	INTERMEDIATE ACCOUNTING I	3
GERH 4006	Principles of Management	<u>3</u>
		18

**Second Semester**

*INGL ----	Second year course in English	3
ESTA 3002	Business Statistics II	3
ECON 3022	Principles of Economics II	3
CONT 4035	COST ACCOUNTING	4
CONT 4019	INTERMEDIATE ACCOUNTING II	3
MERC 3115	Principles of Marketing	<u>3</u>
		19

**THIRD YEAR**

**First Semester**

FINA 4029	Financial Markets I	3
FINA 3006	Business Finance	3
ESPA 3215	Expression and Communication	3
CONT 4015	ADVANCED ACCOUNTING PROBLEMS	4
CONT 4009	INCOME TAX OF PUERTO RICO	3
ELECTIVE	Elective in Natural Sciences	<u>3</u>
		19

**Second Semester**

FINA 4035	Financial Markets II	3
ADMI 4016	The Environment of Organizations	3
GERH 4008	Intro. to Personnel Administration and Industrial Relations	3
CONT 4017	AUDITING	3
ELECTIVE	Elective	3
ELECTIVE	Elective in Natural Sciences	<u>3</u>
		18

**FOURTH YEAR**

**First Semester**

ADMI 4001	Business Law I	3
GERE 4007	Operations Management	3
HUMA 3111	Intro. to Western Culture I	3
ELECTIVE	Elective	3
ELECTIVE	Elective	3
EDFI ----	Physical Education Elective	<u>1</u>
		16

**Second Semester**

ADMI 4002	Business Law II	3
GERH 4026	Administrative Policy	3
HUMA 3112	Intro. to Western Culture II	3
ELECTIVE	Elective	3
CONT 4016	CONTEMPORARY THEORY OF ACCOUNTING	3
ECON 3085	Economy of Puerto Rico	<u>3</u>
		18

Program courses appear in capital letters.

**Total credits required for program: 144**

\*Refer to the Academic Regulations section for information on Advanced Placement.

**CURRICULUM IN COMPUTERIZED INFORMATION SYSTEMS**

**FIRST YEAR**

**First Semester**

Number	Course	Credits
CISO 3121	Intro. to the Study of the Social Sciences	3
*MATE 3171	Pre-Calculus I	3
*ESPA 3101	Basic Course in Spanish	3
*INGL ----	First year course in English	3
CONT 3005	Elementary Accounting I	4
ELECTIVE	Physical Education Elective	2
		<u>18</u>

**Second Semester**

CISO 3122	Intro. to the Study of the Social Sciences	3
MATE 3000	Finite Mathematics	3
*ESPA 3102	Basic Course in Spanish	3
*INGL ----	First year course in English	3
CONT 3006	Elementary Accounting II	4
ADMI 3007	Intro. to Computer Data Processing	3
		<u>19</u>

**SECOND YEAR**

**First Semester**

ECON 3021	Principles of Economics I	3
MATE 3049	Mathematical Analysis for Management Sciences	3
ESTA 3001	Business Statistics I	3
*INGL ----	Second year course in English	3
CONT 4006	Managerial Accounting	3
SICI 3051	PROGRAM DEVELOPMENT I	3
		<u>18</u>

**Second Semester**

ECON 3022	Principles of Economics II	3
ESPA 3215	Expression and Communication	3
ESTA 3002	Business Statistics II	3
*INGL ----	Second year course in English	3
GERH 4006	Principles of Management	3
SICI 3052	PROGRAM DEVELOPMENT II	3
		<u>18</u>

**THIRD YEAR**

**First Semester**

GERE 4007	Operations Management	3
ADMI 4016	The Environment of Organizations	3
FINA 4029	Financial Markets I	3
ECON 3085	Economy of Puerto Rico	3

SICI 4085	INFORMATION SYSTEMS ANALYSIS METHODS	3
ELECTIVE	Elective in Natural Sciences	3
		<u>18</u>

**Second Semester**

GERH 4008	Intro. to Personnel Administration and Industrial Relations	3
FINA 3006	Business Finance	3
FINA 4035	Financial Markets II	3
MERC 3115	Principles of Marketing	3
SICI 4087	STRUCTURED INFORMATION SYSTEM ANALYSIS AND DESIGN	3
ELECTIVE	Elective in Natural Sciences	3
		<u>18</u>

**FOURTH YEAR**

**First Semester**

ADMI 4001	Business Law I	3
HUMA 3111	Intro. to Western Culture I	3
SICI 4095	DATA BASE PROGRAM DEVELOPMENT	3
ELECTIVE	Recommended Elective	3
ELECTIVES	Electives	6
		<u>18</u>

**Second Semester**

ADMI 4002	Business Law II	3
HUMA 3112	Intro. to Western Culture II	3
SICI 4097	SYSTEMS DEVELOPMENT	2
ELECTIVE	Recommended Elective	3
ELECTIVES	Electives	6
		<u>17</u>

PROGRAM COURSES IN CAP LETTERS.

**Total credits required for program: 144**

\*Refer to the Academic Regulations section for information on Advanced Placement.

**RECOMMENDED ELECTIVES**

ADMI 3100	New Business Development
ADMI 4997	Business Practice for Coop Students
CIPO 3045	International Organization and Administration
COMP 3010	Introduction to Computer Programming I
COMP 3110	Introduction to Computers II
COMP 4006	Systems Organization and Programming
COMP 4016	Assembly Language Programming
COMP 4025	Computing Models
CONT 4009	Income Tax of Puerto Rico

CONT 4037	Accounting Information Systems
ESPA 3208	Composition
FILO 3178	Business Ethics
FINA 3005	Principles of Insurance
GERH 4025	Organizational Behavior
ICOM 4029	Compiler Construction
ICOM 4035	Data Structures
INGL 3191	Conversational English
INTD 4000	Congressional Internship-Córdova Program
INTD 4010	Academic Seminar-Washington Center
SICI 3056	Structured Languages
SICI 3057	Data Structures
SICI 3058	Programming In C Language
SICI 4088	Analysis, Design and Management of an Information Network
SICI 4140	Office Automation
SICI 4144	Business Programming Languages
SICI 4145	Software and Hardware Concepts
SICI 4155	Decision-Making Systems
SICI 4157	Advanced Database Concepts
SICI 4168	Electronic Data Processing Auditing
SICI 4170	Information Resources Management
SICI 4990	Information Systems Internship

ECON 3021	Principles of Economics I	3
MATE 3049	Mathematical Analysis for Management Sciences	3
EDFI ----	Physical Education Elective	<u>2</u>
		18

**Second Semester**

ADMI 3007	Intro. to Computer Data Processing	3
CONT 3006	Elementary Accounting II	4
ESTA 3002	Business Statistics II	3
ECON 3022	Principles of Economics II	3
*INGL ----	Second year course in English	3
MERC 3115	Principles of Marketing	<u>3</u>
		19

**THIRD YEAR**

**First Semester**

FINA 4029	FINANCIAL MARKETS I	3
ESPA 3215	Expression and Communication	3
GERH 4006	Principles of Management	3
FINA 3006	BUSINESS FINANCE	3
CONT 4006	Managerial Accounting	3
ELECTIVE	Elective	<u>3</u>
		18

**Second Semester**

FINA 4046	CORPORATE FINANCIAL POLICY	3
FINA 4035	FINANCIAL MARKETS II	3
FINA 4039	PUBLIC SECTOR FINANCES	3
GERH 4008	Introduction to Personnel Administration and Industrial Relations	3
ADMI 4016	The Environment of Organizations	3
ELECTIVE	Elective	<u>3</u>
		18

**FOURTH YEAR**

**First Semester**

FINA 4037	INVESTMENTS	3
ADMI 4001	Business Law I	3
FINA 4036	MANAGEMENT OF FINANCIAL INSTITUTIONS	3
GERE 4007	Operations Management	3
ELECTIVE	Recommended Elective	3
ELECTIVE	Elective	<u>3</u>
		18

**Second Semester**

ECON 3085	Economy of Puerto Rico	3
FINA 4040	CURRENT FINANCIAL TRENDS	3
GERH 4026	Administrative Policy	3
ADMI 4002	Business Law II	3
ELECTIVE	Recommended Elective	3
ELECTIVE	Elective	<u>3</u>
		18

**CURRICULUM IN FINANCE**

**FIRST YEAR**

**First Semester**

Number	Course	Credits
CISO 3121	Intro. to the Study of the Social Sciences	3
*MATE 3171	Pre-Calculus I	3
*INGL ----	First year course in English	3
*ESPA 3101	Basic Course in Spanish	3
HUMA 3111	Intro. to Western Culture I	3
ELECTIVE	Elective in Natural Sciences	<u>3</u>
		18

**Second Semester**

CISO 3122	Intro. to the Study of the Social Sciences	3
MATE 3000	Finite Mathematics	3
*INGL ----	First year course in English	3
*ESPA 3102	Basic Course in Spanish	3
HUMA 3112	Intro. to Western Culture II	3
ELECTIVE	Elective in Natural Sciences	<u>3</u>
		18

**SECOND YEAR**

**First Semester**

CONT 3005	Elementary Accounting I	4
ESTA 3001	Business Statistics I	3
*INGL ----	Second year course in English	3

PROGRAM COURSES IN CAP LETTERS.

**Total credits required for program: 145**

\*Refer to the Academic Regulations section for information on Advanced Placement.

**RECOMMENDED ELECTIVES**

ADMI 3100	New Business Development
ADMI 4996	Small Business Advising
ADMI 4997	Business Practice for Coop Students
CIPO 3045	International Organization and Administration
COMP 3010	Introduction to Computer Programming I
CONT 4007	Federal Income Tax
CONT 4009	Income Tax of Puerto Rico
CONT 4018-	Intermediate Accounting I-II
CONT4019	
CONT 4037	Accounting Information Systems
ECON 4055	History of Economic Thought
ECON 4085	International Economics
ECON 4196	Economics of Industrial Organization
ESPA 3208	Composition
FILO 3157	Introduction to Logic
FILO 3178	Business Ethics
FINA 3005	Principles of Insurance
FINA 3008	Working Capital Management
FINA 4028	International Finance
FINA 4047	Investment Analysis And Portfolio Selection
FINA 4048	Credit and Collection
FINA 4995	Finance Internship
FRAN 3142	French II
GERE 4009	Production Planning and Control
GERH 4025	Organizational Behavior
GERH 4028	Interpersonal Communication Applied To Engineering,
GERH 4030	Training and Development of Human Resources
INGL 3191	Conversational English
INGL 3195	Professional Conversation
INGL 3196	Group Communication
INGL 3197	Professional Presentations
INGL 3198	Professional Interviews
INGL 3231	English Expository Writing
INTD 4000	Congressional Internship-Córdova Program
INTD 4010	Academic Seminar-Washington Center
MERC 3117	Personal Selling
MERC 4065	Marketing in the International Environment
PSIC 3002	Principles of Psychology II
PSIC 3006	Social Psychology Science, and Business Careers

**CURRICULUM IN INDUSTRIAL MANAGEMENT**

**FIRST YEAR**

**First Semester**

Number	Course	Credits
CISO 3121	Intro. to the Study of the Social Sciences	3
*MATE 3171	Pre-Calculus I	3
*INGL ----	First year course in English	3
*ESPA 3101	Basic Course in Spanish	3
HUMA 3111	Intro. to Western Culture I	3
ELECTIVE	Elective in Natural Sciences	<u>3</u>
		18

**Second Semester**

CISO 3122	Intro. to the Study of the Social Sciences	3
MATE 3000	Finite Mathematics	3
*INGL ----	First year course in English	3
*ESPA 3102	Basic Course in Spanish	3
HUMA 3112	Intro. to Western Culture II	3
ELECTIVE	Elective in Natural Sciences	<u>3</u>
		18

**SECOND YEAR**

**First Semester**

CONT 3005	Elementary Accounting I	4
ESTA 3001	Business Statistics I	3
*INGL ----	Second year course in English	3
GERH 4006	Principles of Management	3
ECON 3021	Principles of Economics I	3
MATE 3049	Mathematical Analysis for Management Sciences	<u>3</u>
		19

**Second Semester**

CONT 3006	Elementary Accounting II	4
ESTA 3002	Business Statistics II	3
*INGL ----	Second year course in English	3
MERC 3115	Principles of Marketing	3
ECON 3022	Principles of Economics II	3
ADMI 3007	Intro. to Computer Data Processing	<u>3</u>
		19

**THIRD YEAR**

**First Semester**

FINA 4029	Financial Markets I	3
GERE 4021	PRODUCTION MANAGEMENT I	3
ESPA 3215	Expression and	

	Communication	3
FINA 3006	Business Finance	3
EDFI ----	Physical Education Elective	2
ELECTIVE	Elective	<u>3</u>
		17

**Second Semester**

ADMI 4016	The Environment of Organizations	3
FINA 4035	Financial Markets II	3
GERH 4008	Intro. to Personnel Administration and Industrial Relations	3
GERE 4022	PRODUCTION MANAGEMENT II	3
CONT 4006	Managerial Accounting	3
ELECTIVE	Elective	<u>3</u>
		18

**FOURTH YEAR**

**First Semester**

ECON 3085	Economy of Puerto Rico	3
ADMI 4001	Business Law I	3
GERE 4008	QUANTITATIVE METHODS IN MANAGEMENT	3
GERE 4009	PRODUCTION PLANNING AND CONTROL	3
ELECTIVE	Elective	<u>3</u>
		15

**Second Semester**

ADMI 4057	SEMINAR	3
GERH 4026	Administrative Policy	3
ADMI 4002	Business Law II	3
GERE 4028	MATERIALS MANAGEMENT	3
ELECTIVE	Elective	3
ELECTIVE	Recommended Elective	<u>3</u>
		18

**PROGRAM COURSES IN CAP LETTERS.**

**Total credits required for program: 142**

\*Refer to the Academic Regulations section for information on Advanced Placement.

**RECOMMENDED ELECTIVES**

ADMI 3015	Introduction to International Business
ADMI 3100	New Business Development
ADMI 4039	Research Methods in Business
ADMI 4058	Comparison of Administrative Systems among Enterprises in Puerto Rico and other countries
ADMI 4996	Small Business Advising
ADMI 4997	Business Practice for Coop Students
ALEM 3042	German II

CIPO 3045	International Organization and Administration
CIPO 3065	International Relations
CIPO 4015	Comparative Government and Politics
CIPO 4105	Latin American Government and Politics
CONT 4009	Income Tax of Puerto Rico
ECON 4006	Business Cycles
ECON 4015	Economic Development
ECON 4016	Managerial Economics
ECON 4028	Economics of Natural Resources
ECON 4045	Comparative Economic Systems
ECON 4046	Input-Output Analysis
ECON 4056	Environmental Economics
ECON 4085	International Economics
ECON 4185	Economic Problems of Latin America
ECON 4196	Economics of Industrial Organization
ECON 4225	Labor Economics
ECON 4307	Project Evaluation
ESPA 3208	Composition
FILO 3157	Introduction to Logic
FILO 3178	Business Ethics
FINA 3005	Principles of Insurance
FINA 4028	International Finance
FINA 4037	Investments
FINA 4047	Investment Analysis and Portfolio Selection
FRAN 3142	French II
GERE 4030	Contemporary Aspects of Industrial Management
GERE 4995	Industrial Management Internship
GERH 4009	Human Resources Administration
GERH 4016	Industrial Relations
GERH 4019	Wage and Salary Administration
GERH 4025	Organizational Behavior
GERH 4028	Interpersonal Communication Applied to Engineering, Science, and Business Careers
GERH 4030	Training and Development of Human Resources
HIST 4117	History of Labor in the United States of America
INGL 3191	Conversational English
INGL 3195	Professional Conversation
INGL 3196	Group Communication
INGL 3197	Professional Presentations
INGL 3198	Professional Interviews
INGL 3231	English Expository Writing
INTD 4000	Congressional Internship-Córdova Program
INTD 4010	Academic Seminar-Washington Center
ITAL 3072	Italian II
JAPO 3112	Japanese II
MERC 3117	Personal Selling
MERC 4065	Marketing in the International Environment
MERC 4075	Marketing Research
MERC 4217	Consumer Behavior
MERC 4218	Management of Physical Distribution
PSIC 3002	Principles Of Psychology II
PSIC 3006	Social Psychology

PSIC 4009	Industrial/Organizational Psychology
SICI 3051	Program Development I
SICI 3052	Program Development II
SICI 4085	Information Systems Analysis Methods
SICI 4140	Office Automation
SICI 4144	Business Programming Languages
SICI 4155	Decision-Making Systems
SICI 4157	Advanced Database Concepts
SICI 4170	Information Resources Management
SOCI 3262	Introduction to Sociology II

**THIRD YEAR**

**First Semester**

CONT 4006	Managerial Accounting	3
FINA 4029	Financial Markets I	3
MERC 4217	CONSUMER BEHAVIOR	3
GERE 4007	Operations Management	3
ADMI 3007	Intro. to Computer Data Processing	3
ELECTIVE	Recommended Elective	<u>3</u>
		18

**Second Semester**

FINA 3006	Business Finance	3
FINA 4035	Financial Markets II	3
GERH 4008	Intro. to Personnel Administration and Industrial Relations	3
MERC 4009	PROMOTION AND ADVERTISING	3
ADMI 4016	The Environment of Organizations	3
EDFI ----	Physical Education Elective	<u>2</u>
		17

**FOURTH YEAR**

**First Semester**

ECON 3085	Economy of Puerto Rico	3
ADMI 4001	Business Law I	3
MERC 4215	RETAIL SALES MANAGEMENT	3
ELECTIVES	Electives	6
ELECTIVE	Recommended Elective	<u>3</u>
		18

**Second Semester**

ADMI 4057	SEMINAR	3
GERH 4026	Administrative Policy	3
ADMI 4002	Business Law II	3
MERC 4218	MANAGEMENT OF PHYSICAL DISTRIBUTION	3
ELECTIVES	Electives	<u>6</u>
		18

**PROGRAM COURSES IN CAPITAL LETTERS.**

**Total credits required for program: 145**

\*Refer to the Academic Regulations section for information on Advanced Placement.

**RECOMMENDED ELECTIVES**

ADMI 3100	New Business Development
ADMI 4039	Research Methods in Business
CIPO 3045	International Organization and Administration
CONT 4009	Income Tax of Puerto Rico
ECON 4085	International Economics

**CURRICULUM IN MARKETING**

**FIRST YEAR**

**First Semester**

Number	Course	Credits
CISO 3121	Intro. to the Study of the Social Sciences	3
*MATE 3171	Pre-Calculus I	3
*INGL ----	First year course in English	3
*ESPA 3101	Basic Course in Spanish	3
HUMA 3111	Intro. to Western Culture I	3
ELECTIVE	Elective in Natural Sciences	<u>3</u>
		18

**Second Semester**

CISO 3122	Intro. to the Study of the Social Sciences	3
MATE 3000	Finite Mathematics	3
*INGL ----	First year course in English	3
*ESPA 3102	Basic Course in Spanish	3
HUMA 3112	Intro. to Western Culture II	3
ELECTIVE	Elective in Natural Sciences	<u>3</u>
		18

**SECOND YEAR**

**First Semester**

CONT3005	Elementary Accounting I	4
ESTA 3001	Business Statistics I	3
*INGL ----	Second year course in English	3
GERH 4006	Principles of Management	3
MATE 3049	Mathematical Analysis for Management Sciences	3
ECON 3021	Principles of Economics I	<u>3</u>
		19

**Second Semester**

CONT 3006	Elementary Accounting II	4
ESTA 3002	Business Statistics II	3
*INGL ----	Second year course in English	3
ESPA 3215	Expression and Communication	3
MERC 3115	PRINCIPLES OF MARKETING	3
ECON 3022	Principles of Economics II	<u>3</u>
		19



ECON 4196	Economics of Industrial Organization
ESPA 3208	Composition
FILO 3157	Introduction to Logic
FILO 3178	Business Ethics
FINA 3005	Principles of Insurance
FRAN 3142	French II
GERE 4009	Production Planning and Control
GERE 4028	Materials Management
GERH 4025	Organizational Behavior
GERH 4028	Interpersonal Communication applied to Engineering, Science and Business Careers
GERH 4030	Training and Development of Human Resources
INGL 3191	Conversational English
INGL 3195	Professional Conversation
INGL 3196	Group Communication
INGL 3197	Professional Presentations
INGL 3198	Professional Interviews
INGL 3231	English Expository Writing
INTD 4000	Congressional Internship-Córdoba Program
INTD 4010	Academic Seminar-Washington Center
MERC 3117	Personal Selling
MERC 4065	Marketing in the International Environment
MERC 4075	Marketing Research
MERC 4995	Marketing Internship
PSIC 3002	Principles of Psychology II
PSIC 3006	Social Psychology
PSIC 3015	Theories of Personality Science, and Business Careers
SICI 4085	Information Systems Analysis Methods
SOCI 4155	Social and Cultural Change

*ESPA 3102	Basic Course in Spanish	3
HUMA 3112	Intro. to Western Culture II	3
ELECTIVE	Elective in Natural Sciences	<u>3</u>
		18

**SECOND YEAR**

**First Semester**

CONT 3005	Elementary Accounting I	4
ESTA 3001	Business Statistics I	3
*INGL ----	Second year course in English	3
GERH 4006	PRINCIPLES OF MANAGEMENT	3
ECON 3021	Principles of Economics I	3
MATE 3049	Mathematical Analysis for Management Sciences	<u>3</u>
		19

**Second Semester**

CONT 3006	Elementary Accounting II	4
ESTA 3002	Business Statistics II	3
*INGL ----	Second year course in English	3
ECON 3022	Principles of Economics II	3
GERH 4007	ORGANIZATIONAL THEORY	3
ADMI 3007	Intro. to Computer Data Processing	<u>3</u>
		19

**THIRD YEAR**

**First Semester**

FINA 3006	Business Finance	3
FINA 4029	Financial Markets I	3
ADMI 4016	The Environment of Organizations	3
CONT 4006	Managerial Accounting	3
GERH 4008	INTRO. TO PERSONNEL ADMINISTRATION AND INDUSTRIAL RELATIONS	3
EDFI ----	Physical Education Elective	<u>2</u>
		17

**Second Semester**

GERH 4009	HUMAN RESOURCES ADMINISTRATION	3
FINA 4035	Financial Markets II	3
GERE 4007	Operations Management	3
MERC 3115	Principles of Marketing	3
ESPA 3215	Expression and Communication	3
GERH 4016	INDUSTRIAL RELATIONS	<u>3</u>
		18

**FOURTH YEAR**

**First Semester**

ECON 3085	Economy of Puerto Rico	3
ADMI 4001	Business Law I	3
GERH 4025	ORGANIZATIONAL BEHAVIOR	3
ELECTIVE	Recommended Elective	3

**CURRICULUM IN ORGANIZATIONAL STUDIES (HUMAN RESOURCES)**

**FIRST YEAR**

**First Semester**

Number	Course	Credits
CISO 3121	Intro. to the Study of the Social Sciences	3
*MATE 3171	Pre-Calculus I	3
*INGL ----	First year course in English	3
*ESPA 3101	Basic Course in Spanish	3
HUMA 3111	Intro. to Western Culture I	3
ELECTIVE	Elective in Natural Sciences	<u>3</u>
		18

**Second Semester**

CISO 3122	Intro. to the Study of the Social Sciences	3
MATE 3000	Finite Mathematics	3
*INGL ----	First year course in English	3

ELECTIVES	Electives	<u>6</u>
		18
	<b>Second Semester</b>	
ADMI 4057	SEMINAR	3
GERH 4026	ADMINISTRATIVE POLICY	3
ADMI 4002	Business Law II	3
ELECTIVES	Electives	<u>6</u>
ELECTIVE	Recommended Elective	<u>3</u>
		18

**PROGRAM COURSES IN CAPITAL LETTERS.**

**Total credits required for program: 145**

\*Refer to the Academic Regulations section for information on Advanced Placement.

**RECOMMENDED ELECTIVES**

ADMI 3015	Introduction to International Business
ADMI 3100	New Business Development
ADMI 4058	Comparison of Administrative Systems among Enterprises in Puerto Rico and other countries
ADMI 4997	Business Practice for Coop Students
ALEM 3042	German II
CIPO 3045	International Organization and Administration
CIPO 3065	International Relations
CIPO 4015	Comparative Government and Politics
CIPO 4025	Public Opinion
CIPO 4065	International Law
CIPO 4105	Latin American Government and Politics
CONT 4009	Income Tax of Puerto Rico
ECON 4006	Business Cycles
ECON 4015	Economic Development
ECON 4056	Environmental Economics
ECON 4085	International Economics
ECON 4185	Economic Problems of Latin America
ECON 4196	Economics of Industrial Organization
ECON 4225	Labor Economics
ESPA 3208	Composition
FILO 3157	Introduction to Logic
FILO 3178	Business Ethics
FINA 3005	Principles of Insurance
FRAN 3142	French II
FRAN 3151	Business French I
FRAN 4036	Business French II
GERH 4010	Women and Work
GERH 4019	Wage and Salary Administration
GERH 4028	Interpersonal Communication Applied To Engineering, Science, And Business Careers
GERH 4030	Training and Development of Human Resources
GERH 4995	Organizational Studies Internship
HIST 4117	History of Labor in the United States of America

INGL 3191	Conversational English
INGL 3195	Professional Conversation
INGL 3196	Group Communication
INGL 3197	Professional Presentations
INGL 3198	Professional Interviews
INGL 3231	English Expository Writing
INTD 4000	Congressional Internship-Córdova Program
INTD 4010	Academic Seminar-Washington Center
ITAL 3072	Italian II
JAPO 3112	Japanese II
MERC 3117	Personal Selling
MERC 4065	Marketing in the International Environment
PSIC 3002	Principles Of Psychology II
PSIC 3006	Social Psychology
PSIC 3015	Theories of Personality
PSIC 4009	Industrial/Organizational Psychology
SICI 3051	Program Development I
SICI 3052	Program Development II
SICI 4085	Information Systems Analysis Methods
SICI 4087	Structured Information System Analysis and Design
SICI 4095	Database Program Development
SICI 4097	Systems Development
SICI 4140	Office Automation
SICI 4155	Decision-Making Systems
SICI 4170	Information Resources Management
SOCI 3262	Introduction to Sociology II
SOCI 3265	Research Methods in the Social Sciences
SOCI 3335	Social Disorganization
SOCI 3345	Social Organization
SOCI 4155	Social and Cultural Change
SOCI 4165	Social Problems in the Contemporary World

**CURRICULUM IN OFFICE ADMINISTRATION**

**FIRST YEAR**

**First Semester**

Number	Course	Credits
ADOF 3016	KEYBOARDING AND APPLICATIONS I	3
ELECTIVE	Elective in Natural Sciences	3
CISO 3121	Intro. to the Study of the Social Sciences	3
ESPA 3101	Basic Course in Spanish	3
INGL _____	First year Course in English	<u>3</u>
		15

**Second Semester**

ADOF 3017	KEYBOARDING AND APPLICATIONS II	3
ADMI 3007	Introduction to Computer Data Processing	3

ELECTIVE	Elective in Natural Sciences	3
CISO 3122	Intro. to the Study of the Social Sciences	3
ESPA 3102	Basic Course in Spanish	3
INGL ____	First year Course in English	<u>3</u>
		18

**SECOND YEAR**

**First Semester**

ADMI 4040	Business Documents	3
ADOF 4005	ELECTRONIC PRODUCTION OF DOCUMENTS	3
ADOF 4065	INTRO. OF WORD PROCESSING	3
INGL ____	Second year course in English	3
ELECTIVE	PROFESSIONAL ELECTIVE	<u>3</u>
		15

**Second Semester**

ADOF 3009	RECORDS MANAGEMENT	3
INGL ____	Second year course in English	3
ELECTIVE	PROFESSIONAL ELECTIVE	3
MATE3086	Mathematical Reasoning	3
GERH 4006	Principles of Management	<u>3</u>
		15

**THIRD YEAR**

**First Semester**

ADOF 3105	INTRO. TO THE OFFICE ADMINISTRATION	3
CONT 3005	Elementary Accounting I	4
EDFI ____	Elective in Physical Education	2
ELECTIVE	PROFESSIONAL ELECTIVE	3
ELECTIVE	ELECTIVE	<u>3</u>
		15

**Second Semester**

ADOF 4019	ADMINISTRATIVE OFFICE PROCEDURES	3
ELECTIVE	Elective	3
ELECTIVE	PROFESSIONAL ELECTIVE	3
ELECTIVE	RECOMMENDED ELECTIVE	3
ELECTIVE	ELECTIVE IN ENGLISH	<u>3</u>
		15

**FOURTH YEAR**

**First Semester**

ADOF 4020	TRAINING IN ELECTRONIC EQUIPMENT	3
ADOF 4080	TRAINING AND SEMINAR PLANNING	3
ADMI 4001	Business Law I	3
ELECTIVE	Elective in Humanities	3
ELECTIVE	Elective	<u>3</u>
		15

**Second Semester**

ADOF 4025	OFFICE ADMINISTRATION INTERNSHIP	4
ECON 3021	Principles of Economic: Microeconomics	3
ELECTIVE	Elective in Humanities	3
ELECTIVE	Recommended Elective	3
ELECTIVE	Elective	<u>3</u>
		16

**PROGRAM COURSES IN CAPITAL LETTERS.**

**Total credits required for program: 124**

\*Refer to the Academic Regulations section for information on Advanced Placement.

