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# ORGANIZATION

## HISTORICAL SKETCH

The University of Puerto Rico was created by an act of the Legislative Assembly on March 12, 1903. It emerged as an outgrowth of the Normal School, which had been established three years earlier with the purpose of training teachers for the Puerto Rican school system. In 1908, the benefits of the Morill-Nelson Act were declared applicable to the island, thus fostering 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 that 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. At Mayagüez, the College of Arts and Sciences and the Nuclear Center were established. At Río Piedras, the Colleges of Humanities, Natural Sciences, Social Sciences, and Business Administration emerged. At San Juan, the Schools of Medicine, Odontology, and Tropical Medicine were established.

In 1966, the Legislative Assembly reorganized the University of Puerto Rico into 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

coeducational, bilingual, and nonsectarian school. It comprises the Colleges of Agricultural Sciences, Arts and Sciences, Business Administration, Engineering, and the Division of Extension. The College of Agricultural Sciences encompasses the Agricultural Experiment Station and the Agricultural Extension Service. At the present time, the Campus has over 1,075 professors, researchers, and extensionists, and within its units about 12,800 students.

## MISSION, AIMS, 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 community. This process is aimed at endowing our alumni with a strong technical and professional background and to 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 for solutions to the problems facing us, to promote the enrichment of the arts and culture, the development and transfer of technology as well as to uphold the essential attitudes and values of a democratic society.

In order to achieve the long-range goal mentioned above, the Mayagüez Campus strives to:

- Direct the efforts and initiatives of the Campus 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.
- Provide its students with the means to enable them to understand the changing social and economic problems and issues of our time.
- Develop in the students an 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 also 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 the 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 the students. This will 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 on 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 academic programs and University agencies.
- Standardize procedures for the appointment, tenure, and promotion of academic personnel, without losing sight of the different needs of the 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.

### **ACCREDITATION AND AFFILIATION**

The Mayagüez Campus of the University of Puerto Rico is fully accredited by the Council of Higher Education of Puerto Rico and by the Middle States Association of Colleges and Schools, of which it has been a member since 1946. It is also a member of the Association of

Hispanic-American Universities. In addition, the following programs are accredited by professional entities as follows:

- Chemistry by the American Chemical Society;
- Bachelor's Degree in Nursing by the National League of Nursing;
- Bachelor's degrees in Chemical, Civil, Computer, Electrical, Industrial, and Mechanical Engineering by the Accreditation Board for Engineering and Technology (ABET).

The Mayagüez Campus of the University of Puerto Rico, has been a sponsoring institution of Oak Ridge Associated Universities (ORAU) since 1966. ORAU is a private, not-for-profit consortium of 65 colleges and universities and a management and operating contractor for the US Department of Energy (DOE), with principal offices located in Oak Ridge, Tennessee.

## STRUCTURE AND GOVERNMENT

### Organization of the University of Puerto Rico

Presently the University of Puerto Rico is a well-established and mature institution, with a total enrollment of over 69,000 students. The Mayagüez Campus serves a student population of 12,800 students. It was organized as a result of the University Act (P.L.1), which was approved on January 20, 1966, and amended by Law No. 16 in 1993. 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 are for undergraduate education. These institutional units are autonomous, each of them having a chancellor as chief administrative and academic officer.

### Board of Trustees of the University of Puerto Rico

The Board of Trustees is the governing body of the University of Puerto Rico. Its membership consists of 10 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 representatives of the public interest. 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 an eight-year term, three members to a six-year term, and the remaining two members to four-year terms. The faculty and student representatives are elected to one-year terms. Members representing the public interest may be reappointed to additional terms as long as the total time served does not exceed 8 years. The Board of Trustees elects its president from among its members.

The Board of Trustees, as the main authority of the University of Puerto Rico, is responsible for:

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

The Board of Trustees of the University of Puerto Rico meets in regular sessions according to an annual schedule which it approves and publishes each year. It may hold extraordinary meetings at other times when so directed by its president or required by five of its members.

### President of the University of Puerto Rico

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

The President is responsible for the submission of the yearly budget for consideration by the Board of Trustees; the institutional development plan and its revisions; the regulations, contracts,

and agreements that require university approval; and the annual report. He or she is also responsible for developing and maintaining relationships with other cultural and educational institutions, that are local, national, or international.

### **University Board**

The University Board consists of:

- the President of the University
- the chancellors of the 11 autonomous institutional units
- the Director of Finance
- three additional members appointed by the President with the approval of the Board of Trustees, one faculty representative from each Academic Senate, and one student representative from each unit

The Board is responsible for the preparation of:

- the general By-laws of the University
- the general By-laws of the student body
- the development plan of the University with the recommendations of the Academic Senates.

These 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 is the first avenue of appeals against any decision taken by the Administrative Board or the Academic Senate of an autonomous unit.

### **Chancellor of the Mayagüez Campus**

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

1. presiding over the Administrative Board, the Academic Senate, and the faculty meetings;
2. appointing the deans, departmental directors and University personnel;
3. resolving, on appeal, controversial decisions of the deans;
4. representing the campus at functions, ceremonies, and academic activities;
5. preparing the campus annual report and budget petition for submission to the President.

### **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 budget proposal prepared by the Chancellor, and is responsible for granting tenure, promotions, and leaves of absence.

### **Academic Senate**

The Academic Senate of Mayagüez is a body consisting of the members of the Administrative Board, the Director of the Library, the Director of the Counseling Office, representatives elected from the faculties whose number must not be less than twice the number of the ex-officio members, an elected member of the Library and Counseling Office, and 10 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 law structure.

### **The Faculty**

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

### **The 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 in the Academic Senate, on the Administrative Board, University Board, and the Board of Trustees.

### **The Student Ombudsperson 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 thus enhance the quality of life for the students.

One of the University of Puerto Rico's fundamental objectives is to provide adequate and appropriate conditions to augment the development of its students. The mission of the Student Ombudsperson Office is to promote an effective though informal process to generate solutions to students' problems and conflicts.

In order to redress a grievance or complaint, the student has to initiate the pertinent procedure in the corresponding unit, according to the University's regulations. If such pursuit is not successful or ends up being onerous, the student will be able to seek the Student Ombudsperson's intervention. The complaints can be presented personally or by a written statement.

## 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 - Rights and duties in the academic relationship

- A. The work involved in the subject under study constitutes the basis of the 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 he/she disagrees with them. 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 his/her 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 the 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 the 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 Mayagüez Campus Regulations (Reglamento de Estudiantes del Recinto Universitario de Mayagüez) available in the Office of the Dean of Students.

**Regulations for Students of the Mayagüez Campus**

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 the 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 of Students**

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 the 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 at the Campus Office of the Dean of Students.)

### **INSTITUTIONAL POLICY ON THE PRIVACY OF EDUCATIONAL RECORDS**

The University of Puerto Rico intends to comply fully with the clauses of the Buckley Amendment (Family Educational Rights and Privacy Act of 1974, as amended) of the United States Federal Government. This Act protects the private nature of students' educational files and establishes their right to inspect and examine said files. It also provides the guidelines to correct the accuracy of the information through informal and formal hearings. Students have the right to file complaints, if they so wish, with 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, in relation to alleged violations of the Act by the institution.

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 Offices, and at the Student Affairs Office of the colleges, schools, and programs. These offices maintain the student lists and the location of the students' educational records kept at the University. Questions related to the aforementioned Act should be addressed to the Office of the Registrar.

### **INSTITUTIONAL POLICY AS TO EQUALITY OF OPPORTUNITIES**

The Mayagüez Campus of the University of Puerto Rico guarantees equal opportunities to its applicants for employment and academic admission. It also guarantees students and employees 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. The Campus does not exclude from participation nor deny benefits to nor discriminate 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 he or she has been 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 the Federal regulations for the implementation of Title IX, Educational Amendments of 1972, and Section 504 of the 1973 Rehabilitation Act.

### **FOREIGN NONIMMIGRANT STUDENTS**

The Mayagüez Campus is authorized by law to admit foreign nonimmigrant students. (For additional information, refer to the section on Academic Regulations and to the section on Special Fees for Nonresident Students).

### **THE 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.

### **THE 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, Department of Health and Human Services, Title 45 (Public Welfare), Part 46: Protection of Human Subjects (revised March 8, 1983).

### **POLICY ON 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 thereof. The lack of integrity and the perpetration of academic and scientific fraud include 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.

### **INSTITUTIONAL POLICY ON 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 the provision of services. Grievance procedures are spelled out 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.

### **INSTITUTIONAL POLICY ON 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 and the 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.

## **GENERAL INFORMATION**

### **Research**

In addition to the numerous research laboratories under direct faculty supervision, the Mayagüez

Campus has several research and development institutes which provide valuable support for research activities.

**The Agricultural Experiment Station**, originally established in 1910 by the Sugar Producers Association, 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 is to conduct research and to develop technology to improve agriculture and the quality of life in rural areas. The Station, a component of the College of Agricultural Sciences, has two research centers at Mayagüez and Río Piedras and six agricultural substations located at Adjuntas, Corozal, Juana Díaz, Gurabo, Isabela, and Lajas. The Rum Pilot Plant and the Food Technology Laboratory are two agroindustrial units of the Experiment Station located at the Río Piedras Center. The Station staff, laboratories, a specialized 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 Experiment Station. This Association serves as a regional link to the U. S. Department of Agriculture, the National Association of State Universities and Land Grant Colleges (NASULGC), and the U. S. Congress.

**The Bio-Optical Oceanography Laboratory (BIOL)** of the University of Puerto Rico at Mayagüez, Department of Marine Sciences, has 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: (1) variability of inherent and apparent water optical properties, (2) effects of ultraviolet radiation on tropical marine organisms and on public health, (3) satellite data validation and algorithm development, and (4) estimation of oceanic primary production.

**The Center for Applied Social Research** is an integral part of the Department of Social Sciences. CISA promotes and coordinates practical applications of faculty expertise for the analysis and mitigation of problems arising from or inextricably linked to social behavior and issues.

**The 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 UPR-Mayagüez. The major goals of this grant are to develop the research environment needed to start 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. Currently, the National Science Foundation, the Economic Development Administration of Puerto Rico, and the University of Puerto Rico fund it.

**The Center for Hemispheric 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 maintains relationships with most of the hemisphere's ONCyT members through officially designated liaisons.

CoHemis publishes a free quarterly newsletter in English and Spanish distributed to persons and entities from Canada to Chile who are interested in science and technology (S&T) collaborations in such basic fields as energy, manufacturing, environment and natural resources, manufacturing, and infrastructure. This publication, *CoHemis*, reaches U. S. Congressional committees and educational and government R&D institutions as well as key members of the Latin American S&T community.

**The Center Research Instrumentation Laboratory (CRIL)**, founded in 1982 in the Department of Chemistry, has 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 service to undergraduate, graduate courses and research groups of the Chemistry Department as well as to other academic departments, the community, government agencies and local industry.

**The Heat and Mass Transfer Research Laboratory (HMTRL)** comprises research facilities dedicated to basic and applied theoretical and experimental research in heat and mass transfer phenomena. The facilities are administered by the Mechanical Engineering Department of the University of Puerto Rico at Mayagüez and are located on the first floor of the Luchetti Building.

Facilities associated with the 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 the HMTRL. External agencies and companies sponsor most of the 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 the University of Puerto Rico, Mayagüez Campus, and dedicated to the research and implementation of remote sensing, and 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 region 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 the NASA University Research Centers Program, (NASA-URC), the RAYTHEON Corporation, the 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.

**The 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.

**The 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 has specialist in economics and marketing, analysis of aquaculture enterprises, research facilities, and extension services, the latter in collaboration with the Agricultural Extension Service and the Sea Grant College Program.

CIDACPR has research and production facilities in Lajas and Sabana Grande in Southwest Puerto Rico and consists of 19 employees, including some DMS professors. It offers key services to the Puerto Rican community, performs scientific research to support the local aquaculture industry, and provides fish fingerlings and postlarval prawns for these activities. Formulated fish feed is sold to the farmers through CIDACPR, eliminating the necessity of small-scale aquaculture operations to purchase large quantities of feed. The CIDACPR program provides products and assistance to all aquaculture operations requesting help. CIDACPR also supports training for masters and doctoral students within the Department of Marine Sciences. Research at the CIDACPR station focuses on commercial aspects of aquaculture development in Puerto Rico and experimentation with new species and new culture techniques.

**NASA PaSCoR** - The University of Puerto Rico at Mayagüez (UPRM) has established, through NASA Grant number NCC5-340, the Partnership for Spatial and Computational Research (PaSCoR). The main goal of this 5-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 becomes a professional in these areas with success. The program also aims at developing values such as diversity, teamwork, global awareness and communication. PaSCoR goals will be achieved through five tasks, namely: 1) curriculum development, 2) undergraduate research & student mentoring, 3) industry collaboration, 4) outreach, and, 5) assessment.

Students from various SMET departments at UPRM (Agricultural Sciences, Biology, Geology,

Electrical & 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 open to all SMET student on Campus. Currently, there are eight (8) faculty members involved in student mentoring and course innovation/development, more than 30 students engaged in undergraduate research and more than 750 students taking RS/GIS interdisciplinary courses. NASA site visitors have recognized this project as a model program in the US. 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 20 publications and presentations in local, national and international forums have helped disseminate this curriculum model.

**The Office of the Associate Dean for Academic Affairs and Research of the College of Engineering** 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, the Office distributes an 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 geared towards keeping teaching and research groups informed of new advances and developments in engineering and technology and related fields. The Office also houses the Water Resources Research Institute, which pursues research activities emphasizing the solution of water resources problems on the island.

**The Puerto Rico and U. S. Virgin Island Climatology Center** of the University of Puerto Rico at Mayagüez, Department of Marine Sciences provides the latest climate data and weather information available for the Caribbean. The Climate Office 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 obtained from many other organizations, foremost of which are the National Climate Center, Asheville, North Carolina, and the

Climate Analysis Center, Washington, D. C. The Center receives journals on climate topics and has a large collection of climate data on CD-ROMS.

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

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

The PRWRI 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 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 that add relevance and impact to the research program the Institute supports.

By virtue of the local relevance of its research and the prestige and leadership of the investigators it has supported, the Institute has become the focal point for water-related research in Puerto Rico. Meetings, seminars, technical reports, and a quarterly newsletter are used by the Institute to 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 of these activities facilitate the translation of the research sponsored by the Institute into practical applications of direct benefit to industry, government, and the general public.

**The Research and Development Center of the office of External Resources (ORE)** at the Mayagüez Campus was established in 1986 to encourage and manage research and development activities in the areas of engineering, technology, and science, creating a technological basis to serve the Puerto Rican community. The R&D Center manages several research programs which include basic and applied research, research substations 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 industry, public and private organizations, and government agencies. The Center has its own Advisory Board Committee composed of seven renowned professionals, experts in the fields of science and engineering, to provide counseling and advice on its plans and activities. All the 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. The 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 UPRMC research community through its Accounting and Finance, Budget, Purchasing, Receiving, and External Resources Offices, among others. The Center has its own reference library, of the General Library of the UPRMC, which boasts a specialized collection of materials 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 the researchers on academic and administrative forums; plans and establishes the research policy of UPRMC 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 performance excellence.

**The 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 was an effort 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, teachers, and graduate and undergraduate students.

Student research activities assist them in developing skills in areas where they can gain a broader understanding of possible alternatives for the future. Student participation in national and international symposia is also encouraged at the Center. Center students have the opportunity to meet international and national leaders in their research fields, develop leadership skills and share information at different levels.

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

The 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. The CIRC developed a comprehensive strategic plan which is contained in our website 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: (I) Transportation and, (II) Structural and Geotechnical Systems; the developing thrust is in Water Resources.

Presently, the Center has projects with the Federal Emergency Management Agency, the Sloan Foundation, the National Science Foundation, the USAERDC, the 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 and it is used by all our graduate students as well as undergraduate students doing research under the CIRC's sponsorship.

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

**SNPR**— The Puerto Rican **Seismic Network** 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 the SNPR is to process and analyze local, regional, and teleseismic earthquakes. The data generated are distributed among the scientific and academic communities, civil defense organizations, and are available to the general public.

**The Tropical Center for Earth and Space Studies (TCESS)** of the University of Puerto Rico at Mayaguez 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 is built on the foundations of LARSIP and is funded by the contributions from NASA, UPR, and Fomento. UPRMC installed and operates Synthetic Aperture Radar (SAR) and HRPT tracking stations. These are national facilities available by invitation to other NASA and U. S. 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, both of which 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 in concert 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 the campus have a special impact on research and education as a whole. Of outstanding importance are the Sea Grant College Program and the Resource Center for Science and Engineering.

**The 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, the Inter-American University, the Ana G. Méndez University System, the Sacred Heart University, and the Pontifical Catholic University of Puerto Rico in partnership with the Puerto Rico Department of Education. The RCSE's mission is

to achieve excellence in science, engineering, and mathematics (SEM) education in order to promote the 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, the 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 of the RCSE is in great part due to its development as a consortium based on a collaborative network among the major institutions of higher education, thus providing access to a broad pool of resources and promoting the optimization of efforts. Its goals range from efforts to improve the 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, the RCSE was established as an administrative unit of the University's Central Administration and is directly under the 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 the maximum collaboration of all institutions, thus facilitating a synergistic effect on the improvement of SEM education throughout the island. The RCSE has acted as an intermediary among the consortium institutions, bringing them together to identify the major problems and needs in SEM education on the Island and to develop jointly innovative programs to address these needs. Key academic and administrative officials from all member institutions participate fully in the planning and implementation of the RCSE programs. Offices for the RCSE are located on both the Río Piedras and Mayagüez Campuses.

**The 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 Transportation Technology Transfer Center was created on April 1, 1986 in the Civil Engineering Department of the University of Puerto Rico, Mayagüez Campus.

The Center is one of 57 centers throughout the United States under the Local Technical Assistance Program. The Puerto Rico Transportation Technology Transfer Center program provides service and technical information to local officials of the 78

municipalities, Department of Transportation and Public Works of Puerto Rico and the Virgin Islands Department of Public Works.

The Center activities and operation expenses are funded by several sources: Federal Highway Administration, Department of Transportation of Puerto Rico and the US Virgin Islands Department of Public Works. Moving towards the next millennium, the Puerto Rico Transportation Technology Transfer Center is evolving with new ideas and initiatives such as sponsoring the following student research programs: the Entrepreneurial Training and Technical Assistance Program (ETTAP) and the Tren Urbano UPR/MIT Human Resources Development Program. The Center is committed to start and support distance learning programs and have our first group of graduates from our new Road Scholar Program.

**PRVISMP – The Puerto Rico & Virgin Islands Strong Motion Program** is under the administration of the Civil Engineering and Surveying Department. The main objective of the program is to determine, as accurate as possible, the critical earthquake ground motion for which the structures in Puerto Rico should be designed. The program includes 39 free field stations with digital accelerographs which are distributed in a local strong motion network for the San Juan Metropolitan Area (13 stations), another strong motion network for the Mayagüez Metropolitan Area (10 stations), and others 16 strong motion stations around the Island. The program also includes 6 joint stations where an accelerograph and a broadband seismograph from the PRSN are working together. Finally, two buildings are seismically instrumented. Within the next two years 21 more strong motion stations will be established, a concrete dam and two bridges will be instrumented. Strong motion records are available upon request.

**The UPR Sea Grant College Program.** The National Sea Grant Program was created on October 15, 1966, with the signing of Public Law 89-688, the National Sea Grant College and Program Act. The purpose of the Act is to accelerate the national development of marine resources, including their conservation, proper management, and wise social and economic use. The term Sea Grant was chosen to emphasize the parallel between the present needs of the U. S. to utilize the marine environment and the need for development of the land at the time of the

Morrill Act of 1826, which established the Land Grant Program. The Sea Grant College Program follows the pattern of the Land Grant Program to a limited extent. Sea Grant provides the means by which scholars and institutions of higher education can apply their knowledge and talents to meet the practical needs of the nation and the world, and it includes the Land Grant concept of extension services through which scientific research results may be disseminated and directly applied to practical problems.

The UPR Sea Grant College Program was officially designated as a College program in 1989. This classification means that the Program objectives encompass the principal mandates of the National Sea Grant College Program: marine advisory services, formal education, and scientific research.

**The Pre-College Engineering Program (PCEP)** is a two-week summer-residential program designed to introduce talented high school students to the engineering profession. The main objective of the program is to motivate participants to select and pursue careers in engineering. The program is designed to assist participants in making an informed career selection. This is accomplished by exposing them thoroughly to the engineering profession through a series of enhancing activities. Upon completion of the program, participants are able to decide if they really want to study engineering, and if so, which specific engineering discipline they prefer and why. The program has served a total of 590 students. The success of the program is evidenced by the fact that 94% of the students served that went on to pursue careers in engineering have either completed their degree or are still active students in an engineering program. Funding for the program is provided mostly by corporate institutions.

## PUBLICATIONS

The principal publications of the Mayagüez Campus are:

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

Boletín de Avances Técnicos--A monthly publication of The Technical Information Center. It comprises titles and abstracts of recently

published articles and documents geared to keep business and industry segments as well as teaching and research groups informed of new advances and developments in the areas of engineering, technology, and related fields. The bulletin is distributed free of charge.

Boletín Informativo de la Facultad de Artes y Ciencias-- The College of Arts and Sciences with information related to faculty members, departmental activities, achievements, and other useful information. The publication serves as a link between the faculty and students of the College.

Boletín Marino-- A monthly publication of the Sea Grant Program with information about the activities of the Program.

Boletines Técnicos-- Published by The Agricultural Experiment Station. Technical and informative bulletins about research in agriculture and related areas.

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 College of Arts and Sciences. It focuses on the most recent research on the socioeconomic aspects of Puerto Rico and the Caribbean.

Departmental Publications-- Occasional publications produced by various departments (such as "Contributions" the University of Puerto Rico-Mayagüez, Department of Marine Sciences) with information about their achievements and activities.

El Puente-- A bilingual newsletter (English/Spanish) of The Transportation Technology Transfer Center published three times a year. Its purpose is to serve as a bridge of information between the Center and local transportation officials and as a vehicle for reader response. It consists of brief articles about the latest transportation-related technology as original research related to local transportation problems. It also keeps the reader informed about the latest technical publications and audiovisual materials available from the Center and provides the topics

and dates of the training opportunities sponsored by it.

Revista Internacional de Desastres Naturales, Accidentes e Infraestructura Civil-- This International Journal is published in Spanish and covers the areas of natural hazards, accidents and civil infrastructure problems. The scope of the journal includes fundamental as well as applied research and case studies in the areas mentioned above. All papers submitted to the journal are considered through a peer-review process, and the editorial board is formed by researchers from Puerto Rico, the US, Latin America, and Spain. It is published twice a year at the Department of Civil Engineering, University of Puerto Rico at Mayagüez. The editors-in chief are Dr. Luis A. Godoy and Dr. Luis E. Suarez.

The Journal of Agriculture of the University of Puerto Rico--A scientific periodical published three times a year by the Agricultural Experiment Station. It includes technical and scientific articles related to the agriculture of Puerto Rico and the Caribbean. Authors are members of the University, and other specialists.

Publicaciones de Extensión Agrícola-- A series of publications of interest to farmers and housekeepers which include bulletins and leaflets about livestock, agriculture, agricultural engineering, health and hygiene, nutrition, child care, home economics, clothing and textiles, 4-H Clubs, and other subjects.

## MUSEUM

An Art Gallery in the Carlos Chardón Building of the Mayagüez Campus was inaugurated in 1959 with a Salvador Dalí exhibition. Works by both local and foreign artists are frequently exhibited. The Department of Humanities also has a permanent collection of copies of some of the great paintings and sculptures of the past.

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

Housed in the Physics, Geology, and Marine Sciences Building are the facilities of the Planetarium and the Astronomical Observatory. These are open to the students and the general public, the latter invited for monthly evening shows.

## ACADEMIC SERVICES

### 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 Extension. These include graduate programs, academic institutional research, continuing education programs, and the professional enhancement of the academic personnel. In addition, 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 U. S., 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/or programs:

- Admissions Office
- Center for Professional Enhancement
- Department of Aerospace Studies
- Department of Military Sciences
- Distance Learning
- Division of Extension
- Library System
- Graduate Studies Office
- Registrar's Office

### INTERDISCIPLINARY COURSES

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

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.

### DISTANCE LEARNING

The Distance Learning Program is coordinated from the Office of the Dean of Academic Affairs. This program has coordinated eight

graduate courses in the past two years for

Business Administration, Chemical Engineering, Electrical and Computer Engineering, and Nursing through videoconferencing. The present projects includes the addition of three videoconference courses and four on-line courses. More information about Distance Learning can be obtained at the following internet address: <http://academic.uprm.edu/ed>.

### **ADMISSIONS OFFICE**

The Admissions Office is in charge of the following activities:

1. Receive and process all applications according to the eligibility criteria.
2. Give orientation regarding the eligibility criteria.
3. Compile, maintain, and update statistical data regarding admissions and serve as a facilitator to the academic community that needs this information for tuition evaluation and other procedures.
4. Enforce University admissions regulations.
5. Serve as a consultant to the Administrative Board regarding admissions indexes.

### **CENTER FOR PROFESSIONAL ENHANCEMENT**

The Center for Professional Enhancement (CPE) was established in July, 1996, with matching non recurrent funds from the Central Administration. The concept for the Center began 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 in Spanish), which began in 1990. The PEEA initiative arose mainly because of a petition, expressed as a resolution, from the Parents Association to the Campus Chancellor.

The CPE mission is to expose faculty members to diverse educational strategies in order to promote academic excellence, thereby ensure high-caliber student performance. New faculty, permanent faculty, librarians, counselors, graduate students, and academic management personnel are all considered in 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 are tailored to fit the needs of the audience. They involve theory along with hands-on activities. Services also include workshops for academic management, taping of classes for self-evaluation, educational research activities, and individual assistance for departments and faculty.

The CPE was created in 96-97 by the Administrative Board, through the 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 that every professor must comply with during his/her first year of service. The professor's participation will go on his/her record and will be taken into consideration for the various personnel actions at the institutional level.

For more information visit the CEP Home Page at [shuttle.uprm.edu](http://shuttle.uprm.edu), call (787) 832-4040, extension 3829, 3050 or Fax (787) 831-5249 or E-mail [cep\\_rum@rumac.upr.clu.edu](mailto:cep_rum@rumac.upr.clu.edu).

## **DEPARTMENT OF AEROSPACE STUDIES**

### **AIR FORCE ROTC**

#### **PROGRAM 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 the 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 the students with an understanding of the role of the Air Force in support of the national interest of the U. S.
  5. To develop in the student his or her potential as a leader and manager.
  6. To commission Second Lieutenants dedicated to their tasks who will accept their 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 count towards 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 U. S. 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. The College Deans may consider these courses as general electives for academic credit to a maximum of 12 credit hours. Students enrolled in the Air Force ROTC Program receive all the 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. We have a 1-5 year 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. The 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 and 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, where they are the pride of the Cadet Corps, banquets, dining-outs, and acting as official hosts for the Cadet Corps social activities.

## SCHOLARSHIPS

The Air Force offers scholarships in Bachelor/Master degree to outstanding students selected for admission to the four-year program and the two-year program. These scholarships

pay for the cost of tuition, laboratories, and books, in addition to providing a monthly allowance of \$200 while the minimum requirements for the program are maintained. Cadets accepted in the Advanced Course who did not receive a scholarship before are offered a \$3,000 scholarship yearly (\$1,500 per semester).

### REQUIREMENTS FOR THE ADVANCED COURSE (POC)

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

1. Be a United States citizen.
2. Have good moral character.
3. Be at least 17 years old with parent/legal guardian consent and have two academic years remaining (undergraduate, graduate, or a combination of both).
4. Able to pass the Air Force medical examination.
5. Be interviewed and selected by a board of Air Force officers.
6. Able to 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.
7. Able to qualify on the Air Force Officer Qualifying Test.
8. Able to meet the age limitations before being commissioned.
9. Demonstrate proficiency in the English language by test and interview.

### LEADERSHIP LABORATORY

The first two years of the Leadership Laboratory (Llab) 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 the planning and controlling of military activities of the cadet corps; the preparation and presentation of briefings and other oral and written communications; and the providing of 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

AEST 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, officership and 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.

AEST 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 leadership experiences discussed in class.

AEST 3995-3996. SPECIAL PROBLEMS IN AEROSPACE 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.

AEST 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.

AEST 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 as a profession, officership, 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.

## DIVISION OF EXTENSION

### HISTORY

The Division of Extension was created in the 1958-59 academic year. It was established in order to integrate within a unit several programs existing on the Campus but not administered unitarily. These were: the summer program, the evening program, and the Saturday courses program. The inclusion of these three areas in a new academic unit has served as a basis for innovative and extended services in nontraditional fields.

### GOALS AND OBJECTIVES

#### A. General Goal

To attend the special educational needs at the university level or related to university work that are not being taken care of by the traditional offerings of the university and to link the physical and human resources of the University to the problems and needs of the community, fostering a closer collaboration with it.

#### B. Objectives

1. To provide educational opportunities for the adult working population.
2. To provide educational opportunities to those adults who have interrupted their studies and need new and special alternatives to complete them.
3. To provide educational opportunities to disadvantaged groups, minorities, and other sectors of the community not benefit from traditional offerings.
4. To initiate educational programs and credit courses in response to educational needs that have not been fulfilled by traditional offering.
5. To create continuing education offerings for professional groups.
6. To identify continuing education needs of the community at large and provide the courses and educational experiences to meet these needs.
7. To provide the community at large and groups within the community with information and orientation services.

8. To promote in developing awareness and sensitivity in the University toward responding to the needs of the community and undertake initiatives to have University human and physical resources aid in meeting those needs.

## **PROGRAMS**

The Division of Extension addresses its goals and objectives through various initiatives. Most of these involve the creation of projects, educational offerings, and programs which are transitory in nature and short in duration.

At present, the work of the Division is subdivided into the following programs:

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

### **1. EDUCATION PROGRAM**

The Education Program was originated as an extension program, providing courses for in-service teachers. At present, besides fulfilling this continuing education service to teachers in both private and public schools systems, it includes a Teacher's Training Program for regular students (not a degree program).

#### **A. Teacher's Certificate Options**

The Education Program offers the courses necessary to complete the requirements for a teacher's license as stipulated by the Department of Education of Puerto Rico. The courses required in several areas of certification are offered. The license, however, is obtained by the students from the Department of Education upon presenting evidence of having obtained the credits required. The actual offerings include all courses required for the license in secondary education. In addition, the offerings include some courses required for the teacher's license in elementary education, vocational education, and special education.

#### **B. Teacher-Training Program in Secondary Education**

This intensive training program is for students pursuing a bachelor's degree in the College of Arts and Sciences or of Business Administration.

The Program includes, in addition to education courses, observation and practice in the classroom under the direct supervision of experienced teachers. All participants who successfully complete this training, besides obtaining their degree, have complied with the requirements to obtain a teacher's certificate from the Department of Education of Puerto Rico.

### **2. CONTINUING EDUCATION PROGRAM**

Continuing Education is recognized as a growing need for adults who have obtained a university education and for those who have not. The Division offers educational options at irregular hours (weekdays, evenings, and Saturdays) in order to provide an opportunity for working adults to further their education. It also fulfills different needs for children, adolescents, and elderly people who are interested in developing their knowledge, talents, or abilities.

This nontraditional service provides educational alternatives in special areas such as business administration, microcomputer applications, technical skills, arts, language, handicrafts, and sports in which professional and cultural growth can be obtained independently of traditional programs leading to a degree. 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 noncredit courses, seminars, workshops, or special projects.

### **3. SPECIAL TRAINING PROGRAMS**

Nontraditional needs in the areas of technology and career skills can be met with short-term training programs. The Division of Extension collaborates with other community institutions 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. The courses in these programs do not carry college credits and therefore, cannot be used to fulfill degree requirements. At the completion of a program, however, a certificate will be issued which can serve as a credential for the job market.

**4. COMMUNITY SERVICES**

The University of Puerto Rico at Mayagüez has several administrative units that relate to the community. In addition, the Division of Extension and Community Services, as one of its important tasks, offers educational services to the community in collaboration with the other colleges in the University. An interrelationship with the community through civic and professional groups is promoted in order to respond to the needs within the community.

Typical activities oriented towards the community are rendered through, among others:

- a. Conferences
- b. Seminars
- c. Workshops
- d. Group meetings
- e. Continuing education courses
- f. Short-term special training sessions
- g. Other activities

**AREAS OF STUDY**

**TEACHER'S CERTIFICATION IN SECONDARY EDUCATION**

These courses are available for students of the University of Puerto Rico at Mayagüez and also for in-service teachers.

**Courses in Education:**

Number	Credits	Title
SPED 4006	3	Seminar on the Nature and Needs of Exceptional Children
EDFO 3007	3	Social Foundations of Education
EDFO 3001	3	Human Growth and Development I
EDFO 3002	3	Human Growth and Development II
EDFO 4019	3	Philosophical Foundations of Education
EDPT 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
EXTC 4005	3	Theory and Methodology in the Teaching of Health in Secondary School
EDPT 4047	3	Innovations in the Teaching of Typewriting
EDPT 4048	3	Innovations in the Teaching of Shorthand
EDPT 4135	3	Theory and Methodology in the Teaching of Science in Secondary School
EDPT 4145	3	Theory and Methodology in the Teaching of Mathematics in Secondary School
EDPT 4155	3	Theory and Methodology in the Teaching of History and Social Studies in Secondary School
EDPT 4165	3	Theory and Methodology in the Teaching of Art in Secondary School
EDPT 4185	3	Theory and Methodology in the Teaching of Theatre in Secondary School
EDPT 4215	3	Theory and Methodology in the Teaching of Physical Education in Secondary School
EDPT 4235	3	Theory and Methodology in the Teaching of Spanish in Secondary School
EDPT 4245	3	Theory and Methodology in the Teaching of English in Secondary School

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

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

EDPT 4236	6	Student Teaching of Spanish in Secondary School
EDPT 4246	6	Student Teaching of English in Secondary School

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

EXTC 3005	3	Skills Development in Reading, Writing, and Oral Communication
EDFO 3055	3	Legal Foundations of Education
EDFO 4006	3	The Child and His Social Milieu
EDFO 4025	3	School Health Education
EDFO 3115	3	Philosophy of Health Education

TOTAL CREDITS FOR EDUCATION: 30

NOTE: The student must also complete a course in each one of the following subjects: History of Puerto Rico and History of the United States.

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**, *Assistant Professor of Education*, Ph.D., 1997, University of Puerto Rico.

**HERBERT BRAVO GARCIA**, *Instructor*, M.S. Health Education, 1986, Penn State University.

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

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

**BERNADETTE M. DELGADO ACOSTA**, *Assistant 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**, *Assistant Professor of Education*, Ed.D., 1998, Interamerican University of Puerto Rico.

**LUCILA RIVERA-BAEZ**, *Professor*, Ph.D., 1983, Texas Woman's University-Texas.

**ARMANDO ROVIRA-DE JESUS**, *Professor of Education*, Licenciatura en Filosofía, 1959, Gregorian University, Rome, Italy.

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

## COURSES OF INSTRUCTION

### EDUCATIONAL PROGRAMS AND TEACHING

EXTC 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: EDFO 3002, EDFO 3007, and EDFO 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.

EXTC 4015. PRACTICE OF TEACHING HEALTH IN SECONDARY SCHOOL. Six credit hours. Three hours of seminar and twelve hours of supervised practice per week. Prerequisite: EXTC 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**

SPED 4006. NATURE AND NEEDS OF EXCEPTIONAL LEARNERS. Three credits. 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.

SPED 4008. EDUCATION OF THE MULTIPLE HANDICAPS CHILD. Three credits. Three hours of lecture per week. Prerequisite: SPED 4006.

A basic course in curriculum and methodology for the severely multiple handicapped. Emphasis will be given to the application of behavior modification techniques, sensory stimulation, early intervention, and total communication.

SPED 4038. MOBILITY AND ORIENTATION. Three credits. Three hours of lecture per week. Prerequisites: SPED 4028 and SPED 4029.

This course deals with psychological aspects, skills, and techniques orientation and mobility of the severely visually impaired. Cane travel techniques suited to the geographical problems involved in the orientation and mobility of the visually handicapped in Puerto Rican setting.

**EDUCATION FOUNDATIONS**

EDFO 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.

EDFO 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.

EDFO 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.

EDFO 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.

EDFO 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.

EDFO 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.

EDFO 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.

EDFO 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.

EDFO 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**

EDPT 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.

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

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

EDPT 4048. INNOVATIONS IN THE TEACHING OF SHORTHAND. Three credits.

Three hours of lecture per week. Prerequisites: EDFO 3002 and EDFO 3007.

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

EDPT 4135. 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 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.

EDPT 4137. STUDENT TEACHING OF BIOLOGY IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPT 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.

EDPT 4138. STUDENT TEACHING OF PHYSICS IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPT

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.

EDPT 4139. STUDENT TEACHING OF CHEMISTRY IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPT 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.

EDPT 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 Puerto Rican educational problems.

EDPT 4146. STUDENT TEACHING OF MATHEMATICS IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPT 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.

EDPT 4155. 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 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.

EDPT 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 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.

EDPT 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 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.

EDPT 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 Puerto Rican educational problems.



EDPT 4166. STUDENT TEACHING OF ART IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPT 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.

EDPT 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 Puerto Rican educational problems.

EDPT 4187. STUDENT TEACHING OF BUSINESS EDUCATION IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPT 4047, EDPT 4048, 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 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.

EDPT 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 Puerto Rican educational problems.

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

EDPT 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.

EDPT 4236. STUDENT TEACHING OF SPANISH IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPT 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.

EDPT 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.

EDPT 4246. STUDENT TEACHING OF ENGLISH IN SECONDARY SCHOOL. Six credits. Twelve hours of practice and three hours of discussion per week. Prerequisite: EDPT 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.

## **DEPARTMENT OF MILITARY SCIENCE**

### **U. S. ARMY R.O.T.C. 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 U. S.

The mission of the U. S. 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 the reserve components.

The Army ROTC offers college students a choice of two programs: a four-year program and a two-year advanced program. The four-year program consists of a two-year basic course (MISC 3011-3012, MISC 3021-3022) and a two-year advanced course (MISC 4011-4012, MISC 4021-4022). Credits obtained in these courses are included the general grade point average. The college deans may consider these courses as general electives for academic credit 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 to be eligible for the advanced course. The advanced course is optional and selective. The U. S. Government furnishes all the necessary uniforms, shoes, and any special articles of equipment required to carry out the ROTC program for both the 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 dropping the course. Students enrolled in the advanced course receive a living allowance of up to \$1,500 each year during the advanced course and approximately \$700 for attendance at advanced camp at Fort Lewis, Washington state.

Under the two-year advanced program, the student is required to attend two summer camps. The first will earn credit for the two-year basic course (\$700 for attendance) 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.

Requirements for eligibility are:

**A. Basic course:**

1. Be in a baccalaureate or graduate degree program full time (12 credits or more).
2. Have a 2.00 or better GPA to enter second year of basic course.
- \* 3. Must enroll 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.

**B. Advanced Course:**

1. Have a GPA of 2.00 or better.
2. Be medically qualified (free exam).
3. Be a full-time student (12 credits or more).
- \*\*4. Score 70 or more on the English Comprehension Level Test (ECLT).
5. Have "Junior" in college status (negotiable).

\*Have applied for accreditation of ROTC English courses.

\*\*We will prepare you to pass 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 the scholarship is in effect. In addition, ROTC scholarship students receive approximately \$700 for attendance at the Advanced Camp.

## ORGANIZATIONS

**Pershing Rifle Society:** This military Society was organized at the University during the school year 1958-59. It is a society that takes pride in its membership and strives for leadership, sharpness, neatness, and individual as

well as 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 U. S. by Society its designation as Company P-16 of the 16th Regiment.

**Association of the United States Army (AUSA)** This Society was organized at the University in 1959 and is open to all cadets. A USA has assumed the basic task of enhancing the public image of the ROTC with a program of 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. The AUSA Society is recognized throughout the U. S. by the designation of Bulldog Company.

**C.I. Rangers:** The C.I. Rangers is a military society, started back in 1962. Its mission is to develop physical fitness and mental alertness among all members. To foster Esprit-De-Corps among all ROTC Cadets. Complement the tactical training offered by this ROTC Program so as to enhance the development of the military skills and tactical expertise of its members. Complement the leadership training offered by the ROTC Program so as to improve the leadership and management abilities of its members. Improve the English language proficiency of its members so as to insure their success in the ROTC Program, at Advanced Camp, and as commissioned officers. Support the ROTC program at Detachment ceremonies, demonstrations, and recruiting/retention activities.

## FACULTY

**LIEUTENANT COLONEL ISRAEL REYES,** *Professor of Military Science, M.S., North Carolina State University, 1992.*

**MAJOR WALTER L. HENRY,** *Assistant Professor of Military Science, B.S., University of Alabama, 1989.*

**MAJOR LESTER TORRES,** *Assistant Professor of Military Science, B.A., University of Puerto Rico, Mayagüez, 1981.*

**CAPTAIN CARLOS I. SANTANA,** *Assistant Professor of Military Science, B.S., Interamerican University, San Germán, Puerto Rico, 1986.*

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

**CAPTAIN RAFAEL A. MEDINA,** *Assistant Professor of Military Science, B.A., Polytechnic University of Puerto Rico, 1992.*

**MASTER SERGEANT ANTHONY RODRIGUEZ,** *Senior Instructor.*

**MASTER SERGEANT DAVID BARRETO,** *Drill Instructor.*

**MAJOR SERGEANT JAIME MATOS,** *Operations Sergeant.*

**SERGEANT FIRST CLASS RICHARD CAMPOS,** *Drill Instructor.*

**SERGEANT JAMES MYERS,** *Supply Sergeant.*

**MR. FELIX CHICO,** *English Instructor Supervisor, Training Specialist (Language), M.A., University of Puerto Rico, 1982.*

**MR. BOLIVAR BERNIER,** *English Instructor, Training Specialist (Language), B.A. University of Puerto Rico, Cayey, 1973.*

**MRS. DOROTHY GRAHAM,** *English Instructor, Training Specialist (Language), B.S., Tuskegee University, Alabama, 1961.*

**MRS. OMayra VEDBRAATEN,** *English Instructor, Training Specialist (Language), M.A., Interamerican University, San Germán, Puerto Rico, 1996.*

## COURSES OF INSTRUCTION

**MISC 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.

**MISC 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.

MISC 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.

MISC 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.

MISC 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.

MISC 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.

MISC 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.

MISC 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.

MISC 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.

MISC 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.

MISC 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.

MISC 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.

MISC 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.

MISC 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.

MISC 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.

MISC 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.

## **GRADUATE STUDIES OFFICE**

The Graduate Studies Office is part of the Office of the Dean of Academic Affairs and publishes its own Bulletin of Information for Graduate Studies.

## **LIBRARY SYSTEM**

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

The main library is housed in an air-conditioned building consisting of a central section built in 1963 and the north and south wings added in 1989, covering an area of approximately 124,335 square feet. The library has a seating capacity of 1,278. It also has 19 closed study carrels for graduate students and faculty, 10 study rooms for group discussions, two library instruction classrooms, and a microfilm room.

The Library serves students, faculty, researchers, extension service officers, the administrative staff, and other members of the academic community. It also serves as a public school library for the Mayagüez community and nearby towns. It fully supports the educational and research mission and objectives of the Institution by providing the necessary library and information resources, facilities, and services. To fulfill its purpose, the Library is divided into three major areas: Technical Services, Public Services, and Educational Technology. Two special departmental collections the Research and Development Center and Marine Sciences, are conveniently located in the corresponding academic departments.

Technical Services is in charge of all the technical processes involved in the acquisitions of library materials and the preparation of these materials for the users. This includes selecting, ordering, invoicing, bookkeeping, labeling, and cataloging and classification. Technical Services is also responsible for library automation, staff training, in-house binding and preservation of materials, and the gift and exchange program.

Public Services is in charge of the reference and research services of the following collections:

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

The Educational Technology unit consists of an Audiovisual Services Department located on the second floor of the Sánchez Hidalgo Building and the Closed Circuit Television Department located in the Nursing Building. Audiovisual Services includes the following units: graphic arts, audio studio, an audiovisual equipment lending and repair center, and a film library. Closed Circuit Television (CCTV) produces instructional and educational TV programs and provides videotape recording services for various campus activities. Other services include multi-channel broadcasting of video programs to classrooms and assembly halls, teleconferencing, satellite downlinks, television studio, and a video library.

The Library's holdings include: 229,320 volumes of books; 6,507 journal titles; 507,322 microfiches; 86,218 microcards; 19,254 microfilms; 609,382 government documents; 714 films; 8,500 maps; 8,326 sound recordings; 605 musical scores; 916 sound magnetic tapes; 24,632 slides; 4,177 videocassettes; 687 filmstrips; 4,456 CD-ROMs; 104 computer programs; 2,713 theses; 4.5 million U. S. patents, and 2.1 million U. S. - issued trademarks.

The Library is a selective depository for publications of the U. S. Government, the Interamerican 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 and is also a depository for the U. S. Bureau of the Census publications.

In 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 the only participating library outside the United States and the only one of its kind in Puerto Rico, the Caribbean and Latin America.

The Library's main subject areas of interest are agriculture, animal industries, behavioral sciences, business administration, economics, energy, engineering, geology, humanities, marine and environmental sciences, natural and applied sciences, nursing, and technology.

Among the various services offered by the Library are book loans, document and journal loans, interlibrary loans, reference and information services, access to electronic indexes

and abstracts, online catalog, homepage (<http://www.uprm.edu/library>) library orientations and tours of facilities, library research and instruction courses, document delivery, fax delivery, photocopying machines 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. An information desk service is provided to answer questions and assist patrons in the effective use of the online catalog and of the resources, facilities, and services that are available. The information desk is located in the lobby at the main entrance and is open from Monday through Friday, 9:00 to 11:30 a.m. and from 1:30 to 4:00 p.m.

Members of the Library's professional staff offer the following formal courses: AGRO 4019–Seminar in Horticulture, BIOL 3055–Bibliography and Library Research in the Biological Sciences, and SOSC 3145–Bibliography and Library Research in the Social Sciences, and INTD 3355–Research Methods in Libraries.

Library services are fully automated, and the online catalog can be accessed from terminals and computers installed in the Library, or anywhere on Campus as well as through the Internet. A local area network (LAN) allows for the use of databases in CD-ROM from various collections. 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). In cooperation with the State Department of Education, the Library runs the Puerto Rico Cooperative Information Network, which allows libraries as well as, some public and school libraries throughout the island to share their resources.

The Library's rules and regulations are included in its Bylaws. Copies are available at the Library's Administrative Office.

## GENERAL LIBRARY FACULTY

**MARIA DEL C. AQUINO RUIZ**, *Assistant Professor* (Librarian II), M.L.S. (1991), University of Puerto Rico at Río Piedras.

**MARIA VIRGEN BERRIOS ALEJANDRO**, *Instructor* (Librarian I), M.L.S. (1989), University of Puerto Rico at Río Piedras.

**CARMEN CEIDE NIETO**, *Instructor* (Librarian I), M.L.S. (1990), Interamerican University at San Germán.

**SHEILA DUNSTAN SOPER**, *Professor* (Librarian IV), Associate of the Library Association of United Kingdom (1960), North Western Polytechnic in London.

**MARIA M. FERNANDEZ SOLTERO**, *Instructor* (Librarian I), M.L.S. (1986), UPR at Río Piedras.

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

**ILEANA GUILFUCCI**, *Assistant Professor* (Librarian II, M.L.I.S. (1992), Interamerican University at San Germán.

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

**GLADYS LUCIANO OLIVENCIA**, *Associate Professor* (Librarian III), M.L.S. (1971), University of Puerto Rico at Río Piedras.

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

**RONALDO MARTINEZ NAZARIO**, *Associate Professor* (Librarian III), M.L.S.. (1981), Indiana University at Bloomington.

**ARLENE DEL C. MARTINEZ RODRIGUEZ**, *Assistant Professor* (Librarian II), M.L.S. (1991), Interamerican University at San Germán.

**DEIXTER MENDEZ LORENZO**, *Associate Professor* (Librarian III), M.L.S. (1990), University of Puerto Rico at Río Piedras.



**LIZ PAGAN SANTANA**, *Instructor* (Librarian I), M.L.S. (1997), Pratt Institute, Brooklyn, New York.

**WANDA PEREZ RIOS**, *Instructor* (Librarian I), M.L.S. (1991), University of Puerto Rico at Río Piedras.

**IRMA RAMIREZ AVILES**, *Associate Professor* (Librarian III), A.M.L.S. (1984), University of Michigan.

**LOURDES RIVERA CRUZ**, *Assistant Professor* (Librarian II), M.L.S. (1990), University of Puerto Rico at Río Piedras.

**GRISELL RODRIGUEZ**, *Assistant Professor* (Librarian II), M.L.I.S. (1996), University of Wisconsin at Milwaukee.

**SARA RUIZ GONZALEZ**, *Instructor* (Librarian I), M.L.S. (1989), University of Puerto Rico at Río Piedras.

**ISABEL RUIZ TARDI**, *Assistant Professor* (Librarian II), M.L.I.S. (1989), Louisiana State University; M.A. in English (1976), State University of New York at Fredonia.

**NORMA SOJO RAMOS**, *Associate Professor* (Librarian III), M.S.L.S. (1984), Florida State University at Tallahassee.

**EDITH M. TORRES GRACIA**, *Assistant Professor* (Librarian II), M.L.I.S. (1992), Long Island University, New York; M.B.A. (1988), Interamerican University at San Germán.

**ELSIE TORRES NEGRON**, *Assistant Professor* (Librarian II), M.L.S. (1986), University of Puerto Rico at Río Piedras.

**JEANETTE VALENTIN MARTY**, *Associate Professor* (Librarian III), 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, and

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.

## Veteran Services Office

The Office of the Veteran Services is part of the Registrar's Office. It serves veterans, dependents of veterans, servicemen, and servicewomen in matters pertaining to the Veterans Administration such as: educational benefits, registration, and study at the University. All beneficiaries must complete their programs of study within the Normal time required for completion of programs. If a veteran exceeds these time specifications, the Office of Veterans Affairs will suspend benefit payments.

## STUDENT SERVICES

### OFFICE OF THE DEAN OF STUDENTS

The Office of the Dean of Students aims to assure and maintain an optimal learning environment by providing a variety of services and activities that are support systems for the 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.

### FINANCIAL AID

The Department of Financial Aid administers financial aid programs to assist students who

need help in meeting their cost of education. 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 want to work and are paid for services, and loans that require repayment.

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

In general, to be eligible for financial aid the student must:

- be a U.S. citizen or eligible non-citizen.
- be registered with the Selective Service System (if required).
- be working toward a degree or certificate.
- be making satisfactory academic progress.
- not owe a refund to Title IV Program.
- have financial need (except for Unsubsidized Stafford Loans).

Financial need is the difference between the cost of education and the amount of aid the parents and the student can contribute toward his/her education. The amount of aid a student may receive is determined by evaluating the financial need and the availability of funds. To be considered for all financial aid programs, the student must complete and submit each academic year the Application for Federal Student Aid and an institutional application form together with the required documents.

#### **Norms of Academic Progress for Eligibility to the Programs of Economic Assistance**

The Federal Department of Education, through a circular letter in October, 1994, notified educational institutions that they must establish, publish, and apply reasonable norms that measure the student's academic progress for the purpose of determining eligibility for economic aid in Title IV programs. These cannot be less

restrictive than those applicable to the general student population.

The institution is committed to establish a maximum time margin, so the student can receive economic aid. This maximum time cannot exceed 150% of the normal time required for obtaining the degree, according to the catalog. Moreover, the institution is committed to measure the student's progress in reference to this time margin, at least once a year. The University of Puerto Rico at the Mayagüez Campus has decided to make a yearly evaluation, which will take place at the end of the second semester of the academic year for the student receiving economic aid.

In accordance with Certification Number 95-18 of the Academic Senate and the guidelines contained in the aforementioned circular letter of the Federal Education Department, all students are hereby notified about the criteria to be satisfied at the end of the academic year if they want to maintain their possible eligibility to receive assistance from the economic aid programs.

#### **A. Undergraduate Students**

##### 1. General index

By the end of the academic year, the student's grade level must have reached the minimum retention index for his or her year of studies according to the following table:

<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

The courses taken during the summer immediately following the evaluation are neither considered in favor of nor against the student's index for the purpose of this criterion.

2. The student must have demonstrated academic progress toward the attainment of enough degree credits in order to complete the requirements within the official time frame, as follows:

Two year programs	The equivalent of three years of studies
Three year programs	The equivalent of four and a half years of studies
Four year programs	The equivalent of six years of studies
Five year programs	The equivalent of seven and a half years of studies

For the purpose of these guidelines, one year of study is defined as two semesters in which the student registers at least 12 degree credit hours.

Students having fewer registered credits per semester (nontraditional) will get the corresponding equivalency as follows:

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

The courses taken during the summer immediately after the evaluation will neither be considered in favor of, nor against the student's index for the purpose of this criterion.

A student making satisfactory academic progress must have acquired in an accumulative and satisfactory, at least the indicated percentage of the total required credits for his or her program of study, according to the following table:

Equivalent Years Studied	Percentual Progress according to the Duration of Program			
	Two Years	Three Years	Four Years	Five Years
1	33%	22%	16%	13%
2	66%	44%	33%	26%
3	100%	66%	50%	40%
4		88%	66%	53%
4.5		100%	N/A	N/A
5			83%	66%

6			100%	80%
7				93%
7.5				100%

#### NOTES:

1. These norms apply only to evaluations made with the purpose of determining eligibility for economic aid. They do not change the academic norms on probation and suspension.
2. In order to determine satisfactory academic progress, all the courses having provisional grades of incomplete (I) with A, B, C, or D are considered approved. Courses that are dropped (withdrawn) are considered attempted but not approved.  
  
However, if the student does not comply with the number of required credits because he/she obtained an IF grade in a course, the economic aid will be re-established with the condition that the student presents evidence of having completed the course work (copy of the Incomplete Removal Form processed by the Office of the Registrar).
3. The repetition of courses within the program of studies will be permitted subject to existing institutional norms.
4. The equivalence in credits of the required remedial courses will be considered in order to determine the student's satisfactory academic progress.
5. If a student is readmitted after discontinuing his or her studies, the current academic progress norms at the moment of the readmission will be applied.

#### B. Graduate Students

Graduate students will comply with the existing norms as stated in Certification 97.21 of the Academic Senate.

#### Notification procedure of non-compliance with the Norms of Academic Progress

The students who do not comply with the Norms of Academic Progress will be notified by a letter

from the Department of Financial Aid.

### Process of Appeal

The student who has valid reasons for not complying with the Norms of Academic Progress may appeal in writing to the Institutional Committee of Appeals for Financial Assistance. To that effect he or she must follow the instructions in the letter of notification issued by the Department of Financial Aid.

The Committee will inform the student of its decision in writing with a copy to such Department. This Committee is composed of representatives of each faculty and one representative of the Dean of Students.

### Procedure for re-establishing assistance

Every student whose appeal is considered favorably could be eligible for economic aid as long as he or she had submitted his or her application for economic assistance within the established deadline and complies with the other requirements of eligibility.

## Financial Aid Programs

### Grants and Scholarships

The *Federal Pell Grant Program* is a student aid program which provides grants to undergraduate students who are enrolled in a degree-granting program and do not have a previous baccalaureate degree. Eligibility is determined by the Federal government.

The *Federal Supplemental Education Opportunity Grant (FSEOG)* provides assistance to undergraduates who demonstrate considerable need and gives priority to students who receive Federal Pell Grants.

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

The *Institutional Supplemental Assistance Program* is funded by the University to provide grants to eligible undergraduate and graduate students.

The *Educational Opportunity Law 138 Scholarship program* receives funds assigned by the Puerto Rico Council of Higher Education to assist students in need who also meet specific academic criteria.

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

### Federal Work-Study Program

*America Reads Challenge* pursues the goal to give federal work study students the opportunity to help children learn to read better by the end of third grade.

The *Federal Work-Study Program* provides employment opportunities for undergraduate and graduate students having financial need. Most jobs are on campus, and the students are paid according to the number of hours worked up to the amount awarded.

### Loans

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

The *FFEL Stafford Loan Program* allows undergraduate and graduate students to borrow low-interest Federally subsidized funds through lending institutions such as banks, based on their determined financial need. Students can also get an unsubsidized loan regardless of need. Repayment begins six months after the student graduates or ceases to be enrolled on at least a half-time basis.

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

The Department of Health Services offers primary health care free of charge, for all students. Among the services provided are medical consultation, dental care, emergency and short-stay recuperation care, ambulance services, clinical laboratory tests, psychology service, counseling on addiction, health education program, and coordination and referrals to off-campus health providers for students under the University's health insurance plan or a personal health insurance. 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. These services are offered during working hours from 7:00 am to 9:00 pm, Monday to Thursday and from 7:00am to 4:30pm Friday. A clinical laboratory complements these services.

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

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

The University, through a private company, offers the students an insurance health plan in order to provide a more comprehensive health coverage. The plan is required, unless the student provides evidence of other health insurance coverage. Among the services covered by the university plan are referrals to specialists, X-rays and laboratory tests recommended by physicians, hospital emergency room care, hospitalization, surgical procedures, prescription

medicines, and maternity services that include prenatal and postnatal care.

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

Preventive medicine pursues the prevention, detection, screening and control of medical conditions among students that may need immediate attention, observation or special care. Through a Health Promotion and Prevention Program, individual and group orientation are offered. Some of the areas covered are: nutrition, sexual health, sexually transmitted diseases including AIDS, alcohol and other drug abuse prevention, counseling and referral, chronic illness such as heart diseases, diabetes, asthma and epilepsy, as well as other health related areas with emphasis in the promotion of healthy lifestyles and health maintenance. A resource library with books and printed material is available to the community.

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

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

The department sponsored three students organizations that advocate healthy lifestyles among theirs peers.

## COUNSELING AND GUIDANCE

Counseling and guidance are offered to the students so that they can achieve a better understanding of themselves and make an adequate adjustment to the 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, and psychological and social work services. Counselors assist students with personal, educational, and career development issues and concerns. They also teach a freshman orientation course called UNIV 0002-0006-University Success Skills during the first semester. Psychologists provide individual therapy, and crisis intervention, and offer workshops and lectures on personal, emotional, and social growth topics. A Social Worker provides individuals, couples, and families with intervention in social issues such as relationship with their parents, communication, violence, marriage, pregnancy, and financial needs. Workshops are offered throughout the year according to student needs. Topics such as stress management, assertiveness, personal and social growth, study skills, time management, and decision-making are covered.

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 in the Library as well as college catalogs and bulletins from other institutions. A counselor assists students in the decision-making process as well as in the application process for graduate studies.

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 they devote to sports.

A Freshman Orientation Week is offered one 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 also gives freshmen the

opportunity to meet faculty, staff, and other students. Members of the Peer Counseling Program work intensively during this week and throughout the year in coordination with the Department of Counseling. They assist counselors with high school students during orientation activities such as campus tours, group guidance, open houses, 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, time and stress management, and sex education. It has been designed to enhance the academic and social integration into college in order to help them succeed during their college years.

## **OFF-CAMPUS HOUSING**

The Department of Off-Campus Housing assists students, faculty and staff with locating off-campus housing and offers support throughout the off-campus living experience, providing counseling, information and referral in housing-related matters. Also maintains an interactive apartment, house, rooming houses 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 about leases, utilities, safety, transportation, temporary housing, finances and many other topics relevant to living off-campus. The Off-Campus Housing Department plays a role in educating the off-campus student community regarding their rights and responsibilities both as tenants and as a member of the community. Advises home owners interested in establishing lodging about the required codes by governmental agencies. Maintains a bulletin board with advertisements about selling and buying goods and services in the community. The Housing Mediation Services is a voluntary confidential resource which seeks to assist in the resolution of problems which may arise between students, landlords and students, roommate in the areas of housing. The service offers the 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. Please note that we do not offer legal advice, we referral to local legal advice programs off-campus. Other services are the Child Care Program for Students sponsored by Río Piedras Campus-UPR. The purpose of this program is to provide federal subsidies for off-campus child care while their student's parents attend university classes.

The Off-Campus Housing Department comply with the Ethical Principles and Standards for College and University Student Housing Professional of the ACUHO organization.

## PLACEMENT

The Placement Department's main objective is to provide students with the best resources available that will help them obtain permanent, summer, or temporary employment. The services provided include the arrangement of on-campus interviews with prospective employers, the coordination of employer presentations, and job referrals. The Department offers seminars and workshops aimed to develop job-hunting techniques, resumé preparation, and interviewing skills.

Annually, the Department organizes a Job Fair, where companies and governmental agencies from Puerto Rico and the United States that have job opportunities for students seeking permanent, summer, and employment participate. Each year, the number of students participating increases. The Job Fair is open to students from various disciplines.

A library and video library containing information on the companies that recruit are available for student use. The Department has skilled personnel who can offer individual help in reviewing resúmes, and assisting in the preparation of cover letters, employment applications, etc.

Every year, the Department prepares an employment report for each graduating class that lists the number of students who find jobs or continue their graduate studies in Puerto Rico and the United States and the number who continue to seek employment. Students are advised to start working on their job search as early as their freshmen year, since the better they

do academically from the start the easier it will be for them to find summer or co-op employment during their second or third year of studies.

## 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 is an excellent way to explore different academic, social, and cultural settings. National Student Exchange offers students the opportunity to do course work at another college or university in the United States and its territories.

The International Student Exchange Program offers students the opportunity to take course work in 23 different countries. The Programs encourage students to experience and learn from the exposure to different regional, cultural, and ethnic perspectives and to broaden their educational background. A qualified, full-time undergraduate student may participate for up to one academic year. To be eligible to participate in the Program, a student must have at least a 2.5 grade point average.

This Office also provides orientation services to students from other countries. These students become acquainted with registration procedures, educational facilities, student services, and other sources of assistance. Information is offered in areas of immigration, financial assistance, foreign embassies on the island, programs sponsored by international agencies, housing, and other matter of special concern. The Office works closely with the academic community, the administration, and the local community to familiarize the student with life on campus and the culture of Puerto Rico.

The English Department, in coordination with the International Students Office, offers an intensive English course for foreign students. Specific information is mailed to incoming foreign students. International students sponsor special events throughout the year to promote cultural exchange and familiarize the University community with their country.

## **ATHLETIC ACTIVITIES**

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

The University is a member of the Inter-University Athletic League and fully participates in a variety of intercollegiate sports. The University is also a corresponding member of the National Collegiate Athletic Association (NCAA) and is in the process of becoming an active member. The Inter-University Program offers 14 men's and 11 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, and wrestling. Women's sports include aerobics, basketball, cross-country, judo, softball, swimming, table tennis, tennis, track and field, heptathlon, volleyball, cheerleading, and Taekwom Do as an exhibition activity.

The Intramural Program provides activities and competitions that take place mostly on the campus grounds. Students, faculty, and staff participate in a wide variety of activities for both men and women. Among the sports included are basketball, judo, indoor soccer, soccer, softball, swimming, table tennis, tennis, volleyball, water polo, weight lifting, and wrestling. Student teams in the Intramural Program can 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 non organized recreation. Students and university- sponsored teams can borrow equipment and utilize facilities in their free time.

The athletic facilities include a gymnasium; a coliseum; a 50-meter swimming pool; basketball, volleyball, and tennis courts; a synthetic running track; a weight-lifting gymnasium; a training and conditioning exercise room; an athletic field; a softball park; and judo and wrestling areas.

## **BAND AND ORCHESTRA**

Students with musical talent can be members of different music groups such as the concert band,

marching band, choir, string ensemble, and other pop-rock and Latin music groups. Students interested in participating in any of the groups are required to pass 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 throughout the outside community as representatives of the University.

## **QUALITY OF LIFE OFFICE**

The Quality of Life Office offers a wide variety of services in order to promote a safe campus community, which is conducive to the attainment of the educational objectives of this institution. This Office encourages a safe and secure environment that contribute to the wellness of the campus community.

Proactive prevention programs are offered to deal with problems like campus crime, violence, sexual assault, and use and abuse of alcohol and other drugs, that affect quality of life on our university. This Office fosters the fulfillment of the institutional policies.

## **SOCIAL AND CULTURAL ACTIVITIES**

The University offers diverse social and cultural activities that can be enjoyed by everyone. These events are free of charge and include concerts, shows, dances, plays, films, presentations, tournaments, and exhibitions by recognized artists and performing groups. Special events such as the Pep Rally promote school spirit and student involvement.

Most activities are celebrated in or on campus facilities such as the General Studies Building theater, the coliseum, the gymnasium, and the athletic field. University-sponsored activities are also offered in the city of Mayagüez in municipal government facilities such as the Yagüez theater, the Cultural Center, and the municipal coliseum.

## **STUDENT GOVERNMENT**

The General Student Council is the student government on campus. The Council is



composed of representatives from the different colleges elected by the student body and gives students the opportunity to present their opinions and views to the University administration. Additional information regarding the Council and its functions may be obtained at the General Student Council Office located on the first floor of the Student Center.

## 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. They provide an opportunity for involvement in student activities, and community service and for leadership and personal development. For further information, students should contact the Department of Social and Cultural Activities.

## STUDENT CENTER

The Student Center constitutes the University community center and is open to students, faculty, staff, alumni, and visitors. It is a focal point for cultural, social, and recreational activities and provides study areas for students. A number of departments under the Office of the Dean of Students are located in the Center. These are the offices of Counseling and Guidance, Off-Campus Housing, Placement, Social and Cultural Activities, and the Student Exchange Program and International Student Services.

Other areas within the Center are the Alumni Office, the General Student Council Office, the Graphic Arts Workshop, and an art exhibitions room. There is a game room for playing table tennis, pool, chess, and other recreational games. The Student Center also houses the campus cafeteria, campus bookstore, post office, and a hair styling salon. A Student Aid Center, located on the ground floor, provides low cost specialized services, such as photocopying, photographic film development, and fax services.

# OTHER SERVICES

## CAMPUS 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, year-round, with 18 hours daily under operator assistance. The Center also operates a computing room in the Business Administration Building. The Center serves the academic community in both instruction and research, as well as the Campus Administration.

The principal academic computer facility consists of a Digital ALPHA server DS 20 computer with 512MB of main memory and 72.8GB of disk storage. An ALPHA 2100 5/250 is the exclusive system for library automation. Any user on campus and from other institutions can access the on-line catalog by using a terminal or a personal computer attached to the network. An ALPHA 8250 operates the Administrative Information Systems and student services. This ALPHA system has 1GB in memory and 49.5GB of disk storage.

Each system operates on a time-sharing basis and is capable of handling more than 200 concurrent users. There are more than 600 terminals accessing the systems and more than 1,500 personal computers around campus.

The Center also operates a computing room in the Business Administration Building. Computer Center Services include the use of data processing equipment (i.e., terminals and microcomputers), document printing, software, and consulting. These rooms are available to all students and academic personnel. Most of the departments have additional computer facilities which vary from personal computers to minicomputers and workstations.

The ALPHA computers and most of the workstations on campus are connected to the institutional network RUMNET (Recinto Universitario de Mayagüez Network). Also many departments have their own local area network connected to RUMNET.

RUMNET is part of the wide area network of the University of Puerto Rico (UPRENET) which connects the campuses and other University

agencies, like the Agricultural Experiment Station. It allows remote access, file transfers, and mail exchange between units. UPRENET is connected to the Internet and Bitnet networks, allowing campus users to reach computers almost anywhere in the world.

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 are offered. A monthly newsletter *Compunews* is published by the Computer Center.

There is no cost to the student body or to the academic personnel for the use of computer facilities on campus except for those courses that require them. The University covers the operational expenses of the facilities. The use of the facilities is measured by attendance and number of users registered in the systems. Present plans include the measure of resources usage, CPU time, and designation of quotas to the users.

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

### University Service Enterprises

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

### Campus Bookstore

The bookstore supplies the University community with textbooks, general reading books, office and school supplies, souvenirs, gifts, and personal effects. It is located on the first floor of the Student Center.

### Campus Cafeteria

The cafeteria, located in the Student Center, is equipped with furniture specially designed for

the student's comfort. It 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 10:00 p.m.

### Press and Publications

The Campus Press Office is the link between the University community as well as local and international media. Through press releases and articles regularly published in daily, and weekly newspapers and other publications, the public is informed of the major events on campus. Radio and T.V. announcements are also prepared by the Press Office.

### Alumni Office

The Alumni Office is engaged in activities designed to strengthen relations between the Institution and its graduates. The Office supports and works in close coordination with the Alumni Association, encouraging membership, raising funds through donations, organizing the annual homecoming event, and developing other important activities.

## FEES

### 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. They also pay 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	\$529
Annual basic medical insurance including pharmacy charges	\$810

## 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
Transcript of credits (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 have to pay one-and-a-half times the regular fee. Late applications are accepted only after complete justification is presented.

\*May change from year to year in accordance with changes in contracts with insurance companies.

## REGULATIONS

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

Deferred payment of fees: As a general rule, no deferred payment of fees is granted. However, in very exceptional cases, the Dean of Students is authorized to grant an extension of time which cannot be beyond 30 days before the end of the course.

In those exceptional cases, the student must apply for deferred payment of fees in ample time prior to the registration day so that the merits of the application can be evaluated. On the registration day, those students to whom deferred payment of fees is granted must pay at least 50% of the total fees. The balance must be paid at least 30 days before the last day of classes every semester. Students who fail to pay accordingly must pay a late charge of \$3.00.

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

## TUITION EXEMPTION

### *Honor Registration Exemption*

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

The following students are eligible for honor registration and will be granted exemption from the payment of tuition fees:

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

## REIMBURSEMENTS

**Fees:** Students who drop out of the University of Puerto Rico, Mayagüez Campus, within the first two weeks of any semester or the first week of the Summer Session are entitled to a 50% per cent refund of tuition fees. The application for reimbursement must be approved by the corresponding Dean and the Registrar and filed in the Treasurer's Office within five days following the date of approval. No refunds are allowed thereafter.

Visitors and students forced to withdraw for disciplinary reasons are not entitled to a refund of fees. The medical services fee, the transfer and readmission fees, the construction fee, laboratory fee, and late registration fee are not refundable.

## RETURN OF UNIVERSITY PROPERTY

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

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

# ACADEMIC REGULATIONS

## ADMISSIONS

### FRESHMEN

**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 Admissions 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 the high schools, 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) should be requested from the Scholastic Aptitude Test, P.O. Box 592, Princeton, New Jersey 08540. These tests are offered in January, May, and December. Candidates ought to take the test no later than February of their last year in high school.

Application Procedure: First-year applicants are only considered for admission in the first semester beginning in August, and applications should be submitted before the deadline of November 30<sup>th</sup> of the year prior to admission. The following documents are to be sent officially to the Admissions Office:

- (a) Record of all high school studies.
- (b) Report of test scores obtained on the entrance examination (CEEB or SAT).
- (c) A certified check or money order for \$15 payable to the University of Puerto Rico. After the deadline, the fee is \$22.50.

Selection of Candidates: Admission to the Mayagüez Campus of the University of Puerto Rico is based on an admission index formula. The General Admission Index of students is calculated as follows: 50% the high school index, 25% the verbal score and 25%, the mathematical score on the Aptitude Test of the College Entrance Examination. These raw scores are converted to a scale figure 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 Campus for the program for which the students apply. This varies from year to year and depends on demand for the program and the number of students who can be admitted.

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 the entrance examination are required to present the results obtained in order to be eligible for admission.

Advanced Placement: Advanced placement is granted upon approval of College Board Advanced Placement tests with scores of 4 or 5 in English, Spanish, Mathematics (Level I and Level II), Calculus AB or Calculus BC. Approval with scores of 3 varies according to the academic department. Students who meet the criteria are placed in the next level course as specified by their curricula, and receive credit for the first-level course. These credits are valid to meet graduation requirements and appear in the student record as approved (P) courses.

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 English, but they can be placed in different programs following criteria defined by the academic departments which may include but are not limited to College Board Achievement test scores. Placement is compulsory.

Precalculus Intervention System:

In accordance with regulation 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 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 Precalculus Intervention Laboratory, at least one semester. Only after attending the Support Center for Precalculus and Calculus Teaching and obtaining a passing grade on the diagnostic exam will the student be allowed to register in the precalculus 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 they take the precalculus course. This will raise their probability of passing the course successfully.
- Student with a grade higher than 65% on the diagnostic exam can take the precalculus course without any previous notification.

## READMISSION

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

- |              |   |
|--------------|---|
| February 15  | Last day for submitting applications for readmission for the summer session and the first semester. |
| September 15 | Last day for submitting applications for readmission for the second semester.                       |

The Registrar will process each application with the Dean of the College concerned or with the Dean of Academic Affairs, as the case may be, and will notify the applicant of the action taken. The applicant must pay a nonrefundable fee of

\$27.00. The Mayagüez Campus reserves the right to grant readmission according to the availability of space in the different colleges, departments, or options within the departments, especially if the student has exceeded the number of years required to complete the degree.

## TRANSFERS

### TRANSFER STUDENTS FROM OUTSIDE THE UNIVERSITY OF PUERTO RICO

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

Criteria of Eligibility: 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 general grade point average of 2 or higher (on a scale of 1 to 4).
- (c) Comply with the specific departmental requirements.

Application Procedure: Applications must be filed by the 15<sup>th</sup> of September for the second semester (January), and by the 15<sup>th</sup> of February for the summer session (June, July) and for the first semester (August), 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 catalog or announcements of the institutions attended, describing the courses offered. This applies only to institutions outside of Puerto Rico.
- (c) A certified check or money order payable to the University of Puerto Rico in the amount of \$25.00. After the deadline, the fee is \$37.50. This fee is nonrefundable.

All documents should be send to:

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

Transfer Credits: The University of Puerto Rico, Mayagüez Campus, reserves the right to accept for transfer credit those courses taken at other institutions of higher education. Only courses with a grade of C or better will be evaluated for credit transfer. The maximum number of transferable credits is half 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 the qualified candidates, it will be filled with the best-qualified applicants.

### TRANSFERS WITHIN THE CAMPUS

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

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

The application of a student not having the required minimum of 48 approved credit hours required will be considered only if the student meets one of the following requirements:

- a. Fulfills the General Admission Index (GAI) requirements established by the Administrative Board for the program to which the student was applying at the time he or she was admitted to the Mayagüez Campus. Has a competitive Grade Point Average (GPA) as determined by each college.
- b. Has a minimum of 24 approved credit hours with a GPA of at least 3.0.
3. Meet other academic requirements specified by the program of interest. Students should visit the academic department for further information.
4. Pay a nonrefundable fee of (\$17.00).
5. Does not transfer more than two times.

## TRANSFER STUDENTS FROM ANOTHER CAMPUS OF THE UNIVERSITY OF PUERTO RICO

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

1. Must apply for transfer through the Office of the Registrar of the unit concerned, in accordance with the dates stipulated 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 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 capacity in the different colleges, departments, or options.

## EARLY ADMISSION PROGRAM

The Admissions Office has established an Early Admission Program for those students that have requested Admission to the Mayaguez Campus and comply with certain criteria. The students will be able to register in specially designed summer courses at our Campus.

The criteria which the students have to comply with, are the following:

- General Point Average of 3.50/4.00
- 1,300 points or more in the Mathematics and Verbal parts of the Scholastic Aptitude Test administered by the College Entrance Examination Board
- Compliance with the General Admission Index established by each College

## LANGUAGE OF INSTRUCTION

Spanish is the language of instruction in most courses, but students are required to have a working knowledge of the English language as well. The individual professor decides the language used in his or her lectures and student evaluation activities.

## REGISTRATION

Registration procedures are made available 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 the requirements of the Health Service Department prior to registration. Non compliance will result in cancellation of the enrollment authorization.

Registration is neither complete nor valid until the 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 grade of F in the course. Students are also held responsible for the fulfillment of the academic obligations as specified in their program of studies.

## CLASSIFICATION OF STUDENTS

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

- (a) *Regular students*: those who have fulfilled the entrance requirements to this Campus, are candidates for a degree, and are carrying an academic course load of at least 12 credit-hours.
- (b) *Part-time students*: those who have fulfilled all entrance requirements to this Campus, are candidates for a degree, and are carrying an academic course load of less than 12 credit hours.
- (c) *Auditor 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 not take exams nor receive grades or credit for work done in a course.
- (d) *Transient students*: those who, regardless of whether or not they fulfill the requirements for admission to the Mayagüez Campus of the University of Puerto Rico, 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 imply that the courses requested by the student will be offered.

- (e) *Professional Development*- The University of Puerto Rico Mayagüez Campus makes the educational resources of its academic and research units available to the population of our country. For this reason 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 does want 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 Grade Point Average of 3 or above may carry a maximum of 21 credit hours. During the last two semesters of their study programs, students may be allowed to carry a maximum of 21 credit hours per semester upon the recommendation of the Director of the Department and approval by the Dean of the Faculty.

### **SUMMER SESSION PROGRAMS**

A student's summer session program normally consists of at most seven credit hours, but candidates for graduation and honor students may be permitted to carry a maximum of 10 credit hours subject to the approval of the corresponding dean. The same rule applies for students authorized to take summer courses for credit in other colleges or universities. The programs of such students must have the approval of the Director of the Department and the Dean of the College concerned. Courses taken at institutions other than the various campuses of the University of Puerto Rico will not be accepted unless they are passed with a grade of C (2) or better.

### **WITHDRAWAL**

#### **PARTIAL WITHDRAWAL**

A student may withdraw from individual courses at any time during the term but before the

deadline established in the University Academic Calendar. After the student submits an official request, the Registrar will post a "W" (withdrawn) for the particular course or courses in the permanent record of the student. No partial withdrawal will be permitted after the date indicated above. Students are advised that Federal regulations require faculty to specify the last day of attendance in each course.