**COURSES IN ENGLISH**

INGL 3191	Conversational English
INGL 3195	Professional Conversation
INGL 3196	Group Communication
INGL 3197	Professional Presentations
INGL 3198	Professional Interviews
INGL 3225	Introduction to Linguistics
INGL 3227	Phonetics of English
INGL 3231	English Expository Writing
INGL 3236	Technical Report Writing
INGL 3250	Public Speaking
INGL 3268	Writing for the Communications Media

**COURSES IN HUMANITIES**

ALEM 3041	German I
ALEM 3042	German II
ARTE 3226	History of Art in Puerto Rico
ARTE 4271	Art History to the Renaissance
ARTE 4272	Art History to the Renaissance
ARTE 4311	Art Criticism
ARTE 4331	Comparative Arts
ARTE 4332	Comparative Arts Culture II
FILO 3155	Introduction to Ethics
FILO 3156	Modern and Contemporary Ethics
FILO 3157	Introduction to Logic
FILO 3178	Business Ethics
FRAN 3141	French I
FRAN 3142	French II
HUMA 3111	Introduction to Western Culture I
HUMA 3112	Introduction to Western
HUMA 3115	European Study Tour
HUMA 3271	The Bible as a Literary and Historical Document: The Old Testament
HUMA 3272	The Bible as a Literary and Historical Document; The New Testament
HUMA 3401	Latin American Civilization and Culture

HUMA 3402 Latin American Civilization and Culture  
 HUMA 3411 Introduction to the Culture of South Asia  
 HUMA 3412 Introduction to the Culture of East Asia  
 HUMA 3425 Puerto Rican Thought  
 ITAL 3071 Italian I  
 ITAL 3072 Italian II  
 JAPO 3111 Japanese I  
 JAPO 3112 Japanese II  
 LITE 3005 Literature Appreciation  
 LITE 3035 Mythology in Western Literature  
 LITE 3041 Introduction to Comparative Literature  
 LITE 3042 Introduction to Comparative Literature  
 LITE 4011 Evolution of the Novel  
 LITE 4012 Evolution of the Novel II  
 LITE 4035 Medieval European Literature  
 LITE 4045 Renaissance Literature  
 MUSI 3135 Music Appreciation  
 MUSI 3161 History of Music  
 MUSI 3162 History of Music  
 MUSI 3167 Introduction to Opera  
 TEAT 3052 Introduction to Theater Art  
 TEAT3051 Introduction to Theater Art

#### PROFESSIONAL ELECTIVES

ADOF 3005 Abbreviated Writing System in Spanish  
 ADOF 3007 Abbreviated Writing System in English  
 ADOF 3107 Office Concepts, Systems and Technology  
 ADOF 3115 Telecommunications in Modern Office  
 ADOF 3125 Legal Office Administration  
 ADOF 4015 Spanish Transcription  
 ADOF 4017 English Transcription  
 ADOF 4055 Interpersonal Relations  
 ADOF 4067 Transcription of Magnetic Methods  
 ADOF 4070 Integration of Office Systems  
 ADOF 4075 Integration of Information Processing Programs  
 ADOF 4077 Design and Processing of Documents

#### RECOMMENDED ELECTIVES

ADMI 3015 Introduction to International Business  
 ADMI 3100 New Business Development  
 ADMI 3155 Creativity and Entrepreneurial Innovation  
 ADMI 4002 Business Law II  
 ADMI 4016 The Environment of Organizations  
 CONT 3006 Elementary Accounting II  
 CONT 4006 Managerial Accounting  
 EDFU 3001 Human Growth and Development I  
 EDFU 3002 Human Growth and Development II  
 EDFU 3007 Social Foundations of Education  
 EDFU 4019 Philosophical Foundations of Education  
 ESPA 3295 Spanish Grammar  
 ESPA 3208 Composition  
 FILO 3178 Business Ethics  
 FINA 3005 Principles of Insurance  
 GERH 4007 Organizational Theory

GERH 4008 Introduction to Personnel Administration and Industrial Relations  
 GERH 4009 Human Resources Administration  
 GERH 4010 Women and Work  
 GERH 4025 Organizational Behavior  
 GERH 4028 Interpersonal Communication Applied to Engineering, Science, and Business Careers  
 MERC 3115 Principles of Marketing  
 MERC 3117 Personal Selling  
 PSIC 3001 Principles of Psychology I  
 PSIC 3002 Principles of Psychology II  
 SOCI 3261 Introduction to Sociology I  
 SOCI 3262 Introduction to Sociology II

#### FACULTY

**LUIS R. ALMODOVAR**, *Professor*, M.B.A., 1978, University of Puerto Rico.

**RAMACHANDRA K. ASUNDI**, *Professor*, Ph.D., 1962, University of Liverpool.

**MAYRA BARRETO**, *Professor*, M.S. Ed., 1971, Indiana University.

**HECTOR BRAVO-VICK**, *Assistant Professor*, M.A., 1973, University of Illinois.

**MARIA CABAN**, *Instructor*, M.S., 1979, State University of New York.

**MILAGROS CASTRO-MARTINEZ**, *Assistant Professor*, M.A., 1991, New York University.

**MARTA COLON-DE TORO**, *Professor*, M.B.A., 1980, University of Miami.

**KAREN COTTO**, *Assistant Professor*, M.B.A., 1995, The American University, Washington, D.C.

**ANA L. CRESPO**, *Professor*, M.A. Ed., 1974, New York University.

**JOSE A. CRUZ-CRUZ**, *Associate Professor*, Ph.D., 1997, University of Pittsburgh.

**JUAN F. DE JESUS-MEDINA**, *Assistant Professor*, M.B.A., 1994, University of Puerto Rico, Mayagüez Campus.

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**LUCYANN FERNANDEZ-VANCLEVE**, *Professor*, M.S., 1980, Texas A&M University.

**HAYDEE FIGARELLA**, *Professor*, M.A., 1974, Columbia University, New York.

**BODAPATI V. RADHAKUMARI-GANDHI**, *Professor*, Ph.D., 1983, Texas A&M University.

**AMABEL GARCIA-PEREZ**, *Professor*, M.A., 1978, Pennsylvania State University.

**CANDIDA GONZALEZ-CEBOLLERO**, *Professor*, M.B.A., 1983, Loyola University.

**LEONORA HAMILTON**, *Professor*, M.B.A., 1978, Monterrey Technological Institute.

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**INA JETTER**, *Professor*, M.Acc., 1980, Virginia Polytechnic Institute and State University.

**MARIA DE LOS A. LARRACUENTE**, *Assistant Professor*, M.S.M., 1991, The University of Akron.

**ANA E. MARTIN-QUIÑONES**, *Associate Professor*, M.B.A., 1985, University of Maryland.

**MARIA DE LOS A. MEDINA**, *Associate Professor*, M.E.S., 1992, University of Puerto Rico, Mayagüez Campus.

**DAVID F. MUÑOZ**, *Assistant Professor*, M.B.A., 1993, University of Puerto Rico, Mayagüez Campus.

**WANDA NEGRON**, *Assistant Professor*, M.S., 1988, University of Wisconsin, Madison.

**MARISOL OLIVER**, *Professor*, M.B.A., 1985, University of Puerto Rico, Mayagüez Campus.

**PRATIMA OLTIKAR**, *Assistant Professor*, M.B.A., 1991, University of Puerto Rico, Mayagüez Campus.

**KAREN ORENGO**, *Assistant Professor*, Ph.D., 2000, Sorbone, Paris.

**MARIA J. ORONOZ**, *Associate Professor*, M.P.A., 1977, Pennsylvania State University.

**EULALIO ORTIZ-RODRIGUEZ**, *Professor*, M.S.Acc., 1976, University of Syracuse.

**NORMA ORTIZ-TORRES**, *Associate Professor*, M.B.A., 1984, University of Puerto Rico.

**JAIME PABON-ORTIZ**, *Professor*, M.B.A., 1983, Texas A&M University.

**ANA G. PALACIO-DE SANTOS**, *Professor*, M.A., 1976, Interamerican University.

**MARIO PADRON-CORBERA**, *Professor*, Ph.D., 1969, University of Florida, Ph.D. 1982, University of Illinois.

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**EVA ZOE QUIÑONES**, *Associate Professor*, M.P.A., 1988, University of Texas at Austin.

**JUAN G. RIERA-TORO**, *Professor*, L.L.B., 1963, University of Puerto Rico.

**ARCADIO RIOS**, *Associate Professor*, M.S., 1982, University of Massachusetts.

**LOIDA E. RIVERA-BETANCOURT**, *Professor*, Ph.D., 1990, University of Birmingham.

**ROBERT J. ROLLMAN-DUNLAP**, *Assistant Professor*, M.B.A., 1990, University of Texas at San Antonio.

**JOSE M. ROMAGUERA-CASABLANCA**, *Professor*, Ph.D., 2001, University of Durham.

**YOLANDA RUIZ**, *Assistant Professor*, Ph.D. 2000, University of Texas-Pan American.

**MIGUEL A. SEGUI-FIGUEROA**, *Professor*, L.L.M., 1994, Pontifical Catholic University of Puerto Rico.

**JAIME SEPULVEDA**, *Associate Professor*, M.L.T., 1994, Georgetown University Law Center.

**AWILDA VALLE-RIVERA**, *Professor*, M.S., 1981, Purdue University.

**PEDRO VALLE**, *Professor*, Ph.D., 1984, New York University.

**JORGE I. VELEZ-AROCHO**, *Professor*, Ph.D., 1978, University of Florida.

## **COURSES OF INSTRUCTION**

### **ADMINISTRATION**

ADMI 3007. INTRODUCTION TO COMPUTER DATA PROCESSING. Three credit hours. Two hours of lecture and one two-hour laboratory per week.

Introductory microcomputer course that provides a basic understanding of what a computer is, what it can do, and how it can serve the manager in his or her professional endeavors. The components of a computerized information system will be studied. The integration and application of MIS (Management Information Systems) concepts to a business environment will be explored. The students will acquire practical experience in the use of microcomputers and software packages for



various applications such as work processing, electronic spreadsheets and graphics as a tool to solve managerial problems.

ADMI 3015. INTRODUCTION TO INTERNATIONAL BUSINESS. Three credit hours. Three hours of lecture per week.

Problems and possibilities of doing business in an international context. Provides perspectives required for successful management and planning of international enterprises. Identification of opportunities and difficulties inherent in international business. Major features of the world economy, of the Multinational Corporation (MNC), of current international economic issues, and how international business deals with these problems.

ADMI 3100. NEW BUSINESS DEVELOPMENT. Three credit hours. Three hours of lecture per week. Prerequisite: Consent of the Dean of the Faculty.

Theory and practice of establishing a small business. Topics include, among others: developing a business plan, and buying a franchise or an established business.

ADMI 3155. CREATIVITY AND ENTREPRENEURIAL INNOVATION. Three credit hours. Three hours of lecture per week.

Describe the process of creativity and compare ways to use it as a tool for entrepreneurial innovation. Create and innovate products and services that could be developed into a business. Evaluate creative and innovative ideas of products and services in terms of the risks and opportunities involved.

ADMI 4001. BUSINESS LAW I. Three credit hours. Three hours of lecture per week. Prerequisite: CISO 3122.

An introduction to legal obligations. Comprises the formation, essentials, and the rescission of contracts, including contracts for the sale of goods under the Civil and Commerce Codes of Puerto Rico, leases (with due attention to the statutory provisions of the Reasonable Rent Acts), suretyship, personal and commercial loans, conditional sales, retail sales on credit loans, and factors' liens. The course also includes agency law, as well as basic notions of homestead law and the law of real property.

ADMI 4002. BUSINESS LAW II. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 4001.

This course covers the organization and operation of business associations. It includes partnerships under the Civil Code, and commercial companies; joint accounts, joint ventures, and corporations. It covers the principle of the artificial personality (Artificial Persons) and the concept of limited liability. The course also covers "Bills and Notes" and other negotiable instruments, with emphasis placed on the concept of negotiability, the definition of a holder in due course, the answerability of makers, drawers, and endorsers, bills of exchange, and the protest of bills of exchange, criminal liability of the forgery of negotiable instruments and for the issue of checks without sufficient funds. The course also contains a brief survey bankruptcy law, covering voluntary and involuntary bankruptcy, acts of bankruptcy, and discharge in bankruptcy.

ADMI 4016. THE ENVIRONMENT OF ORGANIZATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: CISO 3122.

A study of the legal and sociopolitical environment within which the business system operates in order to be able to analyze and understand the basic problems and issues the organization is facing in today's world.

ADMI 4039. RESEARCH METHODS IN BUSINESS. Three credit hours. Three hours of lecture per week. Prerequisites: ESTA 3002 and MATE 3049.

Fundamentals of research methods and design; application of research techniques in the solution of business and related problems.

ADMI 4040. BUSINESS DOCUMENTS. Three credit hours. Three hours of lecture per week. Prerequisite: ESPA 3102.

The study and use of language in oral and written communication. Application of the principles of logic and psychology in the editing of commercial and official documents commonly used in business. Use of principles of editing in letters of reference, claims, and collections. Analysis of publicity as a mass communication media and its effective use in the business world.

ADMI 4057. SEMINAR. Three credit hours. Three hours of lecture per week. Prerequisites: ESTA 3002 and twelve credits in program areas.

An advanced and integrated course for business students. Philosophies, practices, and investigation of current problems in the field. Every student is



required to submit an original dissertation on a subject or a current problem for the business manager, in partial fulfillment of the course requirements.

**ADMI 4058. COMPARISON OF ADMINISTRATIVE SYSTEMS AMONG ENTERPRISES IN PUERTO RICO AND OTHER COUNTRIES.** Three credit hours. Fifteen hours of conference and a minimum of eighteen hours of visits to enterprises in Puerto Rico and a trip of at least twelve days to the selected countries. Prerequisite: consent of the Dean of Business Administration.

Comparative analysis of administrative and industrial practices among different enterprises in Puerto Rico and the other countries. Managerial functions, processes, and organizational structures of enterprises will be highlighted. Includes conferences; and plant tours of enterprises.

**ADMI 4995. SPECIAL PROBLEMS.** One to three credit hours per semester. Prerequisite: Consent of the Dean of the Faculty.

Individual studies, investigations, or special problems in any of the various aspects of Business Administration. Problems or topics will be assigned according to the interests and need of individual students. Work will be carried out under the supervision of a faculty member.

**ADMI 4996. SMALL BUSINESS ADVISING.** One to three credit hours. Two to six hours of consultation and advising per week to participating enterprises. Prerequisite: Consent of the Dean of the Faculty.

Students will be assigned to small business administration cases, Junior Achievement mini-companies, and other appropriate organizations to develop perspective and analytical insight about operations, decision-making processes, and interpersonal, group and intergroup relations. Supervision will be in charge of a Faculty member.

**ADMI 4997. BUSINESS PRACTICE FOR COOP STUDENTS.** Three to six credit hours. A maximum of three work periods will be permitted. Prerequisite: Consent of the Dean of the Faculty.

Supervised work experience in a government agency, private enterprise or foundation, in accordance with the student's academic background and the requirements of the work.

## **OFFICE ADMINISTRATION**

**ADOF 3005. ABBREVIATED WRITING SYSTEM IN SPANISH.** Four credit hours. Four hours of lecture per week. Prerequisite: ESPA 3102

Principles of the abbreviated writing system in Spanish. Use of a fast and legible abbreviated reading and writing system at a reasonable speed rate. Review of essential rules for the abbreviated writing system: grammar, punctuation, spelling, and word division.

**ADOF 3007. ABBREVIATED WRITING SYSTEM IN ENGLISH.** Four credit hours. Four hours of lecture per week. Prerequisite: INGL 3102 or INGL 3104.

Principles of the abbreviated writing system in English. Development of a fast and legible abbreviated reading and writing system at a reasonable speed rate. Review of essential rules for the abbreviated: grammar, punctuation, spelling and word division.

**ADOF 3009. RECORDS MANAGEMENT.** Three credit hours. Three hours of lecture per week.

Introduction to records management system. Emphasis on the complete process of records management: creation, distribution, use, maintenance, and disposition. Filing operations and retrieval of documents using manual, mechanical, and automated systems.

**ADOF 3016. KEYBOARDING AND ITS APPLICATIONS I.** Three credit hours. Three hours of lecture with practice per week. Prerequisite: Student of Office Administration or Consent of the Chairperson of the Institute.

Introduction to the touch method of typewriting. Demonstration of the mastering of basic techniques. Development of the basic skills of speed and accuracy at an acceptable level of performance. Writing of simple office documents.

**ADOF 3017. KEYBOARDING AND ITS APPLICATIONS II.** Three credit hours. Three hours of lecture with practice per week. Prerequisite: ADOF 3016.

Improvement of basic techniques and knowledge previously acquired. Further development and application of skills in the production of office documents at an acceptable level of performance.

ADOF 3025. ELEMENTARY SPANISH SHORTHAND. Three credit hours. Three hours of lecture per week. Co-requisite: ESPA 3101.

Principles of Gregg Shorthand System as adapted to the Spanish language. Development of shorthand reading and writing skills at an acceptable speed rate. Review of essential rules for the shorthand transcription process: grammar, punctuation, spelling, and word division.

ADOF 3026. INTERMEDIATE SPANISH SHORTHAND. Three credit hours. Three hours of lecture per week. Prerequisite: ADOF 3025 and ESPA 3101.

Improvement of skills acquired in ADOF 3025. Learning and development of shorthand principles and skills will be continued.

ADOF 3027. ELEMENTARY ENGLISH SHORTHAND. Three credit hours. Three hours of lecture per week. Co-requisite: INGL 3101.

Principles of Gregg Shorthand System as adapted to the English language. Development of shorthand reading and writing skills at an acceptable speed rate. Review of essential rules for the shorthand transcription process: grammar, punctuation, spelling, and word division.

ADOF 3028. INTERMEDIATE ENGLISH SHORTHAND. Three credit hours. Three hours of lecture per week. Prerequisites: ADOF 3027 and INGL 3101.

Improvement of skills acquired in ADOF 3027. Learning and development of shorthand principles and skills will be continued.

ADOF 3105. INTRODUCTION TO OFFICE ADMINISTRATION. Three credit hours. Three hours of lecture per week.

Application of the basic principles to administrate, plan, organize, direct and control the administrative and operational phase of an office. Basic concepts of supervision: preparation of reports, buying processes and development of systems for office administration.

ADOF 3107. OFFICE CONCEPTS, SYSTEMS AND TECHNOLOGY. Three credit hours. Three hours of lecture per week.

Global vision and general background of the modern office. Study of concepts related to the role of the office as a system of support to a company. Analysis of the effects of technology in the

equipment, procedures, environment and human factors in the modern office. Study of the key role played by professional specialized in the administration of office systems.

ADOF 3115. TELECOMMUNICATIONS IN THE MODERN OFFICE. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 3007.

Introduction to the telecommunications in a business environment: telephony, local computer networks, communication channels, hardware, and software. Emphasis in the application of telecommunications to facilitate the exchange of all kind of information: voice, data, text, and images.

ADOF 3125. LEGAL OFFICE ADMINISTRATION. Four credit hours. Four hours of lecture per week. Prerequisite: ADOF 4065.

Study of selected articles of the Civil Code, Notary Law and the Law of Civil Procedures of Puerto Rico and their application for the preparation of documents. Study of the legal terminology and the functioning of the General Court of Justice in order to better understand the cases submitted. Preparation of legal documents, such as: deeds, promissory notes, contracts of bargain and sales, law suits, sentences, resolutions, sworn declarations, appeal documents and summon regulations.

ADOF 4005. ELECTRONIC DOCUMENT PRODUCTION. Three credit hours. Three hours of lecture with practice per week. Prerequisite: ADOF 3017.

Application of previously learned typewriting techniques in the production of office documents. Development of these skills and techniques to an expert level.

ADOF 4015. ELECTRONIC TRANSCRIPTION OF DOCUMENTS IN SPANISH. Four credit hours. Four hours of lecture per week. Prerequisites: ADOF 3005, ADOF 3017, and ADOF 4005.

Improvement of the alphabetic writing system and keyboarding skills, and language usage skills: punctuation, spelling, and word division using different equipment. Letters, memorandum and reports of simple to average degree of difficulty will be dictated in Spanish at a reasonable speed simulating an office environment.

ADOF 4016. ADVANCED SPANISH TRANSCRIPTION. Three credit hours. Three hours of lecture with practice per week. Prerequisites: ADOF 4015 and ADOF 4005.

Integration of shorthand, typewriting, and language skills. Memorandums, letter with special notations, and reports of an average degree of difficulty will be dictated simulating an office environment. These documents will be transcribed using different equipment.

ADOF 4017. ELECTRONIC TRANSCRIPTION OF DOCUMENTS IN ENGLISH. Four credit hours. Four hours of lecture per week. Prerequisites: ADOF 3007, ADOF 3017, ADOF 4005 and either INGL 3102 or INGL 3104.

Improvement of the alphabetic writing system and keyboarding skills, and language usage skills: punctuation, spelling, and word division using different equipment. Letters, memorandum and reports of simple to average degree of difficulty will be dictated in English at a reasonable speed simulating an office environment.

ADOF 4018. ADVANCED ENGLISH TRANSCRIPTION. Three credit hours. Three hours of lecture with practice per week. Prerequisites: ADOF 4017 and ADOF 4005.

Integration of shorthand, typewriting, and language skills. Memorandums, letters with special notations, and reports of an average degree of difficulty will be dictated simulating an office environment. These documents will be transcribed using different equipment.

ADOF 4019. ADMINISTRATIVE OFFICE PROCEDURES. Three credit hours. Three hours of lecture per week. Prerequisite: ADOF 3017.

The study of the procedures, techniques, and protocols utilized in the office to accomplish different tasks. Communication and human relation problems.

ADOF 4020. TRAINING IN ELECTRONIC EQUIPMENT. Three credit hours. Three hours of lecture with practice per week. Prerequisites: ADOF 3017 and ADMI 3007.

Theoretical and practical study of different types of equipment used in an automated office.

ADOF 4025. OFFICE ADMINISTRATION INTERNSHIP. Four credit hours. Eight hours of practice per week. Prerequisites: Senior standing and consent of the Director of the Department.

Practical experience in office administration in a private industry and government office.

ADOF 4055 INTERPERSONAL RELATIONS. Three credit hours. Three hours of lecture per week. Prerequisites: ESOR 4006 or GERH 4006.

Study of the interpersonal relations and its impact on the work setting: structure and organization of the work setting and the skills required for human interaction.

ADOF 4065. INTRODUCTION OF WORD PROCESSING. Three credit hours. Three hours of lecture with practice per week. Prerequisites: ADOF 3016 or CISE 3049.

Basic concepts of word and information processing systems and their applications. Utilization of different word processing programs in a microcomputer.

ADOF 4067. TRANSCRIPTION OF MAGNETIC METHODS. Four credit hours. Four hours of lecture per week. Prerequisites: ADOF 4065 and ADOF 4005.

Learning, developing and mastering the art of transcribing recorded dictations to the computer. Review, development and integration of typewriting and language skills necessary for transcribing commercial documents. Development of proof reading skills.

ADOF 4070. INTEGRATION OF OFFICE SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: ADOF 4065, ADMI 3007 and ADOF 3107.

Synthesis, application and evaluation of concepts related with the role of the office as a support system. Emphasis on the integration of subsystems, short and long term strategic planning, and solving problems related with the process of change and the efficient use of the technological resources in the office.

ADOF 4075. INTEGRATION OF INFORMATION PROCESSING PROGRAMS. Three credit hours. Three hours of lecture per week. Prerequisites: ADOF 4065 and ADMI 3007.

Practical experience in office administration in a private industry or government office.

ADOF 4077. DESIGN AND PROCESSING OF DOCUMENTS. Three credit hours. Three hours of lecture per week. Prerequisite: ADOF 4005.

Design, composition and production of legal, governmental, medical, and industrial documents, among others, using the computer.

ADOF 4080 TRAINING AND SEMINAR PLANNING. Three credit hours. Three hours of lecture per week. Prerequisites: ADOF 3105, ADOF 4019 and ESOR 4006 or GERH 4006.

Development of skills and coordination of activities in the areas of office administration and personnel supervision. Study and application of the basic concepts of planning and organization of trainings and seminars for the office personnel. Emphasis in needs assessment, selection of human and technological resources, and the preparation of training proposals.

### SECRETARIAL SCIENCES

CISE 3049. KEYBOARDING AND TYPEWRITING. Three credit hours. Three hours of lecture per week.

Development of typewriting skills and the use of the keyboard on touch. Input of information to computers. Preparation of documents such as letters, memorandum, reports, tables, etc.

### ACCOUNTING

CONT 3005. ELEMENTARY ACCOUNTING I. Four credit hours. Four hours of lecture per week.

The study of the basic procedures and principles of accounting related to recording business transactions and preparing and using financial statements of an enterprise. The following topics will be discussed: the accounting cycle, financial statements, accounting and valuation of assets and current liabilities.

CONT 3006. ELEMENTARY ACCOUNTING II. Four credit hours. Four hours of lecture per week. Prerequisite: CONT 3005.

Continuation of the study of the basic procedures and principles of accounting relative to the recording of business transactions, preparation and use of the financial statements of an enterprise. The following topics are discussed: accounting and valuation of assets, liabilities accounting, organization forms, and elements of cost accounting.

CONT 4006. MANAGERIAL ACCOUNTING. Three credit hours. Three hours of lecture per week. Prerequisite: CONT 3006.

This course is required for non-accounting major students. The aspects and techniques of accounting that are useful to managers in the performance of their basic functions of planning, organizing, directing and controlling are analyzed and interpreted. The course also includes three basic areas: analysis and interpretation of financial statements, costing procedures in manufacturing enterprises and accounting, and planning techniques useful to the decision-making process.

CONT 4007. FEDERAL INCOME TAX. Three credit hours. Three hours of lecture per week. Prerequisite: CONT 4018.

The study of the principles and procedures necessary to prepare an income tax return for individuals, partnerships and corporations according to the United States of America Income Tax Law. Special attention is given to the computation of gross income and deductions to determine taxable net income.

CONT 4009. INCOME TAX OF PUERTO RICO. Three credit hours. Three hours of lecture per week. Prerequisite: CONT 4006 or CONT 4018.

The study of principles and procedures necessary to prepare an Income Tax return according to the Income Tax Law of the Commonwealth of Puerto Rico, for individuals, partnerships, and corporations. Special attention is given to the computation of gross income and deductions according to the law to determine taxable net income.

CONT 4015. ADVANCED ACCOUNTING PROBLEMS. Four credit hours. Four hours of lecture per week. Prerequisite: CONT 4019.

The study of special problems in the field of accounting. Includes the study of partnerships, installment sales, consignments, home office and branch relationships, business combinations, and consolidated financial statements. Also, an introduction to accounting for governmental entities and not for profit institutions.

CONT 4016. CONTEMPORARY THEORY OF ACCOUNTING. Three credit hours. Three hours of lecture per week. Prerequisite: CONT 4019.

The study of the foundation and development of accounting theory. Includes the discussion and study of research journals, terminology, and opinions of the American Institute of Certified Public Accountants (A.I.C.P.A.) and pronouncements and opinions of other professional authorities in the accounting field.

CONT 4017. AUDITING. Three credit hours. Three hours of lecture per week. Prerequisite: CONT 4019.

The study of the principles of auditing and their application in the examination of financial statements; the standard short-form opinion, internal control systems, auditing programs, and the rules of professional and ethical responsibilities of the independent auditor; also contemporary development in the field of auditing.

CONT 4018-4019. INTERMEDIATE ACCOUNTING I-II. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: CONT 3006.

The study of the principles and procedures of financial accounting at the intermediate level applied to problems of recording and valuation of assets, liabilities and corporate capital, income determination, and expenditures. Includes the presentation, analysis, interpretation, and correction of financial statements.