### **COMPLETE WITHDRAWAL**

A student may completely withdraw from the University of Puerto Rico, Mayagüez Campus, at any time up to the last day of classes. He or she must obtain written permission from the dean of his or her college. After the student submits an official request, the Registrar will post a "W" in every course in his or her program of study for that semester and the date of withdrawal. Students are advised that 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 of the academic discipline followed by a four digit number. The alphabetical codes are based on the Spanish titles of the academic disciplines and are listed at the end of this bulletin. The first digit of the number indicates the course level as follows:

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

### **ALPHABETICAL DISCIPLINE CODES**

ACCO ACCOUNTING



ADMI	BUSINESS ADMINISTRATION	INED	INDUSTRIAL EDUCATION
AEST	AEROSPACE STUDIES	INEG	INDUSTRIAL ENGINEERING
AGEC	AGRICULTURAL ECONOMICS	INTD	INTERDISCIPLINARY
AGED	AGRICULTURAL EDUCATION	ITAL	ITALIAN
AGEG	AGRICULTURAL ENGINEERING	JAPA	JAPANESE
AGEX	AGRICULTURAL EXTENSION	LATI	LATIN
AGMT	MECHANICAL AGRICULTURAL TECHNOLOGY	LITE	LITERATURE
AGRO	AGRONOMY	MANA	MANAGEMENT
ANIN	ANIMAL INDUSTRY	MARK	MARKETING
ANTH	ANTHROPOLOGY	MASC	MARINE SCIENCES
ARTS	ART	MATH	MATHEMATICS
ASTR	ASTRONOMY	MEEG	MECHANICAL ENGINEERING
BIOL	BIOLOGY	METE	METEOROLOGY
BIOS	BIOLOGICAL SCIENCES	MISC	MILITARY SCIENCES
BOCE	MARINE SCIENCES BIOLOGICAL OCEANOGRAPHY	MSTA	MATHEMATICAL STATISTICS
BOTA	BOTANY	MUSI	MUSIC
BUEN	BUSINESS ENGLISH	NUEG	NUCLEAR ENGINEERING
BUSP	BUSINESS SPANISH	NURS	NURSING
CHEG	CHEMICAL ENGINEERING	OFMA	OFFICE ADMINISTRATION
CHEM	CHEMISTRY	ORST	ORGANIZATIONAL STUDIES
CIEG	CIVIL ENGINEERING	PHCS	PHYSICS
COCE	MARINE SCIENCES CHEMICAL OCEANOGRAPHY	PHED	PHYSICAL EDUCATION
COEG	COMPUTER ENGINEERING	PHIL	PHILOSOPHY
COMP	COMPUTER SCIENCE	PHSC	PHYSICAL SCIENCES
COSY	COMPUTERIZED INFORMATION SYSTEMS	PLSC	PLANT SCIENCE
CROP	CROP PROTECTION	POCE	MARINE SCIENCES PHYSICAL OCEANOGRAPHY
ECON	ECONOMY	POSC	POLITICAL SCIENCES
EDFO	EDUCATION FOUNDATIONS	PSYC	PSYCHOLOGY
EDPT	EDUCATIONAL PROGRAMS AND TEACHING	RECR	RECREATION
EDUT	EDUCATIONAL TECHNOLOGY	RUSS	RUSSIAN
ELEG	ELECTRICAL ENGINEERING	SESC	SECRETARIAL SCIENCES
ENGL	ENGLISH	SOCI	SOCIOLOGY
EXTC	DIVISION OF EXTENSION	SOSC	SOCIAL SCIENCES
FINA	FINANCE	SPAN	SPANISH
FREN	FRENCH	SPED	SPECIAL EDUCATION
FTEC	FOOD AND SCIENCE TECHNOLOGY	STAT	STATISTICS
GEEG	GENERAL ENGINEERING	THEA	THEATER
GEOG	GEOGRAPHY	ZOOL	ZOOLOGY
GEOL	GEOLOGY		
GERM	GERMAN		
GOCE	MARINE SCIENCES GEOLOGICAL OCEANOGRAPHY		
GREE	GREEK		
HIST	HISTORY		
HORT	HORTICULTURE		
HRMA	HUMAN RESOURCES MANAGEMENT		
HSTU	HISPANIC STUDIES		
HUMA	HUMANITIES		
IBIO	INDUSTRIAL BIOTECHNOLOGY		

**GRADING SYSTEM**

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 50-minute period. A semester comprises a minimum of fifteen weeks of instruction exclusive of final examinations.

Grades: The grades at the Mayagüez Campus are as follows: A, excellent (4); B, good (3); C, satisfactory (2); D, passing but deficient (1); F, failure (0); P, passed; 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, will not be considered in computing the grade point average of a student. The same rule may apply in some seminars. C is 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. The minimum grade for passing other undergraduate courses is D.

**Grade Point Average:** This is the official measurement of the merit of the work done by the student. 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.

The GPA is computed considering all courses completed. In the determination of 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, before the end of the following semester, the student has made up the deficiency, 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. Consult the academic calendar for applicable deadlines.

**Repetition of Courses:**

- (1) All courses in which students obtain a grade of D, or F, or are not approved can be repeated without restrictions.
- (2) If requested by a student and, after analyzing his or her academic circumstances, the Dean of the College may authorize, in exceptional cases, the repetition of courses 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 should appear on his or her official transcript.

**Graduation Index:** This is computed with honor points as defined above but includes only courses counted towards satisfying degree requirements and the final passing grade.

## EVALUATION OF THE STUDENT'S ACADEMIC COURSEWORK

The evaluation of a student for the purpose of grading will be based on his/her academic progress utilizing the existing diverse forms of evaluation in accordance with 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 are within the professor's jurisdiction. Nevertheless, the professor should inform students of the evaluation procedure at the beginning of the semester and the relative value of daily class participation, laboratory work, tests, and other aspects of a course.

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

Also, the professor will give each student the opportunity to discuss with him or her the grade received or any doubt the student may have concerning it or any other aspect the course.

The student should discuss such matters with the professor within a period of 10 classroom days after an exam or partial work is graded.

## CLASS ATTENDANCE AND EXAMINATIONS

**Class Attendance:** Class attendance is compulsory. The University of Puerto Rico, Mayagüez Campus, reserves the right to deal, with individual cases of nonattendance at any time. Professors are expected to record the

absences of their students. Frequent absences affect the final grade of a student, and may even result in the total loss of his/her credits. Arranging to make up work missed because of legitimate class absences is the responsibility of the student.

**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 impracticable. The professor evaluates the results of the final examination in relation to other class work and uses the method he or she deems most appropriate to classify the work of students, provided that he or she is able to present sufficient evidence of an objective basis for the grades given.

Final examinations scheduled by arrangement must be given during the examination period prescribed in the Academic Calendar including Saturdays and Sundays. No change in the date assigned for a final examination may be made without the written authorization of the respective dean of the college concerned and the Registrar.

**Absence from Examinations:** Students are required to attend all examinations. If a student is absent from an examination for a justifiable reason acceptable to the professor, he or she will be given a special examination. Otherwise, he or she will receive a grade of F for the examination missed.

**Reading Period:** A reading or review period will be provided 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 studying for their final examinations.

## RETENTION STANDARDS

### Satisfactory Academic Progress

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

⇒ Attains the minimum GPA for his/ her year of study as follows:

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

⇒ Has enough credit hours approve to demonstrate academic progress towards the completion of the degree requirements in terms of the timeframe that follows:

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

Or, stated in terms of percentage of credit hours approved:

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		100.0%	80%
9			90%
10			100%

### Probations and Suspensions

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

1. Have a GPA not lower than 0.20 below that required.
2. Have approved during the last two semesters, at least 12 credits if regular students and six credits if part-time students.
3. Have accumulated the percentage of credit hours that follows:

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.

Students on probation will carry a course load of not less than nine nor more than 15 credit hours per semester if a regular student; and not less than three nor more than six credit hours per semester if a part-time student. They must also maintain the number of credit hours required under the probation status.

After a year on probation, students must:

1. Comply with the minimum GPA.
2. Attain the minimum accumulation of credit hours required for good standing status.
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 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 all three 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 with their studies during the following year. Students must apply for readmission after at least one year of academic suspension during the period of time established in the academic calendar. The applications will be evaluated by the Committee on Scholastic Achievement. Readmitted 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 for the institution. As a rule, a student is entitled to be graduated under the curriculum requirements in force at the time of his or her entrance to the institution and should consult his/her department to obtain copy of its specific requirements upon enrollment. However, a student who fails to fulfill the graduation requirements within the timeframe assigned to his/her corresponding curriculum and a student who re-enrolls after a period of absence are governed by the requirements applicable to the class with which they graduate.

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

- (a) Have passed the prescribed courses with a minimum GPA of 2.00. Students with a GPA of 3.00 to 3.32 inclusive graduate with honors (Cum Laude) and those who achieve 3.33 or over, graduate with high honors (Magna Cum Laude). In order to be eligible for graduation with honors or high honors, students must have completed at least 50% of the credit hours required for graduation at this institution.
- (b) Have taken the final 28 credits for their degree at the University of Puerto Rico, Mayagüez Campus, with the understanding that these credits are required for the last

phase of their 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) Have satisfied the following time-limit requirements for the completion of studies for the degree:

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

After this period, the University reserves the right to require the student to repeat all courses which, in the opinion of the respective dean, need review. In all such cases, the student must obtain written consent in duplicate from the dean, together with a list of the courses to be repeated.

Copies of this authorization must be submitted to the director of the department and to the Registrar.

- (d) Have satisfied all financial obligations to the University.
- (e) Have filed 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) Have been recommended for the degree by the faculty.
- (g) Attend the commencement Exercises, unless excused by the Registrar.

The University celebrates commencement exercises once during the academic year at the end of the second semester when all degrees are awarded. Students who meet their course requirements for the degree at the end of the summer session or the first semester may apply to the Registrar's Office after said requirements have been met for a certificate showing that they have completed their studies.

# **COLLEGE OF AGRICULTURAL SCIENCES**

## **ORGANIZATIONAL STRUCTURE**

In accordance with Public Law Number 1 approved January 20, 1966, better known as the University Law, and Certification No. 13 of the Council of Higher Education, dated September 11, 1968, the College of Agricultural Sciences is the unit within the Mayagüez Campus where formal teaching, research, and extension in agriculture are integrated. The three functions are mutually complementary and are included under a central scheme of three-dimensional organization that includes the Faculty of Agriculture, the Agricultural Experiment Station, and the Agricultural Extension Service.

A management team, including the Dean and Director of the College of Agricultural Sciences, the Associate Dean and Assistant Director of the Agricultural Experiment Station, the Associate Dean and Assistant Director of the Agricultural Extension Service, and the Associate Dean of the Faculty of Agriculture imparts direction to the plans and programs of the College of Agricultural Sciences. The Coordinator of International Programs in Agriculture adds a new dimension to the College of Agricultural Sciences.

## **AREAS OF STUDY**

Formal university teaching in the field of agriculture started in Puerto Rico in 1911 with the establishment at Mayagüez of the College of Agriculture and Mechanic Arts. The Faculty of Agriculture is responsible for higher learning in the agricultural sciences and its basic function is performed at three different levels. The emphasis is on the Bachelor's program, but it includes a non-degree program in Pre-Veterinary and graduate studies at the Master's level.

At the undergraduate level, the Faculty of Agriculture offers programs of studies leading to the Bachelor of Agricultural Sciences in various options. Students are trained in all areas related

to the science and art of modern agriculture, as well as in the knowledge and abilities to express themselves. In addition, the student is provided with opportunities for the development of an analytical, critical, and reflective mind.

In order to accomplish these aims, the Faculty of Agriculture offers eleven programs or options leading to the Bachelor's degree:

- (1) Agribusiness,
- (2) Agricultural Economics,
- (3) Agronomy-Crops,
- (4) Agronomy-Soils,
- (5) Animal Industry,
- (6) Crop Protection,
- (7) Education in Agricultural Extension,
- (8) General Agriculture,
- (9) Horticulture,
- (10) Mechanical-Agricultural Technology, and
- (11) Vocational Agriculture Education,

In addition, the Faculty offers a non-degree program of study in Pre-Veterinary for those students who will be 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 in the natural sciences, social sciences, the humanities, and languages. The goal of formal teaching is to prepare the scientists and professionals needed in Puerto Rico for the development and progress of its agriculture and of its rural areas, and to provide them with the knowledge and competence essential to their field of specialization as well as with the indispensable background in sociohumanistics and the positive attitudes necessary to serve the country well. The first year of study is the same for all the options in the Faculty of Agriculture, with the exception of the Pre-Veterinary Program. From the second year on, the student takes the required courses and the professional electives of his or her fields of specialization. All the programs require the student 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 Agriculture also offers graduate courses leading to the Master of Science Degree. The student is able to specialize in one of the following disciplines: (1) Agronomy-Crops, (2) Agronomy-Soils, (3) Horticulture, (4) Crop Protection, (5) Animal Industry, (6) Agricultural

Economics, and (7) Food Science and Technology. For information regarding these programs, the Graduate Studies Catalog of the Mayagüez Campus should be consulted.

## **AGRICULTURAL EXPERIMENT STATION**

The Agricultural Experiment Station was originally established in 1910 as a private entity of the Sugar Producer's 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 of "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. This transfer was made in accordance with the spirit of the Hatch Act approved in 1887, and by virtue of the laws supplementing it, which were extended to Puerto Rico in 1931.

The role of the Agricultural Experiment Station is to provide the scientific and technological base necessary for the total development of the agricultural and rural sectors of Puerto Rico, in accordance with public policies and agricultural priorities of the local Department of Agriculture. As part of its functions, the Experiment Station also conducts agro-industrial research dealing with the processing of agricultural products, the preservation of fresh and processed food products, the development of high quality rums, and the solution of problems related to the conservation of environmental quality. 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, 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 in the central, humid and mountainous region. These at Lajas and Fortuna are in the dry, flat and coastal southern region. The center at Isabela is in the semi arid

region of the northwest and at Gurabo is in the humid northern region of the island of Puerto Rico. This wide distribution allows the evaluation of different crops and animal systems in the ecological zones where they are better adapted.

## **AGRICULTURAL EXTENSION SERVICE**

The Agricultural Extension Service was established in Puerto Rico in 1934 through an understanding between the United States Department of Agriculture and the University of Puerto Rico. Its basic aims are to aid in maintaining a prosperous agriculture, improve the quality of family life, and provide an adequate orientation and guidance for youth and for community resources development.

The informal education role of the Extension Service is developed through four main programs:

- (1) Educational Programs in Agriculture, Marketing and Natural Resources,
- (2) Home Economics and Nutrition,
- (3) Youth and 4-H Clubs, and the
- (4) Community Resources Development.

This administrative unit of the College of Agricultural Sciences has two main offices located at Mayagüez and Río Piedras, and five regional offices located in municipalities within the five agricultural regions of Puerto Rico (San Juan, Arecibo, Mayagüez, Ponce and Caguas). In addition, its 69 local offices fulfill its educational functions by serving the 78 municipalities of Puerto Rico. In each of the areas served by the Agricultural Extension Service, a citizen's committee cooperates with the professional personnel in the preparation and development of annual work plans for the agency, which correspond to the needs of the Puerto Rican people.

## **INTERNATIONAL PROGRAMS IN AGRICULTURE**

The Office of International Programs in Agriculture adds a fourth dimension to the role of the College of Agricultural Sciences. The office 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, particularly

by the Agency for International Development (AID). The Mayagüez Campus is one of the two land grant universities in the tropics, and the only one where Spanish is the native language (although the English language is also used intensively). For this and other reasons, the Campus provides a unique setting, and to some extent is in a privileged position, to serve as an international center for studies, training and research in the field of agriculture.

## **INTEGRATION OF ROLES**

The programmatic and administrative integration of formal agricultural teaching, research, and extension allows the College of Agricultural Sciences to use its human and physical resources to a maximum capacity.

It provides for the full participation of its professors, scientists, and specialists in more than one role, in accordance with the needs, interests, and values of the diverse clientele in agriculture and the rural sector served by the College of Agricultural Sciences.

## **MISSION AND RESPONSIBILITY OF THE COLLEGE**

The primary mission of the College of Agricultural Sciences is to help Puerto Rico realize its maximum potential for agricultural development and to contribute to the solution of many social, economic, environmental and cultural problems of concern to the people of Puerto Rico, the Caribbean Region and the USA. The vital development mission is carried out through the three closely related functions of formal higher education, research and extension.

The formal higher education program of College of Agricultural Sciences conducted through the Faculty of Agricultural Sciences are concerned with the education of young men and women to serve in the Puerto Rico growing and increasingly complex agricultural industry. The curricula for the different fields of study are structured to provide the business, technological and basic science education necessary for graduates to meet the ever changing needs of the diverse and highly specialized agriculture and related business and industries.

Instructional programs provide a strong foundation into the natural sciences, social sciences and humanities, and economics, which support curricula in agricultural sciences and food sciences and technology. The faculty trained in the basic and applied sciences pertaining to agriculture and related areas consists of scholars whose contributions to instruction, research and cooperative extension are recognized well beyond the reaches of this university.

In order to accomplish these aims, the Faculty of Agricultural Sciences offers programs of options leading to the Bachelor's Degree: 1) General Agriculture, 2) Agronomy-Crops, 3) Agronomy-Soils, 4) Horticulture, 5) Animal Industry, 6) Crop Protection, 7) Agribusiness, 8) Agricultural Education Teacher preparation, 9) Agricultural Extension Education, 10) Agricultural Economics, and 11) Mechanical Agricultural Technology. In addition the Faculty offers a non-degree program of study in Pre-Veterinary Sciences for those students who will be pursuing studies in veterinary medicine.

The Faculty of Agricultural Sciences also offers graduate courses and programs leading to the Master of Science Degree. Through that program and courses the students are able to specialize in the following discipline: 1) Agronomy-Crops, 2) Agronomy-Soils, 3) Animal Industry, 4) Agricultural Economics, 5) Agricultural Education, 6) Agricultural Extension Education, 7) Crop Protection, 8) Food Sciences and technology, 9) Horticulture. For more information regarding these programs, refer to the Graduate Studies Bulletin of Information.

## **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 Program in Agricultural Sciences, 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 term of full-time paid employment. The 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 to give students the opportunity to learn under real-world conditions.

**Student eligibility**

To be eligible for the Coop-program, students most meet the following minimum requirements.

- 2.5 GPA
- completed 2 years of study
- certain courses are pre-requisites by some employers

**Employment participation**

The coop organization commits, through a written agreement, to ensure student workplace learning and to evaluate the student’s work experience. While in coop work experience periods, students are considered as actual employees of the hiring organization. These include:

- 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 by it.
- Employers make hiring decisions.

**The Plan**

- The work periods are integrated with the curriculum, do not occur previous to the initial school term or after the final school term has been completed.
- The student must be registered in the cooperative education course assigned and will receive six (6) credit hours in free electives for a minimum of two (2) work experiences, one of which must take place during a regular semester.

**GENERAL PROGRAM IN AGRICULTURAL SCIENCES**

(Interdepartmental Program)

The great diversity of crop and animal enterprises that characterize the island's agriculture requires professionals well prepared

for identification and solve the multiple and varied problem which commonly affect agricultural enterprises, rural life, and economics and social development.

The curriculum for the Agricultural Sciences General Program is primarily designed to prepare students for employment as agronomists or professional agriculturists. Students that graduate from this program may work in positions that require a broad general knowledge and skills in agricultural sciences.

In contrast with programs in Vocational Agricultural Education and Agricultural Extension, that has a general focus, the General Program in Agricultural Sciences offer greater opportunities for studying the technical aspects of agriculture. The student of the General Program, if interested, may also take electives in Agricultural Education or Extension Programs. A three-credit summer practice is required as part of the curriculum.

Students that graduate from this program may work in positions that 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
*ENGL 3---	First year course in English	3
*SPAN 3101	Basic Course in Spanish	3
*MATH 3171	Pre-Calculus I	3
CHEM 3001	General Chemistry	4
PLSC 3005	Fundamentals of Crop Production	
	Or	
ANIN 3005	Fundamentals of Animal Science	4
PHED ----	Basic Course in Physical Education	$\frac{1}{18}$

Second Semester			ELECTIVES	**Electives	<u>2</u>
					18
*ENGL 3---	First year course in English	3			
*SPAN 3102	Basic Course in Spanish	3	<b>SUMMER SESSION</b>		
*MATH 3172	Pre-Calculus II	3			
CHEM 3002	General Chemistry	4	****	Summer Practicum	3
ANIN 3005	Fundamentals of Animal Science				
	Or		<b>FOURTH YEAR</b>		
PLSC 3005	Fundamentals of Crop Production	4	First Semester		
PHED ----	Basic Course in Physical Education	<u>1</u>	HUMA ----	***Elective Course in Humanities	3
		18	PLSC 4005	Physiological Principles of Crop Production	3
<b>SECOND YEAR</b>			AGEC 4019	Introduction to Farm Management	3
First Semester			***** ----Seminar		1
ENGL 3---	Second year course in English	3	ELECTIVES	**Electives	<u>6</u>
BIOL 3435	Elementary Botany	4			16
CHEM 3061	Fundamentals of Organic Chemistry and Biochemistry I	4	Second Semester		
ECON 3021	Principles of Economics I	3	HUMA ----	***Elective Course in Humanities	3
ELECTIVES	**Electives	<u>3</u>	***** ----Seminar		1
		17	ELECTIVES	**Electives	<u>12</u>
Second Semester					16
ENGL 3---	Second year course in English	3	Total Credits required for program: 142		
PHCS 3091	Elements of Physics	3	* Refer to the Academic Regulations section for information on Advanced Placement.		
PHCS 3092	Elements of Physics Laboratory	1	** Minimum requirements of electives. The General Agriculture Program requires a minimum of 26 credits in elective courses.		
CHEM 3062	Fundamentals of Organic Chemistry and Biochemistry II	4	At least 14 of these credits should be professional electives chosen among the course offerings of the Faculty of Agriculture, with the approval of the Dean of the Faculty. The twelve remaining courses correspond to free electives.		
AGED 3005	Agricultural Orientation	1	*** 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.		
BIOL 4015	General Zoology	3	**** Students may enroll in Summer Practice in any Department of the Faculty of Agriculture with the consent of the Department Director.		
ELECTIVES	**Electives	<u>3</u>	***** Students should enroll in seminars in the same department in which they take their Summer Practice.		
		18			
<b>THIRD YEAR</b>					
First Semester					
BIOL 3300	Genetics	3			
SOSC ----	***Elective Course in Social Sciences	3			
CROP 4006	Tropical Plant Pathology	3			
AGRO 3005	General Soils	3			
ANIN 4005	Veterinary Physiology	3			
CROP 4008	Agricultural Entomology	<u>3</u>			
		18			
Second Semester					
AGMT 4015	Agricultural Machinery I	3			
BIOL 3770	General Microbiology	3			
SOSC ----	***Elective Course in Social Sciences	3			
HORT 4009	Horticultural Crops	3			
ANIN 4010	Animal Feeding and Nutrition	4			

## DEPARTMENT OF AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

The Department of Agricultural Economics and Rural Sociology offer programs to obtain a degree in Bachelor of Agricultural Sciences with majors in Agricultural Economics or Agribusiness. Students majoring in Agricultural Economics must take courses in principles of agricultural economics, farm management, marketing of agricultural products, farm finance, economic theory and statistics. Electives may be taken in related courses. Students desiring careers in the Agribusiness option may take electives in business management.

The programs in agricultural economics prepare students for advanced training in agricultural economics and for careers in finance and credit, agribusiness and farm management, and public and private agencies that serve agriculture. The Department also offers a graduate program leading to the Master of Science in Agricultural Economics (see Graduate Bulletin of Information).

### Department Sponsored Organizations

The Agricultural Economist Students' Association, an affiliate of the American Agricultural Economics Association – student section, was established in 1984.

### 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
*ENGL 3---	First year course in English	3
*SPAN 3101	Basic Course in Spanish	3
*MATH 3171	Pre-Calculus I	3
CHEM 3001	General Chemistry	4
PLSC 3005	Fundamentals of Crop Production	
	or	
ANIN 3005	Fundamentals of Animal Science	4
PHED ----	Basic Course in Physical Education	<u>1</u>
		18

##### Second Semester

*ENGL 3---	First year course in English	3
*SPAN 3102	Basic Course in Spanish	3
*MATH 3172	Pre-Calculus II	3
CHEM 3002	General Chemistry	4
ANIN 3005	Fundamentals of Animal Science	
	Or	
PLSC 3005	Fundamentals of Crop Production	4
PHED ----	Basic Course in Physical Education	<u>1</u>
		18

#### SECOND YEAR

##### First Semester

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

##### Second Semester

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

**THIRD YEAR**

## First Semester

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

## Second Semester

ECON 3092	Macro-economic Theory	3
AGEC 4028	Agricultural Finance	3
AGMT 4015	Agricultural Machinery I	3
PLSC 4005	Physiological Principles in Crop Production	3
MSTA 3102	Applied Statistics II	3
SOSC ----	***Elective course in Social Sciences	<u>3</u>
		18

**SUMMER SESSION**

AGEC 4005	Summer Practicum	3
Or		
AGEC 4997	Supervised Professional Occup. Exp. for Coop Students	

**FOURTH YEAR**

## First Semester

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

## Second Semester

HUMA ----	***Elective course in Humanities	3
AGEC 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 Agriculture. 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	141

**FIRST YEAR**

## First Semester

Number	Course	Credits
*ENGL 3---	First year course in English	3
*SPAN 3101	Basic Course in Spanish	3
*MATH 3171	Pre-Calculus I	3
CHEM 3001	General Chemistry	4
PLSC 3005	Fundamentals of Crop Production	
	Or	
ANIN 3005	Fundamentals of Animal Science	4
PHED ----	Basic Course in Physical Education	<u>1</u>
		18

## Second Semester

*ENGL 3---	First year course in English	3
*SPAN 3102	Basic Course in Spanish	3
*MATH 3172	Pre-Calculus II	3
CHEM 3002	General Chemistry	4
ANIN 3005	Fundamentals of Animal Science	
	Or	
PLSC 3005	Fundamentals of Crop Production	4
PHED ----	Basic Course in Physical Education	<u>1</u>
		18

**SECOND YEAR**

First Semester

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

Second Semester

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

**THIRD YEAR**

First Semester

SOSC 3121	An Intro. to the Study of the Social Sciences	3
AGED 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

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

**SUMMER SESSION**

AGED 4005	Summer Practicum	3
Or		
AGED 4997	Supervised Professional Occup. Exp. for Coop Students	

**FOURTH YEAR**

First Semester

GERH 4006	Introduction to Organizations	3
AGED 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
AGED 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 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 among the offerings of the Department of Humanities with the consent 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, among the offerings of the different departments of the Faculty of Agriculture, 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.

**MARIANO ANTONI PADILLA**, *Researcher (Agricultural Economics)*, M.A., 1981, University of Puerto Rico, Río Piedras Campus, Ad-Honorem.

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

**VIVIAN CARRO FIGUEROA**, *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.

**RESTITUTO DEYNES SOTO**, *Specialist of Extension (Agricultural Economics)*, M.S., 1975, University of Puerto Rico, Mayagüez Campus.

**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**, *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.

**MADÉLINE 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.

**JOSE L. TROCHE DUCOT**, *Associate Researcher*, M.S., 1984, University of Puerto Rico.

**COURSES OF INSTRUCTION****DEPARTMENT OF AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY****UNDERGRADUATE COURSES**

AGEC 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.

AGEC 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.

AGEC 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.

AGEC 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.

AGEC 4006. INTRODUCTION TO CONSUMER ECONOMICS. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021 or AGECE 3005.

An examination of topics that illustrate the ways in which consumers make decisions. Emphasis is given to the use of economic principles with respect to use of credit, and the purchase of food, housing, medical plans, education, automobiles, insurance, recreation, and other consumption items.

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

AGEC 4008. AGRICULTURAL COOPERATIVES. Two credit hours. Two hours of lecture per week. Prerequisite: ECON 3021.

Fundamental features of the cooperative movement, with emphasis on farmers cooperatives. Includes aspects of principles, organization, management, problems, limitation and accomplishments of agricultural cooperatives.

AGEC 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.

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

AGEC 4016. INTRODUCTION TO FARM APPRAISAL. Three credit hours. Three hours

of lecture per week.

Study of the factors that affect the value of farm land, principles and methods of farm appraisal, and preparation of appraisal reports.

AGEC 4017-4018. SPECIAL PROBLEMS IN AGRICULTURAL ECONOMICS. One to three credit hours. One to three work periods per week. Prerequisite: Consent of the Department Director.

Problems in any of the various phases of agricultural economics will be assigned or may be selected, subject to the approval of the professor in charge.

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

AGEC 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.

AGEC 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.

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

AGEC 4029. AGRIBUSINESS MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: AGE 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.

AGEC 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, and the ability to work with people.

Graduates of 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 cumulative grade average of 2.00 or better, approval of the head of the department, and in addition may be required to take certain physical and psychological examination or meet other criteria for admission. Students majoring 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>
	142

#### FIRST YEAR

##### First Semester

Number	Course	Credits
*ENGL 3---	First year course in English	3
*SPAN 3101	Basic Course in Spanish	3
*MATH 3171	Pre-Calculus I	3
CHEM 3001	General Chemistry	4
PLSC 3005	Fundamentals of Crop Production	
	or	
ANIN 3005	Fundamentals of Animal Science	4
PHED ----	Basic Course in Physical Education	<u>1</u>
		18

##### Second Semester

*ENGL 3---	First year course in English	3
*SPAN 3102	Basic Course in Spanish	3
*MATH 3172	Pre-Calculus II	3
CHEM 3002	General Chemistry	4



ANIN 3005	Fundamentals of Animal Science	
	or	
PLSC 3005	Fundamentals of Crop Production	4
PHED ----	Basic Course in Physical Education	<u>1</u>
		18

**SECOND YEAR**

First Semester

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

Second Semester

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

**THIRD YEAR**

First Semester

AGMT 4015	Agricultural Machinery I	3
CROP 4006	Tropical Plant Pathology	3
ANIN 4005	Veterinary Physiology	3
AGED 4019	Introduction to Farm Business Administration	3
AGED 4005	Methods in Teaching Vocational Agriculture	3
HUMA ----	***Elective course in Humanities	<u>3</u>
		18

Second Semester

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

**FOURTH YEAR**

First Semester

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

Second Semester

CROP 4008	Agricultural Entomology	3
AGED 4015	Youth Organization and Programs	3
AGED 4017	Agricultural Education Seminar	1
AGED 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 Extension 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
*ENGL 3---	First year course in English	3
*SPAN 3101	Basic Course in Spanish	3
*MATH 3171	Pre-Calculus I	3
CHEM 3001	General Chemistry	4

PLSC 3005	Fundamentals of Crop Production		AGMT 4015	Agricultural Machinery I	3
	or		AGED 4015	Youth Organization and Programs	3
ANIN 3005	Fundamentals of Animal Science	4	EXAG 4006	Extension Teaching Methods and Techniques	3
PHED ----	Basic Course in Physical Education	$\frac{1}{18}$	AGRO 4037	Soil Fertility and Fertilizers	3
			HUMA ----	***Elective course in Humanities	$\frac{3}{18}$

## Second Semester

*ENGL 3---	First year course in English	3
*SPAN 3102	Basic Course in Spanish	3
*MATH 3172	Pre-Calculus II	3
CHEM 3002	General Chemistry	4
ANIN 3005	Fundamentals of Animal Science	
	or	
PLSC 3005	Fundamentals of Crop Production	4
PHED ----	Basic Course in Physical Education	$\frac{1}{18}$

**SECOND YEAR**

## First Semester

ENGL 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
AGED 3005	Agricultural Orientation	1
SOSC ----	***Elective course in Social Sciences	$\frac{3}{17}$

## Second Semester

ENGL 3---	Second year course in English	3
PHCS 3091	Elements of Physics	3
PHCS 3092	Elements of Physics Laboratory	1
BIOL 4015	General Zoology	3
HORT 3005	Plant Propagation	3
SOSC ----	***Elective course in Social Sciences	$\frac{3}{16}$

**THIRD YEAR**

## First Semester

CROP 4006	Tropical Plant Pathology	3
ANIN 4005	Veterinary Physiology	3
EXAG 4005	Extension Philosophy and Objectives	3
HUMA ----	***Elective course in Humanities	3
ELECTIVES	**Electives	$\frac{6}{18}$

## Second Semester

PLSC 4005	Physiological Principles of Crop Production	3
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**SUMMER SESSION**

EXAG 4007	Summer Practice	3
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**FOURTH YEAR**

## First Semester

ANIN 4036	Farm Animals Diseases	3
CROP 4008	Agricultural Entomology	3
AGED 4007	Marketing of Farm Products	3
AGED 4026	Introduction to Rural Sociology	3
ELECTIVES	**Electives	$\frac{6}{18}$

## Second Semester

EXAG 4009	Extension Education Seminar	1
HORT 4009	Horticultural Crops	3
HORT 4008	Vegetable Gardening	3
AGED 4019	Introduction to Farm Management	3
ELECTIVES	**General Electives	$\frac{6}{16}$

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 Agriculture, 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**

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

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

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

**JUAN F. GONZALEZ**, *Instructor*, MS, 1985, University of Puerto Rico at Mayagüez.

## COURSES OF INSTRUCTION

### DEPARTMENT OF AGRICULTURAL EDUCATION

#### UNDERGRADUATE COURSES

**AGED 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.

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

**AGED 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.

**AGED 4006. CURRICULUM DEVELOPMENT.** Three credit hours. Three

hours of lecture per week. Prerequisite: AGED 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.

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

**AGED 4008. SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAMS.** Three credit hours. Three hours of lecture per week. Prerequisite: AGED 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.

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

**AGED 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.

AGED 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.

AGED 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.

AGED 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: AGED 4005, AGED 4006. Co-requisite: AGED 4007.

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

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

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

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

Prerequisite: Consent of the Director of the Department.

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**

AGEX 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.

AGEX 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.

AGEX 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.

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

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

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

AGEX 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.

AGEX 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 of the major 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 the Mechanical Technology in Agriculture Curriculum is the same as that prescribed in most of the other undergraduate curriculums 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. The professional electives are chosen from the course offerings of the Agricultural and Biosystems Engineering Department and related areas. 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 the 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 TECHNOLOGY IN AGRICULTURE CURRICULUM

##### FIRST YEAR

###### First Semester

Number	Course	Credits
*ENGL 3---	First year course in English	3
*SPAN 3101	Basic Course in Spanish	3
*MATH 3171	Pre-Calculus I	3
CHEM 3001	General Chemistry	4
BIOL 3435	Elementary Botany	4
AGED 3005	Agricultural Orientation	1
		18

###### Second Semester

*ENGL 3---	First year course in English	3
*SPAN 3102	Basic Course in Spanish	3
*MATH 3172	Pre-Calculus II	3
CHEM 3002	General Chemistry	4
BIOL 4015	General Zoology	3
PHED ----	Physical Education Elective	1
		17

##### SECOND YEAR

###### First Semester

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

## Second Semester

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

**THIRD YEAR**

## First Semester

AGEC 4019	Introduction to Farm Management	3
AGMT 4009	Agricultural Power	3
SOSC ----	***Elective course in Social Sciences	3
PLSC 4005	Physiological Principles of Crop Production	3
CIEG 4005	Agricultural Surveying	3
AGEC 4007	Marketing of Agricultural Products	<u>3</u>
		18

## Second Semester

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

**SUMMER SESSION**

AGMT 4008	Summer Field Practice	3
Or		
AGMT 4990	Supervised Professional Occup. Exp. for Coop Students	

**FOURTH YEAR**

## First Semester

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

## Second Semester

AGEC 4028	Agricultural Finance	3
AGMT 4037	Seminar in Mechanized Agriculture	1
HUMA ----	***Elective course in Humanities	3
ELECTIVES	**Electives	<u>2</u>
		16

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. In these 24 credits are included 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**, *Assistant 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.

**FERNANDO PEREZ MUÑOZ**, *Associate Professor*, Ph.D., 1996, Iowa 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

AGEG 4045. FIELD PRACTICE IN AGRICULTURAL ENGINEERING. Three credit hours. Six weeks of practice during summer. Prerequisite: Fourth year student.

Field experience in agricultural engineering during the summer session at the end of the fourth year of studies. The course will be offered in cooperation with governmental agencies or private industry. A written report is required.

AGEG 4046. SOIL AND WATER CONSERVATION ENGINEERING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: AGRO 3005, CIEG 4005 and GEEG 4015.

Agricultural hydrology; analysis and design of erosion and flood control structures; terraces, waterways, dams, reservoirs, spillways, and drop inlets; land leveling and smoothing.

AGEG 4047. AGRICULTURAL POWER ENGINEERING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: GEEG 4011 and MEEG 4045.

Application of mechanics and thermodynamics to problems of energy conversion and transmission in agricultural production and processing; correlation of principles of design, engine characteristics, and basic configuration of tractive and stationary power units.

AGEG 4048. AGRICULTURAL STRUCTURES DESIGN. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: GEEG 3011, GEEG 4012 and ANIN 3005.

Functional and structural design of farm buildings; materials, cost estimates, and specifications.

AGEG 4049. SEMINAR IN AGRICULTURAL ENGINEERING. One credit hour. One hour of seminar per week. Prerequisite: AGEN 4045.

Oral reports and general discussion of the experiences and observations gathered during the summer field practice. Revision and discussion of current research and developments in Agricultural Engineering.

AGEG 4056. AGRICULTURAL MACHINERY ENGINEERING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: GEEG 4012, GEEG 4015, and PLSC 3005.

Design and functional, mechanical, and economic analysis of selected machines and combination of machines used in agricultural production and processing.

AGEG 4057. RURAL ELECTRIFICATION ENGINEERING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: ELEG 4005 and ANIN 3005.

Electrical and electronic fundamentals applied to agricultural production and rural living; selection, installation, and operation of electrical equipment for agricultural applications.

AGEG 4058. AGRICULTURAL ENVIRONMENTAL ENGINEERING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: ANIN 3005, MEEG 4045, and ELEG 4075.

Thermodynamic principles related to agricultural engineering processes and operations; properties of air and air-vapor mixtures; refrigeration; solar radiation; environmental requirements for plants, animals, and agricultural products.

AGEG 4059. AGRICULTURAL MACHINERY SYSTEMS ANALYSIS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: GEEG 3025 and PLSC 3005.

Analysis of current agricultural machinery systems; adaptation and planning for sequential operations; machinery for unique and alternate production and harvesting systems; operational management.

AGEG 4065. AGRICULTURAL IRRIGATION AND DRAINAGE ENGINEERING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: AGRO 3005, CIEG 4005 and GEEG 4015.

Soil-water-plant relationships, consumptive use, application efficiencies; salinity problems, pumps and pumping. Principles of design, construction, operation, and maintenance of agricultural drainage and irrigation systems.

AGEG 4066. AGRICULTURAL PROCESS ENGINEERING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: ELEG 4075 and MEEG 4045.

Engineering elements in agricultural products processing and materials handling; thermodynamics and mass transfer principles applied to agricultural processes.

AGEG 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.

AGEG 4996. AGRICULTURAL ENGINEERING PROJECTS. Two to four credit hours.

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

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

AGMT 4006. WOOD SHOP PRACTICES. Two credit hours. One hour of lecture and one three-hour laboratory per week.

Selection, care and use of hand power tools, shop skills including farm carpentry pipe fitting, cold metal work, tool fitting and painting, and farm shop safety.

AGMT 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.

AGMT 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.

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



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

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

AGMT 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.

AGMT 4018. COMPUTER PROGRAMMING IN AGRICULTURE. Two credit hours. Two hours of lecture per week. Prerequisite: MATH 3172.

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

AGMT 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.

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

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

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

AGMT 4028. FARM SERVICE BUILDINGS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: ANIN 3005 and GEEG 3011 and (PHCS 3091 or PHCS 3151 or PHCS 3171).

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

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

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

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

AGMT 4036-4037. SEMINAR IN MECHANIZED AGRICULTURE. One credit hour per semester. One meeting per week each semester. Prerequisite: AGMT 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.

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

AGMT 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.

AGMT 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.

AGMT 4991. 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 research, laboratories, or field trips will be assigned on an individual basis.