CONT 4027. ANALYSIS AND COST CONTROL. Three credit hours. Three hours of lecture per week. Prerequisite: CONT 4035.

The study of the quantitative techniques for solving accounting problems in planning and cost control. Includes budgetary control, standard cost, variable cost control, distribution cost analysis, gross margin analysis, and other selected topics in advanced cost and managerial accounting. Besides, the course provides the analytical techniques that the accountant needs to provide quantitative counsel to management.

CONT 4035. COST ACCOUNTING. Four credit hours. Four hours of lecture per week. Prerequisite: CONT 3006.

The study of the methods and procedures of accounting in the determination of the unit cost of a product. Includes the accounting procedures for the three main elements of the cost of a product (raw materials, direct labor and manufacturing overhead) by the two methods of cost accumulation (job order and process costs). Special emphasis is placed on the discussion of managerial analysis and control of production costs.

CONT 4037. ACCOUNTING INFORMATION SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 3007 and either CONT 4035 or CONT 4006.

A study of Accounting Information Systems and their role in management planning and decision-making. Data processing considerations in the design and operation of Accounting Information Systems. Principles of internal control with emphasis in computerized accounting systems. Accounting applications through software packages.

CONT 4995. ACCOUNTING INTERNSHIP. One to six credit hours. Four hours of work per week per credit during fifteen weeks or its equivalent during a summer session; can be repeated until a maximum of six credits are attained. Prerequisites: CONT 4019, CONT 4035 and consent of the Dean of the Faculty.

Work experience in the area of accounting, in an office or business enterprise, under the supervision of a faculty member and in coordination with an immediate supervisor at the workplace.

CONT 5006. TAX LIABILITIES FOR BUSINESSES IN PUERTO RICO. Three credit hours. Three hours of lecture per week.

A comprehensive of business tax liabilities in Puerto Rico under local or federal laws. Includes topics such as property, municipal, labor-related and excise taxes as well as tax exemptions under the Industrial Incentives Act.

### **ORGANIZATIONAL STUDIES (HUMAN RESOURCES)**

GERH 4005. GOVERNMENTAL CONTROL OF BUSINESS. Three credit hours. Three hours of lecture per week.

Presents a brief explanation of local and federal statutes geared to protect business against coercion and monopoly. Comprehends the powers of state to enforce the law, the civil and criminal remedies, and the protection of the affected parts, the governmental regulation of securities, as well as the regulation of distribution contracts. Also contains a brief explanation of the laws that regulates retails, installment sales, financing of conditioned sales, leases, loans, and consumer services.

GERH 4006. PRINCIPLES OF MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: CISO 3122.

An introduction to the managerial functions of planning, organizing, directing, and controlling analyzed from the point of view of the integration



of human resources to achieve the objectives and goals of the organization. The problems of leadership development, supervision, group motivation and dynamics, organization of human resources, and the establishment and control of working procedures are discussed and worked upon.

GERH 4007. ORGANIZATIONAL THEORY. Three credit hours. Three hours of lecture per week. Prerequisite: ESOR 4006 or GERH 4006.

Comparison of major approaches to the study of organizations: organizational structure, systems of power and influence, inter and intra-organizational conflicts and cooperation and their implication for management.

GERH 4008. INTRODUCTION TO PERSONNEL ADMINISTRATION AND INDUSTRIAL RELATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: ESOR 4006 or GERH 4006 or ININ 4029.

Survey of the basic processes of personnel administration such as recruitment, selection, training, and the administration of wages and salaries. The labor relations perspective is incorporated within the context of the personnel approach of a unionized organization.

GERH 4009. HUMAN RESOURCES ADMINISTRATION. Three credit hours. Three hours of lecture per week. Prerequisite: ESOR 4008 or GERH 4008.

Analysis of the basic processes in personnel administration: job design, recruitment, selection, training, compensation and maintenance. Study of contemporary problems in each of these areas and their possible solutions in the contemporary business and industrial world. Particular emphasis will be given to the local perspective.

GERH 4010. WOMEN AND WORK. Three credit hours. Three hours of lecture per week. Prerequisite: ESOR 4008 or GERH 4008 or ININ 4035 or SOCI 3262 or PSIC 3006.

Study of the characteristics of the working woman. Nature of paid and unpaid "work" and its relationship with the notion of "woman"; changes in the female labor force participation; occupational segregation; wage differences by gender; women career development in traditional and non-traditional occupations. All topics will be analyzed in the context of government and business policies.

GERH 4016. INDUSTRIAL RELATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: ESOR 4008 or GERH 4008.

An analysis of worker-management relationships; development and operation of trade and labor unions; public and private policies on labor relations; collective bargaining, job and union security, and labor and social legislation.

GERH 4019. WAGE AND SALARY ADMINISTRATION. Three credit hours. Three hours of lecture per week. Prerequisite: ESOR 4008 or GERH 4008.

Analysis and evaluation of the different factors and norms which are considered for the establishment of wages and salaries. Basic tools such as job analysis, job evaluation, salary classifications, wage survey, wage incentives, fringe benefits, performance evaluation, and overtime work, are applied within the framework provided by wage and hour legislation, minimum salary regulations, and the norms and procedures created by labor-management relations.

GERH 4025. ORGANIZATIONAL BEHAVIOR. Three credit hours. Three hours of lecture per week. Prerequisite: ESOR 4006 or GERH 4006.

Human behavioral factors which shape the decision making and leadership process in the organization. Study of the effects of such factors on the relationships between the manager and his personnel responsibilities. Specific concepts of perception, motivation, communication, conflict, change and other variables at the individual group and organization level are to be discussed and applied through cases and simulations.

GERH 4026. ADMINISTRATIVE POLICY. Three credit hours. Three hours of lecture per week. Prerequisite: GERE 4007 or GERE 4022 and twelve credits in area of specialization.

Case analysis of contemporary business problems.

GERH 4028. INTERPERSONAL COMMUNICATION APPLIED TO ENGINEERING, SCIENCE, AND BUSINESS CAREERS. Three credit hours. Three hours of lecture per week. Prerequisite: 6 credits in social sciences or humanities courses.

Techniques for communicating effectively in organizations; skills for coping with intra- and inter-organizational conflicts; how to establish an organizational communication program; and other



issues related to communication and interpersonal relationships.

GERH 4030. TRAINING AND DEVELOPMENT OF HUMAN RESOURCES. Three credit hours. Three hours of lecture per week. Prerequisite: ESOR 4008 or GERH 4008.

Development of training programs. The study of general psychological principles such as: learning, motivation, communication, perception, and how these apply to human resources training.

GERH 4995. ORGANIZATIONAL STUDIES INTERNSHIP. One to six credit hours. The student must work four hours per week per credit during fifteen weeks or its equivalent during a summer session. Prerequisites: (ESOR 4007 or GERH 4007), (ESOR 4009 or GERH 4009) and be selected to work in the human resources department of a government agency, private enterprise or foundation.

Supervised work experience in the area of human resources, in a government agency, private enterprise or foundation under the supervision of a faculty member; in coordination with a supervisor from the host organization.

## **STATISTICS**

ESTA 3001. BUSINESS STATISTICS I. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3172 or MATE 3174 or MATE 3000.

An introduction to the concepts of business statistics. Includes topics such as frequency distributions, descriptive measures, random variables, probability distribution, and the concept of Mathematical expectation. An introduction to data analysis using computers.

ESTA 3002. BUSINESS STATISTICS II. Three credit hours. Three hours of lecture per week. Prerequisite: ESTA 3001.

Statistical inference as applied to business: hypothesis testing, one-way analysis of variance, simple linear regression and correlation analysis, multiple regression; enumerative data, contingency tables, and Chi Square tests; and nonparametric methods. Data analysis using computers.

## **FINANCE**

FINA 3005. PRINCIPLES OF INSURANCE. Three credit hours. Three hours of lecture per week. Prerequisite: ESTA 3001.

Basic concepts and problems found in all types of modern-day insurance and in other methods of handling risk. Considers the most important elements of risk and types of insurance. Analyzes the problems of risk and insurance from the manager's point of view, the economic viewpoint of society as a whole, and the individual consumer's viewpoint.

FINA 3006. BUSINESS FINANCE. Three credit hours. Three hours of lecture per week. Prerequisites: CONT 3006 and ADMI 3007.

Financial analysis, including sources and uses of fund statement, cost and control of business funds, working capital management, long-term financing, capital budgeting, financial structure and the use of leverage.

FINA 3008. WORKING CAPITAL MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: FINA 3006.

Problems and practices related to and arising from the course of financing and managing the acquisition, maintenance, and disposition of working capital. Determination of optimum levels of current assets and current liabilities, in order to minimize risk and maximize return.

FINA 3015. MATHEMATICS OF FINANCE. Three credit hours. Three hours of lecture per week. Prerequisite: CONT 3005.

Basic financial principles related to simple, effective and compound interest, discounting of notes and long-term debt amortization schedules. Introduction to present value concepts and minimum rate of return. Basic concepts of descriptive statistics.

FINA 4028. INTERNATIONAL FINANCE. Three credit hours. Three hours of lecture per week. Prerequisite: FINA 3006.

Acquaints the student with the mechanism of balance of payment adjustment, international trade, international monetary systems, short-term and long-term capital flows. Emphasis is given to the effect of the exchange rate on the process of adjustment.

FINA 4029-4035. FINANCIAL MARKETS. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisites: ECON 3021 and ECON 3022.

A comprehensive survey of the macro financial system, including both domestic and international aspects. It introduces the student to modern capital and money markets theory. It analyzes the operations of commercial banks and other financial institutions as holders of savings and sources of money and credit. It also examines the supply, demand and flow of investible funds, the structure of interest rates and the impact of monetary and other governmental policies on interest rates and flow of funds.

FINA 4036. MANAGEMENT OF FINANCIAL INSTITUTIONS. Three credit hours. Three hours of lecture per week. Prerequisite: FINA 4035.

The course provides the student with an understanding of the role of the major financial institutions and of the principal financial management problems faced by these institutions. Emphasis is given to the management problems of commercial banks, savings and loans associations, life insurance companies, investment companies, credit cooperatives, and functioning of pension plans.

FINA 4037. INVESTMENTS. Three credit hours. Three hours of lecture per week. Prerequisite: FINA 3006.

Investment, speculation and gambling; various types of investment media; the test of safety, income, and marketability in the selection of securities; diversification and vigilance in individual portfolio management; techniques for critical analysis and interpretation of corporate reports from the investment point of view; the influence of business cycles on the stock market and upon investment opportunities.

FINA 4039. PUBLIC SECTOR FINANCES. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3021 and ECON 3022.

The study of the allocation, distribution, and stabilization functions of the modern state and their effects on the business firm; analysis of public sector budget policies from the point of view of income and expenditure, theories of taxation; public expenditure, budget incidence and effects, public debt; and their effect on the business decision-making process.

FINA 4040. CURRENT FINANCIAL TRENDS. Three credit hours. Three hours of lecture per week. Prerequisites: FINA 4037, FINA 4046 and FINA 4035.

Current developments in the field of money, banking, foreign exchange, corporation finance, investment, and allied fields. Special attention is given to the developments in Puerto Rico, and to those developments abroad which affect Puerto Rico.

FINA 4046. CORPORATE FINANCIAL POLICY. Three credit hours. Three hours of lecture per week. Prerequisite: FINA 3006.

Advanced problems in corporate financial management, emphasizing long-term financing, dividend policy, internal financing, and intermediate-term financing; corporate external growth; mergers and holding companies, failure, reorganization, and liquidation; the timing of financial policy and the financial life cycle of the firm; consolidation.

FINA 4047. INVESTMENT ANALYSIS AND PORTFOLIO SELECTION. Three credit hours. Three hours of lecture per week. Prerequisite: FINA 4037.

Extended study of the field of investments: portfolio theory and management, investment policies, risk handling, and timing of investment decisions.

FINA 4048. CREDIT AND COLLECTION. Three credit hours. Three hours of lecture per week. Prerequisite: FINA 3006.

Theory, principles, and practices of credit and collection management. Investigation and analysis of credit risk.

FINA 4995. FINANCE INTERNSHIP. One to six credit hours. Four hours of work per week per credit during fifteen weeks or its equivalent during a summer session; can be repeated until a maximum of six credits are attained. Prerequisites: FINA 4046, FINA 4035 and consent of the Dean of the Faculty.

Work experience in the area of finance, in an office or business enterprise, under the supervision of a faculty member in coordination with an immediate supervisor at the workplace.

**INDUSTRIAL MANAGEMENT**

GERE 4007. OPERATIONS MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 3049 or MATE 3011 and ESTA 3002.

An introduction to the concepts, analytical techniques and decision-making procedures in the management of operations. Operation management problems common to different types of business are discussed, with consideration given to the following: location, management of materials, management of maintenance of facilities, statistical control of operations, cost and budget control.

GERE 4008. QUANTITATIVE METHODS IN MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: GERE 4007 or GERE 4022.

Development of certain mathematical models and techniques in operations research applicable to the analysis of such industrial problems as allocation of resources, inventory control, scheduling and traffic flow. Stochastic as well as determinative models are considered giving emphasis to linear and dynamic programming and queuing theory. Attention is centered on the formulation of problems and the evaluation of methodology.

GERE 4009. PRODUCTION PLANNING AND CONTROL. Three credit hours. Three hours of lecture per week. Prerequisite: GERE 4007 or GERE 4022.

Development and operation of production control system, with special attention on such problems as inventory control under conditions of uncertainty, scheduling in the intermittent shop, production planning under conditions of seasonal variation, use of CPM, Pert and simulation distribution analysis.

GERE 4021. PRODUCTION MANAGEMENT I. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 3049, ESOR 4006 or GERH 4006, ESTA 3002 and ADMI 3007.

Concepts, techniques and decision-making procedures encountered in the management of production operations. Basic processes within an industrial organization with emphasis on inventory procurement and control, and problems typical of manufacturing operations.

GERE 4022. PRODUCTION MANAGEMENT II. Three credit hours. Three hours of lecture per week. Prerequisite: GERE 4021.

Development and operation of production control systems with special emphasis on problems of production planning, scheduling, and inventory control under conditions of uncertainty. Also includes simulation techniques.

GERE 4028. MATERIALS MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: GERE 4007 or GERE 4022.

Economic, legal and environmental problems encountered in the acquisition and management of inventories; application of modern business methods to their solution.

GERE 4030. CONTEMPORARY ASPECTS OF INDUSTRIAL MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: GERE 4022.

Integration of practical and theoretical aspects of areas related to Industrial Management: Just in Time, Material Requirement Planning I and II, Quality Assurance, and others.

GERE 4995. INDUSTRIAL MANAGEMENT INTERNSHIP. One to six credit hours. Four hours of work per week per credit during fifteen weeks or its equivalent during a summer session; can be repeated until a maximum of six credits are attained. Prerequisites: GERE 4022 and consent of the Dean of the Faculty.

Work experience in the area of industrial management, in an office or business enterprise, under the supervision of a faculty member in coordination with an immediate supervisor at the workplace.

**MARKETING**

MERC 3115. PRINCIPLES OF MARKETING. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021.

An introduction to the institutions, techniques, policies, and procedures related to the distribution of products and services in the management of manufacturing and commercial institutions.

MERC 3117. PERSONAL SELLING. Three credit hours. Three hours of lecture per week.

Traditional selling techniques. Development of potential to perform successfully in this field. Emphasis on applied persuasion, auto-motivation and development, among other related topics.

MERC 4009. PROMOTION AND ADVERTISEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: MERC 4217.

Introduction to the basic concepts of promotion management. Stimulation of demand through personal selling and advertising. Managerial issues and problems of the promotional manager.

MERC 4065. MARKETING IN THE INTERNATIONAL ENVIRONMENT. Three credit hours. Three hours of lecture per week. Prerequisites: MERC 3115 and ESOR 4006 or GERH 4006.

Marketing within the framework of international markets with special interest in the need to understand other cultures and environments for the success of the firm.

MERC 4075. MARKETING RESEARCH. Three credit hours. Three hours of lecture per week. Prerequisites: MERC 3115 and ESTA 3002.

Systematic gathering, recording and analysis of data about problems relating to the marketing of goods and services.

MERC 4215. RETAIL SALES MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: GERE 4007 or GERE 4022 or MERC 4217.

Examination of the philosophy, concepts and techniques underlying the planning and control of inventories and sales in retail businesses.

MERC 4217. CONSUMER BEHAVIOR. Three credit hours. Three hours of lecture per week. Prerequisites: MERC 3115 and ESOR 4006 or GERH 4006.

Nature of consumer behavior through an analysis of consumer needs, attitudes, environment, and business influence.

MERC 4218. MANAGEMENT OF PHYSICAL DISTRIBUTION. Three credit hours. Three hours of lecture per week. Prerequisites: MERC 3115, and GERE 4007 or GERE 4022.

Analysis of activities pertinent to management of physical distribution such as warehouse

management, order processing, packaging and customer service: management of transportation, commodity classification, regulation and rates, routing, documentation and carrier ability as well as the integration of these functions to the overall management activities of the business.

MERC 4995. MARKETING INTERNSHIP. One to six credit hours. Four hours of work per week per credit during fifteen weeks or its equivalent during a summer session; can be repeated until a maximum of six credits are attained. Prerequisites: MERC 4217 and consent of the Dean of the Faculty.

Work experience in the area of marketing, in an office or business enterprise, under the supervision of a faculty member in coordination with an immediate supervisor at the workplace.

### COMPUTERIZED INFORMATION SYSTEMS

SICI 3051. PROGRAM DEVELOPMENT I. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 3007.

Elemental computer programming and solution of managerial problems using Cobol. Fundamentals of structured program design: development, testing, implementation and documentation; language syntax, file structure, input/output unit, and operational system facilities for the implementation of programs that generate managerial reports.

SICI 3052. PROGRAM DEVELOPMENT II. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 3051.

Advanced computer programming and problem solving using Cobol. Sequential and random access files, processing techniques and development of programs and systems for batch and interactive environments.

SICI 3056. STRUCTURED LANGUAGES. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 3051.

Algorithm design using the logical structures of sequence, selection, and iteration. Modularized top-down design using functions, procedures, and static and dynamic data structures. Structured languages such as Pascal or Ada will be used.

SICI 3057. DATA STRUCTURES. Three credit hours. Three hours of lecture per week.

Prerequisite: SICI 3052 and either SICI 3056 or SICI 3058.

Logical data structures as a tool in file design and as an inherent part in algorithm construction. Definition, representation, and application of data structures as basic parts of algorithms. Among others, the stack, queues, lists, trees, and graphs will be studied.

SICI 3058. PROGRAMMING IN C LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 3052 or other advanced programming language course.

The study of the unique characteristics of the C Language. Programs for different business applications will be developed using its flexibility to work at a lower level of computer hardware. Introduction to object oriented programming using C++.

SICI 4085. INFORMATION SYSTEMS ANALYSIS METHODS. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 3051.

System development life cycle. Process flow, data structure and flow: file and input/output design; program specifications. Collection and reporting activities.

SICI 4087. STRUCTURED INFORMATION SYSTEM ANALYSIS AND DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: SICI 3052 and SICI 4085.

Structured analysis and design strategies for dealing with complex information systems.

SICI 4088. ANALYSIS, DESIGN AND MANAGEMENT OF AN INFORMATION NETWORK. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 4087.

Planning, design, maintenance and management of information networks. Basic concepts on telephony, voice and data transmission, analog and digital transmission, network topology, and local area networks. Group case study, applying the acquired concepts to its solution.

SICI 4095. DATABASE PROGRAM DEVELOPMENT. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 4085.

Program development for the use of the databases with emphasis on loading, modification, and validation of database.

SICI 4097. SYSTEMS DEVELOPMENT. Two credit hours. One hour of lecture per week and two hours of supervised workshop. Prerequisites: SICI 4087 and SICI 4095.

Application of computer programming to systems development. Scheduling and control methods and techniques used in managerial projects toward the solution of system problems. A project is required.

SICI 4140. OFFICE AUTOMATION. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 4087.

Information and decision support systems used as critical elements of the managerial decision process. Data managerial report; electronic filing and retrieving systems; word processing and telecommunications.

SICI 4144. BUSINESS PROGRAMMING LANGUAGES. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 3052.

General description of programming languages. Advanced concepts and capabilities of programming languages used in the business field. Emphasis on structured program design and its implementation using two of the following languages: RPG II, RPG III, BASIC, or C Language. Comparative analysis of these business programming languages.

SICI 4145. SOFTWARE AND HARDWARE CONCEPTS. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 3052.

Technical topics related to computer systems emphasizing the relationship between hardware and software design in the development of business application programs.

SICI 4155. DECISION-MAKING SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: ADMI 3007 and ESTA 3002.

Specialized information systems used by business managers to support decision-making.

SICI 4157. ADVANCED DATABASE CONCEPTS. Three credit hours. Three hours of lecture per week. Prerequisite: SICI 4095.

Investigation and application of advanced database concepts; management, technology, selection and acquisition of the system.

SICI 4168. ELECTRONIC DATA PROCESSING AUDITING. Three credit hours. Three hours of lecture per week. Prerequisites: ADMI 3007, and SICI 4087 or CONT 4017.

Electronic data processing auditing; techniques, controls and auditing types.

SICI 4175. INTRODUCTION TO JAVA PROGRAMMING. Three credit hours. Three hours of lecture per week. Prerequisite: Consent of The Director of the Department or a programming language.

Introduction to object oriented programming concepts. Detailed coverage of the Java Language and its syntax.

SICI 4990. INFORMATION SYSTEMS INTERNSHIP. One to six credit hours. A minimum of four (4) hours per week per credit during fifteen weeks. The student will be able to register in the course more than once up to a maximum of six (6) credits. Prerequisites: SICI 4087 and consent of the Dean of Business Administration.

Work experience in the area of analysis, design and implementation of computer information systems in an office or enterprise. Supervision by a faculty member in coordination with an officer at the work site.



## COLLEGE OF ENGINEERING

### Aims and Objectives

The aims and objectives of the University of Puerto Rico as pertaining to its Mayagüez Campus, of which the College of Engineering constitutes a major educational division, are expressed in Section 12 of the amended University Law, as follows:

"The principal function of the College of Agriculture & Mechanic Arts at Mayagüez shall be, without excluding other scientific and classic studies and including military science, to teach those branches of knowledge related to Agriculture and Mechanic Arts with the purpose of encouraging the liberal and practical education of the industrial classes. This is in accordance with the provisions of the congressional law known as the Second Morrill Act as amended by Congress in 1907."

Following this educational directive, engineering curricula have been designed to provide a firm educational foundation upon which engineering graduates can build social and professional competence after leaving college and become men and women of high value to modern society.

The various engineering curricula are the result of an intense study and a careful appraisal of the present technological education, and of the changing and diverse nature of the needs of modern industry.

The engineering curricula, accordingly, emphasizes the following:

1. A thorough and integrated mastery of both basic and engineering sciences. This is obtained through a subset of integrated courses in mathematics, physics, mechanics and materials, fluid mechanics, electricity, and thermodynamics. These will provide the scientific approach to the solution of problems and the basic knowledge to support the superstructure of specialization encountered in engineering practice.
2. An integrated application of both basic and

engineering sciences to the analysis and design of engineering systems. This is obtained during the last two years of study through a series of courses within the student's major field. In this process of learning, the student acquires the ability to think clearly and logically, to evaluate, to discriminate, and to exercise originality and resourcefulness to accomplish objectives.

3. A fairly comprehensive understanding of human desires and aspirations, human convictions, and human behavior under varying circumstances. This is obtained through a series of integrated courses in the humanities and behavioral sciences, including history, economics, literature, psychology, and the social sciences. These are recognized as indispensable to the proper education of engineers not only because of their practical application in industrial, business, and civic life, but also because they provide a breadth of knowledge that enriches a person's private life.

### Student Chapters of Honorary and Professional Societies

- American Chemical Society Student Affiliate
- American Institute of Chemical Engineers
- American Society for Quality Control
- American Society of Civil Engineers
- American Society of Heating, Refrigeration and Air Conditioning Engineers
- American Society of Mechanical Engineering
- Asociación de Agrimensores de P.R.
- Asociación de Estudiantes de Ingeniería de Computadoras
- Asociación de Estudiantes Graduados Ingeniería Civil
- ALPHA PI MU Industrial Engineering Honor Society
- Institute of Industrial Engineers
- Instituto de Ingenieros Civiles del C.I.A.P.R.
- Instituto de Ingenieros Electricistas y Electrónicos
- Instituto de Ingenieros Mecánicos
- Instituto de Ingenieros Químicos
- National Engineering Honor Society TAU BETA PI
- Sociedad de Ingenieros Manufactureros
- Sociedad de Ingenieros de Puerto Rico
- Sociedad Nacional de Ingenieros Profesionales Capítulo Estudiantil

- Society of Automotive Engineers
- Society of Women Engineers
- Water Pollution Control Federation

### Academic Offerings

The College of Engineering includes the Departments of General, Chemical, Civil, Electrical and Computer, Industrial, and Mechanical Engineering. It also includes a Research and Development Center, composed of a Water Resources Institute.

The Department of General Engineering provides and is responsible for the administration of basic engineering courses taken by students from all departments.

The Departments of Chemical, Civil, Electrical and Computer, Industrial, and Mechanical Engineering provide and are responsible for uniformity of instruction, academic orientation, enrollment, and administration of courses offered by each department, leading to the degree of Bachelor of Science in Chemical, Civil, Electrical, Computer, Industrial, and Mechanical Engineering, and in Surveying and Topography.

The College of Engineering offers graduate education leading to the degrees of Master of Science and Master of Engineering in Chemical, Mechanical, Civil and Electrical. In addition, Master's Degrees of Engineering in Management Systems and Computer Engineering are offered. The College of Engineering offers Doctor of Philosophy degrees in Civil, Computer and Chemical Engineering. Information concerning these programs may be obtained by consulting the Bulletin of Information of the Graduate School.

The Research and Development Center offers an opportunity for undergraduate and graduate students and professors to join their efforts in the common goals of research and development in scientific and technological areas. It is also the objective of the Center to study the particular problems in these areas as they apply to Puerto Rico, and to offer technical and scientific training for the best utilization of the island's own resources.

At the Bachelor's degree level a cooperative education program offers students the opportunity to blend classroom learning with practical work experience. Student participation

in the program is voluntary, but interested students are carefully screened by the Cooperative Education Office of the College of Engineering.

### Advanced Placement

First year students who pass the advanced-level exams with a high score in mathematics, English, and/or Spanish upon request, may be given credit and will not be required to take the basic courses in these subjects.

### Cooperative Education Program

The Cooperative Education Program complements college studies with on-the-job experience alternating study and work periods. Student participation in the program is voluntary; however, interested students are carefully screened by the Cooperative Education Office of the College of Engineering. Work-study periods are scheduled for each student to provide a multitude of learning opportunities available in business, industry, and public agencies which become an integral part of a more comprehensive career-oriented college education.

Participating students receive six (6) academic credits in the free electives category for a minimum of two working periods, one of which must take place during a regular semester. A Cooperative Education Working Agreement is signed by both the participating employer and the Cooperative Education Office to guarantee maximum program effectiveness.

To enter the program students enrolled in a five-year program must be in at least their third year and those enrolled in a four-year program must be in at least their second year and have a general 2.50 GPA or higher.

Cooperative education benefits the student, the participating employer and the university.

#### Benefits to students:

1. The student is able to evaluate a chosen major.
2. Classroom theory and principles become more meaningful through practical application in work assignments.
3. A student earns six academic credits.
4. A student will have the advantage of professional experience upon graduation.

5. A student earns money to help finance his education and academic career.

**Benefits to employers:**

1. The employer and the student can observe each other for several months at work, rather than during a short job interview.
2. Upon returning to campus, a student provides contacts for the employer with other prospective employees.
3. Employers reduce their training costs.

**Benefits to the University:**

1. The program promotes better relationship between industry and university.
2. The program creates ties with governmental, business and industrial communities.
3. The program provides faculty members with opportunities to gain additional information about their subject matter.
3. The program helps update curricula to keep courses aligned with on-the-job requirements.

## DEPARTMENT OF GENERAL ENGINEERING

The General Engineering Department includes professors with an interdisciplinary background from different fields of engineering. It is mainly responsible for most of the academic offerings in engineering during the first three years of study. Since all engineering disciplines rest on a common foundation, the administration and teaching of the basic and common courses can be handled most efficiently outside of the specialized departments.

The common foundation, which can be described as the study of applied physical science, or Engineering Science, is composed of courses such as: Engineering Graphics, Computer Programming, Numerical Methods, Computer Graphics, Applied Mechanics, Mechanics of Materials, Materials Science, and Fluid Mechanics. A broad, yet in-depth, knowledge of all of these areas is indispensable in every field of engineering, not only for further studies, but also for the successful practice of the engineering profession.