AGMT 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**

AGEG 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.

AGMT 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.

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

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

AGMT 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.

AGMT 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.

AGMT 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.

AGMT 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 the majors 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 the same for all students in the Agronomy and Soil Sciences programs. Starting in the third year, students begin taking professional electives of 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 credits summer practicum. The Department also offers a study program leading to the degree of Master in Science with majors in Agronomy and Soils Sciences (see Graduate Studies Bulletin of Information).

### PROGRAMS OF STUDY

#### CURRICULUM IN AGRONOMY

##### FIRST YEAR

###### First Semester

Number	Course	Credits
*ENGL 3---	First year course in English	3
*SPAN 3101	Basic Course in Spanish	3
*MATH 3171	Pre-Calculus I	3
CHEM 3001	General Chemistry	4
PLSC 3005	Fundamentals of Crop Production	
	or	
ANIN 3005	Fundamentals of Animal Science	4
PHED ----	Basic Course in Physical Education	$\frac{1}{18}$

###### Second Semester

*ENGL 3---	First year course in English	3
*SPAN 3102	Basic Course in Spanish	3
*MATH 3172	Pre-Calculus II	3
CHEM 3002	General Chemistry	4
ANIN 3005	Fundamentals of Animal Science	
	or	
PLSC 3005	Fundamentals of Crop Production	4
PHED ----	Basic Course in Physical Education	$\frac{1}{18}$

**SECOND YEAR**

## First Semester

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

## Second Semester

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

**THIRD YEAR**

## First Semester

BIOL 3300	Genetics	3
HUMA ----	***Elective course in Humanities	3
PLSC 4005	Physiological Principles of Crop Production	3
AGRO 4037	Soil Fertility and Fertilizers	3
ELECTIVES	**Electives	<u>6</u>
		18

## Second Semester

BIOL 3770	General Microbiology	3
AGMT 4015	Agricultural Machinery I	3
AGEC 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 4997	Supervised Professional Occup. Exp. for Coop Students	

**FOURTH YEAR**

## First Semester

SOSC ----	***Elective course in Social	
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	Sciences	3
CROP 4006	Tropical Plant Pathology	3
CROP 4017	Weed Control	3
AGRO 4019	Seminar	1
ELECTIVES	**Electives	<u>6</u>
		16
Second Semester		
SOSC ----	***Elective course in Social Sciences	3
CROP 4008	Agricultural Entomology	3
AGRO 4025	Seminar	1
ELECTIVES	**Electives	<u>9</u>
		16

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.

**CURRICULUM IN SOIL SCIENCES****FIRST YEAR**

## First Semester

Number	Course	Credits
*ENGL 3---	First year course in English	3
*SPAN 3101	Basic Course in Spanish	3
*MATH 3171	Pre-Calculus I	3
CHEM 3001	General Chemistry	4
PLSC 3005	Fundamentals of Crop Production	
	or	
ANIN 3005	Fundamentals of Animal Science	4
PHED ----	Basic Course in Physical Education	<u>1</u>
		18

## Second Semester

*ENGL 3---	First year course in English	3
*SPAN 3102	Basic Course in Spanish	3
*MATH 3172	Pre-Calculus II	3

CHEM 3002	General Chemistry	4
ANIN 3005	Fundamentals of Animal Science	
	or	
PLSC 3005	Fundamentals of Crop Production	4
PHED ----	Basic Course in Physical Education	<u>1</u>
		18

**SECOND YEAR**

First Semester

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

Second Semester

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

**THIRD YEAR**

First Semester

BIOL 3300	Genetics	3
HUMA ----	***Elective course in Humanities	3
PLSC 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
AGMT 4015	Agricultural Machinery I	3
AGED 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 Occup. Exp. for Coop Students	

**FOURTH YEAR**

First Semester

SOSC ----	***Elective course in Social Sciences	3
CROP 4006	Tropical Plant Pathology	3
CROP 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
SOSC ----	***Elective course in Social Sciences	3
CROP 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.

**NANCY CAVALLARO**, Professor, Ph.D., 1981, Cornell University.

**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**, *Associate Professor*, Ph.D., 1992, The Pennsylvania State University.

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

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

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

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

**RUSTY SMITH**, *Ad-Honorem*, Ph.D., 1986, Univ. of Illinois.

**ANTONIO SOTOMAYOR RIOS**, *Researcher*, Ph.D., 1964, Purdue University.

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

**ELVIN ROMAN PAOLI**, *Assistant 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.

## 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: CHEM 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: PLSC 3005 and AGRO 3005.

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

**AGRO 4015. 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 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: PLSC 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: PLSC 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 PLSC 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: PLSC 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.

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: CHEM 3062, (BIOL 3015 or BIOL 3300), and either BIOL 3770 or CROP 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**

PLSC 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.

PLSC 4005. PHYSIOLOGICAL PRINCIPLES OF CROP PRODUCTION. Three credit hours. Two hours of lecture and one three-hour



laboratory per week. Prerequisites: BIOL 3435 and CHEM 3002.

Principles of the vital processes of crops: growth, differentiation and development. Mineral nutrition, plant-water relationships, photosynthesis, respiration, photoperiodism and plant hormones.

PLSC 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 of studies is designed for the students to acquire knowledge and develop abilities and experience in the areas of the animal sciences related to domestic animal production, covering different 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. The students enrolled in the program receive courses in several disciplines, such as physiology, 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, the students are awarded the degree of Bachelor of Science in Agriculture (BSA) with major in Animal Industry.

The Animal Industry Program prepares the student 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 to serve as private consultants or through the Agricultural Extension Service or other governmental agencies.. During the course of their studies, students are also strongly encouraged to venture as private entrepreneurs.

The Pre-Veterinary Program is designed to provide those students wishing to continue their studies towards a Doctor of Veterinary Medicine (DVM) degree, with all the coursework in the sciences that are required for admission to the accredited schools of Veterinary Medicine in the United States. This is a three-year, non-degree program but, upon completion, students receive a Certificate. Those students that do not gain admission to a school of veterinary medicine can easily transfer to the program in Animal Industry and obtain a BSA.

The Animal Industry Department also offers a graduate study program leading to the degree of Master of Science in Animal Industry. For additional information about this program, consult the Bulletin of Graduate Studies.

## PROGRAMS OF STUDY

### ANIMAL INDUSTRY CURRICULUM

#### FIRST YEAR

##### First Semester

Number	Course	Credits
*ENGL 3---	First year course in English	3
*SPAN 3101	Basic Course in Spanish	3
*MATH 3171	Pre-Calculus I	3
CHEM 3001	General Chemistry	4
PLSC 3005	Fundamentals of Crop Production	
	or	
ANIN 3005	Fundamentals of Animal Science	4
PHED ----	Elective Course in Physical Education	$\frac{1}{18}$

##### Second Semester

*ENGL 3---	First year course in English	3
*SPAN 3102	Basic Course in Spanish	3
*MATH 3172	Pre-Calculus II	3
CHEM 3002	General Chemistry	4
ANIN 3005	Fundamentals of Animal Science	
	or	
PLSC 3005	Fundamentals of Crop Production	4
PHED ----	Elective Course in Physical Education	$\frac{1}{18}$

**SECOND YEAR**

## First Semester

ENGL 3---	Second year course in English	3
BIOL 3435	Elementary Botany	4
CHEM 3061	Fundamentals of Organic Chemistry and Biochemistry I	4
BIOL 4015	General Zoology	3
ECON 3021	Principles of Economics I	3
AGED 3005	Agricultural Orientation	<u>1</u>
		18

## Second Semester

ENGL 3---	Second year course in English	3
PHCS 3091	Elements of Physics	3
PHCS 3092	Elements of Physics Laboratory	1
CHEM 3062	Fundamentals of Organic Chemistry and Biochemistry II	4
ANIN 4005	Veterinary Physiology	3
AGRO 3005	General Soils	<u>3</u>
		17

**THIRD YEAR**

## First Semester

BIOL 3770	General Microbiology	3
BIOL 3300	Genetics	3
SOSC ----	***Elective course in Social Sciences	3
ANIN 4010	Animal Feeding and Nutrition	4
ELECTIVES	**Electives	<u>3</u>
		16

## Second Semester

PLSC 4005	Physiological Principles in Crop Production	3
AGRO 4046	Agrostology, Forages and Pastures Management	3
SOSC ----	***Elective course in Social Sciences	3
AGEC 4019	Introduction to Farm Management	3
ELECTIVES	**Elective	3
ANIN 4006	Reproduction of Farm Animals	<u>3</u>
		18

**SUMMER SESSION**

ANIN 4007	Summer Practicum	3
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**FOURTH YEAR**

## First Semester

HUMA ----	***Elective course in Humanities	3
ANIN 4037	Seminar	1
ELECTIVES	**Electives	<u>12</u>
		16

## Second Semester

HUMA ----	***Elective course in Humanities	3
ANIN 4038	Seminar	1
ELECTIVES	**Electives	8
ANIN 4019	Animal Breeding	3
AGMT 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 Electives selected from those offered by Department (ANIN code) or closely related areas, which require approval from the Director of the Department of Animal Industry. The remaining 12 credits are free electives.

\*\*\*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
*ENGL 3---	First year course in English	3
MATH 3171	Pre-Calculus I	3
CHEM 3001	General Chemistry	4
BIOL 3021	Animal Biology	3
ANIN 3005	Fundamentals of Animal Science	4
PHED ----	Course in Physical Education	<u>1</u>
		18

## Second Semester

*ENGL 3---	First year course in English	3
*MATH 3172	Pre-Calculus II	3
CHEM 3002	General Chemistry	4

BIOL 3022	Animal Biology	3
ECON 3021	Principles of Economics I	3
PHED ----	Course in Physical Education	$\frac{1}{17}$

**SECOND YEAR**

First Semester

ENGL 3---	Second year course in English	3
MATH 3021	Introductory Calculus	3
BIOL 3435	Elementary Botany	4
CHEM 3461 and CHEM 3462	Organic Chemistry	4
ANIN 4005	Veterinary Physiology	3
ANIN 4037	Seminar	$\frac{1}{18}$

Second Semester

ENGL 3---	Second year course in English	3
MATH 3022	Introductory Calculus	3
ANIN 4010	Animal Feeding and Nutrition	4
CHEM 3463 and CHEM 3464	Organic Chemistry	4
PHCS 3151	Modern College Physics	3
PHCS 3153	Modern College Physics Laboratory	$\frac{1}{18}$

**THIRD YEAR**

First Semester

*SPAN 3101	Basic Course in Spanish	3
ENGL 3236	Technical Report Writing	3
ANIN 4025	Dairy Cattle and Milk Production	
	or	
ANIN 4017	Introduction to Poultry Production	3
HUMA ----	**Elective course in Humanities	3
PHCS 3152	Modern College Physics	3
PHCS 3154	Modern College Physics Laboratory	1
SOSC ----	**Elective course in Social Sciences	$\frac{3}{19}$

Second Semester

*SPAN 3102	Basic Course in Spanish	3
BIOL 3770	General Microbiology	3
CHEM 5071	General Biochemistry	3
BIOL 3300	Genetics	3
BIOL 4027	Introduction to Vertebrate Embryology	3
SOSC ----	**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 (ANIN 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**, *Associate Specialist*, M.S., 1986, University of Puerto Rico.

**JOSE R. LATORRE ACEVEDO**, *Professor*, Ph.D., 1986, University of Arkansas.

**MONSERRATE LOPEZ BENIQUEZ**, *Associate Specialist*, M.S., 1991, University of Puerto Rico.

**JAIME MOYA GUZMAN**, *Assistant Researcher*, Ph.D., 1986, Texas A&M University.

**CARLOS NAZARIO PAGAN**, *Assistant Specialist*, Ph.D., 1988, North Carolina State University.

**WILMA PAGÁN PADILLA**, *Assistant Researcher*, Ph.D., 1989, Ohio State University.

**JOSE PANTOJA LOPEZ**, *Associate 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**, *Associate Specialist*, M.S., 1983, Louisiana State University.

**PAUL F. RANDEL FOLDING**, *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, School of Veterinary Medicine.

**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.

**VICTOR SIBERIO TORRES**, *Professor*, Ph.D., 1996, Michigan State University.

**SAUL WISCOVITCH TERUEL**, *Assistant Specialist*, M.S., 1985, University of Puerto Rico.

## COURSES OF INSTRUCTION

### DEPARTMENT OF ANIMAL INDUSTRY

#### UNDERGRADUATE COURSES

ANIN 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.

ANIN 3017. RABBIT PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: ANIN 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.

ANIN 4005. VETERINARY PHYSIOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: ANIN 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.

ANIN 4006. REPRODUCTION OF FARM ANIMALS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: ANIN 3005 and ANIN 4005.

The anatomy, physiology and pathology of the reproductive system of farm animals, including artificial insemination.

ANIN 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.

ANIN 4008. MILK AND MILK PRODUCTS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: ANIN 3005.

A general course covering the composition and properties of milk, and the manufacture of dairy products.

ANIN 4009. MARKET MILK. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: ANIN 4008.

Processing and distribution of market milk and related products. Field trips required.

ANIN 4010. ANIMAL FEEDING AND NUTRITION. Four credit hours. Three hours of

lecture and one three-hour laboratory per week. Prerequisite: ANIN 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.

ANIN 4016. BEEKEEPING. Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Breeds and behavior of bees, management and agriculture production techniques. Field trips required.

ANIN 4017. POULTRY PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: ANIN 3005.

The principles and practices of poultry breeding, feeding, incubation, brooding, rearing, housing, and sanitation.

ANIN 4018. INTRODUCTION TO RESEARCH IN ANIMAL SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisite: ANIN 3005 and (MATH 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.

ANIN 4019. ANIMAL BREEDING. Three credit hours. Three hours of lecture per week. Prerequisite: ANIN 3005 and either BIOL 3015 or BIOL 3300.

The application of genetics to the problems and methods of livestock's improvement.

ANIN 4020. ARTIFICIAL INSEMINATION IN DOMESTIC ANIMALS. Three credit hours.

One hour of lecture and one six-hour laboratory per week. Prerequisite: ANIN 4006.

Theory and intensive practice of artificial insemination in domestic animals.

ANIN 4025. DAIRY CATTLE AND MILK PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: ANIN 3005.

A study of the various phases of dairy cattle and milk production.

ANIN 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.

ANIN 4028. INTRODUCTION TO HORSE PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: ANIN 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.

ANIN 4029. SWINE AND PORK PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: ANIN 3005.

A study of the various phases of swine production, including butchering, cutting and curing of pork.

ANIN 4035. BEEF PRODUCTION. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: ANIN 3005.

A study of the various phases of beef cattle production, including butchering, cutting and curing of beef.

ANIN 4036. DISEASES OF FARM ANIMALS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: ANIN 4005.

The most common diseases of farm animals in Puerto Rico; their prevention, treatment, and sanitary measure.

ANIN 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.

ANIN 4038. SEMINAR. One credit hour. One meeting per week. Prerequisite: ANIN 4037.

Studies and discussions of research work and other topics of interest in Animal Industry.

ANIN 4040. BEHAVIOR OF FARM ANIMALS. Three credit hours. Three hours of lecture per week. Prerequisite: ANIN 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.

ANIN 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**

ANIN 5346. DAIRY BY-PRODUCTS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: ANIN 4008.

The manufacture of ice cream, cheese, and butter.

ANIN 5347. VETERINARY PARASITOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory

per week. Prerequisites: ANIN 3005 and (BIOL 4015 or BIOL 3022 or BIOL 3052).

Morphology, life cycle, and control of farm animals' parasites.

ANIN 5355. ADVANCED BEEKEEPING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: ANIN 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.

ANIN 5357. SCIENCE AND TECHNOLOGY OF FRESH MEATS. Three credit hours. Two hours of lecture and one four-hour laboratory per week. Prerequisite: ANIN 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 the degree of Bachelor of Science in Agriculture with specialization in Crop Protection. The Department program 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 discipline of entomology, nematology, phytopathology, and weed science in a global approach aimed at protecting crop plant health.

The first year of the study program in crop protection is the same as in most of the other undergraduate curricula in Agricultural Sciences. Specialization gradually begins during the second year. The student, in consultation with his or her advisor, selects 12 credits of professional electives and 12 of free electives. The professional electives are chosen mainly from the Crop Protection Department course offerings.

During the summer between the third and fourth year the students participate in a three-credit summer field practicum in 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 (see Graduate Bulletin of Information).

**PROGRAM OF STUDY**

**CURRICULUM IN CROP PROTECTION**

**FIRST YEAR**

First Semester

Number	Course	Credits
*SPAN 3101	Basic Course in Spanish	3
*ENGL 3---	First year course in English	3
CHEM 3001	General Chemistry	4
*MATH 3171	Pre-Calculus I	3
PLSC 3005	Fundamentals of Crop Production	
	or	
ANIN 3005	Fundamentals of Animal Science	4
PHED ----	Basic Course in Physical Education	$\frac{1}{18}$

Second Semester

*SPAN 3102	Basic Course in Spanish	3
*ENGL 3---	First year course in English	3
CHEM 3002	General Chemistry	4
*MATH 3172	Pre-Calculus II	3
ANIN 3005	Fundamentals of Animal Science	
	or	
PLSC 3005	Fundamentals of Crop Production	4
PHED ----	Basic Course in Physical Education	$\frac{1}{18}$

**SECOND YEAR**

First Semester

ENGL 3---	Second year course in English	3
CHEM 3061	Fundamentals of Organic Chemistry and Biochemistry I	4
AGRO 3005	General Soils	3
PHCS 3091	Elements of Physics	3
PHCS 3092	Elements of Physics Laboratory	1

BIOL 3435	Elementary Botany	$\frac{4}{18}$
Second Semester		
ENGL 3---	Second year course in English	3
CHEM 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
AGED 3005	Agricultural Orientation	$\frac{1}{17}$

**THIRD YEAR**

First Semester

CROP 4016	Agricultural Bacteriology	3
CROP 4006	Tropical Phytopathology	3
BIOL 3300	Genetics	3
PLSC 4005	Physiological Principles of Crop Production	3
SOSC ----	***Elective course in Social Sciences	3
ELECTIVES	**Free electives	$\frac{3}{18}$

Second Semester

CROP 4008	Agricultural Entomology	3
AGEC 4019	Introduction to Farm Management	3
AGMT 4015	Agricultural Machinery I	3
SOSC ----	***Elective course in Social Sciences	3
ELECTIVES	**Professional Electives	$\frac{6}{18}$

**SUMMER SESSION**

CROP 4025	Summer Practicum	3
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**FOURTH YEAR**

First Semester

CROP 4017	Weed Control	3
CROP 4018	Introduction to Agronomy	3
CROP 4019	Pesticides and Their Use in Agriculture	3
HUMA ----	***Elective course in Humanities	3
ELECTIVES	**Professional Electives	$\frac{6}{18}$

Second Semester

PLSC 4007	Plant Breeding	3
CROP 4026	Seminar	1
HUMA ----	***Elective course in	

	Humanities	3
ELECTIVES	**Free Electives	9
		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.

**RODRIGO ECHAVEZ BADEL**, *Researcher*, M.S., 1977, University of Puerto Rico - Mayagüez Campus.

**ROSA A. FRANQUI RIVERA**, *Associate Researcher*.

**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.

**LUIS F. MARTORELL**, *Emeritus Professor*, Ph.D., 1943, Ohio State University.

**LYDIA I. RIVERA VARGAS**, *Associate Professor*, Ph.D., 1994, Ohio State University.

**RITA L. RODRIGUEZ**, *Researcher*, Ph.D., 1993, Cornell University.

**ROCIO DEL P. RODRIGUEZ**, *Researcher*, Ph.D., 1988, Pennsylvania State 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

**CROP 4006. TROPICAL PHITOPATHOLOGY.** 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.

**CROP 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.

**CROP 4016. AGRICULTURAL BACTERIOLOGY.** Three credit hours. Two hours of lecture and one three-hour laboratory



per week. Prerequisites: CHEM 3002 and PLSC 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.

CROP 4017. WEED CONTROL. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: PLSC 3005 and CHEM 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.

CROP 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.

CROP 4019. PESTICIDES AND THEIR USE IN AGRICULTURE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CHEM 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.

CROP 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.

CROP 4026. SEMINAR. One credit hour. One-hour meeting per week.

Review and discussion of the recent literature in crop protection.

CROP 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.

CROP 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 of 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

CROP 5005. PHYTOPATHOGENIC FUNGI. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CROP 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.

CROP 5006. INSECTS OF TROPICAL CROPS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CROP 4008 or PLSC 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 the degree of Bachelor of Science 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 the different 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. (See Graduate Bulletin of Information).

### PROGRAM OF STUDY

#### CURRICULUM IN HORTICULTURE

##### FIRST YEAR

###### First Semester

Number	Course	Credits
*ENGL 3---	First year course in English	3
*SPAN 3101	Basic Course in Spanish	3
*MATH 3171	Pre-Calculus I	3
CHEM 3001	General Chemistry	4
BIOL 3435	Elementary Botany	4
AGED 3005	Agricultural Orientation	$\frac{1}{18}$

###### Second Semester

*ENGL 3---	First year course in English	3
*SPAN 3102	Basic Course in Spanish	3
*MATH 3172	Pre-Calculus II	3
CHEM 3002	General Chemistry	4

PLSC 3005	Fundamentals of Crop Production	4
PHED ----	Basic course in Physical Education	$\frac{1}{18}$

##### SECOND YEAR

###### First Semester

ENGL 3---	Second year course in English	3
CHEM 3061	Fundamentals of Organic Chemistry and Biochemistry I	4
AGRO 3005	General Soils	3
BIOL 4015	General Zoology	3
HORT 3005	Plant Propagation	3
PHED ----	Basic course in Physical Education	$\frac{1}{17}$

###### Second Semester

ENGL 3---	Second year course in English	3
PHCS 3091	Elements of Physics	3
PHCS 3092	Elements of Physics Laboratory	1
CHEM 3062	Fundamentals of Organic Chemistry and Biochemistry II	4
HORT 4005	Ornamental Horticulture	3
ANIN 3005	Fundamentals of Animal Science	$\frac{4}{18}$

##### THIRD YEAR

###### First Semester

BIOL 3300	Genetics	3
PLSC 4005	Physiological Principles of Crop Production	3
AGMT 4015	Agricultural Machinery I	3
PROC 4006	Tropical Plant Pathology	3
SOSC ----	***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
SOSC ----	***Elective course in Social Sciences	3
ELECTIVES	**Electives	$\frac{6}{18}$

**SUMMER SESSION**

HORT 4006	Summer Practicum	3
Or		
HORT 4995	Supervised Professional Occup. Exp. 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	<u>8</u>
		17

## Second Semester

HORT 4045	Starchy Crops	4
HORT 4028	Seminar	1
AGEC 4019	Introduction to Farm Management	3
HORT 4008	Vegetable Crops	3
HUMA ----	***Elective course in Humanities	3
ELECTIVES	**Electives	<u>3</u>
		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**, *Associate Researcher*, Ph.D., 1992, Michigan State University.

**ARTURO CEDEÑO MALDONADO**, *Researcher*, Ph.D., 1973, University of California, Riverside.

**FEIKO H. FERWERDA**, *Assistant Researcher*, M.S., 1987, 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.

**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: PLSC 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 4005. ORNAMENTAL HORTICULTURE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: PLSC 3005.

Theory and practice of the major fields of ornamental horticulture: floriculture, nursery production, turfgrass 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: PLSC 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: PLSC 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: PLSC 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: PLSC 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: PLSC 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: PLSC 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: PLSC 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: PLSC 3005.

Study of the origin, botany, varieties and production practices of tropical fruits with economic potential in Puerto Rico, such as: papaya, mango, soursop, 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: CHEM 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: PLSC 3005.

Management and production of starchy crops like plantains, bananas, yams, taniars, 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 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. One to six credit hour. One to six hours of lecture. Prerequisites: junior or senior standing and consent of the Director of the Department.

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

### ORGANIZATION

The School of Science was organized in 1943 according to the provisions of the University Act of 1942, and was authorized to grant the degree of Bachelor of Science in the fields of Biology, Chemistry, Mathematics, and Physics. The Division of General Studies was organized later, independently, with the objective of offering a series of introductory basic courses to aid the incoming student in acquiring a better understanding of the physical, intellectual, and social world. The School of Science and the Division of General Studies were united to form the College of Arts and Sciences on the Mayagüez Campus in 1959.

In addition to offering its own programs, the College of Arts and Sciences serves the other Colleges of the Mayagüez Campus by providing instruction in those fields of the Arts and Sciences which constitute an essential part of the professional and liberal arts curricula required by these Colleges.

### GOALS

The College of Arts and Sciences aims to accomplish the professional training of its students and to enrich their lives, intellectually and culturally. To achieve these goals the College pursues the following objectives:

- To provide the best possible programs of instruction in the Arts and the Sciences.
- To develop in students the skills and habits of reasoning that are indispensable to intellectual achievements, as well as to promote their capacity to think logically and critically.
- To improve the ability of the students to communicate effectively both orally and in writing.
- To help students develop a better comprehension of human nature, achievements and thought.
- To motivate students to become life-long learners.

### 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 Sciences, Theoretical Physics, Computer Science, and Mathematics Education. The College of Arts and Sciences provides students in these programs the 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, 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 has, among others, 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 the public welfare or in 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 can be obtained by consulting the Graduate Studies Bulletin.

## GRADUATION REQUIREMENTS

The current number of semester hours required for graduation in each major field are indicated in the individual curricula listed in this catalog. In order to graduate, a student must have a minimum general grade point average of 2.00 and a minimum grade point average of 2.2 in the courses constituting the major.

## CHAPTERS OF PROFESSIONAL SOCIETIES

The American Chemical Society, which has been selected as outstanding for about two decades, has had a student affiliate chapter at the College since 1948. Students and teachers meet to conduct scientific and social activities. The chapter sponsors trips and visits to chemical and related industries, and to scientific meetings on the island.

The American Association of Physics Teachers has a Regional (Puerto Rico) Section with its nucleus in the Physics Department on the Mayagüez Campus. A meeting of all sections is held annually in New York City, jointly with the American Physical Society. The objectives of the Regional Section are the improvement in the teaching of physics and the enhancement of 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 the campus, but also provides a link with political science students on other campuses in Puerto Rico.

The Student Nurses Association of the Commonwealth of Puerto Rico aims to promote interaction between the students of Nursing at the College and other chapters on the island, and to encourage leadership in Nursing.

Phi Alpha Delta has had a very active and outstanding pre-legal chapter on Campus since the 1980's.

## DEPARTMENT SPONSORED ORGANIZATIONS

On May 27, 1945, Beta Beta Beta, an honorary society for biology majors, organized the Zeta Alpha Chapter of the College. Juniors and seniors with a minimum grade point average of 3.00, and 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 can receive advanced placement in Spanish, English and Mathematics if they pass the advanced placement examinations with a final score of 4 or 5. Students should contact the Associate Dean for 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>*MATH 3005</b>	
Pre-Calculus	5
<b>CHEM 3041</b>	
General Chemistry	4
<b>BIOL 3051</b>	
General Biology I	4
<b>*ENGL 3---</b>	
First Year Course in English	3
<b>*SPAN 3101</b>	
Basic Course in Spanish	$\frac{3}{19}$

**Second Semester**

<b>MATH 3031</b>	
Calculus I	4
<b>CHEM 3042</b>	
General Chemistry	4
<b>BIOL 3052</b>	
General Biology II	4
<b>*ENGL 3---</b>	
First Year Course in English	3
<b>*SPAN 3102</b>	
Basic Course in Spanish	3
<b>PHED 3----</b>	
Course in Physical Education	<u>1</u>
	19

**SECOND YEAR****First Semester**

<b>MATH 3032</b>	
Calculus II	4
<b>CHEM 3450</b>	
Fundamentals of Organic Chemistry	5
<b>PHCS 3151</b>	
Modern College Physics	3
<b>PHCS 3153</b>	
Modern College Physics Laboratory	1
<b>ENGL 3--- or 4---</b>	
Second Year Course in English	3
<b>PHED 3---</b>	
Course in Physical Education	<u>1</u>
	17

**Second Semester**

<b>MATH 3048</b>	
Mathematical Analysis	4
<b>CHEM 3055</b>	
Analytical Chemistry	4
<b>PHCS 3152</b>	
Modern College Physics	3
<b>PHCS 3154</b>	
Modern College Physics Laboratory	1
<b>ENGL 3--- or 4---</b>	
Second Year Course in English	3
<b>GEEG 3016</b>	
Algorithms and Computer Programming	<u>3</u>
	18

**THIRD YEAR****First Semester**

<b>CHEG 4005</b>	
MATHrials and Energy Balances	4

<b>BIOL 3300</b>	
Genetics	3
<b>BIOL 3770</b>	
General Microbiology	3
<b>SPAN 3--- or 4---</b>	
Second Year Course in Spanish	3
<b>CHEM 4041</b>	
Physical Chemistry	3
<b>ELECTIVE</b>	
Elective	<u>3</u>
	19

**Second Semester**

<b>CHEG 5006</b>	
Mathematical Topics in ChemicalEngineering	3
<b>CHEM 4042</b>	
Physical Chemistry	3
<b>CHEM 4101</b>	
Physical Chemistry Laboratory	1
<b>BIOL 4368</b>	
Microbial Physiology	3
<b>CHEG 4003</b>	
Unit Operations III	4
<b>SPAN 3--- or 4---</b>	
Second Year Course in Spanish	<u>3</u>
	17

**FOURTH YEAR****First Semester**

<b>CHEM 5071</b>	
General Biochemistry	3
<b>SOSC 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>CHEG 4011</b>	
Chemical Eneering Thermodynamics I	3
<b>CHEG 4004</b>	
Unit Operations Lab. III	<u>1</u>
	16

**Second Semester**

<b>BIOL 4925</b>	
Seminar	1
<b>BIOL 4367</b>	
Industrial Microbiology	3
<b>CHEM 5072</b>	
General Biochemistry	3
<b>SOSC 3122</b>	



An Introduction to the Study of the Social Sciences	3
<b>HUMA 3112</b>	
Introduction to Western Culture II	3
<b>CHEG 4012</b>	
Chemical Engineering Thermodynamics II	3
<b>ELECTIVE</b>	<u>3</u>
	19

**FIFTH YEAR****First Semester****IBIO 4905**

Practicum in Industrial Biotechnology	<u>6</u>
	6

**Second Semester****IBIO 5005**

Project in Industrial Biotechnology	2
<b>CHEG 5035</b>	
Biochemical Engineering	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>ELECTIVE</b>	<u>6</u>
	14

**Total credits required 164**

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

**RECOMMENDED ELECTIVES**

<b>BIOL 5395 -</b>	
Molecular Genetics	3
<b>BIOL 5745 -</b>	
Introduction to Biophysics	3
<b>BIOL 4008 -</b>	
Immunology	3

**INDUSTRIAL BIOTECHNOLOGY****UNDERGRADUATE COURSE**

IBIO 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**

IBIO 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 the 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 the degree of Master of Science in Biology (See Graduate Bulletin of Information).

**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>
Totals of credits required	141

**FIRST YEAR****First Semester****BIOL 3051**

General Biology I	4
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**CHEM 3001**

General Chemistry	4
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**\*ENGL 3---**

First year course in English	3
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**\*SPAN 3101**

Basic Course in Spanish	3
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**\*MATH 3171**

Pre-Calculus I	3
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**PHED ----**

Course in Physical Education	$\frac{1}{18}$
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**Second Semester****BIOL 3052**

General Biology II	4
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**CHEM 3002**

General Chemistry	4
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**\*ENGL 3---**

First year course in English	3
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**\*SPAN 3102**

Basic Course in Spanish	3
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**\*MATH 3172**

Pre-Calculus II	3
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**PHED ----**

Course in Physical Education	$\frac{1}{18}$
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**SECOND YEAR****First Semester****BIOL 3425**

Animal Organismal Biology or	
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**BIOL 3417**

Plant Organismal Biology	4
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**CHEM 3461 AND CHEM 3462**

Organic Chemistry	4
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**ENGL 3---**

Second year course in English	3
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**SPAN 3---**

Course above level of basic Spanish	3
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**MATH 3021**

Introductory Calculus	$\frac{3}{17}$
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**Second Semester****BIOL 3125**

Principles of Ecology	3
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**CHEM 3463 AND CHEM 3464**

Organic Chemistry	4
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**ENGL 3---**

Second year course in English	3
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**SPAN 3---**

Course above level of basic Spanish	3
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**MATH 3022**

Introductory Calculus	3
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**ELECTIVES**

Departmental Biology Course Electives	$\frac{3}{19}$
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**THIRD YEAR****First Semester****BIOL 3300**

Genetics	3
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**BIOL 4505**

Human Physiology or	4
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**BIOL 4556**

Comparative Vertebrate Physiology and	
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**BIOL 4557**

Comparative Vertebrate Physiology Laboratory	
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**SOSC 3121**

Intro. to the Study of the Social Sciences	3
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**HUMA 3111**

Intro. to Western Culture I	3
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**PHCS 3151**

Modern College Physics	3
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**PHCS 3153**

Modern College Physics Laboratory	$\frac{1}{17}$
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**Second Semester****BIOL 3010**

Cell Physiology	3
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**SOSC 3122**

Intro. to the Study of the Social Sciences	3
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**HUMA 3112**

Intro. to Western Culture II	3
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**PHCS 3152**

Modern College Physics	3
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**PHCS 3154**

Modern College Physics Laboratory	1
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**BIOL 4925**

Seminar	1
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**ELECTIVES**

**Recommended Elective	$\frac{3}{17}$
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**FOURTH YEAR****First Semester****BIOL 4335**

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	<u>6</u>
	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	<u>6</u>
	17

\*Refer to the Academic Regulations section for information on Advanced Placement.  
 \*\*To be selected from the list of courses in 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>EDFO 3001</b>	3
Human Growth and Development I	
<b>EDFO 3002</b>	3
Human Growth and Development II	
<b>EDFO 3007</b>	3
Social Foundations of Education	
<b>EDFO 3008</b>	3
Educational Implications of the Social and Economic Problems of Puerto Rico	
<b>EDFO 4019</b>	3
Philosophical Foundations of Education	
<b>EDFO 3055</b>	3
Legal Foundations of Education	
<b>EDFO 3115</b>	3
Philosophy of Health Education	
<b>EDFO 4008</b>	3
The Role of the Teacher in Guidance	
<b>EDFO 4006</b>	3

The Child and His Social Milieu	
<b>EDFO 4025</b>	3
School Health Education	
<b>GERM 3041</b>	
(Elementary German I )	
1 year-Recom.	3
<b>GERM 3042</b>	
(Elementary German II)	
1 sem.-Free Elec.	3
<b>ANTH 3015</b>	
Introduction to Physical Anthropology	3
<b>ARTS 3276</b>	
Art Appreciation	3
<b>POSC 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>PHIL 3157</b>	
Introduction to Logic	3
<b>PHIL 4025</b>	
Medical Ethics	3
<b>PHIL 4027</b>	
Bioethics	3
<b>FREN 3141</b>	
(Elementary French I )	
1 year-Recom.	3
<b>FREN 3142</b>	
(Elementary French II)	
1 sem.-Free Elec.	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-Recom.	3
<b>ITAL 3072</b>	
(Elementary Italian II)	
1 sem.-Free Elec.	3
<b>ENGL 3236</b>	
Technical Report Writing	3
<b>COMP 3057</b>	
Computer Fundamentals	3
<b>MSTA 3101</b>	
Applied Statistics I	3
<b>MUSI 3135</b>	

Music Appreciation	3
<b>PSYC 3015</b>	
Theories of Personality	3
<b>PSYC 3027</b>	
Childhood Psychology	3
<b>PSYC 3028</b>	
Psychology of Adulthood	3
<b>PSYC 3035</b>	
Applied Psychology	3
<b>PSYC 3039</b>	
Psychology of Adolescence	3
<b>PSYC 3045</b>	
Mental Higiene	3
<b>CHEM 5071</b>	
General Biochemistry	3
<b>CHEM 3025</b>	
Analytical Chemistry I	4
<b>CHEM 3055</b>	
Analytical Chemistry	4
<b>CHEM 3065</b>	
Analytical Chemistry II	4

Note: Any course offered by the Department of Biology that is neither required by the curriculum nor a service course to other departments will be accepted as a recommended elective.

Note: Other courses that the Department of Biology considers acceptable may also be accepted as recommended electives.

## BACHELOR OF SCIENCE IN BIOLOGY IN INDUSTRIAL MICROBIOLOGY

### SUMMARY OF CREDITS IN PROGRAM

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	<u>3</u>
	140-141

#### FIRST YEAR

##### First Semester

<b>BIOL 3051</b>	
General Biology I	4
<b>CHEM 3001</b>	
General Chemistry	4

<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3101</b>	
Basic Course in Spanish	3
<b>*MATH 3171</b>	
Pre-Calculus I	3
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	18

##### Second Semester

<b>BIOL 3052</b>	
General Biology II	4
<b>CHEM 3002</b>	
General Chemistry	4
<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3102</b>	
Basic Course in Spanish	3
<b>*MATH 3172</b>	
Pre-Calculus II	3
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	18

#### SECOND YEAR

##### First Semester

<b>BIOL 3770</b>	
General Microbiology	3
<b>CHEM 3461 AND CHEM 3462</b>	
Organic Chemistry	4
<b>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>MATH 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>CHEM 3463 AND CHEM 3464</b>	
Organic Chemistry	4
<b>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>MATH 3022</b>	
Introductory Calculus	<u>3</u>
	19

**THIRD YEAR****First Semester**

<b>BIOL 4505</b> Human Physiology	4
or <b>BIOL 4556</b> Comparative Vertebrate Physiology	3
or <b>BIOL 5018</b> Plant Physiology	4
<b>MSTA 3101</b> Applied Statistics I	3
<b>SOSC 3121</b> Intro. to the Study of the Social Sciences	3
<b>HUMA 3111</b> Intro. to Western Culture I	3
<b>PHCS 3151</b> Modern College Physics	3
<b>PHCS 3153</b> Modern College Physics Laboratory	$\frac{1}{16-17}$

**Second Semester**

<b>BIOL 3125</b> Principles of Ecology	3
<b>SOSC 3122</b> Intro. to the Study of the Social Sciences	3
<b>HUMA 3112</b> Intro. to Western Culture II	3
<b>PHCS 3152</b> Modern College Physics	3
<b>PHCS 3154</b> Modern College Physics Laboratory	1
<b>BIOL 4368</b> Microbial Physiology	3
<b>ELECTIVES</b>	$\frac{2}{18}$

**FOURTH YEAR****First Semester**

<b>CHEM 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)	$\frac{1}{17}$

**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	$\frac{3}{18}$

**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 courses in  
recommended electives.

**ELECTIVES IN BIOLOGY,  
BOTANY, OR ZOOLOGY AND  
RECOMMENDED ELECTIVES**

(For the Bachelor of Science in Industrial  
Microbiology)

<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 <b>BIOL 4735</b>	3
Microbiology of Water and Sewage <b>BIOL 4746</b>	3
Economic Mycology <b>BIOL 4778</b>	3
Dairy Bacteriology <b>BIOL 4993</b>	3
Special Topics in Biology I <b>BIOL 4994</b>	1-3
Special Topics in Biology II <b>BIOL 5008</b>	1-3
Sanitary Bacteriology <b>BIOL 5397</b>	3
Eukaryotic Molecular Genetics <b>BIOL 5585</b>	4
Medical and Veterinary Entomology <b>BIOL 5755</b>	3
Virology <b>BIOL 5758</b>	3
Bacterial Genetics <b>BIOL 5765</b>	2
Mycology <b>BOTA 4995-4996</b>	3
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 <b>BIOL 4008</b> Immunology <b>BIOL 4366</b> Food Microbiology <b>BIOL 4367</b> Industrial Microbiology <b>BIOL 4369</b> Practice in Industrial Microbiology <b>BIOL 4375</b> Clinical Microbiology <b>BIOL 4376</b> Freshwater Biology <b>BIOL 4426</b> Animal Parasitology <b>BIOL 4735</b> Microbiology of Water and Sewage <b>BIOL 4746</b> Economic Mycology	3 3 3 3 2 3 3 3 3 3

<b>BIOL 4765</b> Mycology <b>BIOL 4778</b> Dairy Bacteriology <b>BIOL 4901-4902</b> Special Problems in Zoology <b>BIOL 4998</b> Co-op Practice <b>BIOL 5008</b> Sanitary Bacteriology <b>BIOL 5755</b> Virology <b>BIOL 5765</b> Mycology <b>BOTA 4995-4996</b> Special Problems of Botany <b>CHEM 3025</b> Analytical Chemistry I <b>CHEM 3065</b> Analytical Chemistry II <b>CHEM 4998</b> Undergraduate Research I <b>CHEM 4999</b> Undergraduate Research II <b>CHEM 5072</b> General Biochemistry II <b>CHEM 5073</b> General Biochemistry Laboratory I <b>CHEM 5074</b> General Biochemistry Laboratory II <b>COMP 3010</b> Introduction to Computer Programming I <b>COMP 3057</b> Computer Fundamentals <b>ECON 3021</b> Principles of Economics I <b>EDFO 3001-3002</b> Human Growth and Development I and II <b>EDFO 3007</b> Social Foundations of Education <b>EDFO 3008</b> Educational Implications of the Social and Economic Problems of Puerto Rico <b>EDFO 4019</b> Philosophical Foundations of Education <b>EDFO 3055</b> Legal Foundations of Education <b>EDFO 3115</b> Philosophy of Health Education <b>EDFO 4008</b> The Role of the Teacher in Guidance <b>EDFO 4006</b> The Child and His Social Milieu <b>EDFO 4025</b> School Health Education	3 3 1-3 3-6 3 3 3 1-3 4 4 1-3 1-3 3 1 1 3 3 3 6 3 3 3 3 3 3 3
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<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>ORST 4006</b>	
Introduction to Organizations	3
<b>ORST 4007</b>	
Organizational Theory	3
<b>ORST 4008</b>	
Introduction to Personnel Administration and Industrial Relations	3
<b>ORST 4016</b>	
Industrial Relations	3
<b>PSYC 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. Scs., Huma. or Geol.	<u>3</u>
	142

#### FIRST YEAR

##### First Semester

<b>BIOL 3051</b>	
General Biology I	4
<b>CHEM 3001</b>	
General Chemistry	4
* <b>MATH 3171</b>	
Pre-Calculus I	3
* <b>SPAN 3101</b>	
Basic Course in Spanish	3
* <b>ENGL 3---</b>	
First year course in English	<u>3</u>
	17

##### Second Semester

**BIOL 3052**

General Biology II	4
<b>CHEM 3002</b>	
General Chemistry	4
* <b>MATH 3172</b>	
Pre-Calculus I	3
* <b>SPAN 3102</b>	
Basic Course in Spanish	3
* <b>ENGL 3---</b>	
First year course in English	<u>3</u>
	17

#### SECOND YEAR

##### First Semester

<b>ENGL ----</b>	
Second year course in English	3
<b>MATH 3021</b>	
Introductory Calculus	3
<b>CHEM 3461 AND CHEM 3462</b>	
Organic Chemistry	4
<b>BIOL 3300</b>	
Genetics	3
<b>SPAN 3211</b>	
Introduction to Spanish Literature	
or	
<b>SPAN 3295</b>	
Spanish Grammar	3
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	17

##### Second Semester

<b>ENGL ----</b>	
Second year course in English	3
<b>MATH 3022</b>	
Introductory Calculus	3
<b>CHEM 3463 and 3464</b>	
Organic Chemistry	4
*** <b>ELECTIVE</b>	3
<b>SPAN 3212</b>	
Introduction to Spanish Literature	
or	
<b>SPAN 3208</b>	
Composition	3
<b>PHED ----</b>	
Elective in Physical Education	<u>1</u>
	17

#### THIRD YEAR

##### First Semester

<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>PHCS 3151</b>	
Modern College Physics	3
<b>PHCS 3153</b>	

Modern College Physics Laboratory <b>PSIC 3001</b>	1
Principles of Psychology I <b>ENGL 3231</b>	3
English Expository Writing or <b>ENGL 3236</b>	
Technical Report Writing <b>BIOL 3010</b>	3
Cell Physiology	<u>3</u>
	19

**Second Semester**

<b>HUMA 3112</b>	
Intro. to Western Culture II <b>SOSC 3122</b>	3
Intro. to the Study of the Social Sciences	3
<b>PHCS 3152</b>	
Modern College Physics <b>PHCS 3154</b>	3
Modern College Physics Laboratory <b>BIOL 4505</b>	1
Human Physiology <b>ELECTIVE</b>	4
Elective in Biology <b>BIOL 4925</b>	3
Seminar	<u>1</u>
	18

**FOURTH YEAR****First Semester**

<b>PHIL 4025</b>	
Medical Ethics	3
<b>CHEM 3025</b>	
Analytical Chemistry <b>MSTA 3101</b>	4
Applied Statistics I <b>ELECTIVE</b>	3
Recommended Elective in Biology <b>ELECTIVES</b>	3
Free Electives	<u>6</u>
	19

**Second Semester**

<b>HIST ----</b>	
Course in Modern History of P.R.	3
<b>MUSI 3135</b>	
Music Appreciation or <b>ARTS 3276</b>	
Art Appreciation <b>ELECTIVES</b>	3
Electives in Biology <b>ELECTIVES</b>	6
Free Electives	<u>6</u>
	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**

(For the Bachelor of Science in Pre-Medical Studies)

<b>BIOL 3125</b>	
Principles of Ecology	3
<b>BIOL 3425</b>	
Animal Organismal Biology	4
<b>BIOL 3745</b>	
An Introduction to Medical Mycology	3
<b>BIOL 3770</b>	
General Microbiology	3
<b>BIOL 4008</b>	
Immunology	3
<b>BIOL 4016</b>	
Histology	3
<b>BIOL 4027</b>	
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>EDFO 3001-3002</b>	
Human Growth and Development I and II	6
<b>EDFO 3007</b>	
Social Foundations of Education	3
<b>EDFO 3008</b>	3
Educational Implications of the Social and Economic Problems of Puerto Rico	



<b>EDFO 4019</b>	3
Philosophical Foundations of Education	
<b>EDFO 3055</b>	3
Legal Foundations of Education	
<b>EDFO 3115</b>	3
Philosophy of Health Education	
<b>EDFO 4008</b>	3
The Role of the Teacher in Guidance	
<b>EDFO 4006</b>	3
The Child and His Social Milieu	
<b>EDFO 4025</b>	3
School Health Education	

Students who intend to apply for admission to a medicine or dentistry school that requires the B.S. 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**, *Instructor*, M.S., 1992, 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**, *Assistant Professor*, M.S., 1977, North Carolina State University.

**FERNANDO 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**, *Associate Professor*, Ph.D., 1993, Rutgers University, New Brunswick.

**CARLOS J. CASTILLO**, *Professor*, Ph.D., 1973, University of Pennsylvania, Philadelphia.

**MIRIAM CASTRO**, *Assistant Professor*, M.S., 1974, University of Puerto Rico.

**MILDRED CHAPARRO**, *Professor*, Ph.D., 1985, Texas A&M University.

**CARLOS DELANNOY**, *Professor*, Ph.D., 1984, University of Colorado.

**NANETTE DIFFOOT CARLO**, *Professor*, Ph.D., 1992, Virginia Polytechnic Institute and State University.

**MARTHA ESPINOZA**, *Instructor*, M.S., 1991, University of Puerto Rico.

**DUANE A. KOLTERMAN**, *Professor*, Ph.D., 1982, University of Wisconsin-Madison.

**ALLEN R. LEWIS**, *Professor*, Ph.D., 1979, University of Rochester.

**SANDRA LEE MALDONADO**, *Instructor*, M.S., 1996, University of Puerto Rico.

**JOSE A. MARI MUTT**, *Professor*, Ph.D., 1978, University of Illinois.

**JUAN C. MARTINEZ CRUZADO**, *Professor*, Ph.D., 1988, Harvard University.

**ARTURO MASSOL**, *Associate Professor*, Ph.D., 1994, Michigan State University.

**RAFAEL MONTALVO**, *Instructor*, M.S., 1996, University of Puerto Rico.

**VIVIAN NAVAS**, *Professor*, Ph.D., 1990, University of Illinois at Urbana, Illinois.

**CARLOS A. PEREZ MUÑOZ**, *Associate Professor*, Ph.D., 1991, University of California, Davis.

**CARMEN T. PORRATA**, *Associate Professor*, M.S., 1972, University of Puerto Rico.

**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.

**ARIEL SANTIAGO**, *Instructor*, M.S., 1995, University of Puerto Rico.

**ROSA J. SANTIAGO**, *Associate Professor*, M.S., 1963, University of Puerto Rico.

**CARLOS SANTOS**, *Instructor*, M.S., 1992, University of Puerto Rico.

**INES SASTRE DE JESUS**, *Associate Professor*, Ph.D., 1987, City University of New York.

**LYCELY SEPULVEDA**, *Assistant Professor*, Ph.D. 2000, Michigan State University.

**RICHARD D. SQUIRE**, *Professor*, Ph.D., 1969, North Carolina State University.

**JOHN M. USCIAN**, *Associate Professor*, Ph.D., 1994, University of Nebraska-Lincoln.

**MARIA VARGAS**, *Associate Professor*, Ph.D. (1997), Arizona State University.

## COURSES OF INSTRUCTION

### DEPARTMENT OF BIOLOGY

#### UNDERGRADUATE COURSES

**BIOS 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.

**BIOS 3032. INTRODUCTION TO THE BIOLOGICAL SCIENCES II.** Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: BIOS 3001 or BIOS 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: CHEM 3031 or CHEM 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: BIOS 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 (BIOS 3002 or BIOS 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 (BIOS 3032 or BIOS 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: BIOS 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: (BIOS 3002 or BIOS 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: (BIOS 3002 or BIOS 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: (BIOS 3002 and CHEM 3002) or (BIOL 3052 and CHEM 3002) or (BIOL 3043 and BIOL 3044 and CHEM 3002) or (BIOL 3435 and CHEM 3002).

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.

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: BIOS3002 or BIOS3032 or BIOL3052 or (BIOL3043 and BIOL3044) and CHEM3031.

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.

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 3125.

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: BIOS 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 CHEM 3031 or CHEM 3461) or (BIOS 3002 or BIOS 3032 and CHEM 3031).

Physiological principles of the human body.

BIOL 4556. COMPARATIVE VERTEBRATE PHYSIOLOGY. Three credit hours. Three lectures per week. Prerequisite: CHEM 251 or CHEM 260. CHEM 3031 or CHEM 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 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: (BIOS 3002 or BIOS 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 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 three credit hours. One to three two- to four-hour laboratories per week. Prerequisite: Consent of the Director of the Department.

Selected topics in biology, botany, microbiology, and zoology.

BIOL 4993. SPECIAL TOPICS IN BIOLOGY 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 biology, botany, microbiology, and zoology.

BIOL 4994. SPECIAL TOPICS IN BIOLOGY 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 biology, botany, microbiology, and zoology.

BIOL 4998. CO-OP PRACTICE. From 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 5008. SANITARY BACTERIOLOGY.** Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOL 3770.

The important groups of bacteria which are of significance in water, milk, and other foods, and the methods used in the bacteriological analysis and control of these products.

**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: CHEM 3032 or CHEM 3062 or CHEM 3072 or CHEM 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 CHEM 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 5736. CYTOLOGY. Three credit hours. Two hours of lecture and one three-hour laboratory per week.

Cell function and organization revealed by microscopic and ultra-microscopic structures, related to the metabolic, synthetic and replicating system in cells.

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 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 5786. PATHOLOGIC HUMAN BIOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: (BIOL 4515 and

BIOL 4516 and PHCS 3151) or (BIOL 4505 and PHCS 3151) or consent of the Director of the Department.

A systematic study of the dysfunctions of the cardiovascular, digestive, respiratory, genitourinary and endocrine systems.

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 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 Bulletin of Information) 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 faculty. 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 a formal education, research and community service, capacitating students for their further development as professionals in the different fields of chemistry, science, engineering, agronomy, etc. Students completing the program will be conscious of the problems that affect the Puerto Rican and international communities and of the strategies to help in their solution. They will also be aware of their responsibilities and opportunities as human beings, and scientists 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 one 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. In addition, a service oriented instrumentation laboratory (CRIL: Central Research Instrumentation Laboratory) with additional instrumentation is available.

**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>
Total	139

**FIRST YEAR****First Semester**

<b>CHEM 3041</b>	
General Chemistry	4
<b>*MATH 3005</b>	
Pre-Calculus	5
<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3101</b>	
Basic Course in Spanish	3
<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	<u>3</u>
	18

**Second Semester**

<b>CHEM 3042</b>	
General Chemistry	4
<b>MATH 3031</b>	
Calculus I	4
<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3102</b>	

Basic Course in Spanish <b>BIOS 3032</b> Intro. to the Biological Sciences II	3 <u>3</u> 17
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**SECOND YEAR****First Semester**

<b>CHEM 3025</b> Analytical Chemistry I	4
<b>CHEM 3071</b> Organic Chemistry	4
<b>MATH 3032</b> Calculus II	4
<b>PHCS 3151</b> Modern College Physics	3
<b>ENGL 3---</b> Second year course in English	<u>3</u> 18

**Second Semester**

<b>CHEM 3065</b> Analytical Chemistry II	4
<b>CHEM 3072</b> Organic Chemistry	4
<b>MATH 3063</b> Calculus III	3
<b>PHCS 3152</b> Modern College Physics	3
<b>ENGL 3---</b> Second year course in English	3
<b>PHCS 3153</b> General Physics Laboratory	<u>1</u> 18

**THIRD YEAR****First Semester**

<b>CHEM 4041</b> Physical Chemistry	3
<b>MATH 4009</b> Differential Equations	3
<b>PHCS 3154</b> General Physics Laboratory	1
<b>ELECTIVE</b> Recommended Elective	3
<b>SOSC 3121</b> Intro. to the Study of the Social Sciences	3
<b>SPAN 3---</b> Course above level of basic Spanish	3
<b>PHED ----</b> Course in Physical Education	<u>1</u> 17

**Second Semester**

<b>CHEM 4042</b> Physical Chemistry	3
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<b>CHEM 4101</b> Physical Chemistry Laboratory	1
<b>PHED ----</b> Course in Physical Education	1
<b>ELECTIVE</b> Recommended Elective	3
<b>SOSC 3122</b> Intro. to the Study of the Social Sciences	3
<b>SPAN 3---</b> Course above level of basic Spanish	3
<b>CHEM 4000</b> Intermediate Inorganic Chemistry	<u>3</u> 17

**FOURTH YEAR****First Semester**

<b>CHEM 4102</b> Physical Chemistry Laboratory	1
<b>CHEM 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>CHEM ----</b> Elective Course in Chemistry	3
<b>ELECTIVE</b> Free Elective	3
<b>ELECTIVE</b> Free Elective	<u>3</u> 18

**Second Semester**

<b>CHEM 4015</b> Instrumental Methods of Analysis	4
<b>ELECTIVE</b> Free Elective	3
<b>HUMA 3112</b> Intro. to Western Culture II	3
<b>CHEM ----</b> Elective Course in Chemistry	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.

**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**, *Assistant Professor*, Ph.D., 1995, Texas A&M University.
- ILEANA CASANOVA DE BRAS**, *Professor*, M.S., 1969, University of Puerto Rico.
- MIGUEL E. CASTRO**, *Associate Professor*, Ph.D., 1991, University of Texas.
- JOSE E. CORTES**, *Professor*, Ph.D., 1989, University of North Texas.
- ASTRID J. CRUZ**, *Associate Professor*, Ph.D., 1993, University of Massachusetts.
- MARCO A. DE JESUS**, *Instructor*, M.S., 1997, University of Puerto Rico
- MARITZA DE JESUS ECHEVARRIA**, *Associate Researcher*, M.S., 1984, University of Puerto Rico.
- SARA DELGADO**, *Assistant Professor*, M.S., 1981, University of Puerto Rico.
- SHREEKANT DESHPANDE**, *Professor*, Ph.D., 1954, Purdue University.
- EMILIO DIAZ MORALES**, *Professor*, Ph.D., 1986, University of Wisconsin.
- MARIA GUNTIN BURGOS**, *Instructor*, M.S., 1991, University of Puerto Rico.
- SAMUEL P. HERNANDEZ RIVERA**, *Professor*, Ph.D., 1986, Johns Hopkins University.
- AIDALU DE LOS A. JOUBERT CASTRO**, *Assistant 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**, *Associate 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**, *Associate 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**, *Instructor*, Ph.D., 2001, Purdue University.
- BELINDA PASTRANA**, *Associate Professor*, Ph.D., 1995, Rutgers University.
- FRANCIS B. PATRON GEOGHEGAN**, *Assistant 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.
- ROBERT RIOS**, *Associate Professor*, Ph.D., 1995, Rutgers University.
- LUIS RIVERA**, *Associate Researcher*, Ph.D., 1990, University of Puerto Rico.
- CYNTHIA ROBLEDO LUIGGI**, *Professor*, Ph.D., 1981, University of Florida.
- LOLITA DE LOS A. RODRIGUEZ**, *Associate Professor*, M.S., 1986, University of Puerto Rico.
- MANUEL RODRIGUEZ FLORES**, *Professor*, Ph.D., 1968, University of Florida.
- FELIX ROMAN**, *Associate 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**, *Assistant 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

### DEPARTMENT OF CHEMISTRY

#### UNDERGRADUATE COURSES

CHEM 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.

CHEM 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.

CHEM 3002. GENERAL CHEMISTRY II. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: CHEM3001.

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.

CHEM 3025. ANALYTICAL CHEMISTRY I. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: CHEM3002 or CHEM3042.

General concepts of quantitative chemical analysis with emphasis on classical methods including volumetric and gravimetric analysis and chemical equilibria.

CHEM 3031-3032. ORGANIC CHEMISTRY. Four credit hours per semester. Three hours of lecture and one four-hour laboratory per week each semester. Prerequisite: CHEM 3002 or CHEM 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.

CHEM 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 chemical behavior of matter and its atomic and molecular structure. Topics include dimensional analysis, atomic theory, and stoichiometry.

CHEM 3042. GENERAL CHEMISTRY II. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: CHEM 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.

CHEM 3055. ANALYTICAL CHEMISTRY. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: CHEM 3002 or CHEM 3042.

A study of fundamental topics in analytical chemistry. Emphasis will be given to both theory and practice of current instrumental methods of analysis.

CHEM 3061. FUNDAMENTALS OF ORGANIC CHEMISTRY AND BIOCHEMISTRY I. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: CHEM 3002 or CHEM 3042.

Principles of organic chemistry; the chemistry of organic functional groups and reaction mechanisms, emphasizing their importance in biochemistry.

CHEM 3062. FUNDAMENTALS OF ORGANIC CHEMISTRY AND BIOCHEMISTRY II. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: CHEM 3061.

Fundamental concepts of biochemistry; the nature and properties of compounds of biochemical interest.

CHEM 3065. ANALYTICAL CHEMISTRY II. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: CHEM 3025.

Theory and practice of optical spectroscopy, electroanalytical methods, and modern separation techniques.

CHEM 3071-3072. ORGANIC CHEMISTRY. Four credit hours. Three hours of lecture and one four-hour laboratory per week per semester. Prerequisite: CHEM 3042 or CHEM 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.

CHEM 3085. ENVIRONMENTAL CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 3002 or CHEM 3042.

Effect of man's activities upon the biosphere, with particular emphasis on the chemistry of the processes involved.

CHEM 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.

CHEM 3142. PRINCIPLES OF GENERAL, ORGANIC AND BIOLOGICAL CHEMISTRY II. Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisite: CHEM 3141.

Principles of general and organic chemistry with emphasis on biological applications in such topics as: isomerism, carbohydrates, lipids, proteins, nucleic acids, metabolism.

CHEM 3335. INTRODUCTION TO FOOD CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisites: CHEM 3002 or CHEM 3042.

Basic aspects of the relationships of food chemistry to health, nutrition, and industry.

CHEM 3450. FUNDAMENTALS OF ORGANIC CHEMISTRY. Five credit hours. Four hours of lecture and one four-hour laboratory per week. Prerequisite: CHEM 3002 or CHEM 3042.

Properties, reactions, synthesis, and reaction mechanisms of organic compounds.

CHEM 3461. ORGANIC CHEMISTRY I. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 3002 or CHEM 3042.

Nomenclature, structure, preparation, and reactions of non-aromatic and alkyl halides.

CHEM 3462. ORGANIC CHEMISTRY LABORATORY I. One credit hour. One four-hour laboratory per week. Corequisite: CHEM 3461.

Experimental techniques in organic chemistry: separation; purification; reactions of nonaromatic hydrocarbons and alkyl halides; polarimetry.

CHEM 3463. ORGANIC CHEMISTRY II. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 3461. Corequisite: CHEM 3462.

Nomenclature, structure, preparation, and reactions of aromatic hydrocarbons, alcohols, ethers, carbonyl compounds, carboxylic acids, amines, and related compounds; biological compounds.

CHEM 3464. ORGANIC CHEMISTRY LABORATORY II. One credit hour. One four-hour laboratory per week. Prerequisite: CHEM 3462. Corequisite: CHEM 3463.

Experimental techniques in organic chemistry: identification and preparation of organic compounds; spectroscopy.

CHEM 4000. INTERMEDIATE INORGANIC CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 4041.

A study of the elements and their inorganic compounds based on modern concepts of atomic and molecular structure.

CHEM 4007. INORGANIC CHEMISTRY LABORATORY. One credit hour. Four hours of laboratory per week. Corequisite: CHEM 4000.

Inorganic chemistry laboratory including synthesis of inorganic compounds and the study of their spectroscopic properties.

CHEM 4015. INSTRUMENTAL METHODS OF ANALYSIS. Four credit hours. Three hours of lecture and one four-hour laboratory per week. Prerequisite: CHEM3065.

Theory and practice of atomic and molecular spectroscopic methods, mass spectrometry, ion and surface science techniques, and current topics in instrumental analytical chemistry.

CHEM 4026. HISTORY OF CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 3002 or CHEM 3042.

The development of Chemistry from antiquity to the present time with an emphasis on the critical analysis of its concepts.

CHEM 4041. PHYSICAL CHEMISTRY I. Three credit hours. Three hours of lecture per week. Prerequisites: (CHEM3002 or CHEM3042) and (PHCS3151 or PHCS3171). Corequisite: MATH3063 or MATH3048.

Fundamentals and laws of classical thermodynamics applied to ideal and real gases, phase equilibrium, chemical equilibrium, heterogeneous equilibrium of binary systems, and solutions.

CHEM 4042. PHYSICAL CHEMISTRY II. Three credit hours. Three hours of lecture per week. Prerequisites: CHEM4041 and (MATH3063 or MATH3048).

Chemical kinetics, molecular kinetic theory of gases, introduction to quantum mechanics and its application to vibrational, rotational, and electronic spectroscopy.

CHEM 4101. PHYSICAL CHEMISTRY LABORATORY II. One credit hours. One four-hour laboratory per week. Prerequisites: CHEM4041 and (CHEM3055 or CHEM3025).

Experimental determination of thermodynamic properties such as vapor pressure, partial molar volume, enthalpy of reaction, heat capacity, eutectic composition, and equilibrium constants.

CHEM 4102. PHYSICAL CHEMISTRY LABORATORY II. One credit hours. One four-hour laboratory per week. Prerequisite: CHEM4041. Corequisite: CHEM4042.

Use of spectroscopic, kinetic, electrochemical, surface, polarimetric, and computational methods to determine physical and chemical properties.

CHEM 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: CHEM 3072 or CHEM 3032 or CHEM 3450, and either CHEM 3025 or CHEM 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.

CHEM 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.

CHEM 4137. INDUSTRIAL CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 3032 or CHEM 3072 or CHEM 3450 or CHEM 3062.

Chemical principles related to industrial processes, especially those being carried out in Puerto Rico. Field trips required.

CHEM 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.

CHEM 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.

CHEM 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.

CHEM 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.

CHEM 4999. UNDERGRADUATE RESEARCH II. One to three credit hours. Three to nine hours of research per week. Prerequisite: three credits in CHEM 4998.

A research project under the supervision of professors of the department.

## ADVANCED UNDERGRADUATE AND GRADUATE COURSES

CHEM 5005. INTERMEDIATE ORGANIC CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisites: CHEM 3032 or CHEM 3072 or CHEM 3450.

Modern structural organic chemistry at the intermediate level. Nomenclature of polyfunctional compounds; stereochemistry; reaction mechanisms; synthesis.

CHEM 5065. CHEMISTRY OF SYNTHETIC DRUGS. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 3072 or CHEM 3032 or CHEM 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.

CHEM 5066. TOXICOLOGICAL CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 3032 or CHEM 3072 or CHEM 3450 or CHEM 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.

CHEM 5071. GENERAL BIOCHEMISTRY I. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 3463 or CHEM 3072 or CHEM 3450 or CHEM 3062.

Chemical characterization of proteins, carbohydrates, lipids, and nucleic acids; principles of enzymology and bioenergetics; biological membranes and transport; recombinant DNA techniques; biological oxidations.

CHEM 5072. GENERAL BIOCHEMISTRY II. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 5071.

Biosynthesis and biodegradation of carbohydrates, lipids, amino acids, and nucleic acids; integration and regulation of animal metabolism; chemistry of genetic expression and regulation.

CHEM 5073. GENERAL BIOCHEMISTRY LABORATORY I. One credit hour. One four-hour laboratory per week. Corequisite: CHEM 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: CHEM 5073. Corequisite: CHEM 5072.

Characterization of carbohydrates, molecular modeling, and spectroscopic analysis of biomolecules.

CHEM 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 activities, their role in nutrition, and the effect of processing treatment on their chemical composition.

CHEM 5095. NUCLEAR CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisites: (CHEM3002 or CHEM3042) and (MATH3183 or MATH3031 or MATH3144).

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.

CHEM 5105. PRINCIPLES OF QUANTUM CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM4042.

Conceptual development, postulates, and models of quantum mechanics. Approximation methods to the solution of the time-independent Schrödinger equation.

CHEM 5125. CHEMICAL THERMODYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 4042.

Systematic analysis of the fundamental concepts of chemical thermodynamics and their applications.

CHEM 5135. PHYSICAL ORGANIC CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisites: CHEM 4042 and CHEM 3032 or CHEM 3072 or CHEM 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.

CHEM 5145. HETEROCYCLIC COMPOUNDS. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 3072 or CHEM 3032 or CHEM 3450.

Structure, synthesis, and reactions of ring systems containing other atoms besides carbon. Alkaloids will be given special consideration.

CHEM 5150. SPECTROSCOPIC IDENTIFICATION OF ORGANIC COMPOUNDS. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 3032 or CHEM 3072 or CHEM 3450.

Elucidation of the structure of organic compounds by spectroscopic methods, including infrared, ultraviolet, nuclear magnetic resonance, and mass spectrometry techniques.

CHEM 5165. POLYMER CHEMISTRY. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 3072 or CHEM 3032 or CHEM 3450.

Structure, properties, synthesis, reactions, and physical behavior of polymers. Experimental methods used in their analysis.



## DEPARTMENT OF ECONOMICS

The Department of Economics is engaged in the dual function of providing professional training to students majoring in economics and at the same time rendering teaching services to students of other departments on the Mayagüez Campus of the University of Puerto Rico. Professional training of students is offered through a program of study 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 economics courses only as requirements and/or electives within their major field of study.

The common purpose of both functions is to develop students with the ability to think clearly and objectively in dealing with economic decisions and problems. Students are trained specifically to replace value judgements and prejudices with sound economic reasoning based on an objective and rational analysis.

Apart from these two functions, the conduct of research and the promotion of economic education are two integral elements within the Department. A Research Unit with a Microcomputer Laboratory is responsible for the coordination and diffusion of research results and activities pursued by departmental faculty members and occasionally by visiting scholars. Faculty members also participate in the Economic Education Program directed to the enhancement of economic education among the local citizenry through a variety of workshops, conferences and printed materials.

### 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>
Total	134

#### FIRST YEAR

##### First Semester

<b>*SPAN 3101</b>	
Basic Course in Spanish	3
<b>*ENGL 3---</b>	
First year course in English	3
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>*MATH 3171</b>	
Pre-Calculus I	3
<b>ECON 3021</b>	
Principles of Economics: Microeconomics	3
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	16

##### Second Semester

<b>*SPAN 3102</b>	
Basic Course in Spanish	3
<b>*ENGL ----</b>	
First year course in English	3
<b>SOSC 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>MATH 3000</b>	
Finite Mathematics	3
<b>ECON 3022</b>	
Principles of Economics: Macroeconomics	3
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	16

#### SECOND YEAR

##### First Semester

<b>ENGL 3---</b>	
Second year course in English	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>MATH 3049</b>	
Mathematical Analysis for Management Sciences	3
<b>ECON 3091</b>	
Micro Economic Theory	3
<b>ECON ----</b>	
Elective in Economics	3
<b>MSTA 3101</b>	
Applied Statistics I	<u>3</u>
	18

**Second Semester**

<b>ENGL 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>MSTA 3102</b>	
Applied Statistics II	<u>3</u>
	18

**THIRD YEAR****First Semester**

<b>SPAN 3---</b>	
Course above level of Basic	
Spanish	3
<b>PHSC, CHEM or GEOL</b>	
Electives	3
<b>BIOS 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>SPAN 3---</b>	
Course above level of basic	
Spanish	3
<b>PHSC, CHEM, GEOL</b>	
Elective in Physics, Chemistry	
Or Geology	3
<b>BIOS 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	3
<b>ECON ----</b>	
Elective in Economics	3

**ELECTIVE**

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 D. 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**, *Assistant Professor*, Ph.D., 1999, University of North Carolina at Chapel Hill.

**ORLANDO SOTOMAYOR RODRIGUEZ**, *Associate Professor*, Ph.D., 1994, Cornell University.

**NILSA A. VELAZQUEZ MATOS**, *Associate Professor*, J.D., 1994, Pontifical Catholic University of Puerto Rico.

**COURSES OF INSTRUCTION****DEPARTMENT OF ECONOMICS****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 MSTA 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 MATH 3049 and (MATH 3102 or MSTA 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 MATH 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. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3091 and ECON 3092 and (MATH 3102 or MSTA 3102).

Examination of the major economic problems and methods of studying them; application of statistical techniques to the field of economics. Each student is required to prepare an independent research project.

ECON 4405. ANALYSIS OF CONTEMPORARY ECONOMIC PROBLEMS. Three credit hours. Three hours of lecture per week. Prerequisites: ECON 3091 and ECON 3092 and (MATH 3102 or MSTA 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:*** ENGL 3101, 3102, 3201, 3202;

B. ***The Intermediate Sequence:*** ENGL 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 ENGL 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 ENGL 3201-3202

or ENGL 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: ENGL 3101, ENGL 3102, ENGL 3201, ENGL 3202.

The intermediate sequence of courses, starting with ENGL 3103 and ENGL 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 ENGL 3103. Students who successfully pass ENGL 3103 and ENGL 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 Bulletin for additional information.

\*\* 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>
Total	134

### FIRST YEAR

#### First Semester

*ENGL 3---	
First year course in English	3
*SPAN 3101	
Basic Course in Spanish	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	3
*MATH 3171	
Pre-Calculus I	3
<b>PHED ----</b>	
Course in Physical Education	1
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	16

#### Second Semester

*ENGL 3---	
First year course in English	3
*SPAN 3102	
Basic Course in Spanish	3

<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>MATH 3---</b>	3
<b>PHED ----</b>	
Course in Physical Education	1
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	16

**SECOND YEAR****First Semester**

<b>ENGL 3---</b>	
Second year course in English	3
<b>ENGL 3225</b>	
Intro. to Linguistics	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	18

**Second Semester**

<b>ENGL 3---</b>	
Second year course in English	3
<b>ENGL 3227</b>	
Phonetics of English	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>SOSC 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>BIOS 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>ENGL 3351</b>	
American Literature to 1860	3
<b>ENGL 3321</b>	
Survey of English Literature to 1660	3
<b>ENGL 3231</b>	
Expository Writing in English	3
<b>ENGL 3---</b>	

English Elective	3
<b>PHCS, CHEM or GEOL</b>	
Electives	3
<b>ELECTIVE</b>	
Recommended Electives	<u>3</u>
	18

**Second Semester**

<b>ENGL 3352</b>	
American Lit. from 1860 to the Modern Period	3
<b>ENGL 3322</b>	
Survey of English Lit. from 1660 to the Modern Period	3
<b>ENGL 4025</b>	
Shakespeare	3
<b>ENGL 3---</b>	
English Elective	3
<b>PHCS, CHEM or GEOL</b>	
Electives	3
<b>ELECTIVE</b>	
Recommended Electives	<u>3</u>
	18

**FOURTH YEAR****First Semester**

<b>ENGL 4030</b>	
Research and Writing in Literature	3
<b>ENGL ----</b>	
English Electives	9
<b>ELECTIVE</b>	
Recommended Elective	<u>3</u>
	15

**Second Semester**

<b>ENGL ----</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>ENGL 3351</b>	
American Literature to 1860	3
<b>ENGL 3321</b>	
Survey of English Lit. to 1660	3
<b>ENGL 3231</b>	
Expository Writing in English	3
<b>ENGL 4206</b>	
The Structure of English	3
<b>PHCS, CHEM or GEOL</b>	
Electives	3

**ELECTIVE**

Recommended Elective  $\frac{3}{18}$

**Second Semester****ENGL 3352**

American Lit. from 1860  
to the Modern Period 3

**ENGL 3322**

Survey of Eng. Lit. from  
1660 to the Modern Period 3

**ENGL 4075**

Psycholinguistics 3

**ENGL ----**

English Electives 3

**PHCS, CHEM or GEOL**

Electives 3

**ELECTIVE**

Recommended Elective  $\frac{3}{18}$

**FOURTH YEAR****First Semester****ENGL 4028**

Research and Writing in Lang.  
and Linguistics 3

**ENGL ----**

English Electives 9

**ELECTIVE**

Recommended  $\frac{3}{15}$

**Second Semester****ENGL 4208**

History of the English  
Language 3

**ENGL ----**

English Electives 9

**ELECTIVE**

Recommended  $\frac{3}{15}$

**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**

**EDITH D. ALGREN DE GUTIERREZ**, *Professor*,  
Ph.D., 1984, Rennselaer Polytechnic Institute.

**ANDREW S. ALLEN**, *Associate Professor*, Ph.D.,  
1980, University of California at Berkeley.

**OSWALDO AYMAT**, *Professor*, Ph.D., 1988,  
University of Texas-Austin.

**MARUJA ACEVEDO TOLEDO**, *Instructor*, M.A.,  
1986, Interamerican University of Puerto Rico.

**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.

**ARIANE CATHY CULOT NICOLIO**, *Assistant  
Professor*, M.A. 1992, Wichita State University.

**DAVID DAYTON**, *Instructor*, M.A.E.E., 1995,  
University of Puerto Rico.

**ELIZABETH P. DAYTON**, *Associate 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.

**ANTHONY HUNT**, *Professor*, Ph.D., 1971,  
University of New Mexico.

**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**, *Associate Professor*,  
M.A., 1972, University of South Western-Louisiana.

**JEANNETTE LUGO MORALES**, *Associate  
Professor*, M.A., 1980, New York University.

**CARMEN MALDONADO**, *Assistant Professor*,  
M.A., 1981, New York University.

**MARY MARTIN BETANCOURT**, *Professor*,  
Ph.D., 1986, Fordham University, New York.



**BETSY MORALES CARO**, *Assistant Professor*, Ph.D., 1999, University of Texas at Austin.

**BEVERLY H. NIEVES**, *Associate Professor*, M.A., 1952, New York University.

**DARNYD W ORTIZ SEDA**, *Professor*, Ph.D., 1990, Florida State University.

**MYRIAM D. PAGE**, *Associate Professor*, Ph.D., 1990, University of Iowa.

**MARIA L. PIÑEIRO**, *Assistant Professor*, M.A., 1979, Boston College.

**ELLEN PRATT RIOS**, *Assistant Professor*, Ph.D., 1999, Indiana University of Pennsylvania.

**SANDRA RIOS**, *Instructor*, M.A.E.E., 1987, University of Puerto Rico.

**ISMAEL RIVERA RODRIGUEZ**, *Associate Professor*, Ph.D., 1995, Pennsylvania State University.

**MYRNA RIVERA MONTIJO**, *Assistant Professor*, M.A.E.E., 1995, University of Puerto Rico.

**LINDA RODRIGUEZ**, *Associate Professor*, Ph.D., 1994, University of Michigan.

**ROBERT T. SHERWIN**, *Professor*, Ph.D., 1975, The Pennsylvania State University.

**JOHN SLACK**, *Assistant Professor*, Ph.D., 1995, University of Miami.

**GEORGIA SMYRNIU**, *Associate Professor*, Ph.D., 1994, University of Illinois.

**BARBARA STRODT LOPEZ**, *Associate Professor*, Ph.D., 1979, University of California at Los Angeles.

**NIDIA TIRU**, *Associate Professor*, M.A., 1971, Ohio State University.

**CHARMAINE WELLINGTON**, *Assistant Professor*, Ph.D., 1986, University of Illinois.

## COURSES OF INSTRUCTION

### DEPARTMENT OF ENGLISH

#### UNDERGRADUATE COURSES

ENGL 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.

ENGL 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 ENGL 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.

ENGL 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.

ENGL 3104. INTERMEDIATE ENGLISH II. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 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 expressions.

ENGL 3191. CONVERSATIONAL ENGLISH. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 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.

ENGL 3195. PROFESSIONAL CONVERSATION. One credit hour. One hour of lecture and one one-hour laboratory per week. Prerequisite: ENGL 3212 or ENGL 3202 or Consent of the Director of the Department.

An introductory communication course with

emphasis on interpersonal conversation in business and professional settings.

ENGL 3196. GROUP COMMUNICATION. One credit hour. One hour of lecture per week. Prerequisite: ENGL 3212 or ENGL 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.

ENGL 3197. PROFESSIONAL PRESENTATIONS. One credit hour. One hour of lecture 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.

ENGL 3198. PROFESSIONAL INTERVIEWS. One credit hour. One hour of lecture per week. Prerequisite: ENGL 3212 or ENGL 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.

ENGL 3201-3202. ENGLISH COMPOSITION AND READING. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ENGL 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.

ENGL 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.

ENGL 3212. ADVANCED ENGLISH II. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3211 or ENGL 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.

ENGL 3225. INTRODUCTION TO LINGUISTICS. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 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.

ENGL 3227. PHONETICS OF ENGLISH. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

Articulation, rhythm, and intonation of English, including its phonetic description, transcription, and oral practice in the laboratory.