The General Engineering Department also offers interdisciplinary elective courses which are within the competence of its faculty. General Engineering faculty are also involved in research in Engineering, Science, and Engineering Education. Due to their background, projects with an interdisciplinary nature are very frequently the target of our faculty.

### DEPARTMENTAL FACULTY

**EDUARDO AÑESES**, *Assistant Professor*, M.Arch., 1996, Universidad Autónoma de Guadalajara.

**MARCO A. AROCHA**, *Associate Professor*, Ph.D., 1995, University of California.

**JOSE R. ARROYO-CARABALLO**, *Associate Professor*, Ph.D., 1999, University of Puerto Rico, Mayagüez Campus.

**BARBARA CALCAGNO-PIZZARELLI**, *Associate Professor*, M.S.Ch.E., 1981, University of Pennsylvania.

**ANDRES CALDERON-COLON**, *Professor*, Ph.D., 1976, University of Illinois.

**CARMEN CASTAÑEYRA**, *Assistant Professor*, M.S.I.E., 1990, University of Puerto Rico.

**JOSE E. CRESPO-BADILLO**, *Instructor*, M. Arch, 1997, State University of New York at Buffalo.

**MIGUEL A. CRUZ-AROCHO**, *Professor*, M.S Env. E., 1977, Georgia Institute of Technology.

**MEGH GOYAL-AGGARWAL**, *Professor*, Ph.D., 1979, Ohio State University.

**WILFREDO IRIZARRY-RUPERTO**, *Associate Professor*, M.Arch., 1973, University of Puerto Rico.

**ENRIQUE A. MAESTRE-KOPPISCH**, *Professor*, M.S.M.E., 1974, University of Puerto Rico.

**LIONEL R. ORAMA**, *Associate Professor*, Ph.D., 1997, Rensselaer Polytechnic Institute.

**ALLAN L. PHILLIPS**, *Professor*, Ph.D., 1967, University of California.

**LUIS F. PUMARADA-O'NEILL**, *Professor*, Ph.D., 1986, Northwestern University.

**JAIME B. RAMIREZ-VICK**, *Associate Professor*, Ph.D., 1997, Arizona State University.

**MARIO RIVERA-BORRERO**, *Associate Professor*, Ph.D., 1997, Virginia Polytechnic Institute.

**JOSEPH ROBINSON**, *Assistant Professor*, MA, 1984, Counseling Psychology, Seton Hall University.

**WILMA SANTIAGO**, *Assistant Professor*, M. Arch., 1992, University of Wisconsin.

**MAREK RYSZ**, *Professor*, Ph.D., 1981, Technical University of Cracow (Poland).

**JEANNETTE SANTOS-CORDERO**, *Associate Professor*, Ph.D., 1995, Louisiana State University.

**BASIR SHAFIQ**, *Associate Professor*, Ph.D., 1996, University of Illinois.

**ANAND D. SHARMA**, *Professor*, Ph.D., 1980, Texas A&M University.

**ARSALAN SHOKOOH**, *Professor*, Ph.D., 1977, Illinois Institute of Technology.

**WALTER SILVA-ARAYA**, *Professor*, Ph.D., 1993, Washington State University.

**OSCAR MARCELO-SUAREZ**, *Assistant Professor*, Ph.D., 2000, University of Wisconsin-Madison.

**FREYA TOLEDO-FERIA**, *Assistant Professor*, M.S.I.E., 1985, University of Massachusetts.

**OSWALD N.C. UWAKWEH**, *Associate Professor*, 1990, Universite De Nancy1, France.

## COURSES OF INSTRUCTION

### GENERAL ENGINEERING

INGE 3007. HISTORY OF TECHNOLOGY. Three credit hours. Three hours of lecture per week.

Introduction to the history of technology and engineering, from the Stone Age to the Industrial Revolution, emphasizing the relationships between technology, energy, and society. Focuses on Western history and cultures; with examples from Puerto Rico. Includes field trips and student presentations.

INGE 3011. ENGINEERING GRAPHICS I. Two credit hours. One hour of lecture and two one-and-one-half-hour laboratories per week.

Principles of graphic language: Fundamentals of delineation, analysis and solution of space problems, symbols and standards as applied in engineering. Freehand drawing as a tool for visualization. Principles of orthographic projection, sections, auxiliary views and conventional practices. Pictorial drawings: axonometric, oblique and perspective. Introduction to descriptive geometry. Hand and computer-aided drawing.

INGE 3012. ENGINEERING GRAPHICS II. Two credit hours. Two two-hours of lecture-drawing periods per week. Prerequisite: INGE 3011.

Underlying principles of the graphic language: fundamentals of delineation, analysis and solution of space problems, symbols and standards as applied to engineering, spatial geometry: distances between planes and lines, angles between lines and planes, rotation problems. Introduction to graphical mathematics and nomography.

INGE 3016. ALGORITHMS AND COMPUTER PROGRAMMING. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3031 or MATE 3144 or MATE 3183.

Development of algorithms and their implementation in a structured high level language. Programming techniques applied to the solution of engineering and mathematical problems.

INGE 3017. COMPUTER AIDED GRAPHICS. Two credit hours. Two two-hours of lecture-

laboratory periods per week. Prerequisites: INGE 3011 and INGE 3016.

Fundamentals of computer aided graphics in engineering. Description of the equipment, development of programs and data systems, use of commercial programs, modeling of geometric figures.

INGE 3031. ENGINEERING MECHANICS-STATICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3031 or MATE 3144 or MATE 3183.

Analysis of force systems; the laws of equilibrium; analysis of simple frames and cables, distributed forces; friction, centroids and moments of inertia.

INGE 3032. ENGINEERING MECHANICS-DYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 3031 and (FISI 3161 or FISI 3171).

Kinematics of particles and rigid bodies; relations between force, mass and acceleration; kinetics of particles and rigid bodies; work and energy; impulse and momentum.

INGE 3035. ENGINEERING MECHANICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3031 or MATE 3144 or MATE 3183. Co-requisite: FISI 3161 or FISI 3171.

Analysis of force systems; the laws of equilibrium; friction; centroids and moments of inertia. Kinematics and dynamics of particles and rigid bodies; vibrations.

INGE 3045. MATERIALS SCIENCE FOR ELECTRICAL ENGINEERS. Three credit hours. Three hours of lecture per week. Prerequisite: QUIM 3002. Co-requisite: FISI 3162 or FISI 3172.

Principles that determine the properties of conductors, semiconductors, and insulators. Electromechanical properties; diffusion, electrical conduction, thermal conduction; magnetic and optical properties.

INGE 4001. ENGINEERING MATERIALS. Three credit hours. Three hours of lecture per week. Prerequisites: (QUIM 3002 or QUIM 3042) and (FISI 3161 or FISI 3171).

A study of the basic principles that govern the properties and behavior of engineering materials; atomic structures, interatomic forces, amorphous

and crystalline structures; phase transformations; elasticity, plasticity and flow; the study of the capabilities and limitations of such materials, metals, cementing materials, protective coating and lubricating materials.

INGE 4011. MECHANICS OF MATERIALS I. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 3031 and (MATE 3032 or MATE 3184).

Stresses and strains due to axial loads; torsional loads; stresses due to flexion; shear and moment diagrams.

INGE 4012. MECHANICS OF MATERIALS II. Three credit hours. Three hours of lecture per week. Prerequisite: INGE 4011 and (MATE 3063 or MATE 3185).

Analysis of statically determinate and indeterminate beams; three moments theorem; stresses due to combined loads; column theory; dynamic loads.

INGE 4015. FLUID MECHANICS. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 3032 and (MATE 3063 or MATE 3185).

Elements of mechanics of fluids and fluid statics. Development of the fundamental equations of fluid mechanics and its applications. Introduction to dimensional analysis and similitude. Motion of ideal and real fluids including internal and external viscous flows. Introduction to the use of hydraulic machinery.

INGE 4016. FLUID MECHANICS LABORATORY. One credit hour. One three-hour laboratory period per week. Co-requisite: INGE 4015.

Laboratory work supplementing classroom instruction in mechanics of fluid phenomena, measuring devices and techniques, and the testing of fluid machinery.

INGE 4035. NUMERICAL METHODS APPLIED TO ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 3063 or MATE 3185) and INGE 3016.

Numerical procedures for digital computer simulation of engineering problems. The course includes numerical methods for finding roots of equations commonly encountered in engineering problems, curve fitting and modeling of experimental data, quadrature and numerical

differentiation. Systems of linear and non-linear equations arising from engineering applications, solution of initial value problems applied to the fundamental laws of mechanics.

INGE 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory per week. Pre-requisite: Fourth or fifth year student and consent of the Director of the Department.

Participation, under the supervision of a faculty member acting as an investigator, in a research project.

#### ADVANCED UNDERGRADUATE COURSE

INGE 5015. THEORY AND MANAGEMENT OF SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: third year standing or higher.

Introduction to the systems approach and to systems analysis. Analytical methods applicable to interactive contexts, such as economic and ecological systems and to organizations. Topics include: Problem formulation, information management, evaluation and selection of alternatives, implementation and monitoring of solutions.

## DEPARTMENT OF CHEMICAL ENGINEERING

Chemical Engineering is the branch of engineering that serves those industries which convert chemically basic raw materials into a variety of products at a large scale. It applies the principles of conservation of mass, energy, and momentum together with the fundamental principles of engineering, mathematics, chemistry, physics, life sciences, economics, and social sciences, to the development of the optimum use of natural resources.

The education of the chemical engineer is broad, concerning a range of problems which vary from basic and applied research, technical feasibility, and economic evaluation to plant and equipment design, construction, operation, and troubleshooting. A chemical engineer may also be concerned with other activities such as product sales, management, consulting, patent law and environmental planning.

Chemical engineers play an important role in today's world by attempting to solve problems in areas such as environment, renewable energy technologies, food, medical, biotechnology, and new materials development.

This program is fully accredited by ABET, the Accreditation Board for Engineering and Technology. The information below follows the new ABET 2000 EC accreditation Criteria:

### Mission

“Satisfy the technological needs of Puerto Rico related with Chemical Engineering by means of research, services and educating students coming from all socioeconomic levels to convert them in professionals competitive at a worldwide level and knowledgeable of their social and ethical responsibility.”

Attain the following mission supportive objectives:

1. Educate students to practice competently, professionally, and with social responsibility.
2. Integrate education, research, and community services as main responsibility areas.



3. Foster interdisciplinary efforts to solve major technological and societal problems.
4. Create a stimulating environment for the intellectual, social, and ethical development of our academic community.
5. Interact continuously with the external community and assess its needs.
6. Recruit highly qualified students, faculty, and staff.

### Vision

Our vision is to position the Chemical Engineering Department among the top 50 Chemical Engineering Departments in America as defined by external evaluating organizations after the year 2005. This vision assumes a main effort in maintaining the adequate focus in the fundamental core subjects of the profession; offering a curriculum which includes strategic elective courses related with Chemical Engineering; growing the research activity at a strategic rate that provides operational resources; reacting adequately to the demand for the profession by Puerto Rican youth, and satisfying the demand for Chemical Engineers required by Puerto Rico; placing our alumni in jobs inside and outside Puerto Rico; and assuring the accreditation of the Department by key organizations like ABET, MSA, and CES.

### Slogan

"Among Top Fifty Chemical Engineering Departments by the Year 2005"

### Educational Objectives

1. Graduates shall demonstrate professional and technical ability to apply Chemical Engineering principles to meet technological challenges.
2. Graduates shall be able to communicate effectively in Spanish and English, in written and oral formats.
3. Graduates shall be competent in applying core management skills including information, general and project management.
4. Graduates shall demonstrate excellent problem solving and critical/creative thinking skills.

5. Graduates shall exhibit interdisciplinary and leadership skills.
6. Graduates shall master technological and life changes adaptation skills.
7. Graduates shall sell an understanding of the values, issues and challenges facing the individual and society.
8. Graduates shall exhibit a cosmopolitan view of the world.

### ABET Outcomes

Engineering programs must demonstrate that their graduates have:

- a. an ability to apply knowledge of mathematics, science, and engineering.
- b. an ability to design and conduct experiments, as well as to analyze and interpret data.
- c. an ability to design a system, component, or process to meet desired needs.
- d. an ability to function on multidisciplinary teams.
- e. an ability to identify, formulate, and solve engineering problems.
- f. an understanding of professional and ethical responsibility.
- g. an ability to communicate effectively.
- h. the broad education necessary to understand the impact of engineering solutions in a global and societal context.
- i. a recognition of the need for, and an ability to engage in life-long learning.
- j. a knowledge of contemporary issues.
- k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- l. a recognition of basic leadership skills

### PROGRAM OF STUDY

#### CHEMICAL ENGINEERING

#### FIRST YEAR

##### First Semester

Number	Credits	Course
*MATE 3005	5	Pre-Calculus
QUIM 3041	4	General Chemistry
ELECTIVE	3	**Sociohumanistic Elective
*INGL 3---	3	First year course in English
*ESPA 3101	3	Basic Course in Spanish
		18

## Second Semester

MATE 3031	4	Calculus I
QUIM 3042	4	General Chemistry
*INGL 3---	3	First year course in English
*ESPA 3102	3	Basic Course in Spanish
INGE 3011	2	Engineering Graphics I
EDFI---	2	Physical Education Elective
	18	

**SECOND YEAR**

## First Semester

MATE 3032	4	Calculus II
FISI 3171	4	Physics I
FISI 3173	1	Physics Laboratory I
QUIM 3450	5	Fundamentals of Organic Chemistry
INGL 3---	3	Second year course in English
ELECTIVE	1	Free Elective
	18	

## Second Semester

MATE 3063	3	Calculus III
FISI 3172	4	Physics II
FISI 3174	1	Physics Laboratory II
INGL 3---	3	Second year course in English
QUIM 3055	4	Analytical Chemistry
INGE 3016	3	Algorithms and Computer Programming
	18	

**THIRD YEAR**

## First Semester

INGE 3031	3	Engineering Mechanics-Static
ECON 3021	3	Principles of Economics I
MATE 4009	3	Ordinary Differential Equations
QUIM 4041	3	Physical Chemistry I
INQU 4005	4	Materials and Energy Balances
ELECTIVE	2	Free Elective
	18	

## Second Semester

QUIM 4042	3	Physical Chemistry II
QUIM 4101	1	Physical Chemistry Laboratory I
INQU 4008	3	Mathematical Analysis of Chemical Eng. Problems
INQU 4010	4	Momentum Transfer Operations
INQU 4011	3	Chemical Engineering Thermodynamics I
ELECTIVE	3	Free Elective
	17	

**FOURTH YEAR**

## First Semester

QUIM 4102	1	Physical Chemistry Laboratory II
QUIM ----	3	Elective in Chemistry
INQU 4001	4	Heat Transfer Operations
INQU 4012	3	Chemical Engineering Thermodynamics II
ELECTIVE	3	**Sociohumanistic Elective
INEL 4075	3	Fundamentals of Electrical Engineering
	17	

## Second Semester

INQU 4002	4	Mass Transfer Operations
INQU 4017	4	Chemical Eng. Kinetics and Catalysis
INQU 4034	2	Chemical Engineering Laboratory I
INQU ----	3	Elective in Chemical Engineering
INGE 4001	3	Materials Engineering
	16	

**FIFTH YEAR**

## First Semester

INQU 5030	2	Chemical Engineering Laboratory II
INQU 4027	1	Chemical Engineering Seminar
INQU 5021	3	Chemical Engineering Process Design I
INQU 5025	3	Analysis and Control of Processes
INQU ----	3	Elective in Chemical Engineering
ELECTIVES	6	**Sociohumanistic Electives
	18	

## Second Semester

INQU 5022	3	Chemical Engineering Process Design II
INQU ----	2	Elective in Chemical Engineering
ELECTIVE	3	**Sociohumanistic Elective
ELECTIVES	6	Free Electives
	14	

**Total credits required for program: 172**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*The fifteen (15) credit hours of Sociohumanistic electives will be selected by the student, with the advisor's approval, from a list of recommended courses.

**DEPARTMENTAL FACULTY**

**GUILLERMO AGUAYO-TALAVERA**, Professor, Ph.D., 1972, University of Cincinnati.

**JAIME BENITEZ-RODRIGUEZ**, *Professor*, Ph.D., 1976, Rensselaer Polytechnic Institute.

**MOSES BOGERE**, *Associate Professor*, Ph.D., 1993, University of Akron.

**JULIO G. BRIANO-PERALTA**, *Professor*, Ph.D., 1983, University of Pennsylvania.

**NELSON CARDONA-MARTINEZ**, *Professor*, Ph.D., 1989, University of Wisconsin-Madison.

**GUILLERMO COLON-BURGOS**, *Professor*, Ph.D., 1986, University of Massachusetts.

**JOSE A. COLUCCI-RIOS**, *Professor*, Ph.D., 1985, University of Wisconsin-Madison.

**L. ANTONIO ESTEVEZ-DE VIDTS**, *Professor*, Ph.D., 1983, University of California-Davis.

**ARTURO HERNANDEZ-MALDONADO**, *Instructor*, M.S., 1996, University of Puerto Rico, Mayagüez.

**SATYA N. MANDAVILLI**, *Professor*, Ph.D., 1959, Indian Institute of Technology.

**NARINDER K. MEHTA**, *Researcher*, Ph.D., 1979, California Coast University.

**LUENY MORELL-DE RAMIREZ**, *Professor*, M.S.Ch.E., 1977, Stanford University.

**RAFAEL MUÑOZ-CANDELARIO**, *Emeritus Professor*, Ph.D., 1956, Polytechnic Institute of Brooklyn.

**FEDERICO PADRON-GARAY**, *Assistant Professor*, B.S.Ch.E., P.E. 1965, University of Puerto Rico.

**CARLOS A. RAMIREZ-QUIÑONES**, *Professor*, Sc.D. Ch.E., 1979, Massachusetts Institute of Technology.

**CARLOS M. RINALDI-RAMOS**, *Assistant Professor*, Ph.D., 2002, Massachusetts Institute of Technology.

**ABRAHAM RODRIGUEZ-RAMIREZ**, *Professor*, Ph.D., 1973, New York University.

**LORENZO SALICETI-PIAZZA**, *Associate Professor*, Ph.D., 1996, Purdue University.

**DIANA SIBERIO-PEREZ**, *Instructor*, B.S. University of Puerto Rico, Mayagüez.

**LAKSHMI N. SRIDHAR**, *Professor*, Ph.D., 1991, Clarkson University.

**DAVID SULEIMAN-ROSADO**, *Associate Professor*, Ph.D., 1994, Georgia Institute of Technology.

**CARLOS VELAZQUEZ-FIGUEROA**, *Assistant Professor*, Ph.D. 1993, University of Connecticut, Storrs, Connecticut.

**MADELINE TORRES-LUGO**, *Assistant Professor*, Ph.D., 2001, Purdue University.

**GILBERTO VILLAFañE-RUIZ**, *Professor*, Ph.D., 1974, Tulane University.

**CARLOS VELAZQUEZ-FIGUEROA**, *Associate Professor*, Ph. D., 1993, University of Connecticut.

## COURSES OF INSTRUCTION

### CHEMICAL ENGINEERING

INQU 4001. HEAT TRANSFER OPERATIONS. Four credit hours. Four hours of lecture per week. Prerequisites: INQU 4010 and INQU 4011.

Heat transfer principles, including multidimensional flow and unsteady state conditions, radiation heat transfer, design of exchangers, empirical relations.

INQU 4002. MASS TRANSFER OPERATIONS. Four credit hours. Four hours of lecture per week. Prerequisites: INQU 4001 and INQU 4012.

Phase equilibria and equilibrium stage operations, with particular emphasis on distillation, gas absorption, humidification, and liquid-liquid extraction.

INQU 4003. UNIT OPERATIONS III. Four credit hours. Four hours of lecture per week. Prerequisite: INQU 4005.

Theory, applications, and design of unit operations which are mostly employed in the pharmaceutical industry; air, water, and media sterilizations, recovery of fermentation products, aeration, agitation, crystallization, and scale-up.

INQU 4004. UNIT OPERATIONS LABORATORY III. One credit hour. One three-hour laboratory per week. Co-requisite: INQU 4003.

Experimental studies on crystallization, drying of solids, fermentation, sterilization, validation, extraction, and filtration, using pilot plant equipment.

INQU 4005. MATERIALS AND ENERGY BALANCES. Four credit hours. Three hours of lecture and one two-hour discussion period per week. Prerequisites: INGE 3016 and (MATE 3063 or MATE 3185 or MATE 3048). Co-requisite: QUIM 4041 or consent of the Director of the Chemical Engineering Department and consent of the Director of the Industrial Biotechnology Department for the Industrial Biotechnology students.

An introduction to chemical engineering calculations involving the laws of conservation of mass and energy.

INQU 4008. MATHEMATICAL ANALYSIS OF CHEMICAL ENGINEERING PROBLEMS. Three credit hours. Three hours of lecture per week. Prerequisites: INQU 4005 and MATE 4009.

Mathematical analysis of problems of interest in chemical engineering. Methods of interpretation and analysis of experimental data, formulation and solution of mass and energy balance equations in open and closed systems: use of Laplace transforms, error and Bessel functions, matrices, solution of problems by means of digital computers.

INQU 4010. MOMENTUM TRANSFER OPERATIONS. Four credit hours. Four hours of lecture per week. Prerequisite: INQU 4005. Co-requisite: MATE 4009.

Introduction to mass, momentum and energy transport, and the calculation of transport coefficients. Shell momentum balances; analytical solution of problems in viscous flow; dimensional analysis. Introduction to turbulent flow. Friction factor in ducts and particulate systems. Macroscopic balances, application to the design of chemical engineering systems.

INQU 4011. CHEMICAL ENGINEERING THERMODYNAMICS I. Three credit hours. Three hours of lecture per week. Prerequisites: INQU 4005 and QUIM 4041 and (MATE 4009 or MATE 3048).

Thermodynamic principles; applications of the first and second laws of thermodynamics to the solution of chemical engineering problems; thermodynamic properties of fluids.

INQU 4012. CHEMICAL ENGINEERING THERMODYNAMICS II. Three credit hours. Three hours of lecture per week. Prerequisites: INQU 4011 and QUIM 4042.

Emphasis on thermodynamic functions, properties of solutions, phase equilibria, and chemical reaction equilibria.

INQU 4016. PLASTICS TECHNOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: (QUIM 3031 or QUIM 3450) and INQU 4005.

The properties, production, and fabrication of natural and synthetic resins and polymers of industrial importance.

INQU 4017. CHEMICAL ENGINEERING KINETICS AND CATALYSIS. Four credit hours. Four hours of lecture per week. Prerequisites: INQU 4001 and INQU 4012.

The principles of chemical kinetics and catalysis, and their application to reactor design and industrial processes.

INQU 4027. CHEMICAL ENGINEERING SEMINAR. One credit hour. One and one-half hour of seminar per week. Prerequisite: INQU 4010.

Discussion and reports on special topics in chemical engineering. Involves literature searches and evaluation for the preparation of written and oral reports. Students are required to attend all seminars sponsored by the Department of Chemical Engineering.

INQU 4028. PETROLEUM TECHNOLOGY. Three credit hours. Three hours of lectures per week. Prerequisites: INQU 4002 and QUIM 3031.

The conversion of petroleum to useful derivatives, with emphasis on the chemical engineering operations and equipment involved. Problems, trips.

INQU 4029. PHARMACEUTICAL OPERATIONS. Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisite: INQU 4011.

Theory, principles and practices related to the manufacture of pharmaceutical preparations and pharmaceutical related plant and equipment design. Studies on key unit operations like powder weighing, granulating, milling, blending and compressing. Plant and equipment validation and good manufacturing practices (GMP).

INQU 4034. CHEMICAL ENGINEERING LABORATORY I. Two credit hours. Two three-hour laboratories per week. Prerequisite: INQU 4001.

Experimental studies on fluid flow and heat transfer using pilot plant equipment.

INQU 4036. CHEMICAL ENGINEERING PRACTICE. Three credit hours. Thirty five hours per week for seven or more weeks during the summer or its equivalent during the semester. Prerequisites: Consent of the Director of the Department.

A course organized in cooperation with private industry or government to provide the student with practical experience in chemical engineering. The work performed by the student will be jointly supervised by the academic department and an appropriate official from the cooperating organization. An oral and written report will be required from the student upon completion of the project.

INQU 4038. PROJECT MANAGEMENT FOR CHEMICAL ENGINEERS. Three credit hours. Two hours of lecture and two hours of supervised practice per week. Prerequisite: INQU 4002.

Skills for successful management projects that require development, design, construction and operation of chemical plants and related industries.

INQU 4077. UNIT OPERATIONS IN FOOD PROCESSING. Three credit hours. Three hours of lecture per week. Prerequisites: INQU 4001 and INQU 4012. Co-requisite: INQU 4002.

Drying: tray, belt, drum, spray, freeze drying, instantizing, and agglomeration. Freezing and freeze concentration. Membrane processes: osmosis, reverse osmosis, ultrafiltration, electrodialysis. Extrusion. Expression. Microwave heating.

INQU 4995. ENGINEERING PRACTICE FOR CO-OP STUDENTS. Zero to six credit hours. A minimum of two work periods are required for the accreditation of the course, one of which must be a semester. Prerequisite: Consent of the Director of the Department.

Practical experience in chemical engineering in cooperation with private industry or government to be jointly supervised by the academic department, the Co-op program coordinator, and an official from the cooperating organization. A written report

will be required upon completion of each period of work.

INQU 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory per week. Pre-requisite: Fourth or fifth year student and consent of the Director of the Department.

Participation, under the supervision of a faculty member acting as an investigator, in a research project.

### ADVANCED UNDERGRADUATE AND GRADUATE COURSES

INQU 5005. PROCESS HEAT TRANSFER. Three credit hours. Three hours of lecture per week. Prerequisite: INQU 4001.

Design of heat exchangers for chemical processes, condensers and condensation of multicomponent mixtures, evaporation by natural and forced circulation, extended surface heat exchangers, design of process furnaces.

INQU 5006. MATHEMATICAL TOPICS IN CHEMICAL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 4009 or MATE 3048) and INQU 4005.

Statistical analysis of experimental data, curve fitting, and sampling theory; nomography; problem solving with digital computers. Emphasis is given to chemical engineering applications.

INQU 5008. COMPUTER SIMULATION OF PROCESSES AND UNITS. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 3016, INQU 4002, and consent of the Director of the Department.

Analysis, design, and simulation of chemical processes and units using computer programs developed by students under guidance of a faculty member.

INQU 5009. CHEMICAL ENGINEERING APPLICATIONS TO BIOMEDICAL SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Modeling and analysis of vital functions in the human body by methods similar to those used to study the behavior of processing units in chemical plants, such as tracer techniques, microscopic and cell-scale mass and energy transfer, fluid

mechanics of the circulatory system, and reactor kinetics applied to body systems.

INQU 5015. FUNDAMENTALS OF AIR POLLUTION. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4008 or Co-requisite: INQU 4002.

Classification and extent of air pollution problems; meteorology and air pollution; dispersion from effluents; the effect of air pollution on plants and animals; visibility problems; socioeconomic impact of pollution problems; analytical and experimental sampling methods; equipment and process for abating air pollution; governmental regulations for air pollution control.

INQU 5018. AIR POLLUTION CONTROL. Three credit hours. Three hours of lecture per week. Prerequisite: INQU 4010 or Co-requisite: INCI 4008.

A discussion of the theory, principles, and practices related to engineering control of particulate and gaseous emissions from natural, industrial, agricultural, commercial, and municipal sources of atmospheric pollution.

INQU 5019. INDUSTRIAL WASTE CONTROL. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4008 or Co-requisite: INQU 4002.

The minimization of industrial wastes through the proper design and operation of manufacturing plants; treatment of disposal of industrial wastes, with emphasis on the chemical industries in Puerto Rico.

INQU 5021. CHEMICAL ENGINEERING PROCESS DESIGN I. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021. Co-requisites: INQU 4002 and INQU 4017.

Principles of economic evaluation, cost estimation, mathematical techniques and process simulation as applied to chemical engineering design.

INQU 5022. CHEMICAL ENGINEERING PROCESS DESIGN II. Three credit hours. Three hours of lecture per week. Prerequisites: INQU 4017, INQU 4002 and INQU 5021.

Application of the principles of economic evaluation, cost estimation, mathematical techniques, and simulation to the chemical engineering design of processes and/or equipment.

INQU 5025. ANALYSIS AND CONTROL OF PROCESSES. Three credit hours. Three hours of lecture per week. Prerequisites: INQU 4002, INQU 4017 and INQU 4008.

Mathematical simulation of chemical and physical processes. Analysis of first and second order systems; control modes; control hardware; roots locus and frequency response analysis; optimum control settings; applications to the design of control systems.

INQU 5026. MICROCLIMATE AND DISPERSION OF AIR POLLUTANTS. Three credit hours. Three hours of lecture per week. Prerequisite: INQU 4002 or INCI 4008.

Discussion of the elements of microclimate in urban, rural, and valley environments. Dispersion of air pollutants in these environments.

INQU 5027. EQUILIBRIUM STAGE PROCESSES. Three credit hours. Three hours of lecture per week. Prerequisites: INQU 4002 and INGE 3016.

The equilibrium stage concept is applied to the analysis and design of stage-wise separation processes, with application to distillation, gas absorption, and extraction. Multicomponent systems, computer methods, and practical aspects of design are studied.

INQU 5028. ADVANCES IN CHEMICAL ENGINEERING. Two credit hours. Two hours of lecture per week. Prerequisite: INQU 4002. Co-requisite: INQU 4027.

Discussion of chemical engineering topics in which recent advances are particularly striking.

INQU 5030. CHEMICAL ENGINEERING LABORATORY II. Two credit hours. Two three-hour laboratory periods per week. Prerequisite: INQU 4002 and INQU 4017. Corequisite: INQU 5025.

Experimental studies on mass transfer, process control, fermentation, kinetics and catalysis using pilot plant equipment at the Unit Operations Laboratory.

INQU 5035. BIOCHEMICAL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: INQU 4017 or (QUIM 4042 and QUIM 5072).

Concepts of microbiology and biochemistry. Kinetics of enzyme-catalyzed reaction networks



and immobilized enzyme systems; transport phenomena in microbial systems; biological reactor design and analysis; analysis of multiple interacting microbial populations.

INQU 5036. PARTICULATE SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: INQU 4002.

Creation, characterization, separation and agglomeration of particles. Sizing fractionation of powders, surface area and pore size determinations. Pulverization, crystallization, agglomeration, tableting and granulation.

INQU 5037. MEMBRANE SEPARATION PROCESSES. Three credit hours. Two hours of lecture and one hour of discussion per week. Prerequisite: INQU 4002.

Study of the principles of membrane separation processes such as: reverse osmosis, nanofiltration, ultrafiltration, microfiltration, dialysis, electrodialysis, gas permeation and pervaporation. The study will cover mass transfer and the design and operational aspects for both liquid and gas separation system. The separation, purification, and recovery processes will be applied to the chemical, biochemical, and food industries.

INQU 5045. TRANSPORT PHENOMENA. Three credit hours. Three hours of lecture per week. Prerequisites: (INQU 4008 and INQU 4010) or INCI 4008.

Momentum, energy, and mass transport. Emphasis is given in the understanding of basic physical principles and their mathematical description.

INQU 5995. SPECIAL PROBLEMS. One to three credit hours. One to three laboratory, library or independent work periods per week. Prerequisite: Consent of the Director of the Department.

Undergraduate research problems in chemical engineering or related field. Topics vary with interest of student and instructor. Open only to outstanding Chemical Engineering students.

## DEPARTMENT OF CIVIL ENGINEERING AND SURVEYING

The College of Engineering offers a five-year program leading to a Bachelor of Science degree in Civil Engineering and a four-year Bachelor of Science in Surveying and Topography which are administered by the Civil Engineering and Surveying Department.

### VISION:

We provide society with people-serving, problem-solvers in civil engineering and surveying.

### MISSION:

Provide our society with high quality professionals having a strong education in civil engineering and/or land surveying; with rich cultural, ethical, environmental, and social sensitivities; capacity for critical thinking; and the entrepreneurial skills to solve civil infrastructure problems, search for and disseminate new knowledge, provide services to solve engineering problems as members of interdisciplinary teams.

### SLOGAN:

$CE S=(PS)^2$  (Civil Engineers and Surveyors = People-serving, problem solvers)

## CIVIL ENGINEERING

It offers BS in Civil Engineering, and MS, ME, and PhD in structures, environmental, transportation and geotechnical engineering and a BS in Surveying and Topography. It serves approximately 1000 undergraduate students and about 100 graduate students.

### Highlights:

- Ranks among the top ten programs in the US, in terms of graduating Civil Engineers, with an 88% success rate in credit approval.
- Largest program in the US in terms of graduating female Civil Engineers (33% of the student population).

- Only program offering doctoral degrees (structures and environmental) in Civil Engineering in the Caribbean.
- Hosts a faculty with thirty top rank professors with extraordinary local and international academic and research experiences and reputation.
- Supports basic and applied research in man-made and natural hazards (earthquakes, hurricanes, floods, others), transportation, environmental, land surveying, and civil engineering materials.
- The external funding awarded to support research and creative work during 2003 was about \$3.5 million.
- Placed first (from 28 universities) in the Southeast regional ASCE conferences and engineering /creativity student competitions in 2003.

Civil Engineering, the oldest of the traditional divisions of engineering, encompasses a broad range of public and private infrastructure projects for improving the world's large-scale environment with the most innovative and up-to-date technology. Highways, bridges, railroads, dams, docks and wharves, airports, launching facilities, multistory buildings, industrial structures, water, air, and land conservation and protection, and water distribution systems, industrial and residential waste treatment systems, tunnels, and transit systems supported by computer aided design and geographical information systems (the country's infrastructure) are some examples of the work performed by civil engineers. Each work has an impact upon the daily living of most people. Civil engineers, therefore, are called upon to consider, in an integrated manner, the social and physical factors which affect the planning, design, construction, operation, and maintenance of our total infrastructure systems.

The Bachelor's degree program precedes a well-coordinated graduate study program, which offers Master's and Ph.D. degrees in Civil Engineering.

#### **PROGRAM EDUCATIONAL OBJECTIVES:**

We expect that, during the first few years after graduation, our graduates will be able to:

1. Address the challenges which they will face throughout their careers.
2. Pursue lifelong learning and continue to develop their problem-solving skills.
3. Exhibit leadership and team-building skills in a bilingual setting.
4. Provide quality service to the profession, to our government, and to our society.
5. Function as effective members of interdisciplinary teams.
6. Apply emerging engineering technologies and criteria.

#### **PROGRAM OUTCOMES:**

We expect that, by the time of graduation, our students will have:

1. Ability to understand and apply fundamental knowledge of mathematics through differential equations, probability and statistics; science (calculus based physics and general chemistry); and engineering sciences.
2. Proficiency in a minimum of four (4) recognized major civil engineering areas, such as: construction management, environmental, geotechnical structural transportation, and water resources.
3. Ability to conduct experiments and to critically analyze and interpret data in more than one of the major civil engineering areas.
4. Ability to perform civil engineering integrated design of systems, components, or processes by means of practical experiences throughout the professional component of the curriculum.
5. Ability to identify, formulate, and solve civil engineering problems using modern engineering tools, techniques, and skills.

6. Ability to play an effective role in multidisciplinary professional work groups solving engineering problems.
7. Ability to communicate effectively in English and Spanish.
8. Understanding the meaning of compliance with professional practice and ethical issues, such as: bidding; procurement; professional interaction, and professional licensure.
9. Broad education necessary to understand the impact of civil engineering solutions on health, general welfare, safety, environmental quality, and economy in a global context.
10. Commitment to engage in lifelong learning.
11. Necessary awareness of contemporary social, cultural, economic, artistic, aesthetic, environmental, and engineering issues.

The Master's degree program offers three options; a Master of Science which requires a written thesis, a Master of Engineering which requires a comprehensive engineering project, and a Master of Engineering which requires only course work in addition to a final written exam.

The Department also offers a Certificate in Environmental Engineering courses. Nine civil engineering laboratories provide sophomore and senior students with hands-on learning experience. Three equipped computer centers and laboratories provide about 100 computer accesses and terminals to students. A state-of-the-art computer network infrastructure provides rapid and efficient internal and external communication to Internet and other well-known networks.

The Civil Engineering faculty is actively involved in research and public services to external institutions. Various centers provide administrative support to these initiatives: the Civil Infrastructure Research Center (CIRC), the Natural Hazards Mitigation Institute (NHMI), the Transportation Technology Transfer Center (T<sup>2</sup>), and the Computer Aided Instruction and Research Laboratory (CAIREL). Undergraduate students participate in research experiences, both on-campus and off-campus. Students also

participate in summer internship programs in prestigious universities and research centers in the United States of America. This program is fully accredited by ABET, the Accreditation Board for Engineering and Technology.

**PROGRAM OF STUDY /  
CIVIL ENGINEERING CURRICULUM**

**FIRST YEAR**

First Semester

Number	Credits	Course
*MATE 3005	5	Pre-Calculus
QUIM 3001	4	General Chemistry
*INGL 3---	3	First year course in English
*ESPA 3101	3	Basic Course in Spanish
INGE 3011	2	Engineering Graphics I
EDFI ----	$\frac{1}{18}$	Elective in Physical Education

Second Semester

MATE 3031	4	Calculus I
QUIM 3002	4	General Chemistry
*INGL 3---	3	First year course in English
*ESPA 3102	3	Basic Course in Spanish
INGE 3012	2	Engineering Graphics II
EDFI ----	$\frac{1}{17}$	Elective in Physical Education

**SECOND YEAR**

First Semester

MATE 3032	4	Calculus II
FISI 3171	4	Physics I
FISI 3173	1	Physics Laboratory I
INGL 3---	3	Second year course in English
INGE 3031	3	Applied Mechanics-Static
INGE 3016	$\frac{3}{18}$	Algorithms and Computer Programming

Second Semester

MATE 3063	3	Calculus III
FISI 3172	4	Physics II
FISI 3174	1	Physics Laboratory II
INGL 3---	3	Second year course in English
INGE 3032	3	Applied Mechanics-Dynamics
INGE 4011	$\frac{3}{17}$	Mechanics of Materials I

**THIRD YEAR**

First Semester

MATE 4009	3	Ordinary Differential Equations
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INCI 4001	3	Surveying I
INCI 4095	2	Mathematical Methods in Civil Engineering
INGE 4012	3	Mechanics of Materials II
INGE 4001	3	Engineering Materials
INEL 4075	3	Fundamentals of Electrical Engineering
	17	

Second Semester

INCI 4021	3	Structural Analysis I
INCI 4035	3	Civil Engineering Materials
INCI 4002	3	Surveying II
INCI 4136	2	Applied Statistics for Civil Eng.
INGE 4015	3	Fluid Mechanics
INGE 4016	1	Fluid Mechanics Laboratory
GEOL 4015	3	Geology for Engineers
	18	

**FOURTH YEAR**

First Semester

INCI 4007	3	Highway Location and Curve Design
INCI 4008	3	Introduction to Environmental Engineering
INCI 4011	3	Structural Steel Design
INCI 4022	3	Structural Analysis II
ECON 3021	3	Principles of Economics I
ELECTIVES	3	**Sociohumanistic Electives
	18	

Second Semester

INCI 4139	4	Intro. to Geotechnical Engineering
INCI 4012	3	Reinforced Concrete Design
INCI 4138	3	Water Resources Engineering
INCI 4137	3	Intro. to Transportation Engineering
ELECTIVES	6	**Sociohumanistic Electives
	19	

**FIFTH YEAR**

First Semester

INCI 4049	3	Foundations
INCI 4026	3	Highway Engineering
INCI 4145	3	Waterworks and Sewerage Design
ELECTIVE	3	**Sociohumanistic Elective
ELECTIVES	6	***Free Electives
	18	

Second Semester

INCI 4950	3	Integrated Civil Engineering Project
INCI 4055	3	Project Control and Management
INCI 4019	1	Civil Engineering Seminar
ELECTIVE	3	**Sociohumanistic Elective
ELECTIVE	3	Civil Engineering Elective
ELECTIVES	6	***Free Electives
	19	

**Total credits required for this program: 179**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*The fifteen (15) credit-hours of Sociohumanistic electives will be selected by the student, with the advisor's approval, from a list of recommended courses.

\*\*\*The twelve (12) credit-hours of free electives will be selected by the student with the advisor's approval, from available courses with equal or higher, and different contents than those required in the curriculum.

**SURVEYING AND TOPOGRAPHY**

The very high cost of real estate on the Island and the highly sophisticated modern instrumentation used today make this program mandatory in order to produce better-qualified professionals in the field of surveying.

Surveying students will be enrolled in a program that covers a wide spectrum of activities from the very basic plane surveying, to cartography, photogrammetry, geodesy, and astronomy. The student will have the opportunity to apply theory into practice, through laboratory sessions and a summer camp. The program has been designed to meet the needs and the qualification criteria of the Board of Examiners of Engineers, Architects, and Surveyors of Puerto Rico, the Society of Engineers and Surveyors of Puerto Rico, and the surveying profession itself.

**PROGRAM EDUCATIONAL OBJECTIVES:**

The Surveying and Topography Program's specific academic objectives are to:

1. Properly apply knowledge of mathematics, science, and surveying engineering sciences
2. Properly analyze data, legal documents, and field evidence

3. Be able to design measurement criteria to meet minimum accuracy standards in a given job or situation
4. Have the desired personality traits that will assist a student to efficiently work as a leader or a member of a team, not only in field parties but in interdisciplinary teams as well;
5. Be capable of aspiring to achieve the highest standards of the profession, both technically and ethically;
6. Be able to communicate efficiently with others, laymen and professionals, in graphical, oral and written (in English and in Spanish) means;
7. Show a thirst for knowledge which will help a student pursue further studies and/or, at all times keep abreast of contemporary issues at both levels: technological and worldwide;
8. Show a willingness to become involved in the solution of problems and issues, both technological and social; and
9. Be willing to engage in, and capable of attaining life-long learning experiences.

EDFI ----  $\frac{1}{17}$  Elective in Physical Education

**SECOND YEAR**

First Semester

MATE 3032 4 Calculus II  
 INGL 3--- 3 Second year course in English  
 FISI 3171 4 Physics I  
 FISI 3173 1 Physics Laboratory I  
 ECON 3021 3 Principles of Economics I  
 INGE 3031  $\frac{3}{18}$  Engineering Mechanics-Statics

Second Semester

MATE 3063 3 Calculus III  
 INGL 3--- 3 Second year course in English  
 FISI 3172 4 Physics II  
 FISI 3174 1 Physics Laboratory II  
 INGE 3032 3 Engineering Mechanics-Dynamics  
 INGE 3016 3 Introduction to Computers  
 INCI 4001  $\frac{3}{20}$  Surveying I

**THIRD YEAR**

First Semester

MATE 4009 3 Ordinary Differential Equations  
 ASTR 4005 3 Astronomy I  
 INCI 4135 3 Elements of Optics in Surveying and Photogrammetry  
 INCI 4002 3 Surveying II  
 ININ 4007 3 Industrial Organization and Management  
 ELECTIVE  $\frac{3}{18}$  \*\*Sociohumanistic Elective

Second Semester

INCI 4078 2 Topographic Drawing  
 INCI 4081 3 Photogrammetry I  
 INCI 4051 3 Geodesy I  
 INCI 4007 3 Highway Location and Curve Design  
 ELECTIVE 3 \*\*Sociohumanistic Elective  
 GEOL 4015  $\frac{3}{17}$  Geology for Engineers

**SUMMER**

INCI 4018 4 Topographic Practice

**FOURTH YEAR**

First Semester

INCI 4071 3 Adjustment Computation I  
 INCI 4085 3 Theory of Map Projections  
 INCI 4061 3 Legal Aspects I  
 INCI 4087 3 Special Surveys

**PROGRAM OF STUDY  
 SURVEYING AND TOPOGRAPHY  
 CURRICULUM**

**FIRST YEAR**

First Semester

Number	Credits	Course
*MATE 3005	5	Pre-Calculus
QUIM 3001	4	General Chemistry
*INGL 3---	3	First year course in English
*ESPA 3101	3	Basic course in Spanish
INGE 3011	2	Engineering Graphics I
EDFI ----	$\frac{1}{18}$	Elective in Physical Education

Second Semester

MATE 3031	4	Calculus I
QUIM 3002	4	General Chemistry
*INGL 3---	3	First year course in English
*ESPA 3102	3	Basic course in Spanish
INGE 3012	2	Engineering Graphics II

ELECTIVE	3	INCI Elective
ELECTIVE	<u>3</u>	***Free Elective
	18	

Second Semester

INCI 4086	3	Introduction to Physical Geodesy
INCI 4059	3	Geodetic Astronomy
ELECTIVES	9	***Free Electives
ELECTIVE	<u>3</u>	INCI Elective
	18	

**Total credits required for this program: 148**

\*Refer to the Academic Regulations section for information on Advanced Placement.

\*\*The six (6) credit-hours of Sociohumanistic electives will be selected by the student, with the advisor's approval, from a list of recommended courses.

\*\*\*The twelve (12) credit-hours of free electives will be selected by the student with the advisor's approval, from available courses with equal or higher, and different contents than those required in the curriculum.

**DEPARTMENTAL FACULTY**

**FELIPE J. ACOSTA-COSTA**, *Assistant Professor*, Ph.D., 1999, Georgia Institute of Technology.

**ERNESTO ARROYO-MORA**, *Assistant Professor*, M.S.C.E., 1994, University of Puerto Rico.

**JUAN B. BERNAL-VERA**, *Professor*, Ph.D., 1984, University of Texas.

**ARSENIO CACERES-FERNANDEZ**, *Assistant Professor*, Ph.D., 1998, West Virginia University.

**BEATRIZ I. CAMACHO-PADRON**, *Instructor*, M.S.C.E., 1998, University of Florida.

**BENJAMIN COLUCCI-RIOS**, *Professor*, Ph.D., 1984, Purdue University.

**EVI DE LA ROSA-RICCIARDI**, *Instructor*, M.S.C.E., 1995, Purdue University.

**ELBA DIAZ-DE OSBORNE**, *Associate Researcher*, M.S., 1968, University of Puerto Rico.

**ALBERTO M. FIGUEROA-MEDINA**, *Instructor*, M.S.C.E., 1999, University of Puerto Rico.

**JOSE L. FLORES-MALAVE**, *Assistant Professor*, M.S.C.E., 1994, Purdue University.

**LUIS A. GODOY**, *Professor*, Ph.D., 1979, University of London.

**HIRAM GONZALEZ-HERNANDEZ**, *Associate Professor*, M.S.C.E., 1984, University of Puerto Rico.

**ANTONIO A. GONZALEZ-QUEVEDO**, *Professor*, Ph.D., 1991, Purdue University.

**SERGIO L. GONZALEZ-QUEVEDO**, *Associate Professor*, Ph.D., 1985, Massachusetts Institute of Technology.

**JOSE O. GUEVARA**, *Associate Professor*, Ph.D., 1990, University of Florida.

**NELSON IRIZARRY-GUTIERREZ**, *Associate Professor*, Ph.D., 1997, Texas A & M University.

**RICARDO R. LOPEZ-RODRIGUEZ**, *Professor*, Ph.D., 1988, University of Illinois.

**JOSE F. LLUCH-GARCIA**, *Professor*, Ph.D., 1981, Georgia Institute of Technology.

**FELIPE LUYANDA-VILLAFANE**, *Professor*, D.E., 1981, Rensselaer Polytechnic Institute.

**FRANCISCO MALDONADO-FORTUNET**, *Instructor*, M.S., 1994, Georgia Institute of Technology.

**JOSE A. MARTINEZ-CRUZADO**, *Professor*, Ph.D., 1993, University of California.

**INGRID Y. PADILLA-CESTERO**, *Assistant Professor*, Ph.D., 1998, University of Arizona.

**ISMAEL PAGAN-TRINIDAD**, *Professor*, M.S.C.E., 1977, University of Puerto Rico.

**MIGUEL A. PANDO-LOPEZ**, *Assistant Professor*, Ph.D., 2003, Virginia Polytechnic Institute and State University.

**JOSE L. PERDOMO-RIVERA**, *Instructor*, M.S.C.E., 2001, Virginia Polytechnic Institute and State University.

**RICARDO RAMOS-CABEZA**, *Assistant Professor*, Ph.D., 1999, Rensselaer Polytechnic Institute.

**JORGE RIVERA-SANTOS**, *Professor*, Ph.D., 1988, University of Colorado.

**ROQUE A. ROMAN-SEDA**, *Professor*, Ph.D., 1981, Vanderbilt University.

**CARLOS RUIZ**, *Adjunct Professor*, Ph.D., 1987, University of Iowa.



**ALI SAFFAR**, *Professor*, Ph.D., 1986, Worcester Polytechnic Institute.

**IVONNE SANTIAGO-LOPEZ**, *Associate Professor*, Ph.D., 1995, New Mexico State University.

**RAFAEL SEGARRA-GARCIA**, *Professor*, Ph.D., 1988, Virginia Polytechnic Institute and State University.

**LUIS E. SUAREZ-COLCHE**, *Professor*, Ph.D., 1986, Virginia Polytechnic Institute and State University.

**DIDIER M. VALDES-DIAZ**, *Assistant Professor*, Ph.D., 1999, Texas at Austin.

**LINDA VELEZ-RODRIGUEZ**, *Professor*, M.S.G.S., 1981, Ohio State University.

**DANIEL A. WENDINCHANSKY**, *Associate Professor*, Ph.D. 1996, State University of New York at Buffalo.

**RAUL E. ZAPATA-LOPEZ**, *Professor*, Ph.D., 1987, University of Florida.

## COURSES OF INSTRUCTION

### CIVIL ENGINEERING

**INCI 4000. INTRODUCTION TO ARCHITECTURE.** Three credit hours. Three hours of lecture per week. Prerequisite: Fifth year student or consent of the Director of the Department.

The significance of architecture in relation to culture, the development of construction technology, and to the sociopolitical structure of the times. Relationship between the architect and the civil engineer in modern society. Elements of architectural design. Architectural analysis of different types of buildings. Anatomy of the building.

**INCI 4001. SURVEYING I.** Three credit hours. One hour of lecture and two two-hour periods of laboratory or computation per week. Prerequisites: INGE 3012 and (MATE 3032 or MATE 3184).

Measurement of distances, angles and elevation, the transit and the level; measurement and computation of traverses; stadia surveying.

**INCI 4002. SURVEYING II.** Three credit hours. One hour of lecture and two two-hour periods of

laboratory or computation per week. Prerequisite: INCI 4001. Corequisite: INGE 3016.

Random errors, basic triangulation, meridian determination, coordinate systems, topography.

**INCI 4005. AGRICULTURAL SURVEYING.** Three credit hours. Two hours of lecture and one-three hour laboratory per week. Prerequisites: INGE 3011 and (MATE 3172 or MATE 3174 or MATE 3005 or MATE 3143).

Use and care of surveying instruments; measurement of distances, angles, areas, and volumes; subdivision of land; differential and profile leveling, topographic surveying and mapping, interpretation of aerial photographs; elements of legal land surveying.

**INCI 4006. SURVEYING PRACTICE.** Two credit hours. One session of fifteen working days of field work. Prerequisite: INCI 4002.

Execution of field work, computation and drawing in relation to land surveying and subdivision, topographical maps, leveling, route surveys, triangulation, and determination of true meridian.

**INCI 4007. HIGHWAY LOCATION AND CURVE DESIGN.** Three credit hours. Two hours of lecture and three hours of computation per week. Prerequisite: INCI 4002.

Highway location surveys; study and design of simple and compound circular, parabolic, and transition curves; earthwork; special project.

**INCI 4008. INTRODUCTION TO ENVIRONMENTAL ENGINEERING.** Three credit hours. Three hours of lecture per week. Prerequisites: (INGE 4015 or INQU 4010) and (QUIM 3002 or QUIM 3042).

Water and wastewater treatment, water quality measurement and wastewater pollution effects on receiving waters; solid waste management and air pollution control.

**INCI 4011. STRUCTURAL STEEL DESIGN.** Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4021.

Basic methods of stress analysis and design of structural steel elements subjected to elastic and non-elastic stresses due to axial, bending and shearing loads.

**INCI 4012. REINFORCED CONCRETE DESIGN.** Three credit hours. Three hours of

lecture per week. Prerequisite: INCI 4021 and INCI 4035.

Basic methods of stress analysis and design of reinforced concrete elements subjected to bending, shear, combined bending and axial loads.

INCI 4013. STRUCTURAL DESIGN. Three credit hours. Two hours of lecture and one hour computation per week. Prerequisites: INCI 4012 and INCI 4022.

Types of buildings, bridges, floor and roof systems. Design for torsion. Structural design problems. Complete design of a simple structure by the students.

INCI 4018. TOPOGRAPHIC PRACTICE. Four credit hours. Six weeks during the Summer. Prerequisite: INCI 4078.

Field work, computations and drawing related to land surveying and subdivision, topography, meridian determination, triangulation, leveling, lay out of highway curves, and construction work.

INCI 4019. CIVIL ENGINEERING SEMINAR. One credit hour. One hour meeting per week. Prerequisite: Fifth year students.

Presentation and discussion of topics on Civil Engineering by students, faculty members or guest speakers.

INCI 4021. STRUCTURAL ANALYSIS I. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 4012 and INCI 4095.

Concepts in statics and strength of materials, displacement computations and analysis of statically indeterminate structures, using the methods of consistent deformations and minimum work. Influence lines.

INCI 4022. STRUCTURAL ANALYSIS II. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4021.

Analysis of statically indeterminate structures using prismatic and non-prismatic elements by the methods of slope-deflection and moment distribution. Approximate analysis of multistory structures.

INCI 4026. HIGHWAY ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4137 and INCI 4007.

Classification, planning and administration of highway systems. Geometric design; traffic engineering; subgrade structure; flexible and rigid pavement design.

INCI 4028. GEOMETRIC DESIGN OF HIGHWAYS. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4007.

Traffic characteristics and highway capacity; elements, criteria, controls and guide values for geometric design; cross section elements; highway types and access controls; intersection design elements and procedures; grade separation and traffic interchanges.

INCI 4032. SOIL MECHANICS II. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4139.

The theory of consolidation; settlements and contact pressure; stress analysis; stability of slopes; soil compaction and stabilization.

INCI 4035. CIVIL ENGINEERING MATERIALS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INGE 4001.

Engineering application of the physico-chemical properties of materials; aggregate fundamentals; selection of materials, and their structural behavior; test principles and methods applied to concrete, steel, wood, aluminum, asphaltic and other construction materials, failure analysis; specifications.

INCI 4049. FOUNDATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4139 or INCI 4031.

Evaluation of subsoil conditions as they affect the behavior, proportions and choice of type of foundations; relations between foundations and other structural problems; design problems.

INCI 4051. GEODESY I. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4002.

Triangulations, spherical coordinates computation. Legendre's theorem, traverses, leveling, and orthometric and dynamic elevations.

INCI 4052. GEODESY II. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4051.

The shape of the earth, the spheroid and ellipsoid; dimensions of the ellipsoid; radius of curvature in the prime vertical plane and in the normal section at any azimuth; computation of angles and distances on the ellipsoid; the geodesic line.

INCI 4055. INTRODUCTION TO CONSTRUCTION MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: Fourth year standing.

Introduction to construction management: government regulations, construction process, the construction company, financial aspects, bonds, estimates, costs control, bids contracts, project planning and scheduling, finances, equipment, materials, labor and safety.

INCI 4056. CONSTRUCTION METHODS AND EQUIPMENT. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4055.

Selection, layout and organization of installation, equipment and resources for Civil Engineering construction projects, cost studies, operation and productivity of equipment, construction methods in engineering.

INCI 4057. CIVIL ENGINEERING PRACTICE. Three credit hours. Thirty five hours per week for seven (7) or more weeks during the Summer or its equivalent during the semester. Prerequisite: Consent of the Director of the Department.

A course organized in cooperation with private industry or government to provide the student with practical experience in Civil Engineering. The work performed by the student will be jointly supervised by the Academic Department and an appropriate official from the cooperating organization. An oral and written report will be required from the student upon completion of the project.

INCI 4059. GEODETIC ASTRONOMY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: INCI 4051 and ASTR 4005.

Geodetic methods for determining latitude, longitude, and azimuth of second and third order.

INCI 4061. LEGAL ASPECTS I. Three credit hours. Three hours of lecture per week. Prerequisite: Third year students.

Laws of the Board of Examiners of Engineers, Architects, Surveyors and Landscape Architects of Puerto Rico, the College of Engineers and

Surveyors of P.R. (CIAPR), Code of Ethics of the CIAPR, etc.

INCI 4062. LEGAL ASPECTS II. Three credit hours. Three hours of lecture per week. Co-requisite: INCI 4002.