ENGL 3231. ENGLISH EXPOSITORY WRITING. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

Practice in the various forms of expository writing. Detailed class criticism of diction, phrasing, and sentence structure. A research paper will be required.

ENGL 3236. TECHNICAL REPORT WRITING. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

Supervised writing, with emphasis on clearness, correctness, conciseness, completeness, and appropriate tone; practice in organizing paragraphing, sentence structure, word choice, grammar, and punctuation.

ENGL 3238. CREATIVE WRITING. Three credit hours. Three hours of lecture per week. Prerequisite: (ENGL 3202 or ENGL 3104 or ENGL 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.

ENGL 3250. PUBLIC SPEAKING. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3212 or ENGL 3104.

Principles and practice of oral presentations, their preparation, composition, and delivery, including formal, informal, and impromptu speech.

ENGL 3268. WRITING FOR THE COMMUNICATIONS MEDIA. Three credit hours. Three hours of lecture per week. Prerequisites: ENGL 3202 or ENGL 3104 or ENGL 3212.

Theory and practice in writing to broadcast information to an audience through the communications media.

ENGL 3300. STUDIES IN LITERATURE AND LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

Study of a special topic directed by an instructor in whose particular field of specialization the content of the course falls.

ENGL 3305. MODERN AMERICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

Major American writers of the present century with particular attention to the development of prose fiction and modern cultural attitudes.

ENGL 3306. MODERN BRITISH LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

Major British writers of the present century with particular attention to the development of prose, fiction and modern cultural attitudes.

ENGL 3312. THE NOVEL IN ENGLISH LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

Discussion of the works of the major English novelists from the eighteenth century to the present.

ENGL 3317. THE NOVEL IN AMERICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

Discussion of the major American novelists of the nineteenth and twentieth centuries.

ENGL 3318. LITERATURE OF THE ENGLISH-SPEAKING CARIBBEAN. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

Caribbean novelists, short story writers, poets, and playwrights of the 20th century who write in English.

ENGL 3321. ENGLISH LITERATURE TO 1798. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

Representative authors and major movements from the beginnings of English literature to the end of the Neoclassical period.

ENGL 3322. ENGLISH LITERATURE FROM 1798 TO MODERN PERIOD. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

Representative authors and major movements in English literature from the beginnings of the Romantic Period to the Modern Era.

ENGL 3323. MODERN DRAMA IN ENGLISH SINCE 1890. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

A survey of modern drama in England, Ireland, and the United States including such figures as Wilde, Shaw, O'Neill, Miller, Albee, and Pinter.

ENGL 3325. MODERN POETRY. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 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.

ENGL 3326. LITERATURE OF MINORITIES IN THE UNITED STATES. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

English-language literature of minorities in the United States, with particular attention to African American, Asian American, Native American, and Latino works.

ENGL 3345. TOPICS IN CINEMA. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3102 or ENGL 3104 or ENGL 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.

ENGL 3351. AMERICAN LITERATURE TO 1860. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

Major works of the literature of the United States from the colonial period to the onset of the Civil War.

ENGL 3352. AMERICAN LITERATURE FROM 1860 TO THE EARLY MODERN PERIOD. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3202 or ENGL 3104 or ENGL 3212.

Major works of the literature of the United States from the Civil War up to the nearly modern period.

ENGL 4000. ENGLISH LITERATURE OF THE 17TH CENTURY. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of ENGL 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.

ENGL 4009. LITERATURE OF THE ENGLISH RENAISSANCE. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of ENGL 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.

ENGL 4017. THE ROMANTIC MOVEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of ENGL 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.

ENGL 4025. SHAKESPEARE. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of ENGL 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.

ENGL 4026. SOCIOLINGUISTICS. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 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.

ENGL 4027. OLD AND MIDDLE ENGLISH LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of ENGL 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.

ENGL 4028. RESEARCH AND WRITING IN LANGUAGE AND LINGUISTICS. Three credit hours. Three hours of lecture per week. Prerequisites: ENGL 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.

ENGL 4030. RESEARCH AND WRITING IN LITERATURE. Three credit hours. Three hours of seminar per week. Prerequisites: ENGL 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.

ENGL 4047. ENGLISH PHONOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: (ENGL 3225 and ENGL 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.

ENGL 4075. PSYCHOLINGUISTICS. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 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.

ENGL 4095. THE VICTORIAN PERIOD. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of ENGL 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.

ENGL 4097. ENGLISH LITERATURE OF THE 18TH CENTURY. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of ENGL 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.

ENGL 4107. RHETORICAL THEORY. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 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.

ENGL 4108. ADVANCED TECHNICAL COMMUNICATION. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3236 or consent of the Director of the Department.

Principles and practice of writing and presenting technical communications.

ENGL 4125. INTRODUCTION TO SEMANTICS. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 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.

ENGL 4205. MORPHOLOGY AND SYNTAX. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3225.

Theory of language structure, primarily from the viewpoint of transformational-generative grammar.

ENGL 4206. THE STRUCTURE OF ENGLISH. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3225 or consent of the Director of the Department.

Advanced grammar course, especially in syntax.

ENGL 4208. HISTORY OF THE ENGLISH LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: ENGL 3225 or consent of the Department Director.

The English language from its Anglo-Saxon origins to modern times.

ENGL 4316. AMERICAN ROMANTICISM. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of ENGL 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.

ENGL 4317. AMERICAN REALISM AND NATURALISM. Three credit hours. Three hours of lecture per week. Prerequisite: One literature course at the level of ENGL 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**

ENGL 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.

ENGL 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.

ENGL 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.

ENGL 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.

ENGL 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 the degree of Bachelor of Sciences in Geology. As part of the 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, and X-ray analytical instruments including (an electron microprobe and XRF/XRD), geochemical, stable isotope, and remote sensing/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>
Total	141

#### FIRST YEAR

##### First Semester

*ENGL 3---	
First year course in English	3
*MATH 3171	
Pre-Calculus I	3
<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	3
<b>GEOL 3025</b>	
Earth Sciences	3
*SPAN 3101	
Basic Course in Spanish	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	<u>3</u>
	18

##### Second Semester

*ENGL 3---	
First year course in English	3
*MATH 3172	
Pre-Calculus II	3
<b>BIOS 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
*SPAN 3102	
Basic Course in Spanish	3

<b>HUMA 3112</b>	
Intro. to Western Culture II	<u>3</u>
	19

#### SECOND YEAR

##### First Semester

<b>MATH 3031</b>	
Calculus I	4
<b>CHEM 3001</b>	
General Chemistry	4
<b>ENGL 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>MATH 3032</b>	
Calculus II	4
<b>CHEM 3002</b>	
General Chemistry	4
<b>ENGL 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>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>PHCS 3151</b>	
Modern College Physics I	3
<b>PHCS 3153</b>	
Modern College Physics Lab. I	1
<b>COMP ----</b>	
Elective in Computer Science	3
<b>GEOL 4045</b>	
Petrogenesis of Crystalline Rocks	3
<b>GEOL 4046</b>	
Sedimentary Environments and Lithogenesis	3
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	17

##### Second Semester

<b>SPAN 3---</b>	
Course above level of basic Spanish	3

<b>PHCS 3152</b>	
Modern College Physics II	3
<b>PHCS 3154</b>	
Modern College Physics Lab. II	1
<b>GEOL 4009</b>	
Stratigraphy	3
<b>ELECTIVES</b>	
Free Electives	6
<b>PHED ----</b>	
Course in Physical Education	$\frac{1}{17}$

## SUMMER BETWEEN THIRD AND FOURTH YEAR

<b>GEOL 4018</b>	
Field Geology	6

### FOURTH YEAR

#### First Semester

<b>GEOL 4049</b>	
Undergraduate Research I	2
<b>GEOL 4011</b>	
Undergraduate Seminar	1
<b>GEOL ----</b>	
Geology Electives	3
<b>ELECTIVE</b>	
Recommended Elective in Science (not Geology), Mathematics, Engineering, Economics and/or Agronomy	3
<b>ELECTIVE</b>	
Free	3
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	$\frac{3}{15}$

#### Second Semester

<b>GEOL 4055</b>	
Undergraduate Research II	2
<b>GEOL 4012</b>	
Undergraduate Seminar	1
<b>GEOL ----</b>	
Geology Elective	3
<b>ELECTIVE</b>	
Recommended Elective in Science (not Geology), Mathematics, Engineering, Economics and/or Agronomy	3
<b>ELECTIVE</b>	
Free Elective	3
<b>SOSC 3122</b>	
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

**JAMES JOYCE**, *Professor*, Ph.D., 1985,  
Northwestern University at Evanston, Illinois.

**INGRID KLICH**, *Assistant Professor*, Ph.D., 1997,  
Texas A & M University.

**GLEN MATTIOLI**, *Professor*, Ph.D., 1987,  
Northwestern University at Evanston, Illinois.

**CARLOS MENDOZA**, *Associate Professor*, Ph.D.,  
1985, Colorado School of Mines.

**THOMAS MILLER**, *Assistant 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**, *Assistant Professor*, Ph.D.,  
1999, University of Colorado.

**JOHANNES SCHELLEKENS**, *Professor*, Ph.D.,  
1993, Syracuse University, New York.

## 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: CHEM 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: GEOL4015 or CIEG4001. Corequisite: GEOL3025.

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 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 (PHCS 3152 or PHCS 3162 or FISI 3172) and MATH 3032.

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.

## 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 that emphasizes the dual aspects of language and literature. It offers specialized courses in Spanish Language, Hispanic Philology, and 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 Bulletin of Information).

## 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>
Total	136

### FIRST YEAR

#### First Semester

<b>*SPAN 3101</b>	
Basic Course in Spanish I	3
<b>*ENGL 3---</b>	
First year course in English	3
<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	3
<b>SOSC 3121</b>	
Intro. to the Study of the	

Social Sciences	3
<b>*MATH 3171</b>	
Pre-Calculus I	3
<b>PHED ----</b>	
Course in Physical Education	$\frac{1}{16}$

**Second Semester**

<b>*SPAN 3102</b>	
Basic Course in Spanish II	3
<b>*ENGL 3---</b>	
First year course in English	3
<b>BIOS 3032</b>	
Intro. to the Biological Sciences II	3
<b>SOSC 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>MATH 3---</b>	
**Recommended Course in Mathematics	3
<b>PHED ----</b>	
Course in Physical Education	$\frac{1}{16}$

**SECOND YEAR****First Semester**

<b>SPAN 3211</b>	
Intro. to Spanish Literature I	3
<b>ENGL 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>PHCS, CHEM or GEOL</b>	
Elective in Physics, Chemistry or Geology	$\frac{3}{18}$

**Second Semester**

<b>SPAN 3212</b>	
Intro. to Spanish Literature II	3
<b>ENGL 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>PHCS, CHEM or GEOL</b>	
Elective in Physics, Chemistry or Geology	$\frac{3}{18}$

**THIRD YEAR****First Semester**

<b>SPAN 4201</b>	
Intro. to Linguistics I	3
<b>SPAN 4221</b>	
Spanish-American Literature I	3
<b>SPAN 4251</b>	
The Golden Age	3
<b>HIST 3241</b>	
History of Puerto Rico	3
<b>ELECTIVE</b>	
Romance Language elective	3
<b>SPAN ----</b>	
Electives in Spanish	$\frac{3}{18}$

**Second Semester**

<b>SPAN 4202</b>	
Intro. to Linguistics II	3
<b>SPAN 4222</b>	
Spanish-American Literature II	3
<b>SPAN 4252</b>	
The Golden Age	3
<b>HIST 3242</b>	
History of Puerto Rico	3
<b>ELECTIVE</b>	
Romance Language Elective	3
<b>SPAN ----</b>	
Electives in Spanish	$\frac{3}{18}$

**FOURTH YEAR****First Semester**

<b>SPAN 4011</b>	
Diachrony of the Spanish Language	3
<b>SPAN 4231</b>	
Puerto Rican Literature I	3
<b>SPAN 4491</b>	
Seminar	1
<b>SPAN ----</b>	
Electives in Spanish	3
<b>ELECTIVES</b>	
Electives	$\frac{6}{16}$

**Second Semester**

<b>SPAN 4012</b>	
The Spanish Language in America	3
<b>SPAN 4232</b>	
Puerto Rican Literature II	3
<b>SPAN 4492</b>	

Seminar	1
<b>SPAN ----</b>	
Elective in Spanish	3
<b>ELECTIVE</b>	
Electives	<u>6</u>
	16

**Total credits required: 136**

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

\*\*To be chosen from the alternatives defined by the Department.

## DEPARTMENTAL FACULTY

**MARLENE ACARON RAMIREZ**, *Professor*, M.A., 1974, University of Puerto Rico. Research and Teaching Interests: Puerto Rican and Spanish American Literature, Studies of the Female Gender in Literature.

**MANUEL ALVAREZ NAZARIO**, *Emeritus Professor*, Ph.D., 1954, Universidad Central de Madrid. Research and Teaching Interest: Romanesque Philology.

**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**, *Instructor*, 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.

**MIGUEL A. FEAL DEIBE**, *Professor*, Licenciatura, 1966, Universidad Complutense de Madrid. Research and Teaching Interest: Spanish Literature.

**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**, *Associate 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 GRANIOLA RODRIGUEZ**, *Professor*, Ph.D. 1987, University of Illinois, Urbana. Research and Teaching interests: Spanish American and Mexican Literature, Critical Theory of Literature, Novel, Writing.

**LUIS LOPEZ ALVAREZ**, *Professor*, Ph.D., 1985, Université de Paris III Sorbone Nouvelle. Research and Teaching Interests: Literature and National Identity, Poetry, Communication, Exchange Programs, Journalism, International Relations, Political Sciences, Social Sciences. Poet.

**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**, *Associate 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**, *Associate 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, syntaxis, 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**, *Assistant 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

SPAN 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.

SPAN 3021. MASTERPIECES OF SPANISH AMERICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 3102.

Study of masterpieces of Spanish American Literature from the sixteenth century to the nineteenth century, including examples of Puerto Rican literature.

SPAN 3022. MASTERPIECES OF SPANISH AMERICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 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.

SPAN 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.

SPAN 3102. BASIC COURSE IN SPANISH II. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 3101.

Practice in the critical reading of essays, poetry, and drama; the writing and editing of expository texts; effective oral communication in Spanish.

SPAN 3208. COMPOSITION. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 3102.

Theory of grammar applied to the written language; comparison among languages of diverse literary genres; elements of semantic and stylistics.

SPAN 3211-3212. INTRODUCTION TO SPANISH LITERATURE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: SPAN 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.

SPAN 3215. EXPRESSION AND COMMUNICATION. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 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.

SPAN 3295. SPANISH GRAMMAR. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 3102.

A study of phonetic, orthography, morphology and syntax. Emphasis on written and oral compositions.

SPAN 3305. CINEMA AND HISPANIC LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 3102.

A comparative analysis of literary and cinematic codes in Hispanic texts and the films based on them.

SPAN 3315. WOMEN AND WRITING IN HISPANIC AMERICA. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 3102.

Identity, intimacy, and social struggle of Hispanic American women in representative texts written by women; diverse readings from a gender perspective.

SPAN 4007. FICTION IN PUERTO RICAN LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 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.

SPAN 4011. DIACHRONY OF THE SPANISH LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: (SPAN 4201 and SPAN 4202) or ENGL 3225.

Phonological, morpho-syntactic and lexico-semantic evolution of the Spanish language from Latin.

SPAN 4012. THE SPANISH LANGUAGE IN HISPANIC AMERICA. Three credit hours. Three hours of lecture per week. Prerequisite: (SPAN 4201 and SPAN 4202) or ENGL 3225.

Analysis of Hispanic American Spanish from the perspectives of linguistic geography, dialectology, and sociolinguistics.

SPAN 4021-4022. CERVANTES. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: SPAN 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.

SPAN 4051-4052. SPANISH LITERATURE OF THE NINETEENTH CENTURY. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: SPAN 3212.

Study of the currents of Romanticism, Post-romanticism and Realism in Spanish literature.

SPAN 4056. MODERNISM LITERATURE IN SPANISH AMERICA. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 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.

SPAN 4061-4062. SPANISH POETRY. Three credit hours per semester. Three hours of lecture



per week each semester. Prerequisite: SPAN 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.

SPAN 4071-4072. THE SHORT STORY IN SPANISH-AMERICA. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: SPAN 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.

SPAN 4105. PUERTO RICAN POETRY. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 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.

SPAN 4201. INTRODUCTION TO LINGUISTICS I. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 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.

SPAN 4202. INTRODUCTION TO LINGUISTICS II. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 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.

SPAN 4221-4222. SPANISH-AMERICAN LITERATURE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: SPAN 3212.

Lecture accompanied by the reading of selected works.

SPAN 4231-4232. PUERTO RICAN LITERATURE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: SPAN 4222.

Lectures accompanied by the reading of selected works.

SPAN 4251-4252. THE GOLDEN AGE. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: SPAN 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.

SPAN 4405. TECHNICAL AND SCIENTIFIC WRITING. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 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.

SPAN 4491-4492. SEMINAR. One credit hour per semester. One hour of lecture per week per 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.

SPAN 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.

SPAN 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**

SPAN 5005. POETIC GENERATION OF 1927. Three credit hours. Three hours of lecture per week. Prerequisite: SPAN 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 the 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 of the students in the University.

Among the facilities of the Department are an art gallery, a specialized library and study room for our majors, computer center, a theatre workshop and an interdisciplinary research center for practical and professional ethics and the philosophy of science and technology. The University is in the process of funding new and expanded art facilities.

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 and diversity, and to value true knowledge. The Department of Humanities promotes research among its faculty, and 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 the 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.

### **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>
Total	136

#### **FIRST YEAR**

##### **First Semester**

<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>ITAL, FREN or GERM</b>	
Modern Language	
(First year course)	3
<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3101</b>	
Basic Course in Spanish	3
<b>*MATH 3171</b>	
Pre-Calculus I	3

**PHED ----**  
Course in Physical  
Education 1  
16

**Second Semester**

**HUMA 3112**  
Intro. to Western Culture II 3  
**ITAL, FREN or GERM**  
Modern Language  
(First year course) 3  
**\*ENGL 3---**  
First year course in English 3  
**\*SPAN 3102**  
Basic Course in Spanish 3  
**\*\*MATH, COMP or MSTA**  
Recommended Course in  
Mathematics 3  
**PHED ----**  
Course in Physical  
Education 1  
16

**SECOND YEAR****First Semester**

**LITE 3025**  
Literary Theory 3  
**LITE 3041**  
Intro. to Comparative  
Literature 3  
**ITAL, FREN or GERM**  
Modern Language  
(Second year course) 3  
**ENGL 3---**  
Second year course in  
English 3  
**SPAN 3---**  
Course above level of basic  
Spanish 3  
**ELECTIVE**  
Free Electives 3  
18

**Second Semester**

**LITE 3035**  
Mythology in Western  
Literature 3  
**LITE 3042**  
Intro. to Comparative  
Literature 3  
**ITAL, FREN or GERM**  
Modern Language  
(Second year course) 3  
**ENGL 3---**  
Second year course in  
English 3  
**SPAN 3---**  
Course above level of basic  
Spanish 3  
**ELECTIVE**

Free Electives 3  
18

**THIRD YEAR****First Semester**

**LITE 4011**  
Evolution of the Novel 3  
**LITE 4021**  
Comparative Drama 3  
**PHIL 3001**  
Intro. to Philosophy 3  
**SOSC 3121**  
Intro. to the Study of the  
Social Sciences 3  
**PHCS, CHEM or GEOL**  
Electives 3  
**ELECTIVE**  
Free Electives 3  
18

**Second Semester**

**LITE 4012**  
Evolution of the Novel 3  
**LITE 4022**  
Comparative Drama 3  
**PHIL 3002**  
Intro. to Philosophy 3  
**SOSC 3122**  
Intro. to the Study of the  
Social Sciences 3  
**PHCS, CHEM or GEOL**  
Electives 3  
**ELECTIVE**  
Free Electives 3  
18

**FOURTH YEAR****First Semester**

**LITE 4051**  
Comparative Poetry 3  
**LITE 4091**  
Comparative Literature  
Seminar 1  
**LITE ----**  
Elective in Comparative  
Literature 3  
**BIOS 3031**  
Intro. to the Biological  
Sciences I 3  
**HIST ----**  
Elective in History 3  
**ELECTIVE**  
Elective in a National  
Literature 3  
16

**Second Semester**

**LITE 4052**  
Comparative Poetry 3

**LITE 4092**

Comparative Literature Seminar	1
<b>LITE ----</b>	
Elective in Comparative Literature	3
<b>BIOS 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.

\*\*MATH 3000, MATH 3172, COMP 3010, COMP 3057, MSTA 3015 or MSTA 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>FREN 3141</b>	
French I	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3101</b>	
Basic Course in Spanish	3
<b>*MATH 3171</b>	
Pre-Calculus I	3
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	16

**Second Semester**

<b>FREN 3142</b>	
French II	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3102</b>	
Basic Course in Spanish	3
<b>MATH, COMP or MSTA---</b>	
**Recommended Course in Mathematics	3
<b>PHED----</b>	
Course in Physical Education	<u>1</u>
	16

**SECOND YEAR****First Semester**

<b>FREN 3143</b>	
French III	3
<b>FREN 3060</b>	
French Phonetics	3
<b>LATI 3011</b>	
Elementary Latin	3
<b>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>ELECTIVE</b>	
Free Electives	<u>3</u>
	18

**Second Semester**

<b>FREN 3144</b>	
French IV	3
<b>FREN 3155</b>	
Conversation I	3
<b>LATI 3012</b>	
Elementary Latin	3
<b>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>ELECTIVE</b>	
Free Electives	<u>3</u>
	18

**THIRD YEAR****First Semester**

<b>FREN 4181</b>	
French Literature to the Revolution	3
<b>FREN 4115</b>	
French Composition	3

<b>FREN 4151</b>	
French Culture & Civilization	3
<b>PHIL 3001</b>	
Introduction to Philosophy	3
<b>PHCS, CHEM or GEOL</b>	
Electives	3
<b>ELECTIVE</b>	
Free Electives	<u>3</u>
	18

**Second Semester**

<b>FREN 4182</b>	
French Literature to the Revolution	3
<b>FREN 4116</b>	
Conversation II	3
<b>FREN 4152</b>	
French Culture & Civilization	3
<b>PHIL 3002</b>	
Introduction to Philosophy	3
<b>PHCS, CHEM or GEOL</b>	
Electives	3
<b>ELECTIVE</b>	
Free Electives	<u>3</u>
	18

**FOURTH YEAR****First Semester**

<b>FREN 4191</b>	
French Literature since the Revolution	3
<b>FREN 4221</b>	
French Seminar	1
<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	3
<b>SOSC 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>FREN 4192</b>	
French Literature since the Revolution	3
<b>FREN 4222</b>	
French Seminar	1
<b>BIOS 3032</b>	
Intro. to the Biological Sciences II	3
<b>SOSC 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.

\*\*MATH 3000, MATH 3172, COMP 3010, COMP 3057, MSTA 3015, or MSTA 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>PHIL 3001</b>	
Intro. to Philosophy	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3101</b>	
Basic Course in Spanish	3
<b>*MATH 3171</b>	
Pre-Calculus I	3
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	<u>3</u>
	18

**Second Semester**

<b>PHIL 3002</b>	
Intro. to Philosophy	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3102</b>	
Basic Course in Spanish	3
<b>*MATH 3172</b>	
Pre-Calculus II	3

<b>SOSC 3122</b>				<b>GERM 3043</b>	
Intro. to the Study of the				German III	
Social Sciences	<u>3</u>			or	
	18			<b>GREE 3011</b>	
<b>SECOND YEAR</b>				Elementary Greek	
				or	
<b>First Semester</b>				<b>LATI 3011</b>	
				Elementary Latin	3
<b>PHIL 3157</b>				<b>PSYC 3001</b>	
Introduction to Logic	3			Principles of Psychology I	3
<b>PHIL 3158</b>				<b>BIOS 3031</b>	
Ancient Philosophy	3			Introduction to Biological	
<b>FREN 3141</b>				Sciences I	3
French I				<b>ELECTIVE</b>	
or				Free Electives	<u>3</u>
<b>GERM 3041</b>					18
German I	3			<b>Second Semester</b>	
<b>ENGL 3---</b>					
Second year course in				<b>PHIL 3166</b>	
English	3			Contemporary Philosophy	3
<b>SPAN 3---</b>				<b>FREN 3144</b>	
Course above level of basic				French IV	
Spanish	3			or	
<b>PHCS, CHEM or GEOL</b>				<b>GERM 3044</b>	
Electives	<u>3</u>			German IV	
	18			or	
<b>Second Semester</b>				<b>GREE 3012</b>	
				Elementary Greek	
<b>PHIL 3159</b>				or	
Medieval Philosophy	3			<b>LATI 3012</b>	
<b>FREN 3142</b>				Elementary Latin	3
French II				<b>PSYC 3002</b>	
or				Principles of Psychology II	3
<b>GERM 3042</b>				<b>BIOS 3032</b>	
German II	3			Introduction to Biological	
<b>ENGL 3---</b>				Sciences II	3
Second year course in				<b>PHIL 4041</b>	
English	3			Metaphysics I	
<b>SPAN 3---</b>				or	
Course above level of basic				<b>PHIL 4146</b>	
Spanish	3			Epistemology I	3
<b>HIST 3202</b>				<b>ELECTIVE</b>	
Modern World History II				Free Electives	<u>3</u>
or					18
<b>HIST 3195</b>				<b>FOURTH YEAR</b>	
History of the Ancient					
World	3			<b>First Semester</b>	
<b>PHCS, CHEM or GEOL</b>					
Physics, Chemistry or				<b>PHIL 4146</b>	
Geology course	<u>3</u>			Epistemology I	
	18			or	
<b>THIRD YEAR</b>				<b>PHIL 4041</b>	
				Metaphysics I	3
<b>First Semester</b>				<b>PHIL 4161</b>	
				Philosophy Seminar	1
<b>PHIL 3155</b>				<b>PHIL ----</b>	
Introduction to Ethics	3			Third or fourth level course in	
<b>PHIL 3165</b>				Philosophy	3
Modern Philosophy	3			<b>PHIL 3167</b>	
<b>FREN 3143</b>				Symbolic Logic I	3
French III				<b>ELECTIVE</b>	
or				Free Electives	6

<b>PHED ----</b>	
Basic Course in Physical Education	$\frac{1}{17}$

**Second Semester**

<b>PHIL ----</b>	
Third or fourth level course in Philosophy	3

<b>PHIL ----</b>	
Elective in Philosophy	3

<b>PHIL 4162</b>	
Philosophy Seminar	1

<b>ELECTIVES</b>	
Free Electives	7

<b>PHED ----</b>	
Basic Course in Physical Education	$\frac{1}{15}$

**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	$\frac{14}{140}$
Total	

**FIRST YEAR****First Semester**

<b>HUMA 3111</b>	
Intro. to Western Culture I	3

<b>*ENGL 3---</b>	
First year course in English	3

<b>*SPAN 3101</b>	
Basic Course in Spanish	3

<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	3

<b>*MATH 3171</b>	
Pre-Calculus I	3

<b>PHED ----</b>	
Course in Physical Education	1

<b>ELECTIVE</b>	
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Electives	$\frac{2}{18}$
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**Second Semester**

<b>HUMA 3112</b>	
Intro. to Western Culture II	3

<b>*ENGL 3---</b>	
First year course in English	3

<b>*SPAN 3102</b>	
Basic Course in Spanish	3

<b>SOSC 3122</b>	
Intro. to the Study of the Social Sciences	3

<b>MATH, COMP or MSTA</b>	
**Recommended Courses	3

<b>PHED ----</b>	
Physical Education	1

<b>ELECTIVE</b>	
Electives	$\frac{2}{18}$

**SECOND YEAR****First Semester**

<b>ARTS 3121</b>	
Painting and Drawing Workshop	3

<b>ARTS 3151</b>	
Fundamentals of Art Theory	3

<b>FREN 3141</b>	
French I	

or	
<b>ITAL 3071</b>	

Italian I	3
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<b>ENGL 3---</b>	
Second year course in English	3

<b>SPAN 3---</b>	
Course above level of basic Spanish	3

<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	$\frac{3}{18}$

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**Second Semester**

<b>ARTS 3122</b>	
Painting and Drawing Workshop	3

<b>ARTS 3152</b>	
Fundamentals of Art Theory	3

<b>FREN 3142</b>	
French II	

or	
<b>ITAL 3072</b>	

Italian II	3
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<b>ENGL 3---</b>	
Second year course in English	3

<b>SPAN 3---</b>	
Course above level of basic Spanish	3

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**BIOS 3032**

Intro. to the Biological  
Sciences II 3  
18

**THIRD YEAR****First Semester****ARTS 4251**

Graphic Arts Workshop 3

**ARTS 4271**

Art History to the  
Renaissance 3

**ARTS ----**

Elective in Art 3

**FREN 3143**

French III  
or

**ITAL 3073**

Italian III 3

**PHIL 3001**

Introduction to Philosophy 3

**PHCS, CHEM or GEOL**

Electives 3  
18

**Second Semester****ARTS 4252**

Graphic Arts Workshop 3

**ARTS 4272**

Art History to the  
Renaissance 3

**ARTS ----**

Elective in Art 3

**FREN 3144**

French IV  
or

**ITAL 3074**

Italian IV 3

**PHIL 3002**

Introduction to Philosophy 3

**PHCS, CHEM or GEOL**

Electives 3  
18

**FOURTH YEAR****First Semester****ARTS 4291**

Sculpture and Modeling  
Workshop I 3

**ARTS 4259**

Modern Art 3

**ARTS 4321**

Art Seminar 2

**HIST ----**

Elective in History 3

**ELECTIVE**

Electives 5  
16

**Second Semester****ARTS 4292**

Sculpture and Modeling  
Workshop II 3

**ARTS 4335**

Modern Art 3

**ARTS 4322**

Art Seminar 2

**HIST ----**

Elective in History 3

**ELECTIVE**

Electives 5  
16

**Total credits required: 140**

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

\*\*MATH 3000, MATH 3172, COMP 3010,  
COMP 3057, MSTA 3015 or MSTA 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>
Total	140

**FIRST YEAR****First Semester****HUMA 3111**

Intro. to Western Culture I 3

**\*ENGL 3---**

First year course in English 3

**\*SPAN 3101**

Basic Course in Spanish 3

**SOSC 3121**

Intro. to the Study of the  
Social Sciences 3

**\*MATH 3171**

Pre-Calculus I 3

**PHED ----**

Course in Physical Education 1  
16

**Second Semester****HUMA 3112**

Intro. to Western Culture II 3

**\*ENGL 3---**



First year course in English <b>*SPAN 3102</b>	3
Basic Course in Spanish <b>SOSC 3122</b>	3
Intro. to the Study of the Social Sciences <b>MATH, COMP or MST A----</b>	3
<b>**Recommended Courses</b> <b>PHED ----</b>	3
Course in Physical Education	$\frac{1}{16}$

**SECOND YEAR**

**First Semester**

<b>ARTS 3151</b> Fundamentals of Art Theory	3
<b>FREN 3141</b> French I or <b>ITAL 3071</b> Italian I	3
<b>PHIL 3001</b> Introduction to Philosophy	3
<b>ENGL 3---</b> Second year course in English	3
<b>SPAN 3---</b> Course above level of basic Spanish	3
<b>BIOS 3031</b> Intro. to the Biological Sciences I	$\frac{3}{18}$

**Second Semester**

<b>ARTS 3152</b> Fundamentals of Art Theory	3
<b>FREN 3142</b> French II or <b>ITAL 3072</b> Italian II	3
<b>PHIL 3002</b> Introduction to Philosophy	3
<b>ENGL 3---</b> Second year course in English	3
<b>SPAN 3---</b> Course above level of basic Spanish	3
<b>BIOS 3032</b> Intro. to the Biological Sciences II	$\frac{3}{18}$

**THIRD YEAR**

**First Semester**

<b>ARTS 4271</b> Art History to the Renaissance	3
<b>PHIL 4051</b> Principles of Aesthetics	3

<b>FREN 3143</b> French III or <b>ITAL 3073</b> Italian III	3
<b>ARTS ----</b> Elective in Art	3
<b>HIST ----</b> Elective in History	3
<b>PHCS, CHEM or GEOL</b> Electives	$\frac{3}{18}$

**Second Semester**

<b>ARTS 4272</b> Art History to the Renaissance	3
<b>PHIL 4052</b> Contemporary Aesthetics	3
<b>FREN 3144</b> French IV or <b>ITAL 3074</b> Italian IV	3
<b>ARTS ----</b> Elective in Art	3
<b>HIST ----</b> Elective in History	3
<b>PHCS, CHEM or GEOL</b> Electives	$\frac{3}{18}$

**FOURTH YEAR**

**First Semester**

<b>ARTS 4259</b> Modern Art	3
<b>ARTS 4311</b> Art Criticism	3
<b>ARTS 4321</b> Art Seminar	2
<b>ARTS ----</b> Electives in Art	3
<b>ELECTIVES</b> Electives	$\frac{7}{18}$

**Second Semester**

<b>ARTS 4335</b> Modern Art	3
<b>ARTS 4312</b> Art Criticism	3
<b>ARTS 4322</b> Art Seminar	2
<b>ARTS ----</b> Electives in Art	3
<b>ELECTIVES</b> Electives	$\frac{7}{18}$

**Total credits required: 140**

\*Refer to the Academic Regulations section for information on Advanced Placement.  
 \*\*MATH 3000, MATH 3172, COMP 3010, COMP 3057, MSTA 3015 or MSTA 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.

**LUIS E. BACO RODRIGUEZ**, *Professor*, Ph.D., 1974, Universidad de Navarra.

**PAULETTE BAUMGARDT**, *Professor*, Ph.D., 1972, University of Wisconsin.

**ANDERSON BROWN**, *Associate Professor*, Ph.D., 1996, University of Colorado at Boulder.

**YVETTE CABRERA VEGA**, *Assistant Professor*, M.F.A., 1983, Pratt Institute.

**CARLOS A. CASABLANCA**, *Professor*, Ph.D., 1979, University of La Sorbonne.

**EDWIN CORDERO**, *Associate Professor*, M.A., 1981, Pratts Institute.

**WADED CRUZADO**, *Professor*, Ph.D., 1990, University of Texas at Arlington.

**FELIX DIAZ VELEZ**, *Professor*, Ph.D., 2000, University of Puerto Rico.

**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**, *Associate Professor*, M.A., 1975, Universidad Nacional Autónoma de México.

**MARIE SILVIE GAUTIER**, *Professor*, Ph.D., 1977, Yale University.

**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**, *Assistant Professor*, Ph.D, 1996, University of Maryland, College Park.

**ELENA LUGO**, *Professor*, Ph.D., 1967, Georgetown University.

**ROSA FERNANDA MARTINEZ CRUZADO**, *Professor*, Ph.D., 1982, University of J.W. Goethe, Frankfurt.

**ZULMA MIURA**, *Professor*, M.A., 1973, University of Chicago.

**ROBERTA ORLANDINI**, *Professor*, Ph.D., 1988, Drew University.

**ALFREDO ORTIZ**, *Assistant Professor*, M.F.A., 1985, Pratt Institute.

**GERALDINE POIZAT**, *Assistant Professor*, Ph.D., 1997, Université Lyon II - Lumière, Lyon.

**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**, *Assistant Professor*, Ph.D., 1998, The City University of New York-Graduate Center.

**ALBERTO TRALDI**, *Professor*, Ph.D., 1973, Columbia University.

**JAMES H. WARD III**, *Professor*, Ph.D., 1967, Tulane University.

**FELIX ZAPATA**, *Associate Professor*, M.F.A., 1984, Rochester Institute of Technology.

**COURSES OF INSTRUCTION****DEPARTMENT OF HUMANITIES****ART****UNDERGRADUATE COURSES**

ARTS 3121-3122. PAINTING AND DRAWING WORKSHOP. Three credit hours per semester. Six hours workshop per week each semester.

Design and study of techniques of artistic expression; an opportunity to experiment with a great variety of materials, such as pencil, crayon, ink, charcoal, pastel, water-color, casein, and combinations of these. Students will be free to choose subjects of interest from among still-life landscapes, studies, architecture in Mayagüez, paintings and sculpture from the museum, or original composition.

ARTS 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.

ARTS 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.

ARTS 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.

ARTS 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.

ARTS 3235. WATERCOLOR. Three credit hours. Six hours of workshop per week. Prerequisite: ARTS 3121.

Methods, materials, and techniques of watercolor.

ARTS 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's life.

ARTS 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.

ARTS 3532. COMPUTERS IN THE VISUAL ARTS II. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: ARTS 3531.

Creation of digitized three-dimensional images; computer animation.

ARTS 4259-4335. MODERN ART. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisite: ARTS 4272.

The development of modern art since the time of the impressionists and their precursors, in painting, sculpture, architecture, and the graphic arts.

ARTS 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.

ARTS 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.

ARTS 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.

ARTS 4331-4332. 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?

ARTS 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.

ARTS 4996. SPECIAL TOPICS II. One to three credit hours. One to three hours of lecture or two to six hours of workshop per week. Prerequisite: consent of the Director of the Department.

Special seminar on a chosen theme in fine arts, plastic arts, art history or art theory.

## **FRENCH**

### **UNDERGRADUATE COURSES**

FREN 3060. FRENCH PHONETICS. Three credit hours. Three hours of lecture per week. Prerequisite: FREN 3141.

A study of the sounds, intonation and rhythm of the French language, with intensive laboratory practice.

FREN 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.

FREN 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.

FREN 3143-3144. FRENCH III-IV. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: FREN 3142.

Review of French grammar; study of French idioms and word groups; composition; intensive and extensive readings.

FREN 3151. BUSINESS FRENCH I. Three credit hours. Three hours of lecture per week. Prerequisite: FREN 3143.

Basic French vocabulary and style used in business and commerce.

FREN 3155. CONVERSATION I. Three credit hours. Three hours of lecture per week. Prerequisite: FREN 3141 or consent of the Director of the Department.

Intensive oral practice in the French language. The emphasis will be on contemporary colloquial French.

FREN 4007. ADVANCED GRAMMAR. Three credit hours. Three hours of lecture per week. Prerequisite: FREN 3144.

An advanced study of French grammar by means of translations from Spanish to French.

FREN 4008. ADVANCED COMPOSITION. Three credit hours. Three hours of lecture per week. Prerequisite: FREN 4115.

Intensive study of the techniques of composition, with emphasis on style and editing.

FREN 4036. BUSINESS FRENCH II. Three credit hours. Three hours of lecture per week. Prerequisite: FREN 3144 or FREN 3151.

Advanced French vocabulary and style used in business and commerce. Emphasis on written and oral reports. Offered in French.

FREN 4115. FRENCH COMPOSITION. Three credit hours. Three hours of lecture per week. Prerequisite: FREN 3144.

A study of the techniques of composition, and of the most common French idiomatic expressions. Intensive grammar review.

FREN 4116. CONVERSATION II. Three credit hours. Three hours of lecture per week. Prerequisite: FREN 3155.

A course in advanced French conversation, with emphasis on idiomatic expressions and common phrases, and applied grammar. Translations from Spanish to French.

FREN 4141-4142. FRENCH POETRY. Three credit hours per semester. Three lectures per week each semester. Prerequisite: FREN 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.

FREN 4145. THE FRENCH NOVEL. Three credit hours. Three hours of lecture per week. Prerequisite: FREN 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.

FREN 4147. MODERN FRENCH LITERATURE. Three credit hours. Three hours of lecture per week. Prerequisite: FREN 3144.

A survey of the French novel, the poetry, and the theatre of the Twentieth Century, focusing on outstanding works and major literary movements.

FREN 4149. FRENCH POETRY. Three credit hours. Three hours of lecture per week. Prerequisite: FREN 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.

FREN 4151-4152. FRENCH CULTURE AND CIVILIZATION. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisite: FREN 3144.

Panoramic view of the development of French culture and civilization; its contribution to all aspects of European culture. Given in French.

FREN 4181-4182. FRENCH LITERATURE TO THE REVOLUTION. Three credit hours. Three hours of lecture per week per semester. Prerequisite: FREN 3144.

A study of selected works representative of the chief periods of French literature from the Middle Ages to the Revolution.

FREN 4185. HISTORY OF THE FRENCH LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: FREN 3144 and FREN 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.

FREN 4191. FRENCH LITERATURE SINCE THE REVOLUTION. Three credit hours. Three hours of lecture per week. Prerequisite: FREN 3144.

A study of selected works representatives of the chief periods of French literature from the Revolution to the present.

FREN 4192. FRENCH LITERATURE SINCE THE REVOLUTION. Three credit hours. Three hours of lecture per week. Prerequisite: FREN 3144.

A study of selected works representative of the chief periods of French literature from the Revolution to the present.

FREN 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.

FREN 4237. UNDERGRADUATE RESEARCH II. One credit hour. Three hours of research per week. Prerequisite: FREN 4236.

Writing and presentation of a research paper in French on a topic related to French language, literature, or culture.

FREN 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.

FREN 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**

### **UNDERGRADUATE COURSES**

GERM 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.

GERM 3043-3044. GERMAN III-IV. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: GERM 3042.

Thorough review of grammar, advanced composition, readings from German authors.

GERM 4001-4002. GERMAN LITERATURE. Three credit hours per semester. Three hours of

lecture per week per semester Prerequisite: GERM 3044.

A study of selected readings in the prose and poetry of the Nineteenth Century from Novalis to Storm and Hauptmann.

## **GREEK**

### **UNDERGRADUATE COURSES**

GREE 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**

### **UNDERGRADUATE COURSES**

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**

#### **UNDERGRADUATE COURSES**

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.

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**

### **UNDERGRADUATE COURSES**

JAPA 3111. JAPANESE I. Three credit hours. Three hours of lecture per week.

Fundamentals of Japanese language and culture with an emphasis on spoken language.

JAPA 3112. JAPANESE II. Three credit hours. Three hours of lecture per week. Prerequisite: JAPA 3111 or JAPA 3101.

Fundamentals of Japanese language and culture with an emphasis on spoken language; introduction to the written language.

JAPA 3211. JAPANESE III. Three credit hours. Three hours of lecture per week. Prerequisite: JAPA 3112 or JAPA 3102.

Intermediate study of Japanese language and culture. Practice of katakana, hiragana, and Chinese characters.

JAPA 3212. JAPANESE IV. Three credit hours. Three hours of lecture per week. Prerequisite: JAPA 3211 or JAPA 3201.

Intermediate study of Japanese language and culture with an emphasis on reading and writing.

## **LATIN**

### **UNDERGRADUATE COURSES**

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**

### **UNDERGRADUATE COURSES**

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. 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 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 SPAN 3212 or SPAN 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 /PHIL 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/ PHIL 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 topic 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

### UNDERGRADUATE COURSES

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 3171-3172. MUSICAL READING AND THEORY. Three credit hours per semester. Three hours of lecture per week each semester.

A study of notation and reading in various keys; rhythms, intervals, and the construction of major and minor scales; auditory exercises, rhythmic and melodic dictation, analysis of minor forms, and melodic composition.

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

### UNDERGRADUATE COURSES

PHIL 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.

PHIL 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.

PHIL 3155. INTRODUCTION TO ETHICS. Three credit hours. Three hours of lecture per week.

Fundamentals of moral evaluation in human conduct.

PHIL 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.

PHIL 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.

PHIL 3158. ANCIENT PHILOSOPHY. Three credit hours. Three hours of lecture per week.

History of philosophy from the Presocratics to Plotinus.

PHIL 3159. MEDIEVAL PHILOSOPHY. Three credit hours. Three hours of lecture per week. Prerequisite: PHIL 3001 or PHIL 3002 or PHIL 3158.

History of philosophy from Saint Augustine to Francisco Suárez.

PHIL 3165. MODERN PHILOSOPHY. Three credit hours. Three hours of lecture per week. Prerequisite: PHIL 3001 or PHIL 3002 or PHIL 3158 or PHIL 3159.

History of philosophy from the Renaissance to Immanuel Kant.

PHIL 3166. CONTEMPORARY PHILOSOPHY. Three credit hours. Three hours of lecture per week. Prerequisite: PHIL 3001 or PHIL 3002 or PHIL 3165.

History of philosophy of the nineteenth and twentieth centuries.

PHIL 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.

PHIL 3168. PHILOSOPHY OF SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisite: PHCS 3171 or PHCS 3161 or PHCS 3151 or PHCS 3091 or PHCS 3012.

Introductory philosophical exposition of the development and the fundamental assumptions of the principal concepts and theories of science, particularly of modern physics.

PHIL 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.

PHIL 3175. PHILOSOPHY OF HISTORY. Three credit hours. Three hours of lecture per week.

Philosophical consideration of history as a human process; principal theories.

PHIL 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.

PHIL 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.

PHIL 4027. BIOETHICS. Three credit hours. Three hours of lecture per week.

Moral problems related to biological research and technology.

PHIL 4041. METAPHYSICS I. Three credit hours. Three hours of lecture per week. Prerequisite: PHIL 3001 or PHIL 3002 or PHIL 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.

PHIL 4042. METAPHYSICS II. Three credit hours. Three hours of lecture per week. Prerequisite: PHIL 4041.

Metaphysical thought after the Renaissance: rationalism, critical and absolute idealism, and Heideggerian existentialism.

PHIL 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.

PHIL 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.

PHIL 4052. CONTEMPORARY AESTHETICS. Three credit hours. Three hours of lecture per week.

Contemporary aesthetic school: experimental, hedonistic, psychological, psychoanalytical, sociological, phenomenological, existentialist, and others.

PHIL 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.

PHIL 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.

PHIL 4145. SYMBOLIC LOGIC II. Three credit hours. Three hours of lecture per week. Prerequisite: PHIL 3167.

The logic of relations; deductive systems; theory of classes; philosophical bases of symbolic logic.

PHIL 4146. CONTEMPORARY EPISTEMOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PHIL 3165. Corequisite: PHIL 3166.

Current issues in epistemology; such as foundationalism versus coherence and internalism versus externalism. Recent writings of representative figures in the field.

PHIL 4147. PHILOSOPHY OF PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3002.

Philosophical presuppositions of scientific inquiry in psychology.

PHIL 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.

PHIL 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.

PHIL 4155. ADVANCED ETHICS. Three credit hours. Three hours of lecture per week. Prerequisite: PHIL 3155.

Comparative study of selected ethical theories.

PHIL 4156. EPISTEMOLOGY AND SCIENCE. Three credit hours. Three hours of lecture per week. Prerequisite: PHIL 3165.

Epistemological analysis of the nature, structure, and ontological implications of scientific theories, including their roles in the scientific enterprise.

PHIL 4157. PHENOMENOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PHIL 3166.

Theory and practice of phenomenology as a system and as a philosophical method, especially through the writings of Edmond Husserl.

PHIL 4158. ANALYTIC PHILOSOPHY. Three credit hours. Three hours of lecture per week. Prerequisites: PHIL 3165 and PHIL 3166.

Analytic and linguistic philosophy of the Twentieth Century, including logical atomism, neopositivism, and linguistic analysis.

PHIL 4159. PRAGMATISM. Three credit hours. Three hours of lecture per week. Prerequisites: PHIL 3165 and PHIL 3166.

Pragmatism as a method, a theory of knowledge, and a theory of values.

PHIL 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.

PHIL 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.

PHIL 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.

PHIL 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**

RUSS 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**

### **UNDERGRADUATE COURSES**

THEA 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.

THEA 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.

THEA 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.

THEA 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.

THEA 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.

THEA 4011-4012. DIRECTING I-II. Three credit hours per semester. Two hours of lecture and two workshops per week each semester. Prerequisite: THEA 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 the degrees of Master of Science and Doctor of Philosophy in Marine Sciences. The information about these programs appears in the Graduate School Catalogue. There are several advanced undergraduate courses which are available as electives to qualified students.

The department has its origins in the Institute of Marine Biology, established in 1954 to promote and conduct research in this discipline. With expansion of both its scope and its capabilities the Institute grew to become in August 1968, the Department of Marine Sciences, which began the Ph.D. program in 1972. The department has continued to broaden and strengthen its academic and research activities, and research remains as an important function of the department.

Students specialize in biological, physical, chemical, or geological oceanography, fisheries biology, aquaculture, or one of the areas within marine biology but, through core courses and electives, gain an overall appreciation of marine sciences. Having a Bachelor of science degree and a minimum GPA of 2.8 are admission requirements in addition to those of the Graduate School.

In addition to the academic requirements of the Graduate School, students in both the Master's and doctoral program must take four core courses: Biological Oceanography, Chemical Oceanography, Physical Oceanography, and Geological Oceanography. All students are required to write a thesis.

Excellent teaching and research facilities exist both on campus and at a field station. A marine sciences collection is located on the main campus. The field station is on 18-acre

Magueyes Island within a protected embayment off La Parguera, 22 miles from Mayagüez. In addition to classroom-laboratory facilities, the station has indoor and outdoor aquaria and tanks with running seawater, a museum containing reference collections of fish, invertebrate, and algae, a 51' Thompson trawler, and 72' RV Isla Magueyes trawler, a 35' diesel Downeast, and a number of smaller boats.

Research facilities for warm water aquaculture include some 8 acres of earthen ponds, two hatcheries and numerous concrete tanks, plastic pools and aquaria facilities with running water available for controlled environmental studies. In addition, a 140-acre site is being renovated to allow the aquaculture program to operate demonstration farm that will produce shrimp and fish at commercial scales.

Aquaculture is one of the major disciplines of the Department of Marine Sciences. It comprises fresh and marine environments. The academic program in aquaculture is strongly supported by the Commercial Aquaculture Research and Development Center (CIDACPR). The mission of this Center is to assist the local government to foster and develop a successful and environmentally sound aquaculture industry in Puerto Rico.

The Marine Sciences Department's aquaculture students and faculty conduct their research and training at CIDACPR'S Aquaculture Research Stations (Sabana Grande, 160 acres, and Lajas 35 acres), three hatcheries (prawn, fish and clams) and a small processing plant. Modest mariculture facilities and the clam hatchery are located at DCM's Magueyes Island.

The University of Puerto Rico Sea Grant Program and the Puerto Rico Resource Center for Science and Engineering contribute substantially to the strength of the Marine Sciences Program. There is a considerable interaction with other science departments in Mayagüez and with the Medical Sciences and Río Piedras campuses. During the past five years, docent members of the Department have been awarded annually on the average, 1.8 million dollars in externally funded grants.

**DEPARTMENTAL FACULTY**

**DALLAS E. ALSTON**, *Professor*, Ph.D., 1978, Auburn University.

**NILDA E. APONTE**, *Associate Professor*, Ph.D., 1990, University of Puerto Rico.

**RICHARD S. APPELDOORN**, *Professor*, Ph.D., 1980, University of Rhode Island.

**ROY ARMSTRONG**, *Associate Professor*, Ph.D., 1990, University of Puerto Rico.

**DAVID L. BALLANTINE**, *Professor*, Ph.D., 1977, University of Puerto Rico.

**JORGE E. CAPELLA**, *Associate Professor*, Ph.D., 1989, Texas A&M University.

**JORGE E. CORREDOR**, *Professor*, Ph.D., 1978, University of Miami.

**RICARDO C. CORTES**, *Professor*, M.S., 1976, University of Puerto Rico.

**JORGE R. GARCIA**, *Associate Researcher*, Ph.D., 1992, University of Rhode Island.

**JUAN G. GONZALEZ LAGO**, *Professor*, Ph.D., 1973, University of Rhode Island.

**DANNIE A. HENSLEY**, *Professor*, Ph.D., 1978, University of South Florida.

**JOHN M. KUBARYK**, *Professor*, Ph.D., 1980, Auburn University.

**JOSE M. LOPEZ DIAZ**, *Professor*, Ph.D., 1976, The University of Texas.

**AURELIO MERCADO**, *Professor*, M.S., 1973, University of Miami.

**JULIO MORELL**, *Associate Researcher*, M.S., 1983, University of Puerto Rico.

**JACK MORELOCK**, *Professor*, Ph.D., 1967, Texas A&M University.

**GOVIND S. NADATHUR**, *Professor*, Ph.D., 1982, M.S. University of Baroda, Gujarat, India.

**THOMAS R. TOSTESON**, *Professor*, Ph.D., 1959, University of Pennsylvania.

**ERNESTO WEIL**, *Associate Professor*, Ph.D., 1992, University of Texas at Austin.

**ERNEST H. WILLIAMS**, *Professor*, Ph.D., 1974, Auburn University.

**AMOS WINTER**, *Professor*, Ph.D., 1981, The Hebrew University of Jerusalem, Israel.

**PAUL YOSHIOKA**, *Professor*, Ph.D., 1973, University of California-San Diego.

**BAQAR R. ZAIDI**, *Researcher*, Ph.D., 1983, University of Puerto Rico.

**COURSES OF INSTRUCTION****MARINE SCIENCES****ADVANCED UNDERGRADUATE COURSES**

MASC 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.

BOCE 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.

BOCE 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.

BOCE 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.



BOCE 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, Xanthophyta, Cyanophyta, Phaenophyta, 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.

BOCE 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.

BOCE 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.

BOCE 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.

BOCE 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.

POCE 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 options leading to the Bachelor of Science: Pure Mathematics, Computer Science, and Mathematics Education. The Bachelor of Science in Mathematics provides students solid preparation, 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 options leading to the Master of Science degree: Pure Mathematics, Applied Mathematics, Scientific Computing, and Statistics. For more details, see the Graduate Bulletin of Information.

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 each and every one of the courses taken by the student which are classified within the student's major field of study. Further explanation of placement criteria and other important information is provided in the Academic Regulations section.

**BACHELOR OF SCIENCE IN  
MATHEMATICS****(Option: Pure Mathematics, General)****FIRST YEAR****First Semester**

<b>*MATH 3005</b>	
Pre-Calculus	5
<b>CHEM 3001</b>	
General Chemistry	4
<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	3
<b>*SPAN 3101</b>	
Basic Course in Spanish	3
<b>*ENGL 3---</b>	
First year course in English	$\frac{3}{18}$

**Second Semester**

<b>MATH 3031</b>	
CALCULUS I	4
<b>CHEM 3002</b>	
General Chemistry	4
<b>BIOS 3032</b>	
Intro. to the Biological Sciences II	3
<b>*SPAN 3102</b>	
Basic Course in Spanish	3
<b>*ENGL 3---</b>	
First year course in English	3
<b>PHED ----</b>	
Course in Physical Education	$\frac{1}{18}$

**SECOND YEAR****First Semester**

<b>MATH 3032</b>	
CALCULUS II	4
<b>COMP 3010</b>	
INTRODUCTION TO COMPUTER PROGRAMMING I	3
<b>SPAN 3---</b>	
Course above level of Basic Spanish	3
<b>ENGL 3---</b>	
Second year course in English	3
<b>MATH 3020</b>	
INTRODUCTION TO THE FOUNDATIONS OF MATHEMATICS	3
<b>PHED ----</b>	
Course in Physical Education	$\frac{1}{17}$

**Second Semester**

<b>MATH 3063</b>	
CALCULUS III	3
<b>PHCS 3171</b>	
Physics I	4
<b>PHCS 3173</b>	
Physics Laboratory I	1
<b>SPAN 3---</b>	
Course above level of Basic Spanish	3
<b>ENGL 3---</b>	
Second year course in English	3
<b>MATH 4031</b>	
Intro. to Linear Algebra	$\frac{3}{17}$

**THIRD YEAR****First Semester**

<b>MATH 4009</b>	
Ordinary Differential Equations	3
<b>MATH 4008</b>	
Introduction to Algebraic Structures	3
<b>MATH ----</b>	
**Requirements in Mathematics	3
<b>PHCS 3172</b>	
Physics II	4
<b>PHCS 3174</b>	
Physics Laboratory II	1
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	$\frac{3}{17}$

**Second Semester**

<b>MSTA 4001</b>	
Mathematical Statistics I	3
<b>MATH ----</b>	
**Requirements in Mathematics	3
<b>SOSC 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>ELECTIVES</b>	
Recommended Electives	6
<b>ELECTIVE</b>	
Free Elective	$\frac{3}{18}$

**FOURTH YEAR****First Semester**

<b>MATH 4051</b>	
Advanced Calculus I	3
<b>MATH 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	$\frac{6}{18}$

**Second Semester**

<b>MATH 4052</b>	
Advanced Calculus II	3
<b>MATH 4010</b>	
Intro. to Complex Variables with Applications	3
<b>MATH 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	$\frac{3}{16}$

**Total credits required : 139**

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

\*\*To be chosen from MATH 4071, MATH 4072, MATH 3040, MATH 4007 or MSTA 4002.

**BACHELOR OF SCIENCE IN MATHEMATICS****(Option: Mathematics Education)****FIRST YEAR****First Semester**

<b>*MATH 3005</b>	
Pre-Calculus	5
<b>CHEM 3001</b>	
General Chemistry	4
<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	3
<b>*SPAN 3101</b>	
Basic Course in Spanish	3
<b>*ENGL 3---</b>	
First year course in English	$\frac{3}{18}$

**Second Semester**

<b>MATH 3031</b>	
CALCULUS I	4
<b>CHEM 3002</b>	
General Chemistry	4
<b>BIOS 3032</b>	
Intro. to the Biological Sciences II	3
<b>*SPAN 3102</b>	
Basic Course in Spanish	3

<b>*ENGL 3---</b>	
First year course in English	3
<b>PHED ----</b>	
Course in Physical Education	$\frac{1}{18}$

**SECOND YEAR****First Semester**

<b>MATH 3032</b>	
CALCULUS II	4
<b>COMP 3010</b>	
Introduction to Computer Programming I	3
<b>MATH 3020</b>	
Intro. to the Foundations of Mathematics	3
<b>SPAN 3---</b>	
Course above level of Basic Spanish	3
<b>ENGL 3---</b>	
Second year course in English	3
<b>PHED ----</b>	
Course in Physical Education	$\frac{1}{17}$

**Second Semester**

<b>MATH 3063</b>	
CALCULUS III	3
<b>MATH 4031</b>	
Intro. to Linear Algebra	3
<b>MATH 3030</b>	
Intro. to Geometry	3
<b>SPAN 3---</b>	
Course above level of Basic Spanish	3
<b>ENGL 3---</b>	
Second year course in English	3
<b>EDFO 3007</b>	
Social Foundations of Education	$\frac{3}{18}$

**THIRD YEAR****First Semester**

<b>MATH 4009</b>	
Ordinary Differential Equations	3
<b>MATH 4008</b>	
Introduction to Algebraic Structures	3
<b>PHCS 3171</b>	
Physics I	4
<b>PHCS 3173</b>	
Physics Laboratory I	1
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	3

<b>EDFO 3001</b> Human Growth and Development	<u>3</u> 17
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**Second Semester**

<b>MSTA 4001</b> Mathematical Statistics I	3
<b>MATH 3040</b> Theory of Numbers	3
<b>PHCS 3172</b> Physics II	4
<b>PHCS 3174</b> Physics Laboratory II	1
<b>SOSC 3122</b> Intro. to the Study of the Social Sciences	3
<b>EDFO 3002</b> Human Growth and Development	<u>3</u> 17

**FOURTH YEAR****First Semester**

<b>MATH 4023</b> Mathematics Education I	3
<b>EDFO 4019</b> Philosophical Foundations of Education	3
<b>EDPT 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	<u>6</u> 18

**Second Semester**

<b>MATH 4050</b> Undergraduate Seminar	1
<b>EDPT 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	<u>3</u> 16

Note: The courses EDFO 4025, SPED 4006, and EXTC 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**

**(Option: Computer Science)**

**FIRST YEAR****First Semester**

<b>*MATH 3005</b> Pre-Calculus	5
<b>CHEM 3001</b> General Chemistry	4
<b>BIOS 3031</b> Intro. to the Biological Sciences I	3
<b>*SPAN 3101</b> Basic Course in Spanish	3
<b>*ENGL 3---</b> First year course in English	<u>3</u> 18

**Second Semester**

<b>MATH 3031</b> CALCULUS I	4
<b>CHEM 3002</b> General Chemistry	4
<b>BIOS 3032</b> Intro. to the Biological Sciences II	3
<b>*SPAN 3102</b> Basic Course in Spanish	3
<b>*ENGL 3---</b> First year course in English	3
<b>PHED ----</b> Course in Physical Education	<u>1</u> 18

**SECOND YEAR****First Semester**

<b>MATH 3032</b> CALCULUS II	4
<b>MATH 3020</b> Intro. to the Foundations of Mathematics.	3
<b>COMP 3010</b> Intro. to Computer Programming I	3
<b>SPAN 3---</b> Course above level of Basic Spanish	3
<b>ENGL 3---</b> Second year course in English	3
<b>PHED ----</b> Course in Physical Education	<u>1</u> 17

**Second Semester**

<b>MATH 3063</b>	
Calculus III	3
<b>MATH 4031</b>	
Intro. to Linear Algebra	3
<b>COMP 3110</b>	
INTRODUCTION TO COMPUTERS II	3
<b>SPAN 3---</b>	
Course above level of Basic Spanish	3
<b>ENGL 3---</b>	
Second year course in English	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	18

**THIRD YEAR****First Semester**

<b>MATH 4009</b>	
ORDINARY DIFFERENTIAL EQUATIONS	3
<b>MATH 4008</b>	
INTRODUCTION TO ALGEBRAIC STRUCTURES	3
<b>COMP 3075</b>	
INTRODUCTION TO DATA STRUCTURES	3
<b>PHCS 3171</b>	
Physics I	4
<b>PHCS 3173</b>	
Physics Laboratory I	1
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	<u>3</u>
	17

**Second Semester**

<b>MSTA 4001</b>	
MATHEMATICAL STATISTICS I	3
<b>COMP 3029</b>	
PROGRAMMING LANGUAGES	3
<b>PHCS 3172</b>	
Physics II	4
<b>PHCS 3174</b>	
Physics Laboratory II	1
<b>SOSC 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>MATH 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>MATH 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

**Courses in option in CAP letters.****Total credits required for program: 139**

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

**DEPARTMENTAL FACULTY**

**ROBERT ACAR**, *Assistant Professor*, Ph.D., 1987, University of Wisconsin-Madison.

**EDGAR ACUÑA FERNANDEZ**, *Professor*, Ph.D., 1989, University of Rochester.

**CARLOS ALMADA**, *Associate Professor*, Ph.D., 1991, University of Colorado, Boulder.

**LUISA ANDINO MORENO**, *Associate Professor*, M.S., 1984, University of Puerto Rico.

**JULIO E. BARETY MACHIN**, *Professor*, Ph.D., 1972, University of New Mexico.

**ALVARO BOLANO 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**, *Assistant 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 DZIOBIAK**, *Associate Professor*, Ph.D., 1982, Wroclaw University, Poland.

**ENRIQUE GALLO ZELEDON**, *Assistant Professor*, M.S., 1967, University of Puerto Rico, M.S.I.E., 1976, University of California, Berkeley.

**ANA C. GONZALEZ RIOS**, *Assistant Professor*, M.S., 1988, University of Puerto Rico at Mayagüez.

**HAEDEH GOORANSARAB**, *Assistant 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.

**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 BERMUDEZ**, *Professor*, M.S., 1974, Rensselaer Polytechnic Institute.

**ELEMER NEMESSZEGHY**, *Professor*, Ph.D., 1955, Catholic University of Louvain, Belgium.

**OCTAVIAN NICOLIO**, *Associate Professor*, Ph.D., 1994, Wichita State University.

**BHALCHANDRA C. OLTIKAR**, *Professor*, Ph.D., 1977, Carleton University, Canada.

**ARTURO PORTNOY**, *Assistant Professor*, Ph.D., 1997, Rensselaer Polytechnic Institute.

**AVIJIT PURKAYASTHA**, *Associate Professor*, Ph.D., 1993, Northern Illinois University.

**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**, *Associate 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**, *Associate Professor*, 1988, Ph.D., Institute for Mathematics and Mechanics of Academy of Sciences, Alma, USSR.

**PABLO TARAZAGA**, *Professor*, Ph.D., 1977, Universidad Nacional de San Luis, Argentina.

**NILSA TORO DE ACARON**, *Associate Professor*, M.S., 1983, University of Puerto Rico.

**PEDRO M. VASQUEZ URBANO**, *Assistant Professor*, D.Sc., 1997, The George Washington University.

**JULIO VIDAURAZAGA**, *Associate Professor*, Ph.D., 1982, Suny at Stony Brook, N.Y.

**PAUL K. WAYLAND**, *Professor*, Ph.D., 1979, Louisiana State University.

## COURSES OF INSTRUCTION

### DEPARTMENT OF MATHEMATICS

#### UNDERGRADUATE COURSES

**MATH 3000. FINITE MATHEMATICS.** Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3171 or MATH 3173.

Counting techniques, probability, matrix algebra, linear programming, and systems of linear equations.

**MATH 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.

**MATH 3020. INTRODUCTION TO THE FOUNDATIONS OF MATHEMATICS.** Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3031 or MATH 3183 or MATH 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.

**MATH 3021. CALCULUS FOR BIOLOGICAL SCIENCES I.** Three credit hour. Three hours of lecture per week. Prerequisite: MATH 3172.

A basic course in differential and integral calculus of one real variable with applications.

**MATH 3022. CALCULUS FOR BIOLOGICAL SCIENCES II.** Three credit hour. Three hours of lecture per week. Prerequisite: MATH 3021.

Integration techniques, topics in probability, functions of several variables, introduction to differential equations, and applications.

**MATH 3030. INTRODUCTION TO GEOMETRY.** Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3032 or MATH 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.

**MATH 3031. CALCULUS I.** Four credit hours. Four hours of lecture per week. Prerequisite: MATH 3005 or MATH 3143 or MATH 3172 or MATH 3174.

Elementary differential and integral calculus of one real variable with applications.

**MATH 3032. CALCULUS II.** Four credit hours. Four hours of lecture per week. Prerequisite: MATH 3031 or MATH 3183 or MATH 3144.

Integration techniques, infinite series, vectors, polar coordinates, vector functions, and quadric surfaces; applications.

**MATH 3040. THEORY OF NUMBERS.** Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3032 or MATH 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.

**MATH 3048. MATHEMATICAL ANALYSIS.** Four credit hours. Four hours of lecture per week. Prerequisite: MATH 3032 or MATH 3184. Co-requisite: MATH 3010 or COMP 3010 or GEEG 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.

**MATH 3049. MATHEMATICAL ANALYSIS FOR MANAGEMENT SCIENCES.** Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3000 or MATH 3172 or MATH 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.

MATH 3063. CALCULUS III. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3032 or MATH 3184.

Differential and integral calculus of several variables, and an introduction to differential equations with applications.

MATH 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.

MATH 3172. PRECALCULUS II. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3171 or MATH 3173.

Analytic trigonometry; complex numbers; the fundamental theorem of algebra; conic sections; systems of equations; matrices operations; sequences; and mathematical induction.

MATH 3181. DISCRETE MATHEMATICS I. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3031.

Sets, relations, and notation; algorithms; logic; graphs; trees.

MATH 3182. DISCRETE MATHEMATICS II. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3181.

Combinatorics, difference equations, relations, Boolean algebra, computational models.

MATH 4000. ELEMENTS OF TOPOLOGY. Three credit hours. Three hours of lecture per week. Co-requisite: MATH 4008

Introduction to topology including topological spaces, continuous functions and homeomorphisms, metric spaces, compact spaces, connected spaces, separation axioms, and elements of homotopy.

MATH 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.

MATH 4007. HIGHER GEOMETRY. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3063 or MATH 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.

MATH 4008. INTRODUCTION TO ALGEBRAIC STRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3020.

Introduction to algebraic systems; sets, semigroups, groups, rings, fields.

MATH 4009. ORDINARY DIFFERENTIAL EQUATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3063 or MATH 3185.

Ordinary differential equations with applications: basic existence theorem, linear systems, the Laplace transform, series solutions, introduction to Fourier series and orthogonal functions.

MATH 4010. INTRODUCTION TO COMPLEX VARIABLES WITH APPLICATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3063 or MATH 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.

MATH 4020. PARTIAL DIFFERENTIAL EQUATIONS AND FOURIER SERIES. Three



credit hours. Three hours of lecture per week. Prerequisite: MATH 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.

**MATH 4021. FUNDAMENTALS OF MATHEMATICAL LOGIC.** Three credit hours. Three hours of lecture per week. Prerequisite: MATH 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.

**MATH 4023. MATHEMATICS EDUCATION I.** Three credit hours. Three hours of lecture per week. Prerequisite: MATH 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.

**MATH 4031. INTRODUCTION TO LINEAR ALGEBRA.** Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3032 or MATH 3184.

Euclidean vector spaces, matrices and linear equations, spectral decomposition of normal operators.

**MATH 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.

**MATH 4051. ADVANCED CALCULUS I.** Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3063 or MATH 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.

**MATH 4052. ADVANCED CALCULUS II.** Three credit hours. Three hours of lecture per week. Prerequisite: MATH 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.

**MATH 4061. NUMERICAL ANALYSIS I.** Three credit hours. Three hours of lecture per week. Prerequisites: (MATH 3063 or MATH 3185) and (MATH 3010 or GEEG 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.

**MATH 4062. NUMERICAL ANALYSIS II.** Three credit hours. Three hours of lecture per week. Prerequisites: MATH 4031 and MATH 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.

**MATH 4071. INTRODUCTION TO MATHEMATICS OF MODERN SCIENCE I.** Three credit hours. Three hours of lecture per week. Prerequisite: MATH 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.

MATH 4072. INTRODUCTION TO MATHEMATICS OF MODERN SCIENCE II. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 4009.

Laplace transforms; Gamma, Beta and Bessel functions; partial differential equations and boundary value problems; vector analysis; probability, empirical formulas, and curve fitting.

MATH 4088. DIFFERENTIAL GEOMETRY USING COMPUTERS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: MATH 4009 and (MATH 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.

MATH 4120. HISTORY OF MATHEMATICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3032 or MATH 3184.

A survey of the historical development of the elementary branches of Mathematics.

MATH 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**

MATH 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.

MATH 5047. INTERMEDIATE DIFFERENTIAL EQUATIONS. Three credit hours. Three hours of lecture per week. Prerequisites: MATH 4009 and MATH 4031 or its equivalent.

Existence, continuity and differentiability of solutions; stability and Lyapunov's theorem.

MATH 5049. CALCULUS OF VARIATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 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.

MATH 5055. VECTOR ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3063 or MATH 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.

MATH 5056. TENSOR ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3063 or MATH 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.

MATH 5150. LINEAR ALGEBRA. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 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: MATH 3171 or MATH 3005 or MATH 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 GEEG 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 MATH 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: (MATH 3075 or COMP 3075 and MATH 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: MATH 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: MATH 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**

MSTA 3015. ELEMENTARY STATISTICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3171 or MATH 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.

MSTA 3016. STATISTICAL DATA ANALYSIS. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Pre-requisite: (MATH 3031 or MATH 3144) and COMP 3010.

Statistical data analysis including descriptive and inferential statistics and exploratory data analysis.

MSTA 3101. APPLIED STATISTICS I. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3171 or MATH 3173.

Basic concepts of methods of applied statistics. Descriptive statistics: probability; random variables; probability distribution. Statistical analysis through computers.

MSTA 3102. APPLIED STATISTICS II. Three credit hours. Three hours of lecture per week. Prerequisite: MSTA 3101 or MSTA 3015 or its equivalent.

Sampling, elements of estimation and tests of hypotheses, regression and correlation analysis, chi-square and contingency tables.

MSTA 4001. MATHEMATICAL STATISTICS I. Three credit hour. Three hours of lecture per week. Prerequisite: MATH 3032.

Nature of statistics, probability, random variables and their probability distributions, moment generating functions, sampling distributions and the central limit theorem.

MSTA 4002. MATHEMATICAL STATISTIC II. Three credit hour. Three hours of lecture per

week. Prerequisite: MSTA 4001 and MATH 3063.

Multivariate probability distributions, methods of estimation, tests of hypotheses, linear models, design of experiments, analysis of variance, and contingency tables.

**MSTA 4005. NON-PARAMETRIC APPLIED STATISTICS.** Three credit hours. Three hours of lecture per week. Prerequisite: MSTA 3102 or MSTA 4001 or STAT 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.

**MSTA 4006. STATISTICS FOR THE BIOLOGICAL SCIENCE.** Three credit hours. Three hours of lecture per week and two hours of laboratory per week. Prerequisite: MATH 3021.

Statistical methods applied to the biological sciences. Includes descriptive statistics, probability, statistical inference, and analysis of variance, categorical data analysis, regression analysis, survival analysis, and sampling methods. Intensive use of a statistical computer package.

**MSTA 4038. SAMPLING METHODS.** Three credit hours. Three hours of lecture per week. Prerequisite: MSTA 3102 or MSTA 4001 or STAT 3002.

Introduction to the theory and application of statistical sampling methods.

### **ADVANCED UNDERGRADUATE AND GRADUATE COURSE**

**MSTA 5015. STOCHASTIC SIMULATION.** Three credit hours. Three hours of lecture per week. Prerequisite: MSTA 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. Lectures, simulated laboratory experiences, independent studies and clinical practice are all methods used to present the subject matter of nursing. Clinical practice is arranged under faculty direction with the cooperation of variety of health care facilities including Mayaguez Medical Center, other medical centers and community hospitals.

The nursing Department sponsors various students and professional organizations, among them: The Nursing Student Association, the Epsilon Lambda Chapter of the Sigma Theta Tau International, Inc., Nursing Honor Society and the Nursing Alumni Association. The Puerto Rico Chapter of the League for Nursing had its origin in the Nursing Department.

### **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>
Total	144

**FIRST YEAR****First Semester**

<b>*ENGL 3---</b>	
First year course in English	3
<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	3
<b>PSYC 3001</b>	
Principles of Psychology I	3
<b>*MATH 3171</b>	
Pre-Calculus I	3
<b>CHEM 3141</b>	
Principles of General, Organic and Biologic Chemistry	4
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	17

**Second Semester**

<b>*ENGL 3---</b>	
First year course in English	3
<b>BIOS 3032</b>	
Intro. to the Biological Sciences II	3
<b>PSYC 3002</b>	
Principles of Psychology II	3
<b>**MATH 3---</b>	
Recommended Course in Mathematics	3
<b>CHEM 3142</b>	
Principles of General, Organic and Chemistry	4
<b>NURS 3005</b>	
Introduction to Nursing	<u>3</u>
	19

**SECOND YEAR****First Semester**

<b>ENGL 3---</b>	
Second year course in English	3
<b>*SPAN 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>NURS 3015</b>	
Interpersonal Relationships in Nursing	3
<b>NURS 3021</b>	
Introduction to Clinical Nursing I	4
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	18

**Second Semester****ENGL 3---**

Second year course in English	3
<b>*SPAN 3102</b>	
Basic Course in Spanish	3
<b>NURS 3022</b>	
Introduction to Clinical Nursing II	4
<b>NURS 3035</b>	
Fundamentals of Nutrition	2
<b>NURS 3045</b>	
Psychiatric Nursing	<u>6</u>
	18

**THIRD YEAR****First Semester**

<b>SPAN 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>NURS 4001</b>	
MATHrnal and Child Nursing I	6
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	<u>3</u>
	19

**Second Semester**

<b>SPAN ----</b>	
Course above level of basic Spanish	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>MSTA 3015</b>	
Elementary Statistics	3
<b>NURS 4002</b>	
MATHrnal and Child Nursing II	6
<b>SOSC 3122</b>	
Intro. to the Study of the Social Sciences	<u>3</u>
	18

**FOURTH YEAR****First Semester**

<b>NURS 4015</b>	
Management in Hospital Nursing	3
<b>NURS 4031</b>	
Medical and Surgical Nursing	6
<b>NURS 4041</b>	
Senior Seminar in Nursing	1
<b>ELECTIVES</b>	
Electives	<u>9</u>
	19

**Second Semester****NURS 4025**

Nursing in Community Health	6
<b>NURS 4032</b>	
Medical and Surgical Nursing	6
<b>NURS 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: MATH 3172 or COMP 3057 or COMP 3010.

## DEPARTMENTAL FACULTY

**CELIA R. COLON RIVERA**, *Professor*, Ph.D., 1989, University of Wisconsin - Madison.

**MADELINE DELGADO CARABALLO**, *Instructor*, M.S.N., 1996, Pontifical Catholic University of Puerto Rico.

**TERESA JIMENEZ VEGA**, *Associate Professor*, M.S.N., 1978, University of Puerto Rico - Medical Sciences Campus.

**ANA LOPEZ AVILES**, *Instructor*, M.S.N., 1992, Pontifical Catholic University of Puerto Rico.

**ABIGAIL MATOS PAGAN**, *Instructor*, M.S.N., 1987, Pontifical Catholic University of Puerto Rico, Adult Nurse Practitioner, 1997, State University of New York, Syracuse.

**ROSE M. MENDEZ AVILES**, *Instructor*, M.S.N., 1997, University of Puerto Rico – Medical Sciences Campus.

**MIRIAM J. NIETO VAZQUEZ**, *Instructor*, 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**, *Instructor*, M.S.N., 1990, Pontifical Catholic University of Puerto Rico.

**HAYDEN RIOS ITURRINO**, *Professor*, 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.

**MARISOL SANTIAGO SEPULVEDA**, *Assistant Professor*, M.S.N., 1993, Pontifical Catholic University of Puerto Rico.

**MARIA SANTIAGO GALARZA**, *Assistant Professor*, M.S.N., 1992, Pontifical Catholic University of Puerto Rico.

**MARGARET E. TORO PEREZ**, *Instructor*, 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 University of Puerto Rico.

**SANDRA ZAPATA**, *Assistant Professor*, M.S.N. 1987, Pontifical Catholic University of Puerto Rico.

## COURSES OF INSTRUCTION

### DEPARTMENT OF NURSING

#### BACCALAUREATE PROGRAM

**NURS 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.

**NURS 3015. INTERPERSONAL RELATIONSHIPS IN NURSING.** Three credit hours. Three hours of lecture per week. Prerequisite: (PSYC 3002 and NURS 3005) or authorization of the Department Director.

Introduction to the study of nursing as a therapeutic interpersonal process.

NURS 3021. INTRODUCTION TO CLINICAL NURSING I. Four credit hours. Two hours of lecture and one six-hour laboratory per week. Prerequisites: (NURS 3005 and BIOS 3002 or BIOS 3032) or consent of the Director of the Department. Co-requisites: (BIOL 3715, BIOL 3716 and NURS 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.

NURS 3022. INTRODUCTION TO CLINICAL NURSING II. Four credit hours. Two hours of lecture and one six-hour laboratory per week. Prerequisite: NURS 3021. Co-requisite: NURS 3035.

Development of more complex clinical nursing skills.

NURS 3035. FUNDAMENTALS OF NUTRITION. Two credit hours. Two hours of lecture per week. Co-requisite: NURS 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.