A study of those laws of Puerto Rico which rule land ownership, land transfer, and land use.

INCI 4071. ADJUSTMENT COMPUTATION I. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4051 and (MATE 3063 or MATE 3185).

Theory and analysis of random errors, normal distribution, adjustment of simple triangulation and leveling networks by condition and observation equations, least squares.

INCI 4072. ADJUSTMENT COMPUTATION II. Three credit hours. One lecture and two two-hour periods of computation per week. Prerequisite: INCI 4071.

Solution of normal equations; Cholesky's method; adjustment of leveling and triangulation networks; method of variation of coordinates; Lagrangian multipliers; trisection and intersection adjustment.

INCI 4078. TOPOGRAPHIC DRAWING. Two credit hours. One hour of lecture and three-hour laboratory or computation per week. Prerequisite: INCI 4002.

The plane table, drawing, interpretation and utilization of topographic maps; volume computation.

INCI 4079. PHOTO INTERPRETATION. Three credit hours. One lecture and two two-hour periods of computation or laboratory per week. Prerequisite: GEOL 4015 .

Analysis and interpretation of patterns in aerial photography: color tones and vegetation, geologic formation, erosion, soil and rock types, drainage, and other engineering works.

INCI 4081. PHOTOGRAMMETRY I. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4002 and INCI 4135.

Geometry of aerial photographs, determination of distances and coordinates, elevations by radial displacement, stereoscopy, and parallax.

INCI 4082. PHOTOGRAMMETRY II. Three credit hours. One hour of lecture and two two-hour

periods of computation or laboratory per week.  
Prerequisite: INCI 4081.

Flight planning and photographic control; theory of stereo plotters of the second and third order; introduction to analytical photogrammetry.

INCI 4085. THEORY OF MAP PROJECTIONS. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4051 and (MATE 3063 or MATE 3185).

Mathematical analysis of map projections, the Lambert conformal conic projection of Puerto Rico.

INCI 4086. INTRODUCTION TO PHYSICAL GEODESY. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4071.

The shape of the earth, the geoid, gravimetry, Stokes' theorem applied to the determination of the shape of the earth, isostatic equilibrium.

INCI 4087. SPECIAL SURVEYS. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4002.

Techniques and equipment used in topographic surveys, hydrography, mine surveys, optical tooling, electronic distance measurements.

INCI 4088. CARTOGRAPHY. Three credit hours. Three hours of lecture per week.

History of maps; scales and projections, symbols; map reproduction, map types and their uses.

INCI 4095. MATHEMATICAL METHODS IN CIVIL ENGINEERING. Two credit hours. Two hours of lecture per week. Prerequisite: INGE 3016 and (MATE 3063 or MATE 3185).

Numerical methods applied to Civil Engineering with computer use.

INCI 4125. INTRODUCTION TO LAND INFORMATION SYSTEMS. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: INCI 4002 and be a senior student.

Methods for the acquisition and conversion of data to be used in a Land Information System (LIS) for later analysis. Different types of data structures, including databases in a LIS. Emphasis in vector-based systems. Observe the benefits of a land information system in Puerto Rico.

INCI 4135. ELEMENTS OF OPTICS IN SURVEYING AND PHOTOGRAMMETRY. Three credit hours. Three hours of lecture per week. Prerequisite: FISI 3162 or FISI 3172.

Principles of geometrical optics applied to surveying and photogrammetry; lenses, mirrors, and prisms; lens formula, anallactic lenses; self-reducing tachometer's optics; the Scheimpflug condition, principles of photography.

INCI 4136. APPLIED STATISTICS FOR CIVIL ENGINEERING. Two credit hours. Two hours of lecture per week. Prerequisite: MATE 3063 or MATE 3185.

Application of probability and statistical theory in civil engineering. Probability fundamentals; continuous and discrete distributions; point and interval estimation; test of hypothesis; multiple regression.

INCI 4137. INTRODUCTION TO TRANSPORTATION ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4136.

Basic concepts in transportation: demand, service and equilibrium; transportation planning process and economics; components, operation and design of transportation systems.

INCI 4138. WATER RESOURCES ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: INGE 4015 or INQU 4010.

Hydrologic measurements; hydrographs; probability theory applied to hydrologic computations; well hydraulics; capacity of reservoirs and stability of dams; hydraulic of open channels and of pressure conduits; flood control; legal and economic aspects of water resources.

INCI 4139. INTRODUCTION TO GEOTECHNICAL ENGINEERING. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisites: INGE 4011 and (INGE 4015 or INQU 4010). Co-requisite: GEOL 4015.

Sampling, identification and description of soils; index and hydraulic properties; interaction between mineral particles and water; permeability and seepage; stress-strain and consolidation characteristics of soils; shear strength determinations. Stress distribution and soil improvement.

INCI 4145. WATERWORKS AND SEWERAGE DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4138.

Design of water transmission, distribution, and collection systems. Analysis of flow in pipe networks, head losses, pressure distribution; system configuration; sewer hydraulics; quantities of water, sewage, and storm flows used in design; design of water supply systems, sanitary and storm sewers, and pumping stations.

INCI 4950. INTEGRATED CIVIL ENGINEERING PROJECT. Three credit hours. One hour of lecture and four hours of practice per week. Pre-requisite: Consent of the Director of the Department.

Design of a Civil Engineering project, integrating subdisciplines of the profession. Development of a project from its inception, and a conceptual and preliminary design, to its final design. Development of design alternatives, including computational methodology, plans, cost estimates, and specifications.

INCI 4995. ENGINEERING PRACTICE FOR CO-OP STUDENTS. Zero to six credit hours. A minimum of two work periods are required for the accreditation of the course one of which must be a semester. Prerequisite: Consent of the Director of the Department.

Practical experience in civil engineering in cooperation with private industry or government to be jointly supervised by the Academic Department, the Co-op Program Coordinator, and an official from the cooperating organization. A written report will be required upon completion of each period of work.

INCI 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory per week. Pre-requisite: Fourth or fifth year student and consent of the Director of the Department.

Participation, under the supervision of a faculty member acting as an investigator, in a research project.

### **ADVANCED UNDERGRADUATE AND GRADUATE COURSES**

INCI 5005. CONSTRUCTION COST ESTIMATES. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4055.

Conceptual and preliminary cost estimates: cost index, square feet method, unit of service method, parametrics estimates, and other methods. Source of data for preparing cost estimates. Detail cost estimates: unit price estimates, lump sum estimates, instruction to bidders, process for preparing detailed estimate, materials, labor, equipment, project indirect cost, recapitulation, company indirect cost, profit and contingency. Construction cost estimates of building and engineering projects. Use of the computer for cost estimating.

INCI 5006. APPLIED HYDRAULICS. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4138.

Dimensional analysis and modeling; hydraulic machinery and structures; steady conduit and open channel flow; pipe network system.

INCI 5007. SOLID WASTE MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4008.

The solid waste problem: volume reduction and storage of solid wastes, design and optimization of collection systems, recycling, integrated treatment and disposal systems.

INCI 5008. INTRODUCTION TO HYDROLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4138.

The elements of the hydrologic cycle; probability theory and commonly used probability distributions in hydrology: hydrologic and hydraulic flood routing analysis; use of hydrologic concepts in design.

INCI 5009. FUNDAMENTALS OF AIR POLLUTION. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4008

Classification and extent of air pollution problems, its effects on plants, animals, visibility, and its socio-economic impact; dispersion of effluents; analytical and experimental sampling methods.

INCI 5012. APPLIED SANITARY ENGINEERING CHEMISTRY. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: INCI 4008.

The application of chemical principles to the sanitary engineering field. Physical, chemical, and biochemical analysis of water and wastewater. Interpretation of analytical data. Integration of experimental data into the design process. The



preparation of laboratory reports in the form of engineering reports is emphasized.

INCI 5015. WATER TREATMENT AND POLLUTION CONTROL. Three credit hours. Two lectures and one three-hour laboratory per week. Prerequisite: INCI 4008.

Study of water and wastewater treatment processes in terms of the underlying physical, chemical, and biological principles; the application of the principles to the study of unit treatment processes and to the design, operation, and analysis of performance of integrated treatment plants; the influence of the self-purification of natural bodies of water and of the planned use of the resources on the type and degree of treatment of waste and its disposal; wastewater reclamation.

INCI 5017. PRESTRESSED CONCRETE STRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4012. Co-requisite: INCI 4022.

Prestressing systems and materials; stress losses, design of beams for flexure, bond, shear and bearing; specifications and economics of design.

INCI 5018. MATRIX ANALYSIS OF STRUCTURES I. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4022 and Consent of the Director of the Department.

Use of matrix methods in the analysis of structures; flexibility and stiffness methods.

INCI 5026. BRIDGE DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: INCI 4012 and INCI 4022.

Bridge analysis and design; bridge types, characteristics; design problems.

INCI 5027. MODEL ANALYSIS OF STRUCTURE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: INCI 4022.

Model analysis in structural engineering; similarity of structures; theory of models of trussed and framed structures and shells; direct and indirect model analysis of structures.

INCI 5029. PRINCIPLES OF CITY PLANNING. Three credit hours. Three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

The scope of planning; legal bases for planning; transportation planning process; public spaces and recreation; land use; zoning; land subdivision. Economic and social aspects of planning. Planning at the local, regional and national levels.

INCI 5047. INTRODUCTION TO ROCK MECHANICS. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4139 or INCI 4031.

Fundamentals of rock mechanics: properties of rocks; strength and deformation characteristics of intact and in-situ rocks, computation of internal stresses in a rock mass; methods of rock exploration; application of rock mechanics.

INCI 5049. GEOSYNTHETICS IN CIVIL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4139.

Manufacture, properties and test methods of the different products which comprise the geosynthetics. Applications in: drainage and filtration, design of pavements, earth retaining structures, systems of pollution control, sanitary landfills and other environmental projects.

INCI 5055. DESIGN OF TIMBER STRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4021.

Physical and mechanical properties of solid and laminated wood; design and behavior of flexural, tension, and compression members; design of timber connections and mechanical fasteners; special problems in the design of wood trusses, shear walls, diaphragms and plywood composite beams.

INCI 5056. STRUCTURAL ANALYSIS III. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4022.

Application of methods for analysis of statically indeterminate structures. Moment distribution. Slope deflection and energy theorems.

INCI 5075. PLANNING AND SCHEDULING OF CONSTRUCTION PROJECTS. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4055.

Introduction to planning and scheduling of construction projects. Presentation of basic concepts of planning and scheduling: division of the project into tasks or activities and estimation of the duration of each task; bar charts, development of networks of the two classical types; critical path



method and precedence. Presentation of random networks using PERT and simulation languages for construction projects. Presentation of resource leveling and project control concepts. Utilization of computer programs to accomplish the analysis of the methods previously described.

INCI 5146. INTRODUCTION TO TRAFFIC ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: INCI 4137.

Operation and geometric analysis and design of intersections. Interrupted traffic flow theory, queuing theory, capacity and level of service, traffic studies, service models for signalized intersections and traffic simulation models.

INCI 5995. SPECIAL TOPICS. One to six credit hours. The contact will vary according to the topic to be presented. Prerequisite: Consent of the Director of the Department.

The topics will be presented by visiting professors and members of the department who are specialists in the field to be covered. The selection and scope of the topics shall be in accordance with the interests and needs of the students.

INCI 5996. SPECIAL PROBLEMS. One to six credit hours. The contact will vary according to the topic to be presented. Prerequisite: Consent of the Director of the Department.

Research and special problems in Civil Engineering and related fields. Open to outstanding students in the field of Civil Engineering.

## DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

The Department of Electrical and Computer Engineering offers programs leading to the Bachelor's and Master's degrees in the areas of Electrical Engineering and Computer Engineering. In a joint effort with the Mathematics Department, it offers a Ph.D. program in Computing and Information Sciences and Engineering.

It is the Department's mission to:

- Prepare citizens from the entire socioeconomic spectrum so that they may have (1) excellent skills in the electrical technology fields, computational fields, and related areas; (2) leadership and capacity of the continuous learning necessary to develop those skills; (3) social and environmental responsibility; and (4) appreciation of economic, esthetic, and cultural values which complete their formation.
- Expand the frontiers of knowledge within the electrical and computer engineering fields and related areas.
- Provide benefits obtained through teaching and research activities in service to the academic community and to Puerto Rico.

It is the Department's vision to be recognized as the best electrical and computer engineering department in Latin America, the first source of bilingual Hispanic electrical and computer engineers in the Puerto Rico and United States labor markets, with the depth and scope that a five-year Bachelor's degree program can provide.

Our slogan, "Preparing model engineers to serve humanity in the third millennium", denotes our commitment to prepare electrical and computer engineers that not only act as role models for others, but have consciousness of the importance of service and commitment to society under the technological demands of the new millennium.

More information on our programs may be found at: <http://www.ece.uprm.edu>.

## Facilities

The Department recognizes the importance of having students involved in research as early as possible. The Industrial Affiliates Program was founded in 1989 as a means to provide undergraduate students with the opportunity to engage in research sponsored by our industry affiliates, under the supervision of a faculty member. Many undergraduate students also participate in research through our Undergraduate Research courses (INEL 4998 and ICOM 4998) and obtain practical experience through the Practice in Engineering course (INEL 4048).

Several computing and research laboratories are available for undergraduate courses and research projects. The Electrical and Computer Engineering Department operates CEENET a network consisting of Windows, Linux and Solaris servers running on multiprocessor computers. In addition, several clusters of workstations provide users' access to the computational resources. CEENET local users have access to other resources within Campus and the Internet.

Laboratory facilities used exclusively for undergraduate level work include:

- Applied Database and Software Engineering Laboratory (ADASEL)
- Electrical Measures and Electronics Laboratory
- Electromechanical Conversional Laboratory
- Communications and Signal Processing (DSP) Laboratory
- Instructional Computer-Aided Design Laboratory (INCADEL)
- Integrated Circuits Design Laboratory (ICDL)
- Linux Laboratory
- Microprocessor Systems Development Laboratory
- Network and Operating Systems Laboratory
- Process Instrumentation and Control Laboratory
- Robotics Laboratory
- Tools and Toys Laboratory (DSP)

Research laboratory facilities available for both undergraduate senior and graduate level work include:

- Atmospheric Phenomena Laboratory
- Center for Power Electronic Systems (CPES)
- Computing Research Laboratory
- Electric Energy Processing Systems Laboratory
- Human Computer Interaction Laboratory
- Ionospheric Radar Laboratory
- Laboratory for Applied Remote Sensing and Image Processing (LARSIP)
- Microwave and Antenna's Laboratory
- Optoelectronic Systems Research Laboratory
- PASCOR Laboratory
- Power Electronics Laboratory
- Radiation Laboratory
- Software Research Laboratory (SoReL)
- Space Information Laboratory Process Control Laboratory

The Electrical and Computer Engineering Department is the largest academic department at UPRM, and it is currently the 24th Largest in the USA. The Department currently includes over 1,400 undergraduate, over 120 MS students, and over 20 Ph.D. students enrolled in its programs (with over 27% female students – nearly twice the average of US programs). The Department accounts for over 12% of the entire undergraduate student population at UPRM. During the academic year 2001-02 a total of 235 undergraduate degrees in electrical and computer engineering were awarded.

The Electrical and Computer Engineering Department has a very dynamic and prolific faculty. During the academic year 2001-02, the Department obtained approximately \$4.2M in external funds for research, academic, and outreach activities – 21% of UPRM total research funds obtained. The ECE faculty members were also responsible for over 33% of all undergraduate and graduate research assistantship funding awarded at UPRM, thus placing them as leaders in research mentoring. The quality of the Department's faculty is clearly illustrated by the following sample of recently obtained prestigious research awards: one National Science Foundation (NSF) Presidential Early Career Award, four NSF Career Awards, one NASA Faculty Award for Research, two NSF Major Research Instrumentation Awards, one NSF Next Generation Software Award, one NSF Computer Information Science and Engineering Award, and two NSF Engineering Research Center Awards.

## **Bachelor of Science in Electrical Engineering**

Electrical Engineering integrates mathematical and scientific principles of electricity and magnetism to analyze electrical phenomena and to design electrical systems. Electrical systems are present in almost any situation of our daily lives, ranging from the generation of electrical power vital to the social and economic well-being of society, to appliances, instruments, and devices at home and at work. Electrical and electronics systems are present in almost all aspects of daily life. Therefore, our Electrical Engineering program is designed to prepare students for a wide-range of careers involving design and implementation of electrical systems.

The objectives of the Bachelor of Science in Electrical Engineering Program are to:

1. Obtain a broad educational experience necessary to understand the impact of electrical engineering problems and solutions within a global and societal context.
2. Possess a combination of knowledge and analytical, computational, and experimental skills necessary to solve practical electrical engineering problems.
3. Have adequate communications skills both as an individual and as part of a team.
4. Value the importance of lifelong learning
5. Be aware of contemporary issues and be able to make decisions taking into consideration professional and societal needs, and ethical implications.

The profession of Electrical Engineering has evolved to encompass many fields of specialization. In recognition of that fact, the undergraduate program is structured into a common core sequence of courses which provides a broad coverage of the areas which Electrical Engineers are expected to master, and a cluster of technical electives which study closely at least one area of the discipline. Current options include:

- Applied electromagnetics
- Communications and signal processing
- Control systems and robotics
- Electrical machinery, power generation and transmission

- Electronic devices and systems

Electronic devices and systems are the core of all modern communication, information processing, control, and automation systems present in industrial and consumer use. The electronic collection, transmission, and processing of information are vital to support the needs of society. Signals need to be transmitted efficiently for a wide variety of applications, from entertainment to space exploration. The success of an industrial society depends on the production of high quality goods and services, which in turn require effective robotic and automation systems.

Since computer systems are present in all aspects of engineering practice, the program incorporates the use of computerized analysis, design techniques, and tools where appropriate. The curriculum incorporates laboratory courses in Chemistry, Physics, Electronics, and Electrical Machinery to allow students practical experiences with physical and engineering principles. Technical electives provide structured design experiences where students learn to design practical systems with real world constraints.

The general education component is designed to aid in the development of an engineer that is aware not only of the technical needs associated with work, but also of the general needs of society. Such individual needs to communicate adequately; understand the importance of cultural, ethical, and social issues, and value the need to constantly upgrade knowledge.

Upon completion of the program, graduates should be able to demonstrate the following outcomes:

- a. Ability to apply knowledge of mathematics, science, and engineering necessary to carry out analysis and design appropriate to electrical engineering problems.
- b. Ability to design and conduct experiments as well as analyze and interpret data.
- c. Ability to design a system to meet desired needs.
- d. Ability to function on multidisciplinary teams.
- e. Ability to identify, formulate, and solve engineering problems.

- f. Understanding of professional and ethical responsibility.
- g. Ability to communicate effectively.
- h. Broad education necessary to understand impact of engineering solutions in a global/societal context.
- i. Recognition of the need for and ability to engage in lifelong learning.
- j. Knowledge of contemporary issues.
- k. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

This program is fully accredited by ABET, the Accreditation Board for Engineering and Technology.

**PROGRAM OF STUDY**

**ELECTRICAL ENGINEERING CURRICULUM**

**FIRST YEAR**

First Semester

Number	Credits	Course
*MATE 3005	5	Pre-Calculus
QUIM 3001	4	General Chemistry
INGE 3011	2	Engineering Graphics I
*ESPA 3101	3	Basic Course in Spanish
*INGL 3---	3	First year course in English
EDFI ----	<u>1</u>	Course in Physical Education
	18	

Second Semester

MATE 3031	4	Calculus I
QUIM 3002	4	General Chemistry
*ESPA 3102	3	Basic Course in Spanish
*INGL 3---	3	First year course in English
EDFI ----	<u>1</u>	Course in Physical Education
	15	

**SECOND YEAR**

First Semester

MATE 3032	4	Calculus II
FISI 3171	4	Physics I
FISI 3173	1	Physics Laboratory

INGE 3016	3	Algorithms and Computer Programming
INGL 3---	3	Second year course in English
INGE 3035	<u>3</u>	Engineering Mechanics
	18	

Second Semester

MATE 3063	3	Calculus III
FISI 3172	4	Physics II
FISI 3174	1	Physics Laboratory II
INGE 3045	3	Materials Science for Electrical Eng.
INEL 3105	3	Electrical Systems Analysis I
INGL 3---	<u>3</u>	Second year course in English
	17	

**THIRD YEAR**

First Semester

MATE 4009	3	Ordinary Differential Equations
INEL 4102	3	Electrical Systems Analysis II
INEL 4201	3	Electronics I
INEL 4205	3	Logic Circuits
INEL 4151	3	Electromagnetic I
INEL 4115	<u>1</u>	Electrical Measurements Laboratory
	16	

Second Semester

ININ 4010	3	Probability and Statistics for Engineers
INEL 4103	3	Electrical Systems Analysis III
INEL 4202	3	Electronics II
INEL 4211	1	Electronics Laboratory I
INEL 4152	3	Electromagnetic II
INEL 4206	<u>3</u>	Microprocessors
	16	

**FOURTH YEAR**

First Semester

ININ 4015	3	Engineering Economic Analysis
INEL 4405	3	Electric Machines
INEL 4301	3	Communications Theory I
INEL 4505	3	Introduction to Control Systems
INEL 4212	1	Electronics Laboratory II
ELECTIVE	<u>3</u>	Elective
	16	

Second Semester

INME 4045	3	General Thermodynamics for Engineers
MATE/INGE 4xxx	3	***Elective in Advanced Mathematics
INEL 4406	1	Electric Machines Laboratory
INEL ----	6	**Electrical Engineering Electives
ELECTIVE	<u>3</u>	***Sociohumanistic Elective
	16	

**FIFTH YEAR**

First Semester

INEL ----	6	**Electrical Engineering Electives
ELECTIVES	6	***Sociohumanistic Electives
ELECTIVES	<u>3</u>	Elective
	15	

Second Semester

INEL ----	6	**Electrical Engineering Electives
ELECTIVES	6	***Sociohumanistic Electives
ELECTIVES	<u>6</u>	Electives
	18	

**Total credits required for this program: 165**

- \* Refer to the Academic Regulations section for information on Advanced Placement.
- \*\* Requirements for the BSEE degree include eighteen (18) credit hours of technical electives. These are classified in five areas of emphasis: (a) Control, (b) Electronics, (c) Power, (d) Telecommunications, and (e) Applied Electromagnetics. Course selection will be made by the student with the advisor's approval and must satisfy the following requirements:
- \*\*\* The fifteen (15) credit hours of Socio-humanistic electives will be selected by the student, with the advisor's approval, from a list of recommended courses.

**Bachelor of Science in Computer Engineering**

Computer Engineering integrates computer science and electronics principles to analyze and design computer systems. The Computer Engineering program encompasses all aspects of design, theory and practice related to systems of digital and analog computation and information processing; components and circuits for computing systems; relevant portions of supporting disciplines; applications, use, and programming of computing devices and information processing systems; and the use of computers in electrical and electronic engineering.

The curriculum for the study of computer engineering provides a general education in mathematics, science, and humanities; computer science; electronics, including practical and theoretical aspects of hardware; and specialized

study in selected areas of computer engineering, including information systems, human-computer interaction, object technologies, compiler construction, advanced electronics and very-large-scale integration.

The objectives of the Bachelor of Science in Computer Engineering program are:

1. Obtain a broad educational experience necessary to understand the impact of computer engineering problems and solutions within a global and societal context.
2. Possess a combination of knowledge and analytical, computational, and experimental skills necessary to solve practical computer engineering problems.
3. Have adequate communications skills both as an individual and as part of a team.
4. Value the importance of lifelong learning.
5. Be aware of contemporary issues in order to make decisions taking into consideration professional and societal needs, and ethical implications.

The general education component is designed to aid in the development of a professional that is aware not only of the technical professional needs, but also the general needs of society. Such a professional needs to be able to communicate adequately, understand the importance of cultural, ethical, and social issues, and value the need to constantly upgrade knowledge.

Upon completion of the program, graduates should be able to demonstrate the following outcomes:

- a. Ability to apply knowledge of mathematics, science, and engineering necessary to carry out analysis and design appropriate to computer engineering problems.
- b. Ability to design and conduct experiments as well as analyze and interpret data.
- c. Ability to design a computer system to meet desired needs.
- d. Ability to function on multidisciplinary teams.

- e. Ability to identify, formulate, and solve engineering problems.
- f. Understanding of professional and ethical responsibility.
- g. Ability to communicate effectively.
- h. Broad education necessary to understand impact of engineering solutions in a global/societal context.
- i. Recognition of the need for and ability to engage in lifelong learning.
- j. Knowledge of contemporary issues.
- k. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The program is fully accredited by ABET, the Accreditation Board for Engineering and Technology.

**PROGRAM OF STUDY**

**COMPUTER ENGINEERING CURRICULUM**

**FIRST YEAR**

First Semester

Number	Credits	Course
*MATE 3005	5	Pre-Calculus
QUIM 3001	4	General Chemistry
*INGL 3---	3	First year course in English
*ESPA 3101	3	Basic Course in Spanish
INGE 3011	2	Engineering Graphics I
EDFI ----	<u>1</u>	Physical Education Elective
	18	

Second Semester

MATE 3031	4	Calculus I
QUIM 3002	4	General Chemistry
*INGL 3---	3	First year course in English
*ESPA 3102	3	Basic Course in Spanish
ECON 3021	3	Principles of Economics I
EDFI ----	<u>1</u>	Physical Education Elective
	18	

**SECOND YEAR**

First Semester

MATE 3032	4	Calculus II
FISI 3171	4	Physics I
FISI 3173	1	Physics Laboratory I
INGE 3016	3	Algorithms and Computer Programming
INGE 3035	3	Engineering Mechanics

INGL 3---	<u>3</u>	Second year course in English
	18	

Second Semester

MATE 3063	3	Calculus III
FISI 3172	4	Physics II
FISI 3174	1	Physics Laboratory II
INGE 4001	3	Engineering Materials
INGL 3---	3	Second year course in English
INEL 3105	<u>3</u>	Electrical System Analysis I
	17	

**THIRD YEAR**

First Semester

ICOM 4015	3	ADVANCED PROGRAMMING
INEL 4102	3	ELECTRICAL SYSTEMS ANALYSIS II
INEL 4115	1	ELECTRICAL MEASUREMENTS LABORATORY
INEL 4201	3	ELECTRONICS I
INEL 4205	3	LOGIC CIRCUITS
MATE 4009	<u>3</u>	Ordinary Differential Equations
	16	

Second Semester

ICOM 4035	3	DATA STRUCTURES
INEL 4206	3	MICRO-PROCESSORS
INEL 4207	3	DIGITAL ELECTRONICS
INEL 4211	1	ELECTRONICS LABORATORY I
ININ 4011	3	Probability Theory for Engineers
INME 4045	<u>3</u>	General Thermodynamics for Engineers
	16	

**FOURTH YEAR**

First Semester

ICOM 4036	3	PROGRAMMING LANGUAGES FOR ENGINEERS
INEL 4217	3	MICRO-PROCESSOR INTERFACING
INEL 4225	1	DIGITAL ELECTRONICS LABORATORY
INEL 4301	3	COMMUNICATIONS THEORY I
MATE 4061	3	Numerical Analysis I
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	16	

Second Semester

ICOM 5007	4	OPERATING SYSTEMS PROGRAMMING
INEL 4215	3	COMPUTER ARCHITECTURE AND ORGANIZATION



INEL 4307	3	COMMUNICATION BETWEEN COMPUTERS
ELECTIVE	3	**Sociohumanistic Elective
ELECTIVE	<u>3</u>	Elective
	16	

**FIFTH YEAR**

First Semester

ININ 4015	3	Engineering Economic Analysis
ICOM 4009	3	SOFTWARE ENGINEERING
ICOM/INEL	3	TECHNICAL ELECTIVE
ELECTIVE	6	**Sciohumanistic Electives
ELECTIVE	<u>3</u>	Elective
	18	

Second Semester

ICOM/INEL	6	TECHNICAL ELECTIVES
ELECTIVE	3	**SocioHumanistic Elective
ELECTIVES	<u>6</u>	Electives
	15	

**Program Courses in CAPS letters.**

**Total number of credits in the program: 168**

- \* Refer to the Academic Regulations section for information on Advanced Placement.
- \*\* The fifteen (15) credit hours of Sociohumanistic electives are selected by the student, with the advisor's approval, from a list of recommended courses.

**DEPARTMENTAL FACULTY**

**JAIME ARBONA-FAZZI**, *Professor*, Ph.D., 1972, University of Arkansas.

**JAVIER ARROYO-FIGUEROA**, *Associate Professor*, Ph.D., 1997, University of Florida.

**GERSON BEAUCHAMP**, *Professor*, Ph.D., 1990, Georgia Institute of Technology.

**JOSE A. BORGES-DELGADO**, *Professor*, Ph.D., 1989, University of Illinois.

**JUAN R. CARO-MORENO**, *Professor*, M.S.N.E., 1971, University of Puerto Rico.

**JOSE R. CEDEÑO-MALDONADO**, *Assistant Professor*, Ph.D., 2002, Ohio State University.

**JOSE COLOM-USTARIZ**, *Associate Professor*, Ph.D., 1998, Pennsylvania State University.

**ISIDORO COUVERTIER**, *Associate Professor*, Ph.D. 1996, Louisiana State University.

**JORGE A. CRUZ-EMERIC**, *Professor*, U.P.R., Ph.D., 1976, University of Florida.

**SANDRA CRUZ-POL**, *Associate Professor*, Ph.D., 1998, Pennsylvania State University.

**JOSE L. CRUZ-RIVERA**, *Professor*, Ph.D., 1996, Georgia Institute of Technology.

**RAFAEL FERNANDEZ-SEIN**, *Professor*, M.E.E., 1968, Cornell University.

**SHAWN HUNT**, *Professor*, Ph.D., 1992, Michigan State University.

**HENRICK M. IERKIC-VIDMAR**, *Professor*, Ph.D., 1980, Cornell University.

**SAMUEL R. IRIZARRY-MILAN**, *Professor*, Ph.D., 1974, University of Michigan.

**AGUSTIN A. IRIZARRY-RIVERA**, *Associate Professor*, Ph.D., 1996, Iowa State University.

**MANUEL JIMENEZ-CEDEÑO**, *Associate Professor*, Ph.D, 1999, Michigan State University.

**LUIS O. JIMENEZ-RODRIGUEZ**, *Professor*, Ph.D., 1996, Purdue University.

**EDUARDO J. JUAN**, *Assistant Professor*, Ph.D., 2001, Purdue University.

**BALDOMERO LLORENS-ORTIZ**, *Professor*, P.D.E.E., 1976, Massachusetts Institute of Technology.

**HECTOR MONROY-AYALA**, *Professor*, M.S.E.E., 1971, Ohio State University.

**JOSE NAVARRO-FIGUEROA**, *Instructor*, M.S.E.E., University of Puerto Rico-Mayagüez.

**THOMAS L. NOACK**, *Professor*, Ph.D., 1963, Iowa State University.

**EFRAIN O'NEIL-CARRILLO**, *Associate Professor*, Ph.D., 1999, Arizona State University.

**JORGE ORTIZ-ALVAREZ**, *Professor*, Ph.D., 1984, University of Houston.

**ROGELIO PALOMERA**, *Professor*, Docteur des Science, 1979, Swiss Federal Polytechnical Institute.

**HAMED PARSIANI**, *Professor*, Ph.D., 1979, Texas A&M University.

**ROBERTO PEREZ-COLON**, *Professor*, M.E.E., 1979, University of Puerto Rico.

**JOSE A. RIVERA-CARTAGENA**, *Associate Professor*, Ph.D., 1992, The City University of New York.

**WILSON RIVERA-GALLEGO**, *Assistant Professor*, Ph.D. 2000, Mississippi State University.

**PEDRO I. RIVERA**, *Professor*, Ph.D. 1990, University of Florida.

**DOMINGO A. RODRIGUEZ-RODRIGUEZ**, *Professor*, Ph.D., 1988, City University of New York.

**MANUEL RODRIGUEZ-MARTINEZ**, *Assistant Professor*, Ph.D., 1996, Computer Science University of Maryland.

**NESTOR J. RODRIGUEZ-RIVERA**, *Professor*, Ph.D., 1988, University of Wisconsin.

**RAFAEL RODRIGUEZ-SOLIS**, *Associate Professor*, Ph.D., 1997, Pennsylvania State University.

**PROVIDENCIA RODRIGUEZ**, *Instructor*, M.B.E., 1994, Case Western Reserve University.

**JOSE ROSADO-ROMAN**, *Assistant Professor*, Ph.D. 1999, Cornell University.

**JULIO A. SANTIAGO-PEREZ**, *Professor*, M.S.E.E., 1970, Rensselaer Polytechnic Institute.

**NAYDA G. SANTIAGO-SANTIAGO**, *Instructor*, M.E., 1990, Cornell University.

**JAIME SEGUEL**, *Professor*, Ph.D. 1987, City University of New York.

**MANUEL TOLEDO**, *Assistant Professor*, Ph.D. 1995, Boston University.

**RAUL TORRES-MUNIZ**, *Associate Professor*, Ph.D., 1998, University of Virginia.

**RAMON E. VASQUEZ-ESPINOSA**, *Professor*, Ph.D., 1984, Louisiana State University.

**JOSE FERNANDO-VEGA**, *Assistant Professor*, Ph.D. 1989, Syracuse University.

**BIENVENIDO VELEZ**, *Assistant Professor*, Ph.D., 1999, Massachusetts Institute of Technology.

**MIGUEL VELEZ-REYES**, *Professor*, Ph.D., 1992, Massachusetts Institute of Technology.

**KRISHNASWAMY VENKATESAN**, *Professor*, Ph.D., 1974, University of Roorkee.

## COURSES OF INSTRUCTION

### ELECTRICAL ENGINEERING

INEL 3105. ELECTRICAL SYSTEMS ANALYSIS I. Three credit hours. Three hours of lecture per week. Prerequisite: MATE 3032 or MATE 3184. Co-requisites: (FISI 3172 or FISI 3162) and (MATE 3063 or MATE 3185).

Analysis of direct current and alternating current linear electric circuits; laws and concepts that characterize their behavior.

INEL 4048. ELECTRICAL ENGINEERING PRACTICE. Three credit hours. Thirty five hours per week for seven (7) or more weeks during the Summer or its equivalent during the semester. Prerequisite: Consent of the Director of the Department.

A course organized in cooperation with private industry or government to provide the student with practical experience in electrical engineering. The work performed by the student will be jointly supervised by the Academic Department and an appropriate official from the cooperating organization. An oral and written report will be required from the student upon completion of the project.

INEL 4075. FUNDAMENTALS OF ELECTRICAL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 3063 or MATE 3185) and (FISI 3172 or FISI 3162). (Not for electrical or computer engineering students.)

Laws and fundamental concepts that govern the behavior of electric and magnetic circuits; ideal models of resistors, voltage and current sources, capacitors and inductors; three-phase circuits and transformers.

INEL 4076. FUNDAMENTALS OF ELECTRONICS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4075.

Fundamentals and applications of analog and digital electronics.

INEL 4077. BASIC ELECTRONICS LABORATORY. One credit hour. One three-hour laboratory per week. Co-requisite: INEL 4076.

Description and use of basic equipment for electrical measurements in digital and analog circuits.

INEL 4085. FUNDAMENTALS OF TRANSFORMERS AND ELECTRIC MACHINERY. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4075.

Electromechanical energy converters such as transformers; induction, synchronous and direct current machines; distribution systems where these converters are used.

INEL 4086. TRANSFORMERS AND ELECTRIC MACHINERY LABORATORY. One credit hour. One three-hour laboratory per week. Co-requisite: INEL 4085. (Not for electrical or computer engineering students).

Voltage, current electrical and mechanical power measurements and other parameters related to the operation of single phase, three phase, and direct current equipment.

INEL 4102. ELECTRICAL SYSTEMS ANALYSIS II. Three credit hours. Three hours of lecture per week. Prerequisites: (FISI 3172 or FISI 3162) and INGE 3016 and INEL 3105. Co-requisite: INEL 4115 and MATE 4009.

Network functions; circuit analysis by Laplace transforms and Fourier series; two-port networks; Butterworth and Chebyshev filters; computer-aided analysis of these systems.

INEL 4103. ELECTRICAL SYSTEMS ANALYSIS III. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 4009, INEL 4102 and INEL 4151.

Analysis of magnetic circuits and polyphase balanced systems; transformers; power transmission lines; computer-aided analysis of their systems.

INEL 4115. ELECTRICAL MEASUREMENTS LABORATORY. One credit hour. One two-hour laboratory per week. Co-requisite: INEL 3105.

Experiments with electronic components and equipment; measurement techniques.

INEL 4146. IONOSPHERIC RADIO WAVES PROPAGATION. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4152.

Introduction to magnetoionic theory of ionospheric radio wave propagation; physics of the ionosphere; the dispersion equation in the ionosphere; ray theory; nonlinear processes and discussion of some ionospheric experiments.

INEL 4151. ELECTROMAGNETICS I. Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 3063 or MATE 3185) and (FISI 3172 or FISI 3162). Co-requisite: MATE 4009.

Static and time-varying electric and magnetic fields; dielectric, magnetic and conducting materials; capacitance, inductance and conductivity; magnetic circuits; dielectric and magnetic hysteresis; Maxwell's equations; wave equation.

INEL 4152. ELECTROMAGNETICS II. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 4009 and INEL 4151.

Maxwell equations and the wave equation; plane electromagnetic waves in dielectric and conducting media; energy flow and the Poynting vector; wave polarization, reflection, refraction and diffraction. Guided waves; transmission lines; conductive and dielectric wave guides; Smith chart; impedance matching, cavity resonators; single antenna.

INEL 4201. ELECTRONICS I. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 3105 and (FISI 3172 or FISI 3162).

Semiconductor device characteristics; semiconductor diodes, bipolar junction transistors and field effect transistors; analysis of basic digital circuits; analysis and design considerations of transistor amplifiers; introduction to integrated circuits.

INEL 4202. ELECTRONICS II. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4201 and INEL 4102.

Analysis and design of multi-stage amplifiers, wave generation and power circuits; operational amplifier characteristics and applications.

INEL 4205. LOGIC CIRCUITS. Three credit hours. Three hours of lecture per week. Prerequisite: INGE 3016. Co-requisite: INEL 4201.

Boolean algebra, its theorems and postulates. Design of combinational circuits; minimization and reduction techniques, use of medium or large scale integration (MSI/LSI) in digital circuit design; analysis and design of sequential circuits; practical design considerations.

INEL 4206. MICROPROCESSORS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4205 and INEL 4201.

Architecture, organization and operation of microprocessors and their supporting devices; design of microprocessor-based systems.

INEL 4207. DIGITAL ELECTRONICS. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 4201 and INEL 4205.

Theory of operation of transistor-transistor logic (TTL) and metal-oxide-semiconductor (MOS) gates; operation of semiconductor memories; programmable logic arrays (PLA); operational amplifiers; multivibrators; analog gates; analog to digital (A/D) and digital to analog (D/A) converters.

INEL 4211. ELECTRONICS LABORATORY I. One credit hour. One three-hour laboratory per week. Prerequisites: INEL 4115 Co-requisite: INEL 4201.

Experiments with basic amplifiers and digital circuits. Design and testing of simple electronic circuits.

INEL 4212. ELECTRONICS LABORATORY II. One credit hour. One three-hour laboratory per week. Prerequisites: INEL 4211. Co-requisite: INEL 4202.

Experiments and projects with electronic circuits emphasizing their design.

INEL 4215. COMPUTER ARCHITECTURE AND ORGANIZATION. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4206.

Architectural aspects of general purpose computers: instruction sets, addressing modes, data types, registers, support for programming languages and operating systems. Comparative study of commercial architectures. Organizational aspects of general purpose computers: central processing unit, control unit, microprogramming, arithmetic and logic units, memory systems, input/output systems.

INEL 4217. MICROPROCESSOR INTERFACING. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 4206.

Interfacing of the microprocessor with devices such as: cathode ray tube (CRT), floppy disks, hard disks, direct memory access unit (DMA), interrupt

controller, timers, modems, magnetic tape units, keyboards, analog to digital (A/D) and digital to analog (D/A) converters. Emphasis in the hardware and software design.

INEL 4225. DIGITAL ELECTRONICS LABORATORY. One credit hour. One three-hour laboratory per week. Prerequisites: INEL 4211. Co-requisite: INEL 4207.

Experiments with digital electronic circuits and analog gates.

INEL 4301. COMMUNICATIONS THEORY I. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4102.

Components and communications systems; Fourier transform analysis of filtered signals; Nyquist theorem; analog to digital and digital to analog conversion processes; bandwidth; modulation and noise. Computer-aided analysis.

INEL 4305. TELECOMMUNICATIONS ELECTRONICS I. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisites: INEL 4201. Corequisite: INEL 4202.

Impedance matching circuits; radio frequency amplifiers; filters; oscillators; mixer circuits.

INEL 4307. COMMUNICATION BETWEEN COMPUTERS. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 4301, INEL 4206 and (ININ 4010 or ININ 4011).

Computer network organization. Characteristics of voice grade channels used for digital communication. Synchronization and multiplexing. Information codes and interfacing standards and protocols. Data encryption techniques. Distributed computing and local area networks.

INEL 4405. ELECTRIC MACHINES. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4103.

Electromechanical energy conversion; induction, synchronous and direct current machines.

INEL 4406. ELECTRIC MACHINES LABORATORY. One credit hour. One three-hour laboratory per week. Prerequisites: INEL 4115 and INEL 4103. Co-requisite: INEL 4405.

Magnetic circuits; single phase transformers; three phase systems: load and transformers; single-phase and three-phase induction motors.

INEL 4407. ELECTRICAL SYSTEMS DESIGN I. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4103.

Design of electrical systems for buildings; wiring systems, illumination, protection and grounding.

INEL 4408. ELECTRICAL SYSTEMS DESIGN II. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4103.

Design of electrical systems for buildings: exterior illumination, signal systems, and emergency/standby power equipment.

INEL 4415. POWER SYSTEM ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4103.

Formulation of bus admittance and bus impedance matrices, symmetrical components, symmetrical and unsymmetrical faults, load flow, economic operation of power system.

INEL 4416. POWER ELECTRONICS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4201 and INEL 4103.

Design of circuits for rectification, inversion, frequency conversion, direct current (D.C.) and alternating current (A.C.) machines control, and other non-motor applications using solid state power devices.

INEL 4505. INTRODUCTION TO CONTROL SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4102.

Analysis of control systems and their mathematical models; analysis and design of control systems for single-input single-output plants; computer solution of problems will be emphasized.

INEL 4995. ENGINEERING PRACTICE FOR CO-OP STUDENTS. Zero to six credit hours. A minimum of two work periods are required for accreditation of the course, one of which must be a semester. Prerequisite: Consent of the Director of the Department.

Practical experience in electrical engineering in cooperation with private industry or government to be jointly supervised by the academic department, the Co-op Program Coordinator, and an official from the cooperating organization. A written report will be required upon completion of each period of work.

INEL 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory per week. Pre-requisite: Fourth or fifth year student and consent of the Director of the Department.

Participation, under the supervision of a faculty member acting as an investigator, in a research project.

### **ADVANCED UNDERGRADUATE AND GRADUATE COURSES**

INEL 5205. INSTRUMENTATION. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4206 and INEL 4202.

Signals from transducers; signal conditioning, data conversion and transmission; effects of noise. Data storage and display; use of microprocessors in instrumentation.

INEL 5206. DIGITAL SYSTEMS DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4207.

Design methods in combinational and sequential systems. Use of programmable logic devices in digital systems design. Analysis and design of system controllers.

INEL 5305. ANTENNA THEORY AND DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4152 and INEL 4301.

Radiation mechanism. Types of antennas; impedance; radiation patterns; arrays. Antenna measurements.

INEL 5306. MICROWAVE ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4152.

Rectangular and circular wave guides; passive components; tubes, and solid-state devices used in microwave systems.

INEL 5307. OPTICAL COMMUNICATIONS. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 4301 and INEL 4152. Optical communication principles; transmitter and receiver design; fiber optic channels.

INEL 5309. DIGITAL SIGNAL PROCESSING. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4301.



Signal classification; Z-transform and discrete Fourier transform; matrix representation of digital filters and digital systems; digital filter design; discrete Fourier transform algorithms.

INEL 5315. THEORY OF COMMUNICATIONS II. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4011 and INEL 4301.

Information theory; coding theory; signal design; noise and probability of error.

INEL 5325. COMMUNICATION SYSTEM DESIGN: CIRCUITS AND ANTENNAS. Three credit hours. One hour of lecture and two two-hour laboratories per week. Prerequisite: INEL 5305 or INEL 5306.

Design of communication circuits and antennas. Several design projects including: specification, evaluation and selection of alternatives and implementation. Written reports and computer use required.

INEL 5326. COMMUNICATION SYSTEM DESIGN: SIGNAL PROCESSING. Three credit hours. One hour of lecture and two two-hour laboratories per week. Prerequisite: INEL 5309.

Block diagram design and simulation of communication systems. Design projects including: specification, evaluation and selection of alternatives, and implementation. Computer and laboratory work and written reports required.

INEL 5407. COMPUTER AIDED POWER SYSTEM DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4415.

Design of power systems using digital computers; load flow, economic load dispatch, symmetrical and unsymmetrical faults. Selection of breakers.

INEL 5408. ELECTRICAL MOTORS CONTROL. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 4405, INEL 4416 and INEL 4505.

Characteristics and selection criteria of alternating current (A.C.) and direct current (D.C.) motors; design and control of solid state drive systems; braking methods; heating and duty cycle calculations. Performance calculations and design of closed loop controllers.

INEL 5505. LINEAR SYSTEM ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4505.

Linear spaces and matrices; state variables representations for linear continuous and discrete systems; the Z-transform and its application; controllability and observability; state estimators; stability.

INEL 5506. PROCESS INSTRUMENTATION AND CONTROL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4206 and INEL 4505.

Design of process instrumentation and control systems, based on analog and digital instruments and mini or microcomputers. Standards and practical considerations emphasized.

INEL 5508. DIGITAL CONTROL SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: INEL 4505.

Analysis and design of digital control systems; stability, controllability and observability of discrete systems. Practical considerations when implementing a digital control system.

INEL 5516. AUTOMATION AND ROBOTICS. Three credit hours. Three hours of lecture per week. Prerequisite: INEL 4206 or ININ 4057.

Analysis and design of automated pneumatic systems using programmable controllers. Programming of industrial robots.

INEL 5995. SPECIAL PROBLEMS. One to six credit hours.

Investigations and special problems in Electrical Engineering or related fields, open to outstanding Electrical Engineering students.

## COMPUTER ENGINEERING

ICOM 4009. SOFTWARE ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 4036.

Techniques used during the software development cycle; specification, design, testing, documentation and maintenance. Use of a procedure oriented language in the design and implementation of a software project.

ICOM 4015. ADVANCED PROGRAMMING. Three credit hours. Two hours of lecture and two hours of computation per week. Prerequisite: INGE 3016.



Advanced programming techniques applied to the solution of engineering problems; extensive use of subprograms, logical and specification statements. Principles of multiprogramming, multiprocessing, and real-time systems.

ICOM 4017. COMPUTER-BASED INFORMATION SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 4035.

Analysis and design of computer-based management information systems; communication theory and the flow of information within organizations; methods and procedures of gathering, disseminating and controlling information; integrated Electronic Data Processing versus batch-controlled system; the development and installation of information processing systems.

ICOM 4029. COMPILER CONSTRUCTION. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisite: ICOM 4036.

Techniques involved in the analysis of source languages and the generation of efficient object codes with emphasis on the components of a compiler.

ICOM 4035. DATA STRUCTURES. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisite: ICOM 4015.

Basic concepts of data. Representation of information as data inside and outside the computer. Lists in linear, orthogonal, strings and array forms. Tree structures. Techniques for storage allocation, distribution, collection, and sorting of data. Data structures in programming languages.

ICOM 4036. STRUCTURE AND PROPERTIES OF PROGRAMMING LANGUAGES. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 4035.

Comparative study of programming styles, including imperative, object-oriented, functional, logic, and concurrent programming. Concepts of data encapsulation and inheritance. Formal specification of the syntactic structure of a language. Context-free grammars and parse trees.

ICOM 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory per week. Pre-requisite: Fourth or fifth year student and consent of the Director of the Department.

Participation, under the supervision of a faculty member acting as an investigator, in a research project.

### **ADVANCED UNDERGRADUATE AND GRADUATE COURSES**

ICOM 5007. OPERATING SYSTEMS PROGRAMMING. Four credit hours. Three hours of lecture and one-three hour laboratory per week. Prerequisites: ICOM 4035 and INEL 4206.

Concepts of operating systems, multiprogramming, multiprocessing, batch, partitioned, and real time. Organizational and processing of file systems. Study of queueing theory and information flow control.

ICOM 5015. ARTIFICIAL INTELLIGENCE. Three credit hours. Three hours of lecture per week. Prerequisite: ICOM 4036.

An introduction to the field of artificial intelligence: LISP language, search techniques, games, vision, representation of knowledge, inference and process of proving theorems, natural language understanding.

## DEPARTMENT OF INDUSTRIAL ENGINEERING

The Industrial Engineering Department offers a program leading to a Bachelor of Science degree in Industrial Engineering. It is a five-year program which prepares professionals for the practice of Industrial Engineering in Puerto Rico and elsewhere.

Graduates from the Industrial Engineering program are instrumental in planning, designing, implementing and evaluating products, services, and systems which integrate people, materials, equipment, and information for the progress and improvement of the quality of life of humankind. They insure that these products, services, or systems can be provided economically with the required level of quality necessary for satisfying society's needs. The Industrial Engineer draws upon knowledge and skills mostly from the areas of mathematics and the physical, social, physiological and computer sciences, together with principles and methods of engineering analysis and design.

The mission of the Industrial Engineering Department is to serve society through the formation of excellent professional engineers by performing research, and by providing service in Industrial Engineering and related fields, through innovative and creative processes with a highly motivated workforce within a favorable work environment.

Its vision is to be the best alternative for the Hispanic bilingual community in: forming professionals of excellence in Industrial Engineering and related areas through an innovative educational curricula and real life learning experiences; providing leading outreach and technology transfer activities taking advantage of the unique industrial concentration existing in Puerto Rico; and, performing research in line with the operational excellence and innovation needs of its industrial, government, and service partners.

The educational objectives of the Industrial Engineering undergraduate program are the following:

1. Our graduates will demonstrate extensive training and education in the

industrial engineering areas of: design of work facilities and systems, design of statistical quality control and improvement systems, design of automated computer-based control systems for manufacturing and service systems, and economic evaluation of engineering solutions.

2. Our graduates will exhibit rich industrial experience through projects, internships, cooperative education and other interactions with professional and industrial organizations.
3. Our graduates will have ethical, social, and environmental sensibilities, and will be able to communicate effectively in a bilingual setting and become industry leaders.
4. Our graduates will have the ability to work in multi-disciplinary teams.
5. Our graduates will have an understanding of the need to continue to develop entrepreneurial skills.

Graduates from the Industrial Engineering program are prepared to work in manufacturing, service and governmental organizations. Employers of some of our industrial engineering graduates include:

- Manufacturing industries such as pharmaceuticals, textiles, food processing, electronics, clothing and shoes, health and hospital related products.
- Services industries such as: banks, hospitals, supermarket chains, furniture chains, communications, managerial consultants, system developers, public utilities, and cooperatives.
- Government agencies.

This program is fully accredited by ABET, the Accreditation Board for Engineering and Technology.

**PROGRAM OF STUDY**

**INDUSTRIAL ENGINEERING CURRICULUM**

**FIRST YEAR**

First Semester

Number	Credits	Course
*MATE 3005	5	Pre-Calculus
QUIM 3001	4	General Chemistry
*INGL 3---	3	First year course in English
*ESPA 3101	3	Basic Course in Spanish
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	18	

Second Semester

MATE 3031	4	Calculus I
QUIM 3002	4	General Chemistry
*INGL 3---	3	First year course in English
*ESPA 3102	3	Basic Course in Spanish
EDFI ----	1	Physical Education Elective
INGE 3011	<u>2</u>	Engineering Graphics I
	17	

**SECOND YEAR**

First Semester

MATE 3032	4	Calculus II
FISI 3171	4	Physics I
FISI 3173	1	Physics Laboratory I
INGL 3---	3	Second year course in English
INGE 3031	3	Engineering Mechanics-Static
INGE 3016	<u>3</u>	Algorithms and Computer Programming
	18	

Second Semester

MATE 3063	3	Calculus III
FISI 3172	4	Physics II
FISI 3174	1	Physics Laboratory II
INGL 3---	3	Second year course in English
INGE 3032	3	Engineering Mechanics-Dynamics
INGE 4011	3	Mechanics of Materials I
EDFI ----	<u>1</u>	Physical Education Elective
	18	

**THIRD YEAR**

First Semester

ININ 4010	3	Probability and Statistics for Engineers
MATE 4145	4	Linear Algebra and Differential Equations
INME 4045	3	General Thermodynamics for Engineers

INGE 4001	3	Engineering Materials
INEL 4075	3	Fundamentals of Electrical Engineering
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	19	

Second Semester

INME 4055	3	Manufacturing Processes
INME 4056	1	Manufacturing Processes Laboratory
INEL 4076	3	Fundamentals of Electronics
INEL 4077	1	Basic Electronics Laboratory
ININ 4020	3	Applied Statistics in Industry
ECON 3021	3	Principles of Economics I
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	17	

**FOURTH YEAR**

First Semester

ININ 4057	3	Real Time Process Control
ININ 4015	3	Engineering Economic Analysis
ININ 4021	3	Deterministic Models in Operations Research
ININ 4078	3	Statistical Quality Control
ININ 4077	<u>4</u>	Work Systems Design
	16	

Second Semester

ININ 4085	3	Accounting for Engineers
ININ 4039	3	Production Planning and Control I
ININ 4009	4	Work Measurement
ININ 4022	3	Probabilistic Models in Operations Research
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	16	

**FIFTH YEAR**

First Semester

ININ 4086	3	Cost Analysis and Control
ININ 4040	3	Facility Layout and Design
ININ 4075	3	Production Planning and Control II
ELECTIVE	3	Industrial Engineering Elective
ELECTIVES	<u>6</u>	Free Electives
	18	

Second Semester

ININ 4079	3	Design Project
ININ 4035	3	Human Resources Planning or
ININ 4029	3	Human Behavior in Work Organizations
ELECTIVE	3	Industrial Engineering Elective
ELECTIVE	3	**Sociohumanistic Elective
ELECTIVES	<u>6</u>	Free Electives
	18	

**Total credits required for this program: 174**

- \* Refer to the Academic Regulations section for information on Advanced Placement.
- \*\* The fifteen (15) credit hours of Sociohumanistic electives will be selected by the student, with the advisor's approval, from a list of recommended courses.

**DEPARTMENTAL FACULTY**

**JACK T. ALLISON-FINCHER**, *Professor*, Ph.D., 1983, Texas A&M University.

**NOEL ARTILES-LEON**, *Professor*, Ph.D., 1988, Iowa State University.

**SONIA BARTOLOMEI-SUAREZ**, *Associate Professor*, Ph.D., 1996, Pennsylvania State University.

**RAFAEL BLANES**, *Instructor*, B.S., 1966, University of Puerto Rico.

**VIVIANA CESANI-VAZQUEZ**, *Associate Professor*, Ph.D., 1998, University of Wisconsin, Madison.

**JOSE R. DELIZ-ALVAREZ**, *Professor*, Ph.D., 1971, New York University.

**DAVID R. GONZALEZ**, *Associate Professor*, Ph.D., 1996, Pennsylvania State University.

**MERBIL GONZALEZ-MARTINEZ**, *Professor*, Ph.D., 1984, Rensselaer Polytechnic Institute.

**WILLIAM HERNANDEZ-RIVERA**, *Associate Professor*, Ph.D., 1996, Texas A&M University.

**MARIA DE LOS A. IRIZARRY-SERRANO**, *Associate Professor*, Ph.D., 1996, North Carolina State University.

**OMELL PAGAN-PARES**, *Associate Professor*, Doctor of Engineering, 1995, Universidad Politécnica de Madrid.

**NAZARIO RAMIREZ-BELTRAN**, *Professor*, Ph.D., 1988, Texas A&M University.

**PEDRO RESTO-BATALLA**, *Associate Professor*, Ph.D., 1982, Texas A&M University.

**AGUSTIN RULLAN-TORO**, *Professor*, Ph.D., 1990, Lehigh University.

**GÜRSEL A. SÜER**, *Professor*, Ph.D., 1989, Wichita State University.

**ZULMA R. TORO-RAMOS**, *Professor*, Ph.D., 1988, Georgia Institute of Technology.

**COURSES OF INSTRUCTION****INDUSTRIAL ENGINEERING**

**ININ 4007. INDUSTRIAL ORGANIZATION AND MANAGEMENT.** Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 3063 or MATE 3185) and ECON 3021.

Principles of design and control; decision models in engineering and industrial systems.

**ININ 4009. WORK MEASUREMENT.** Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisites: ININ 4077 and (ININ 4012 or ININ 4020).

Theory and practice of work measurement systems; time studies using direct observations; standard data; predetermined time systems and work sampling; formula construction, line balancing, learning curves and wage payment plans.

**ININ 4010. PROBABILITY AND STATISTICS FOR ENGINEERS.** Three credit hours. Three hours of lecture per week. Prerequisites: (MATE 3032 or MATE 3184) and INGE 3016.

Descriptive statistics. Probability theory. Discrete and continuous random variables and distributions and their applications in engineering. Sample statistics and their distributions. Applications to engineering problems. Hypothesis testing and confidence intervals. Emphasis on the use of statistical computer packages and their use in Engineering.

**ININ 4015. ENGINEERING ECONOMIC ANALYSIS.** Three credit hours. Three hours of lecture per week. Prerequisites: ININ 4010 or ININ 4011.

Criteria and techniques of economic analysis as related to decision making in engineering projects where time and money are the primary trade-offs. Discounted cash flows; comparison of alternatives using equivalent annual cost, present worth, or rate of return; break-even analysis, depreciation, tax effects, replacement, sensitivity, and risk analysis.

**ININ 4016. INDUSTRIAL SAFETY.** Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4077.

The fundamentals of safety engineering, accident analysis and prevention, and accident cost determination; analysis of the accident problem in Puerto Rico. Emphasis is placed on the development of a philosophy of safety.

ININ 4017. COMPUTER-BASED INFORMATION SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 3016.

Analysis and design of computer-based information systems; database logical and physical models; database languages; user interface; internet; common applications to industrial engineering.

ININ 4018. SYSTEMS SIMULATION WITH DIGITAL COMPUTERS. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4022.

Modeling the interrelationship between systems components by means of computer programs; generation of random variables using computers; special purpose simulation languages. Input and output analysis. Emphasis is placed in problem solving using modern simulation packages.

ININ 4020. APPLIED INDUSTRIAL STATISTICS. Three credit hours. Three hours of lecture per week. Prerequisites: (ININ 4010 or ININ 4011) and (MATE 3063 or MATE 3185).

Application of advanced statistical concepts in engineering. Joint probability functions, goodness of fit test, regression analysis, multicollinearity, design and analysis of industrial experiments. Emphasis on the use of statistical computer packages and their use in engineering.

ININ 4021. DETERMINISTIC MODELS IN OPERATIONS RESEARCH. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4010 or ININ 4011.

Formulation and solution of linear programming problems: the Simplex method, duality and sensitivity analysis; transportation problems; Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT); integer programming problems: branch and bound; linearization of non-linear objective functions; shortest route and maximum flow algorithms.

ININ 4022. PROBABILISTIC MODELS IN OPERATIONS RESEARCH. Three credit hours. Three hours of lecture per week. Prerequisite: (ININ 4012 or ININ 4020).

Simulation techniques; queuing theory; application to industrial systems problems.

ININ 4027. DESIGN AND ANALYSIS OF ENGINEERING EXPERIMENTS. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4012 or ININ 4020.

Fundamental principles in the design and analysis of engineering experiments: randomized blocks, latin squares, split plots, factorial experiments, fractional factorials; confounding and response surface methodology.

ININ 4029. HUMAN BEHAVIOR IN WORK ORGANIZATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4077.

Cognitive theories and behavioral principles which attempt to explain, predict, and control individual and group behavior in work organizations.

ININ 4035. HUMAN RESOURCES PLANNING. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4077.

Selection, training, utilization and control of human resources.

ININ 4039. PRODUCTION PLANNING AND CONTROL I. Three credit hours. Three hours of lecture per week. Prerequisites: ININ 4021 and (ININ 4012 or ININ 4020). Co-requisite: ININ 4015.

Analysis and design of production-inventory systems: Forecasting (Multiple regression and time series analysis), aggregate production planning, master production schedule, inventory systems and their models, project control. Computer applications in these areas.

ININ 4040. FACILITY LAYOUT AND DESIGN. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisites: ININ 4039 and ININ 4009. Co-requisite: ININ 4015.

Planning facility layout and materials handling systems. Analytical and computerized solution of problems in the design of physical facilities.

ININ 4046. INDUSTRIAL ENGINEERING PRACTICE. Three credit hours. Thirty five hours per week for seven (7) or more weeks during the Summer or its equivalent during the semester. Prerequisite: Consent of the Director of the Department.

A course organized in cooperation with private industry or government to provide the student with practical experience in industrial engineering. The work performed by the student will be jointly supervised by the Academic Department and an appropriate official from the cooperating organization. An oral and written report will be required from the student upon completion of the project.

ININ 4057. REAL TIME PROCESS CONTROL. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisites: INGE 3016 and INEL 4076. Co-requisites: INME 4055 and (INEL 4077 or INME 4031).

Use of computer-based controllers to control processes using digital and analog signals.

ININ 4075. PRODUCTION PLANNING AND CONTROL II. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4039.

Evaluation and design of computerized systems for planning and controlling production. Material requirements planning, bill of materials, inventory accuracy and cycle counting, feasible master production plan, capacity planning, shop floor control, integrity requirements of the data bases, systems implementation. Formation of product families, group technology, just in time, kanban system, production synchronization, integration of production control systems.

ININ 4077. WORK SYSTEMS DESIGN. Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisite: ININ 4010 or ININ 4011. Co-requisite: INME 4055.

Strategies and models used in work systems design: motion studies, design of methods, human factors, environmental conditions and implementation of design.

ININ 4078. STATISTICAL QUALITY CONTROL. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisites: ININ 4010 or ININ 4012.

Statistical control of the quality of processes; statistical methods for quality improvement; univariate and multivariate control charts for variables; attribute control charts; process capability studies; gage and measurement studies; setting specification limits; analysis and design of

sampling inspection plans; Mil. Std. 105E, rectifying inspection plans.

ININ 4079. DESIGN PROJECT. Three credit hours. Two hours of independent study and one one-hour laboratory per week. Prerequisites: ININ 4075, ININ 4015, ININ 4022 and ININ 4040.

Development and presentation of a system design project.

ININ 4085. ACCOUNTING FOR ENGINEERS. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021.

Basic accounting concepts and systems; uses and limitation of accounting data in the solution of managerial and financial problems; interpretation and use of accounting information for decision making.

ININ 4086. COST ANALYSIS AND CONTROL. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4085.

Methods used in industry for budgeting, recording, analyzing, and controlling costs; profit planning; design and operation of cost systems; standard cost; and financial statement analysis.

ININ 4810. CONCURRENT ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4077 or INEL 4206 or INME 4011 or INQU 4001.

Introduction to concurrent engineering topics, and its role in modern engineering, design for manufacturing, how concurrent engineering affects product life-cycle issues, safety and integrity in design and manufacturing, maintenance, product disposal and product costing. Case studies and interdisciplinary team work

ININ 4995. ENGINEERING PRACTICE FOR CO-OP STUDENTS. Zero to six credit hours. A minimum of two work periods are required for the accreditation of the course, one of which must be a semester. Prerequisite: ININ 4020.

Practical experience in industrial engineering in cooperation with private industry or government to be jointly supervised by the academic department, the Co-op Program Coordinator, and an required upon completion of each period.



ININ 4996. SPECIAL PROBLEMS. One to three credit hours. One to three laboratory periods per week. Prerequisite: Consent of the Director of the Department.

Investigations and special problems in Industrial Engineering or related fields. Open only to outstanding students in the field of Industrial Engineering.

ININ 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory per week. Pre-requisite: Fourth or fifth year student and consent of the Director of the Department.

Participation, under the supervision of a faculty member acting as an investigator, in a research project.

**ADVANCED UNDERGRADUATE AND GRADUATE COURSES**

ININ 5505. TOTAL QUALITY MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4078 or consent of the Director of the Department.

Introduction to innovative philosophies in total quality control. The impact of leadership, organizational infrastructure and client satisfaction on quality management. Utilization and management of information, personnel, processes and product design for continuous quality improvement.

ININ 5559. ENGINEERING STATISTICS. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 3032 and INGE 3016.

Development of probability theory for scientific and engineering inference. Discrete and continuous random variables and distributions and their applications in engineering. Hypothesis testing and confidence intervals. Regression analysis. Applications to engineering problem solving.

ININ 5565. MEASUREMENT AND PREDICTION OF PRODUCT RELIABILITY. Three credit hours. Three hours of lecture per week. Prerequisite: ININ 4020.

Introduction to reliability theory; system analysis; constant failure rate models; state dependent systems; availability; maintainability; complete and censored data analysis (parameter estimation and distribution fitting); prediction of reliability.

ININ 5575. SEQUENCING AND SCHEDULING OF RESOURCES. Three credit hours. Three hours of lecture per week. Co-requisite: ININ 4021.

Conceptual and practical aspects involved in the scheduling of resources. Examples and applications drawn from areas such as manpower, computer, and transportation.

## DEPARTMENT OF MECHANICAL ENGINEERING

The College of Engineering offers a five-year program leading to a Bachelor of Science degree in Mechanical Engineering. The program is administered by the Department of Mechanical Engineering.

Mechanical engineers are present in almost every industry. Most fundamentally, they apply the principles of two physics' fields—mechanics and heat—to the design of machines. Heat is one of the principal forms in which we use energy, so mechanical engineering is fundamental to all processes in which energy is produced and used. The field of mechanics is divided into the sub-fields of *solid mechanics* and *fluid mechanics*, and both of these sub-fields are basic to mechanical engineering.

A few of the myriad activities in which mechanical engineers engage are engine design, automobiles, jets, diesel locomotives, or lawn mowers; rocket propulsion; combustion research; rapid transit systems, such as the new subways; earth-moving machinery; air-conditioning systems; wind energy and solar energy devices; aerospace vehicles; turbines for electric power generation; automatic control for rolling mills; farm machinery; typewriters; computer input—output devices; prosthetic devices and artificial limbs; artificial hearts; precision measuring equipment; printing presses; food processing systems; and pumps to circulate water in a swimming pool or to drive coolant through a nuclear power plant. The list is almost endless, but wherever a machine is needed to create motion, move a load, create energy, or convert it, there you will find mechanical engineers at work.  
— Excerpts from J.D. Kemper, "Introduction to the Engineering Profession", Second Edition, Saunders College Publishing, ISBN: 0-03-092858-3.

### Mission of the Undergraduate Mechanical Engineering Program:

The mission of the Mechanical Engineering Program is to provide society with professionally prepared mechanical engineers capable of leading the scientific, technological, and economical development of the environment in which they live.

### Mechanical Engineering Program Objectives:

The objectives of the program are:

1. To provide society with mechanical engineering graduates with broad scientific and technical knowledge and skills to enable them to work professionally in areas of analysis, design and realization of mechanical and thermal systems.
2. To provide the structured environment needed to facilitate the search and understanding of scientific knowledge while providing a flexible atmosphere which promotes creativity and innovation among students, faculty and staff in constant search for new knowledge.

### Undergraduate Mechanical Engineering Educational Objectives:

At the end of the program the student must:

1. Be capable of using modern engineering tools to apply mathematics, science, and engineering fundamentals to the modeling, analysis, and solution of real-life mechanical engineering problems.
2. Be capable of designing and conducting experiments and maintaining a critical and objective mind when interpreting data.
3. Be able to communicate effectively in both English and Spanish.
4. Have the skills needed to perform effectively in multidisciplinary teams.
5. Be able to generate specifications, and subsequently design a component, system, or process to meet desired needs in both the mechanical and thermal domain.
6. Have an understanding of the engineering canons of ethics and the contemporary issues where they apply.
7. Be motivated to continue the quest for knowledge throughout life.

This program is fully accredited by the Accreditation Board of Engineering and Technology (ABET).

**PROGRAM OF STUDY**

**MECHANICAL ENGINEERING CURRICULUM**

**FIRST YEAR**

First Semester

Number	Credits	Course
*ESPA 3101	3	Basic Course in Spanish
*INGL 3---	3	First year course in English
INGE 3011	2	Engineering Graphics I
QUIM 3001	4	General Chemistry
*MATE 3005	5	Pre-Calculus
EDFI ----	<u>1</u>	Physical Education Elective
	18	

Second Semester

*ESPA 3102	3	Basic Course in Spanish
*INGL 3---	3	First year course in English
QUIM 3002	4	General Chemistry
MATE 3031	4	Calculus I
EDFI----	1	Physical Education Elective
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	18	

**SECOND YEAR**

First Semester

MATE 3032	4	Calculus II
INGL 3---	3	Second year course in English
INGE 3031	3	Engineering Mechanics-Static
INGE 3016	3	Algorithms and Computer Programming
FISI 3171	4	Physics I
FISI 3173	<u>1</u>	Physics Laboratory I
	18	

Second Semester

INGL 3---	3	Second year course in English
MATE 3063	3	Calculus III
INGE 3032	3	Engineering Mechanics-Dynamics
INGE 3017	2	Computer Aided Graphics
FISI 3172	4	Physics II
FISI 3174	<u>1</u>	Physics Laboratory II
	18	

**THIRD YEAR**

First Semester

INME 4001	3	Thermodynamics I
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MATE 4009	3	Ordinary Differential Equations
INGE 4011	3	Mechanics of Materials I
MATE 4061	3	Numerical Analysis I
ECON 3021	3	Principles of Economics I
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	18	

Second Semester

INME 4005	3	Mechanism Design
INME 4002	3	Thermodynamics II
INGE 4012	3	Mechanics of Materials II
INGE 4001	3	Engineering Materials
INGE 4015	3	Fluid Mechanics
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	18	

**FOURTH YEAR**

First Semester

INGE 4016	1	Fluid Mechanics Laboratory
INEL 4075	3	Principles of Electrical Engineering
INME 4011	3	Analysis of Machine Elements I
INME 4015	3	Heat Transfer
INME 4007	3	Metallurgy for Engineers
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	16	

Second Semester

INME 4003	3	Thermodynamics III
INEL 4076	3	Fundamentals of Electronics
ININ 4007	3	Industrial Organization and Management
INME 4012	3	Analysis of Machine Elements I
INME 4055	3	Manufacturing Processes
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	18	

**FIFTH YEAR**

First Semester

INME 4031	1	Mechanical Engineering Lab. I
INME 4009	3	Automatic Controls
INME 4057	4	Engineering Design
INEL 4085	3	Fundamentals of Transformers and Electric Machinery
INEL 4086	1	Transformers and Electric Machinery Lab.
ELECTIVES	<u>6</u>	Free Electives
	18	

Second Semester

INME 4032	1	Mechanical Engineering Lab. II
INME ----	3	Mechanical Engineering Elective
INME ----	3	Design Elective
INME 4058	3	Computer Aided Design
INME 4056	1	Manufacturing Processes Lab.

ELECTIVES  $\frac{6}{17}$  Free Electives

**Total credits required for this program: 175**

- \* Refer to the Academic Regulations section for information on Advanced Placement.
- \*\* The fifteen (15) credit hours of Sociohumanistic electives will be selected by the student, with the advisor's approval, from a list of recommended courses.

#### DEPARTMENTAL FACULTY

**JAYANTA BANERJEE**, *Professor*, Ph.D., 1969, University of Waterloo.

**SORAYA BENITEZ-VELEZ**, *Instructor*, M.S., 1999, University of Florida, Gainesville.

**SANDRA COUTIN**, *Associate Professor*, Ph.D., 1996, Kansas State University.

**DAVID B. DOONER**, *Associate Professor*, Ph.D., 1991, University of Florida.

**NIHAD DUKHAN**, *Visiting Professor*, Ph.D., 1996, University of Toledo, Illinois.

**JORGE E. GONZALEZ-CRUZ**, *Professor*, Ph.D., 1994, Georgia Institute of Technology.

**VIJAY K. GOYAL**, *Assistant Professor*, Ph.D. 2002, Virginia Tech University.

**GUSTAVO GUTIERREZ**, *Assistant Professor*, Ph.D. 2002, Wisconsin Milwaukee University.

**ANTONIO HERNANDEZ**, *Instructor*, M.S., 1993, University of California at Berkeley.

**YI JIA**, *Associate Professor*, Ph.D., 1994, Harbin Institute of Technology, Harbin, China.

**FREDERICK A. JUST-AGOSTO**, *Associate Professor*, Ph.D., 1997, Virginia Polytechnic Institute.

**SCOTT KIEFER**, *Assistant Professor*, Ph.D., 2000, North Carolina State University.

**NESTOR L. PEREZ-BARRIOS**, *Professor*, Ph.D., 1988, University of Idaho.

**FERNANDO E. PLA-BARBY**, *Professor*, Ph.D., 1978, University of Texas.

**RAMON L. ROMAN**, *Assistant Professor*, Ph.D., 1993, West Virginia University.

**LOURDES M. ROSARIO**, *Professor*, Ph.D., 1988, University of Rhode Island.

**ALI SABZEVARI**, *Professor*, Ph.D., 1967, Case Western Reserve of Technology, Cleveland, Ohio.

**DAVID SERRANO**, *Professor*, Sc.D., 1987, Massachusetts Institute of Technology.

**ANTONI SKRZYPINSKI**, *Visiting Professor*, Ph.D., 1970, Krakow University, Polonia.

**PAUL A. SUNDARAM**, *Professor*, Ph.D., 1988, Ohio State University.

**MIGUEL A. TORRES-FEBUS**, *Associate Professor*, Ph.D., 1993, Massachusetts Institute of Technology.

**VALENTIN, RICKY**, *Assistant Professor*, Ph.D., 2003, University of Maryland.

**NELLORE VENKATARAMAN**, *Professor*, Ph.D., 1970, Purdue University.

#### COURSES OF INSTRUCTION

##### MECHANICAL ENGINEERING

INME 3810. PRODUCT DISSECTION. Two credit hours. One hour of lecture and two hours of workshop per week. Prerequisite: INGE 3011.

Product dissection to develop in students the ability to understand the machines: its functionality, history, social impact, design methodology, market constraints and customer needs. Use of proper technical vocabulary to describe mechanical and electrical components. Develop oral, written and drafting communication skills.

INME 4001. THERMODYNAMICS I. Three credit hours. Three hours of lecture and one hour of tutorage per week. Prerequisites: QUIM 3002 and FISI 3172 and FISI 3174.

A study of the first and second laws of thermodynamics; properties, equations of state, and thermodynamic relations.

INME 4002. THERMODYNAMICS II. Three credit hours. Three hours of lecture and one hour of tutorage per week. Prerequisite: INME 4001.

The application of the fundamental concepts of thermodynamics to the study of power and refrigeration cycles and combustion processes.

Introduction to gas dynamic: concepts, nonreactive mixtures and psychrometrics.

INME 4003. DESIGN OF THERMAL AND FLUID SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: INME 4001 and INME 4015.

Analysis and design of piping systems and heat exchangers. Selection of pumps and fans. Systems simulation and modeling.

INME 4005. MECHANISM DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 3032 and INGE 3016 and INME 3810.

Fundamental concepts of mechanism design including synthesis, and kinematics and kinetic analysis. Study of linkages, cams, gears, gear trains, and flexible connectors mechanisms, among others.

INME 4006. DYNAMICS OF MACHINERY. Three credit hours. Two hours of lecture and one two-hour computation or demonstration period per week. Prerequisites: MATE 4009 and INME 4005.

A study of static and inertia forces in machinery; free and forced vibration isolation; balancing of rotors; critical speed of shafts.

INME 4007. METALLURGY FOR ENGINEERS. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisites: INME 4001 and INGE 4001.

A study of the relationship of the mechanical properties of metals to their micro and macro structure, with emphasis on the application of metals in the fields of engineering.

INME 4008. AERODYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisites: MATE 4009, INME 4001 and INGE 4015.

The basic principles of aerodynamics, with particular reference to airfoils, and the theory of lift and drag; airplane performance problems from the standpoint of power required, rate of climb, range and economy at various altitudes.

INME 4009. AUTOMATIC CONTROLS. Three credit hours. Two hours of lecture and

one two-hour laboratory per week. Prerequisites: MATE 4009, INGE 3032, INEL 4075 and (INEL 3105 or INEL 4005).

Utilization, calibration and sensitivity of instruments for measuring temperature, pressure, volume, strain, and fluid flow. Analysis of electrical, electronic, hydraulic, mechanical and pneumatical servomechanisms. Control systems and their characteristics, such as: response, sensitivity and stability.

INME 4011. DESIGN OF MACHINE ELEMENTS I. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 4012 and INGE 4001.

Application of the fundamentals of statics dynamics, strength of material, and materials science to the design of machine members and other mechanical elements.

INME 4012. DESIGN OF MACHINE ELEMENTS II. Three credit hours. Three hours of lecture per week. Prerequisite: INME 4011.

Analysis and design of specific machine components including screws, nuts, springs, gears, bearings, shafts, brakes, clutches, and couplings.

INME 4015. HEAT TRANSFER. Three credit hours. Three hours of lecture per week. Prerequisites: INGE 4015, MATE 4009, INGE 3016 and INME 4001 or INME 4045.

Fundamentals of steady and unsteady conduction, forced and natural convection and radiation. Introduction to heat exchangers.

INME 4018. ENERGY CONVERSION. Three credit hours. Three hours of lecture per week. Prerequisites: INME 4015, INEL 4076 and INME 4002.

A study of the different methods of energy conversion. The course will cover the basic theoretical concepts, and will include discussions on conventional and modern devices for energy conversion, such as steam generators, internal combustion engines, turbines, thermoionic and thermoelectric systems, fuel cells, thermonuclear plants, and lasers.

INME 4019. ENERGY AUDITING AND MANAGEMENT. Three credit hours. Three

hours of lecture per week. Prerequisite: INME 4001 or INQU 4011.

Fundamental concepts of energy engineering; principles and methods related to the use, conservation, auditing and management of energy sources.

INME 4027. POWER PLANT ENGINEERING. Three credit hours. Two hours of lecture and three of computation per week. Prerequisites: INME 4002 and INME 4015.

The application of fundamental concepts of thermal sciences and economics to the analysis of power generating stations; emphasis on steam and gas systems.

INME 4028. FLUID MACHINERY. Three credit hours. Two hours of lecture and one two-hour computation period per week. Prerequisites: INGE 4015 and INME 4002.

A presentation of the engineering applications of fluid mechanics in the study and design of fluid machinery, such as axial and centrifugal fans, blowers and compressors, pumps, fluid couplings, torque converters and turbines.

INME 4031. MECHANICAL ENGINEERING LABORATORY I. One credit hour. One three-hour laboratory per week. Prerequisites: INME 4015, INEL 4076 and INME 4002.

Principles and application of the data acquisition planning. Instrumentation technique; analysis and reduction of data and technical report writing.

INME 4032. MECHANICAL ENGINEERING LABORATORY II. One credit hour. One three-hour laboratory per week. Prerequisite: INME 4031.

Continuation of INME 4031. Experiments and projects in Mechanical Engineering and related fields.

INME 4035. REFRIGERATION AND AIR CONDITIONING. Three credit hours. Three hours of lecture per week. Prerequisites: INME 4015 and INME 4002.

A comprehensive study of the fundamentals of air conditioning; psychometric calculations;

comfort, health and industrial processes requirements; heating and cooling loads; air conditioning equipment and its selection.

INME 4037. INTERNAL COMBUSTION ENGINES. Three credit hours. Three hours of lecture per week. Prerequisite: INME 4015.

A presentation and study of modern spark-ignition and compression-ignition engines, including types and characteristics; operating power cycles; combustion phenomena; engine performance; heat losses and efficiencies.

INME 4039. MECHANICAL ENGINEERING PRACTICE. Three credit hours. Thirty five hours per week for seven (7) or more weeks during the Summer or its equivalent during the semester. Prerequisite: Consent of the Director of the Department.

A course organized in cooperation with private industry or government to provide the student with practical experience in mechanical engineering. The work performed by the student will be jointly supervised by the Academic Department and an appropriate official from the cooperating organization. An oral and written report will be required from the student upon completion of the project.

INME 4045. GENERAL THERMODYNAMICS FOR ENGINEERS. Three credit hours. Three hours of lecture per week. Prerequisites: QUIM 3002 and either (FISI 3172 or FISI 3162 or FISI 3012).

Fundamental laws and principles of thermodynamics and their application in engineering. Thermodynamic and energetic concepts, properties of pure substances, heat transfer, heat engines.

INME 4055. MANUFACTURING PROCESSES. Three credit hours. Three hours of lecture per week. Prerequisite: INGE 4001.

Different manufacturing processes and machine tools; influence of the method of fabrication upon the properties of materials; computer and numerical control of machine-tools; use of plastics.

INME 4056. MANUFACTURING PROCESSES LABORATORY. One credit



hour. One three-hour laboratory per week. Co-requisite: INME 4055.

Demonstrations and operation of machine-tools in modern manufacturing.

INME 4057. ENGINEERING DESIGN. Four credit hours. Two hours of lecture and two three-hour periods of computation per week. Prerequisites: INME 4002, INME 4007, INME 4012, and INME 4015.

Formulation, design and analysis of engineering projects; creative aspects of design; design methodology, safety, liability and patents. Technical presentations, both oral and written.

INME 4058. COMPUTER AIDED ENGINEERING DESIGN. Three credit hours. Two hours of lecture and two hours of computation per week. Prerequisites: INME 4012 and INGE 3017.

Study of the basic concepts underlying the state-of-the-art engineering software. Use of engineering design software and interactive workstations in the design of machine elements, energy conversion systems, transfer processes, and control systems.

INME 4065. PRODUCT DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: Consent of the Director of the Department.

Factors affecting a product design: composition, cost, reliability, quality, maintainability, manufacturability, and aesthetics. These factors are applied in a project design.

INME 4995. ENGINEERING PRACTICE FOR COOP STUDENTS. Zero to six credit hours. A minimum of two work periods are required for the accreditation of the course, one of which must be a semester. Prerequisite: Consent of the Director of the Department.

Practical experience in mechanical engineering in cooperation with private industry or government to be jointly supervised by the academic department, the Co-op Program Coordinator, and an official from the cooperating organization. A written report will be required upon completion of each period of work.

INME 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of research per week. Prerequisite: Fourth or fifth year student and consent of the Director of the Department.

Participation, under the supervision of a faculty member acting as an investigator, in a research project.

### ADVANCED UNDERGRADUATE AND GRADUATE COURSES

INME 5005. LUBRICATION. Three credit hours. Three hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Fundamental principles and concepts of lubrication theory; hydrostatic and hydrodynamic lubrication; examples of journal and thrust bearing design, using both the hydrostatic and hydrodynamic principles; considerations in boundary lubrication.

INME 5006. DIMENSIONAL ANALYSIS AND THEORY OF MODELS. Three credit hours. Two lectures and one two-hour computation or demonstration period per week. Prerequisite: Consent of the Director of the Department.

The nature and use of dimensional analysis; systematic calculation of dimensionless products; algebraic theory of dimensional analysis; similarity and model testing, and differential equations and similarity. Applications cover topics in structural analysis, turbulent flow, the theory of heat, boundary layer theory, and others. The course includes the design, construction and testing of a model.

INME 5007. SOLAR ENERGY APPLICATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: INME 4015 or INQU 4001 or Consent of the Director of the Department.

Fundamentals of solar radiation, its measurement, and methods of estimation. Selected topics on heat transfer relevant to systems design applications of solar energy such as flat plate and focusing collectors, energy storage systems, heating and cooling systems, power systems, and distillation processes.

INME 5008. CORROSION. Three credit hours. Three hours of lecture per week. Prerequisite: INME 4007.

Electrochemical principles and corrosion mechanisms; protection and prevention of

corrosion in metals; the effects of temperature, environment, and metallurgical factors.

INME 5015. SELECTED TOPICS IN MECHANICAL ENGINEERING. One to six credit hours. One to six hours of lecture per week. Prerequisite: Consent of the Director of the Department.

A study of certain selected topics in mechanical engineering not covered by other existing courses.

INME 5018. MATERIALS FAILURE ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisites: INME 4012 and INME 4007.

Materials science concepts used to identify, correct and prevent failures due to the improper use of materials or to problems in manufacturing

processes. In depth study of failure mechanisms such as fatigue, wear, creep, and corrosion.

INME 5025. METALS FATIGUE. Three credit hours. Three hours of lecture per week. Prerequisite: INME 4007.

Nature of metal fatigue; modern approaches to design of mechanical components for repeated loadings; importance of residual stresses and stress concentrations; analysis of cumulative damage and life prediction; cycle counting and sequence of events.

INME 5995. SPECIAL PROBLEMS. One to six credit hours. One to six hours of lecture per week. Prerequisite: Consent of the Director of the Department.

Researches and special problems in Mechanical Engineering and related fields.

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