NURS 3045. PSYCHIATRIC NURSING. Six credit hours. Two hours of lecture and two six-hour laboratories per week. Prerequisites: NURS 3015. Co-requisite: NURS 3022.

Care and rehabilitation of mentally ill adults and children. Integration of in-patient care with local resources and family.

NURS 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.

NURS 4001. MATERNAL AND CHILD NURSING I. Six credit hours. Two hours of lecture and two six-hour laboratories per week. Prerequisites: NURS 3022 and NURS 3035 and NURS 3045. Co-requisite: BIOL 3725.

Theory and clinical experience in maternal and child care following a family-centered approach.

NURS 4002. MATERNAL AND CHILD NURSING II. Six credit hours. Two hours of lecture and two six-hour laboratories per week. Prerequisite: NURS 4001.

Theory and clinical experience in maternal and child care following a family-centered approach.

NURS 4015. MANAGEMENT IN HOSPITAL NURSING. Three credit hours. Three hours of lecture per week. Prerequisite: MSTA 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.

NURS 4025. NURSING IN COMMUNITY HEALTH. Six credit hours. Two hours of lecture and two six-hour laboratories per week. Prerequisite: 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.

NURS 4026. LEGAL ASPECTS OF NURSING. Two credit hours. Two hours of lecture per week. Prerequisite: NURS 1005 or NURS 3021 or its equivalent.

Legal implications in nursing practice.

NURS 4031. MEDICAL AND SURGICAL NURSING I. Six credit hours. Two hours of lecture and two six-hour laboratories per week. Prerequisites: 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.

NURS 4032. MEDICAL AND SURGICAL NURSING II. Six credit hours. Two hours of lecture and two six-hour laboratories per week. Prerequisite: NURS 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.

NURS 4041. SEMINAR IN NURSING I. One credit hour. One hour of lecture per week. Prerequisite: MSTA 3015 or senior standing student.

Research in nursing: the application of the scientific method for the conception and definition of a research problem; its ethical and legal aspects.

NURS 4042. SEMINAR IN NURSING II. One credit hour. One hour of lecture per week. Prerequisite: NURS 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.

NURS 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.

NURS 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 the 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 who could perform as teachers, coaches and recreational leaders. The academic offerings include three well balanced professional areas of study at the Bachelor's Degree level. The academic options are classified as: The Teaching of 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 Teacher of Physical Education: with a strong base 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 the student who has the desire to become a coach or official in sports or continue graduate studies in related fields of Physical Education and Sports.

The Recreational Program (1304) is designed for the student who has the desire to provide recreational services in different settings. This option focuses on the 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 the student's development and maintenance of health and skill related fitness, enjoy leisure activities, and assume leadership in recreational and sports activities in their communities.

The student will be able to complete the selected program in four years without the necessity of studying during the summer session programs. The selected program must be completed within eight years at our University, according to what has been stipulated within our official regulations.

**BACHELOR OF ARTS IN PHYSICAL EDUCATION**

**TEACHING IN PHYSICAL EDUCATION OPTION**

**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>
Total	135-137

**FIRST YEAR**

**First Semester**

<b>ENGL 3101</b>	
Basic Course in English	3
<b>SPAN 3101</b>	
Basic Course in Spanish	3
<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	3
<b>MATH 3171</b>	
Precalculus I	3
<b>PHED 3465</b>	
Personal and Community Health	3
<b>PHED 3265</b>	
Weight Lifting & Weight Training for Different Sports	1
<b>PHED ----</b>	
Physical Education Elective	<u>1</u>
	17

**Second Semester**

<b>ENGL 3102</b>	
Basic Course in English	3
<b>SPAN 3102</b>	
Basic Course in Spanish	3
<b>BIOS 3032</b>	
Intro. to the Biological Sciences II	3
<b>MSTA 3015</b>	
Elementary Statistics	3
<b>PHED ---</b>	
Fundamentals	1
<b>PHED ----</b>	
Physical Education Elective	1
<b>PHED 3645</b>	
First Aid and Security	<u>2</u>
	16

**SECOND YEAR**

**First Semester**

<b>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>EDFO 3001</b>	
Human Growth and Development I	3
<b>PHED 3555</b>	
History and Principles of Physical Education	3
<b>PHED ----</b>	
Fundamentals	<u>2</u>
	17

**Second Semester**

<b>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>SOSC 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>EDFO 3002</b>	
Human Growth and Development II	3
<b>SPED4006</b>	
Nature and needs of Exceptional learners	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	18

**THIRD YEAR****First Semester****PHSC-CHEM**

Elective in Physics (3)

Or

Chemistry (4) 3-4

**HUMA 3111**

Intro. to Western Culture I 3

**EDFO 3007**Social Foundation of  
Education 3**PHED 4115**Biomechanics of Human  
Movement 3**PHED ----**

Fundamentals 1

**HIST 3241**History of Puerto Rico 3  
16-17**Second Semester****PHSC-CHEM**

Elective in Physics (3)

or

Chemistry (4) 3-4

**HUMA 3112**

Intro. to Western Culture II 3

**EDFO 4019**Philosophical Foundation of  
Education 3**PHED 3395**The Teaching of Physical  
Education for the  
Handicapped 3**PHED 4005**

Fundamentals of Motor 3

**ELECTIVE**Free elective 3  
18-19**FOURTH YEAR****First Semester****PHED 4205**Teaching Methods and  
Techniques in Physical  
Education 3**PHED 4105**

Physiology of Exercise 3

**PHED 4045**Evaluation and Research in  
Physical Education 3**EXTC 3005**Oral and written  
Reading skills 3**EDPT 4215**Theory and methodology 1  
17

In the teaching of Physical  
Education in Secondary  
School 3

**HIST 3111**  
History of USA 3  
18

**Second Semester**

**EDPT 4216**  
Student Teaching of Physical  
Education in Secondary  
School 6

**ELECTIVE**  
Free Elective 3

**PHED 4125**  
Organization, Adm., and  
Supervision of  
Physical Education 3

**ELECTIVE**  
Free elective 3  
15

**Total credits required: 135-137****RECREATION OPTION****SUMMARY OF CREDITS IN PROGRAM**

Faculty requirements 54-56

Departmental requirements

Major area 31

Non-major area 29

Recommended electives 6

Free electives 12

Total 132-134

**FIRST YEAR****First Semester**

**ENGL 3101**  
Basic Course in English 3

**SPAN 3101**  
Basic Course in Spanish 3

**BIOS 3031**  
Intro. to the Biological  
Sciences I 3

**MATH 3171**  
Precalculus I 3

**PHED 3465**  
Personal and Community  
Health 3

**PHED 3265**  
Weight Lifting & Weight  
Training for Different  
Sports 1

**PHED ----**  
Physical Education Elective 1  
17

**Second Semester**

<b>ENGL 3102</b>	
Basic Course in English	3
<b>SPAN 3102</b>	
Basic Course in Spanish	3
<b>BIOS 3032</b>	
Intro. to the Biological Sciences II	3
<b>MSTA 3015</b>	
Elementary Statistics	3
<b>PHED 3645</b>	
First Aid and Security	2
<b>PHED ----</b>	
Fundamentals	1
<b>PHED ----</b>	
Physical Education Elective	<u>1</u>
	16

**SECOND YEAR****First Semester**

<b>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>SOSC 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>PHED ----</b>	
Fundamentals	<u>1</u>
	16

**Second Semester**

<b>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>SOSC 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>PHED 4005</b>	
Fundamental of Motor Learning	3
<b>PHED ----</b>	
Fundamentals	<u>1</u>
	16

**THIRD YEAR****First Semester**

<b>PHSC-CHEM</b>	
Elective in Physics (3)	
or	
Chemistry (4)	3-4
<b>EDFO 3001</b>	
Human Growth and Development I	3
<b>EDFO 3007</b>	
Social Foundation of Education	3
<b>PHED 4115</b>	
Biomechanics of Human Movement	3
<b>PHED 3665</b>	
Recreational Sports	2
<b>PHED 3395</b>	
The Teaching of Physical Education for the Handicapped	<u>3</u>
	17-18

**Second Semester**

<b>PHSC-CHEM</b>	
Elective in Physics (3)	
or	
Chemistry (4)	3-4
<b>EDFO 3002</b>	
Human Growth and Development II	3
<b>EDFO 4019</b>	
Philosophical Foundation of Education	3
<b>PHED 4045</b>	
Evaluation and Research in Physical Education	3
<b>ELECTIVE</b>	
Recommended Elective	3
<b>PHED ----</b>	
Fundamentals	<u>1</u>
	16-17

**FOURTH YEAR****First Semester**

<b>RECR 4135</b>	
Organization of Recreation	2
<b>PHED 4105</b>	
Physiology of Exercise	3
<b>PHED 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

**Second Semester**

<b>RECR 4255</b>	
Seminar in Recreation	2
<b>PHED 4190</b>	
Exercise Prescription	3
<b>PHED 4125</b>	
Organization, Adm., and Superv. 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 OPTION**

**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>
Total	133-135

**FIRST YEAR**

**First Semester**

<b>ENGL 3101</b>	
Basic Course in English	3
<b>SPAN 3101</b>	
Basic Course in Spanish	3
<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	3
<b>MATH 3171</b>	
Precalculus I	3
<b>PHED 3265</b>	
Weight Lifting & Weight Training for Different Sports	1
<b>PHED 3465</b>	
Personal and Community Health	3
<b>PHED ----</b>	
Physical Education elective	<u>1</u>
	17

**Second Semester**

<b>ENGL 3102</b>	
Basic Course in English	3
<b>SPAN 3102</b>	
Basic Course in Spanish	3
<b>BIOS 3032</b>	
Intro. to the Biological	

Sciences II	3
<b>MSTA 3015</b>	
Elementary Statistics	3
<b>PHED 3645</b>	
First Aid and Security	2
<b>PHED ----</b>	
Fundamentals	1
<b>PHED ----</b>	
Physical Education Elective	<u>1</u>
	16

**SECOND YEAR**

**First Semester**

<b>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>PHED 3395</b>	
The Teaching of Physical Education for the Handicapped	3
<b>PHED ----</b>	
Fundamentals	<u>1</u>
	16

**Second Semester**

<b>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>SOSC 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>PHED 4005</b>	
Fundamentals of Motor Learning	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	18

**THIRD YEAR**

**First Semester**

<b>PHSC-CHEM</b>	
Elective in Physics (3) or Chemistry (4)	3-4
<b>EDFO 3001</b>	
Human Growth and Development I	3

<b>EDFO 3007</b>	
Social Foundation of Education	3
<b>PHED 4115</b>	
Biomechanics of Human Movement	3
<b>PHED ----</b>	
Coaching and Officiating Fundamentals	2
	<u>2</u>
	16-17

**Second Semester**

<b>PHSC-CHEM</b>	
Elective in Physics (3) or Chemistry (4)	3-4
<b>EDFO 3002</b>	
Human Growth and Development II	3
<b>EDFO 4019</b>	
Philosophical Foundation of Education	3
<b>PHED 4045</b>	
Evaluation and Research in Physical Education	3
<b>PHED ----</b>	
Coaching and Officiating	2
<b>PHED ----</b>	
Coaching and Officiating	<u>2</u>
	16-17

**FOURTH YEAR****First Semester**

<b>PSYC 3001</b>	
Principles of Psychology I	3
<b>PHED 4230</b>	
Athletic Training	3
<b>PHED ----</b>	
Coaching and Officiating	2
<b>PHED 4105</b>	
Physiology of Exercise	3
<b>PHED 4205</b>	
Teaching Methods and Techniques in Physical Education	3
<b>ELECTIVE</b>	
Free Elective	<u>3</u>
	17

**Second Semester**

<b>PHED 4250</b>	
Seminar in Coaching and Officiating	2
<b>PHED 4125</b>	
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**, *Associate Professor*, M.S.Ed., 1979, University of Miami.

**ISRAEL GARCIA LUCCA**, *Associate 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 ORIOL**, *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.

**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**, *Associate 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.

**FREDESWINDO VARGAS SANABRIA**, *Associate Professor*, M.A., 1980, New York University.

## COURSES OF INSTRUCTION

### DEPARTMENT OF PHYSICAL EDUCATION

#### UNDERGRADUATE COURSES

PHED 3038. RECREATIONAL SWIMMING. One credit hour. One hour of lecture and one hour of practice per week. Prerequisite: PHED 3245.

Skills and techniques of recreational aquatic games.

PHED 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.

PHED 3075. DEVELOPMENT, TRAINING AND TECHNIQUE OF SPORTS. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: PHED 3058.

Theory, strategy and mechanics of coaching various interscholastic and intercollegiate track and field events.

PHED 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.

PHED 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.

PHED 3095. COACHING AND OFFICIATING BASKETBALL. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: PHED 3215.

Theory and practice in coaching and officiating basketball.

PHED 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.

PHED 3215. FUNDAMENTALS OF BASKETBALL. One credit hour. One hour of lecture and one hour of practice per week.

Theoretical and practical approaches to basketball.

PHED 3225. FUNDAMENTALS OF VOLLEYBALL. One credit hour. One hour of lecture and one hour of practice per week.

Theoretical and practical approaches to volleyball.

PHED 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.

PHED 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.

PHED 3246. AQUATIC SKILLS. One credit hour. One hour of lecture and one hour of practice per week. Prerequisite: PHED 3245.

Aquatic techniques, with emphasis on recreation: water safety, lifesaving, skin diving, and underwater fishing. Field trips required.

PHED 3255. ADVANCED SWIMMING. One credit hour. One hour of lecture and one hour of practice per week. Prerequisite: PHED 3245.

A course for advanced swimmers with emphasis in the improvement of strokes.

PHED 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.

PHED 3285. AQUATIC SKILLS AND WATER SAFETY. One credit hour. One hour of lecture and one-hour laboratory per week. Prerequisite: PHED 3245.

Training, techniques and development of skills in aquatic activities, and water safety.

PHED 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.

PHED 3305. FOLK DANCES. One credit hour. One hour of lecture and one hour of practice per week.

Theory and practice of different folk dances.

PHED 3325. CURRICULUM IN PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisite: EDFO 3002, EDFO 3007 y EDFO 4019.

Philosophy, principles and major trends in curriculum design for particular grade levels.

PHED 3380. PHYSICAL ACTIVITIES AND THE ELDERLY. Three credit hours. Three hours of lecture per week. Prerequisite: BIOS 3002 or BIOS 3032.

Development of beneficial exercises and activities for the elderly.

PHED 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.

PHED 3465. PERSONAL AND COMMUNITY HEALTH. Three credit hours. Three hours of lecture per week.

Basic knowledge of current individual and community health problems.

PHED 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.

PHED 3596. FUNDAMENTALS OF SOCCER. One credit hour. One hour of lecture and one hour of practice per week.

Theory and practice of soccer.

PHED 3615. COACHING AND OFFICIATING SWIMMING. Two credit hours. One hour of lecture and two one-hour laboratories per week. Prerequisite: PHED 3245.

Theory, strategy, and techniques in coaching swimming.

PHED 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.

PHED 3665. RECREATIONAL SPORTS. Two credit hours. Two hours of lecture per week.

Methods, materials, and techniques in teaching selected recreational activities.

PHED 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.

PHED 3997. 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.

PHED 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.

PHED 4005. FUNDAMENTALS OF MOTOR LEARNING. Three credit hours. Three hours of lecture per week. Prerequisite: BIOS 3002 or BIOS 3032.

Aspects of physiology, psychology, and education that form the basis for understanding motor activity.

PHED 4010./PSYC 4010. PSYCHOLOGICAL ASPECTS OF SPORTS. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3001.

Psychological factors involved in motor performance and in sports.

PHED 4045. EVALUATION AND RESEARCH IN PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3015 or MSTA 3015.

Methods of evaluation and research in physical education including the use of microcomputers.

PHED 4055. COACHING AND OFFICIATING VOLLEYBALL. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: PHED 3225.

Theory and practice in coaching and officiating volleyball.

PHED 4065. COACHING AND OFFICIATING SOCCER. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: PHED 3596.

Theory and practice in coaching and officiating soccer.

PHED 4075. COACHING AND OFFICIATING SOFTBALL AND BASEBALL. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: PHED 3077.

Theory and practice in coaching and officiating softball and baseball.

PHED 4105. PHYSIOLOGY OF EXERCISE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: BIOS 3002 or BIOS 3032.

Scientific evaluation of the effects of muscular activities upon the human body; factors involved in physical conditioning, fatigue, and diet.

PHED 4115. BIOMECHANICS OF HUMAN MOVEMENT. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: MATH 3171 or MATH 3173 or MATH 3086.

Application of mechanical principles to the study of human movement with an emphasis on the function of the musculoskeletal system.

PHED 4125. ORGANIZATION, ADMINISTRATION AND SUPERVISION OF PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisite: PHED 3555.

Organization, administration and supervision of physical education, including intramural and interscholastic sports.

PHED 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.

PHED 4179. INTRODUCTION TO MOTOR SKILL DEVELOPMENT. Three credit hours. Three hours of lecture per week. Prerequisite: (BIOS 3002 or BIOS 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.

PHED 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.

PHED 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.

PHED 4195. TEACHING AND TRAINING IN TENNIS. Two credit hours. One hour of lecture and two hours of practice per week. Prerequisite: PHED 3295.

Theory and practice of teaching and training in tennis.

PHED 4205. TEACHING METHODS AND TECHNIQUES IN PHYSICAL EDUCATION. Three credit hours. Three hours of lecture per week. Prerequisites: EDFO 3002, EDFO 3007 and EDFO 4019.

Philosophy, curriculum, evaluation, methods and techniques in the process of teaching physical education.

PHED 4225. LIFEGUARDING. Three credit hours. Two hours of lecture and two hours of supervised practice per week. Prerequisite: PHED 3285 or consent of the Director of the Department.

The duties, responsibilities, knowledge, training, lifeguarding skills and its applications in various aquatic emergencies.

PHED 4230. ATHLETIC TRAINING. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: PHED 3645.

Prevention, treatment, and rehabilitation of injuries related to sports.

PHED 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.

PHED 4998. UNDERGRADUATE RESEARCH. From one to three credit hours. From two to four hours of research per week per credit. Prerequisites: PHED 4045 and consent of the Director of the Department.

A research project in Physical Education under the supervision of a professor of the department.

PHED 5005. BIOMECHANICS OF SPORTS. Three credit hours. Three hours of lecture per week. Prerequisites: PHED 4115 and PHED 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 and 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 tables that follow. Students looking for information concerning the graduate program should consult the Graduate Bulletin of Information.

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 high school 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 want to make Physics their career.

The Bachelor of Science Program in the 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 the certification of teachers of 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 commit himself or herself to any of the traditional fields of study in the physical sciences and instead requires a broader preparation in general science.

A wide variety of subjects can be elected by the students to fulfill the requirements of free electives. These include traditional choices from mathematics, chemistry, geology, computer sciences, arts and humanities and nontraditional selections of business, biology, education and engineering. Students contemplating taking courses outside the Faculty of Arts and Sciences should seek counsel from the departmental advisor regarding the availability of such courses. Students are encouraged to make coherent selections of their free electives.

Recommended electives must be taken from the list of courses corresponding to the program of study that follows. This list is revised periodically to incorporate changes in the academic offerings. Other courses might be

taken only with consultation of the departmental advisor.

Courses with the code ASTR (Astronomy) or METE (Meteorology) are offered by the Department of Physics. In those cases determined by the Department they can be considered as recommended electives in Physics.

## BACHELOR OF SCIENCE IN PHYSICS

### SUMMARY OF CREDITS IN PROGRAM

Faculty requirements	49
Departmental requirements	
Major area	43
(6 crs. recommended electives in Physics or Astronomy)	
Non-major area	31
(3 crs. computer programming course)	
Recommended electives	6
Free electives	<u>12</u>
Total	141

### FIRST YEAR

#### First Semester

<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3101</b>	
Basic Course in Spanish	3
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>CHEM 3001</b>	
General Chemistry	4
<b>*MATH 3005</b>	
Pre-Calculus	<u>5</u>
	18

#### Second Semester

<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3102</b>	
Basic Course in Spanish	3
<b>SOSC 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>CHEM 3002</b>	
General Chemistry	4
<b>MATH 3031</b>	
Calculus I	4

**PHED ----**  
 Course in Physical Education       $\frac{1}{18}$

**SECOND YEAR****First Semester**

**ENGL 3---**  
 Second year course in English      3

**SPAN 3---**  
 Course above level of basic  
 Spanish      3

**BIOS 3031**  
 Intro. to the Biological  
 Sciences I      3

**MATH 3032**  
 Calculus II      4

**PHCS 3161**  
 GENERAL PHYSICS I      4

**PHCS 3163**  
 GENERAL PHYSICS LAB. I       $\frac{1}{18}$

**Second Semester**

**ENGL 3---**  
 Second year course in English      3

**SPAN 3---**  
 Course above level of basic  
 Spanish      3

**BIOS 3032**  
 Intro. to the Biological  
 Sciences II      3

**PHCS 3162**  
 GENERAL PHYSICS II      4

**PHCS 3164**  
 GENERAL PHYSICS  
 LAB. II      1

**MATH 3063**  
 Calculus III      3

**PHED ----**  
 Course in Physical Education       $\frac{1}{18}$

**THIRD YEAR****First Semester**

**HUMA 3111**  
 Intro. to Western Culture I      3

**PHCS 4051**  
 INTERMEDIATE  
 MECHANICS      3

**PHCS 4076**  
 INTERMEDIATE  
 LABORATORY I      2

**PHCS 4105**  
 MODERN PHYSICS      3

**MATH 4009**  
 Ordinary Differential  
 Equations      3

\*\*----

Computer programming  
 course       $\frac{3}{17}$

**Second Semester**

**HUMA 3112**  
 Intro. to Western Culture II      3

**PHCS 4052**  
 DYNAMICS      3

**PHCS 4068**  
 ELECTROMAGNETISM      3

**PHCS 4077**  
 INTERMEDIATE  
 LABORATORY II      2

**PHCS 4125**  
 COMPUTERS IN PHYSICS      3

**\*\*PHCS ---**  
 RECOMMENDED

ELECTIVE IN PHYSICS       $\frac{3}{17}$

**FOURTH YEAR****First Semester**

**PHCS 4001**  
 SEMINAR I      1

**PHCS 4046**  
 WAVE MECHANICS      3

**PHCS 4057**  
 THERMAL PHYSICS      3

**MATH 4071**  
 Intro. to Mathematics of  
 Modern Science I      3

**\*\*ELECTIVE**  
 Recommended Elective      3

**ELECTIVES**  
 Free Electives       $\frac{6}{19}$

**Second Semester**

**PHCS 4002**  
 SEMINAR II      1

**\*\*PHCS ----**  
 RECOMMENDED

ELECTIVE IN PHYSICS      3

**MATH 4072**  
 Intro. to Mathematics of  
 Modern Science II      3

**\*\*ELECTIVE**  
 Recommended Elective      3

**ELECTIVES**  
 Free Electives       $\frac{6}{16}$

**Total credits required: 141**

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 Physics)

### Courses in Biology

**BIOL 5745**  
Introduction to Biophysics 3

### Courses in Chemistry

**CHEM 3025**  
Analytical Chemistry I 4

**CHEM 3031**  
Organic Chemistry I 4

**CHEM 3032**  
Organic Chemistry II 4

**CHEM 3065**  
Analytical Chemistry II 4

**CHEM 4041**  
Physical Chemistry I 3

**CHEM 4042**  
Physical Chemistry II 3

**CHEM 4135**  
Industrial Chemistry 2

### Courses in Computer Sciences

**COMP 3010**  
Introduction to Computer Programming I 3

**GEEG 3016**  
Algorithms and Computer Programming 3

### Courses in Mathematics

**COMP 3029**  
Programming Languages 3

**MATH 4008**  
Introduction to Algebraic Structures 3

**MATH 4010**  
Intro. to Complex Variables with Applications 3

**MATH 4020**  
Partial Differential Equations and Fourier Series 3

**MATH 4021**  
Fundamentals of Mathematical Logic 3

**MATH 4031**  
Introduction to Linear Algebra 3

**MATH 4051**  
Advanced Calculus I 3

**MATH 4061**  
Numerical Analysis I 3

### Philosophy Courses

**PHIL 3157**  
Introduction to Logic 3

**PHIL 3167**  
Symbolic Logic I 3

**PHIL 3168**  
Philosophy of Science 3

### Electives in Astronomy or Physics

**ASTR 4005**  
Astronomy I 3

**ASTR 4006**  
Astronomy II 3

**PHCS 4017**  
Physical Optics 3

**PHCS 4049**  
Electronics 3

**PHCS 4116**  
Solid State Physics 3

**PHCS 4997**  
Special Problems in Physics 1-3

**PHCS 4999**  
Undergraduate Research 1-3

**PHCS 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>
TOTAL	15

## BACHELOR OF SCIENCE IN PHYSICAL SCIENCES

### SUMMARY OF CREDITS IN PROGRAM

Faculty requirements	49
Departmental requirements	

Major area	30
(9 crs. recommended electives in Physics or Astronomy)	
Non-major area	37
Recommended electives	14*
Free electives	<u>12</u>
Total	142

\*Includes: 8 credits in Chemistry, 3 credits in Computer Sciences, and 3 credits in Geology.

### FIRST YEAR

#### First Semester

##### \*ENGL 3---

First year course in English 3

##### \*SPAN 3101

Basic Course in Spanish 3

##### SOSC 3121

Intro. to the Study of the  
Social Sciences 3

##### CHEM 3001

General Chemistry 4

##### \*MATH 3005

Pre-Calculus 5  
18

#### Second Semester

##### \*ENGL 3---

First year course in English 3

##### \*SPAN 3102

Basic Course in Spanish 3

##### SOSC 3122

Intro. to the Study of the  
Social Sciences 3

##### CHEM 3002

General Chemistry 4

##### MATH 3031

Calculus I 4

##### PHED ----

Course in Physical Education 1  
18

### SECOND YEAR

#### First Semester

##### ENGL 3---

Second year course in English 3

##### SPAN 3---

Course above level of basic  
Spanish 3

##### BIOS 3031

Intro. to the Biological  
Sciences I 3

##### MATH 3032

Calculus II 4

##### PHCS 3161

GENERAL PHYSICS I 4

##### PHCS 3163

GENERAL PHYSICS  
LAB. I 1  
18

#### Second Semester

##### ENGL 3---

Second year course in English 3

##### SPAN 3---

Course above level of basic  
Spanish 3

##### BIOS 3032

Intro. to the Biological  
Sciences II 3

##### PHCS 3162

GENERAL PHYSICS II 4

##### PHCS 3164

GENERAL PHYSICS  
LAB. II 1

##### MATH 3063

Calculus III 3

##### PHED ----

Course in Physical Education 1  
18

### THIRD YEAR

#### First Semester

##### PHCS 4076

INTERMEDIATE  
LABORATORY I 2

##### PHCS 4105

MODERN PHYSICS 3

##### \*\*ELECTIVE

Recommended elective in  
Computer Sciences 3

##### EDFO 3007

Social Foundations of  
Education 3

##### EDFO 3001

Human Growth and  
Development I 3

##### \*\*CHEM ----

Recommended elective in  
Chemistry 4  
18

#### Second Semester

##### EDFO 4019

Philosophical Foundations of  
Education 3

##### EDFO 3002

Human Growth and  
Development II 3

##### \*\*PHCS ----

RECOMMENDED  
ELECTIVE IN PHYSICS 3

##### \*\*CHEM ----

Recommended elective in  
Chemistry 4

##### GEOL 3025

Earth Sciences  $\frac{3}{16}$

**FOURTH YEAR****First Semester**

**ASTR 4005**  
ASTRONOMY I 3  
**\*\*GEOL ----**  
Elective in Geology 3  
**EDPT 4135**  
Theory and Methodology  
in the Teaching of Science  
in Secondary School 3  
**HUMA 3111**  
Intro. to Western Culture I 3  
**PHCS 4049**  
ELECTRONICS 3  
**ELECTIVE**  
Free Elective  $\frac{3}{18}$

**Second Semester**

**HUMA 3112**  
Intro. to Western Culture II 3  
**\*\*PHCS ----**  
RECOMMENDED ELECTIVE  
IN PHYSICS 3  
**\*\*PHCS ----**  
RECOMMENDED ELECTIVE  
IN PHYSICS  
or  
**\*\*ASTR ----**  
RECOMMENDED ELECTIVE  
IN ASTRONOMY 3  
**ELECTIVES**  
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**

**CHEM 3025**  
Analytical Chemistry I 4  
**CHEM 3031**  
Organic Chemistry I 4  
**CHEM 3032**

Organic Chemistry II 4  
**CHEM 3065**  
Analytical Chemistry II 4  
**CHEM 3085**  
Environmental Chemistry 3

**Computer Sciences Courses**

**COMP 3010**  
Introduction to Computer  
Programming I 3  
**GEEG 3016**  
Algorithms and Computer  
Programming 3  
**PHCS 4125**  
Computers in Physics 3

**Geology Courses**

**GEOL 3026**  
Life in the Past 3  
**GEOL 3027**  
Geological Aspects of the  
Environmental Sciences 3  
**GEOL 3035**  
Mineralogy 3  
**GEOL 3045**  
Planetary Geology 3

**Mathematics Courses**

**MATH 3030**  
Introduction to Geometry 3  
**MATH 4009**  
Ordinary Differential  
Equations 3  
**MATH 4071**  
Intro. to Mathematics of  
Modern Science I 3  
**MATH 4120**  
History of Mathematics 3

**Electives in Astronomy or Physics**

**ASTR 4006**  
Astronomy II 3  
**PHCS 4001**  
Seminar I 1  
**PHCS 4002**  
Seminar II 1  
**PHCS 4017**  
Physical Optics 3  
**PHCS 4046**  
Wave Mechanics 3  
**PHCS 4051**  
Intermediate Mechanics 3  
**PHCS 4052**  
Dynamics 3  
**PHCS 4057**

Thermal Physics <b>PHCS 4068</b>	3
Electromagnetism <b>PHCS 4077</b>	3
Intermediate Laboratory II <b>PHCS 4116</b>	2
Solid State Physics <b>PHCS 4125</b>	3
Computers in Physics <b>PHCS 4997</b>	3
Special Problems in Physics <b>PHCS 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.

**ALFONSO BARRIENTOS**, *Professor*, Ph.D., 1987, University of South Carolina.

**DORIAL CASTELLANOS**, *Associate 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**, *Associate 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.

**WINSTON KHAN**, *Professor*, Ph.D., 1964, University of Birmingham-England.

**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.

**ANGEL M. LOPEZ**, *Professor*, Ph.D., 1977, University of Massachusetts.

**JOSE R. LOPEZ**, *Professor*, Ph.D., 1983, Michigan State University.

**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.

**JUAN A. MIRANDA COLON**, *Instructor*, M.S., 1994, University of Puerto Rico, Mayagüez Campus.

**LESZEK NOWAKOWSKI**, *Professor*, Ph.D., 1983, N. Copernicus University-Torun, Poland.

**MOISES ORENGO AVILES**, *Associate Professor*, Ph.D., 1996, Brown University.

**CARLOS V. PABON**, *Assistant Professor*, Ph.D., 1994, City College of New York.

**JOSE PALATHINGAL**, *Professor*, Ph.D., 1965, University of Pennsylvania.

**LUIS M. QUIÑONES RODRIGUEZ**, *Professor*, Ph.D., 1973, Purdue University-Indiana.

**RAFAEL A. RAMOS**, *Assistant Professor*, Ph.D., 1994, Boston University.

**EFRAIN ROSARIO GARCIA**, *Professor*, Ph.D., 1976, State University of New York at Albany.

**MAHARAJ S. TOMAR**, *Associate Professor*, Ph.D., 1973, University of Roorkee, India.

**ESOV VELAZQUEZ**, *Assistant Professor*, Ph.D., 1999, University of Puerto Rico.



**COURSES OF INSTRUCTION****DEPARTMENT OF PHYSICS****UNDERGRADUATE COURSES**

PHCS 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.

PHCS 3028. ELECTROMAGNETISM FOR TEACHERS. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: PHCS 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.

PHCS 3029. MODERN PHYSICS FOR TEACHERS. Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisite: PHCS 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.

PHCS 3091. ELEMENTS OF PHYSICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3172 or MATH 3174 or MATH 3005 or MATH 3143.

Basic concepts of mechanics, thermodynamics, optics, and electromagnetism oriented specially towards agriculture.

PHCS 3092. ELEMENTS OF PHYSICS LABORATORY. One credit hour. One two-hour laboratory per week. Co-requisite: PHCS 3091.

Laboratory exercises and demonstrations applying the principles studied in PHCS 3091.

PHCS 3151-3152. MODERN COLLEGE PHYSICS. Three credit hours per semester. Two

hours of lecture and one hour of discussion per week each semester. PHCS 3151: Prerequisite: MATH 3021, Corequisite: MATH 3031 or MATH 3144 or MATH 3183. PHCS 3152: Prerequisite: MATH 3022 or MATH 3031 or MATH 3144 or MATH 3183.

Mechanics, heat, sound, electricity, magnetism, and optics. Differential and integral calculus will be used as much as possible.

PHCS 3153-3154. MODERN COLLEGE PHYSICS LABORATORY. One credit hour per semester. One two-hour laboratory per week each semester. Co-requisite: PHCS 3151-3152.

This course is to supplement PHCS 3151-3152.

PHCS 3161. GENERAL PHYSICS I. Four credit hours. Four hours of lecture per week. Prerequisite: MATH 3031 or MATH 3183.

Principles of mechanics, acoustics, and thermodynamics, with application to classical and modern physics.

PHCS 3162. GENERAL PHYSICS II. Four credit hours. Four hours of lecture per week. Prerequisite: PHCS 3161 or PHCS 3171.

Principles of electricity, magnetism, and optics, with application to classical and modern physics.

PHCS 3163. LABORATORY OF GENERAL PHYSICS I. One credit hour. One two-hour laboratory per week. Co-requisite: PHCS 3161 or PHCS 3171.

Experiments in mechanics, waves, and thermodynamics to complement PHCS 3161.

PHCS 3164. LABORATORY OF GENERAL PHYSICS II. One credit hour. One two-hour laboratory per week. Prerequisite: PHCS 3163 or PHCS 3173. Co-requisite: PHCS 3162 or PHCS 3172.

Experiments in electricity, magnetism, and optics to complement PHCS 3162.

PHCS 3171. PHYSICS I. Four credit hours. Four hours of lecture per week. Prerequisite: MATH 3031 or MATH 3183 or MATH 3144.

Principles of mechanics, waves, and thermodynamics for engineering and physical sciences.

PHCS 3172. PHYSICS II. Four credit hours. Four hours of lecture per week. Prerequisite: PHCS 3171 or PHCS 3161.

Principles of electricity, magnetism, optics, and modern physics for engineering and the physical sciences.

PHCS 3173. PHYSICS LABORATORY I. One credit hour. A two-hour laboratory per week. Co-requisite: PHCS 3171 or PHCS 3161.

Experiments in mechanics, waves, and optics to complement the PHYSICS I course.

PHCS 3174. PHYSICS LABORATORY II. One credit hour. A two-hour laboratory per week. Prerequisite: PHCS 3173 or PHCS 3163. Co-requisite: PHCS 3172 or PHCS 3162.

Experiments in electricity, magnetism, and modern physics to complement the PHYSICS II course.

PHCS 4001-4002. SEMINAR. One credit hour per semester. Two hours of lecture per week each semester.

Discussion and reports of special topics in Physics.

PHCS 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.

PHCS 4017. PHYSICAL OPTICS. Three credit hours. Three hours of lecture per week. Prerequisite: PHCS 3162 or PHCS 3172.

Interference, diffraction and polarization phenomena; wave surfaces, resolving power of optical instruments, magneto-optical phenomena.

PHCS 4046. WAVE MECHANICS. Three credit hours. Three lectures per week. Prerequisites: PHCS 4052 and MATH 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.

PHCS 4049. ELECTRONICS. Three credit hours. Two lectures and one three-hour laboratory per week. Prerequisites: (PHCS 3164 or PHCS 3174 or PHCS 3154) and (PHCS 3162 or PHCS 3172 or PHCS 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.

PHCS 4051. INTERMEDIATE MECHANICS. Three credit hours. Three hours of lecture per week. Prerequisite: PHCS 3162 or PHCS 3172 and MATH 3063 or MATH 3185.

A study of kinematics, dynamics, gravitation, and motion of rigid bodies; elasticity, hydrostatics and hydrodynamics; vibration and wave motion.

PHCS 4052. DYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisite: PHCS 4051.

Dynamics of particles and rigid bodies. Lagrange and Hamilton's equations of motion and related matters.

PHCS 4057. THERMAL PHYSICS. Three credit hours. Three hours of lecture per week. Prerequisite: PHCS 3162 or PHCS 3172 or PHCS 3012 and MATH 3063 or MATH 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.

PHCS 4068. ELECTROMAGNETISM. Three credit hours. Three hours of lecture per week. Prerequisite: (PHCS 3162 or PHCS 3172) and (MATH 3063 or MATH 3185).

An introductory study of electric theory, electrostatics, electric and magnetic field, theory of linear circuits, and electromagnetic radiation.

PHCS 4076. INTERMEDIATE LABORATORY I. Two credit hours. Two three-hour laboratories per week. Prerequisite: PHCS 3164 or PHCS 3174 or PHCS 4049.

Includes intermediate laboratory experiments in mechanics, electricity, magnetism, and modern physics, stressing the importance of precision measurements and appropriate experimental techniques.

PHCS 4077. INTERMEDIATE LABORATORY II. Two credit hours. Two three-hour laboratories per week. Prerequisite: PHCS 3164 or PHCS 3174 or PHCS 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.

PHCS 4105. MODERN PHYSICS. Three credit hours. Three hours of lecture per week. Prerequisite: PHCS 3162 or PHCS 3172.

A study of topics of twentieth century physics, including Relativity theory, Radiation theory, atomic structure of hydrogen like atoms, introduction to Schroedinger's equation, radioactive and selected topics in nuclear and solid state physics.

PHCS 4125. COMPUTERS IN PHYSICS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: GEEG 3025 or MATH 3010 or COMP 3010 or consent of the Director of the Department.

Introduction to computer techniques and their applications to physics.

PHCS 4135. APPLIED OPTICS. Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisite: PHCS 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.

PHCS 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.

PHCS 4997. SPECIAL PROBLEMS IN PHYSICS. One to three 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.

PHCS 4999. UNDERGRADUATE RESEARCH. One to three credit hours. Prerequisite: Consent of the Head 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

PHCS 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.

PHCS 5047. LASER PHYSICS. Three credit hours. Three hours of lecture per week. Prerequisites: PHCS 4105 and PHCS 4068.

Semiclassical 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: PHCS 3151 or PHCS 3011 or PHCS 3161 or PHCS 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: PHCS 3152 or PHCS 3012 or PHCS 3162 or PHCS 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: PHCS 4051 and METE 4007.

Radiation, radiation measurements, meteorological optics, atmospheric electricity, and dynamics of the atmosphere.

## **PHYSICAL SCIENCE**

PHSC 3011-3012. PHYSICAL SCIENCE. Three credit hours per semester. Three hours of lecture per week per semester. Co-requisite: MATH 3171 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 that affect the community and the society as a whole.

In order to achieve the aforementioned goals, the Department provides programs leading to the 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 the following:

- 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>
Total	133 or 135

**FIRST YEAR**

**First Semester**

*ENGL 3---	
First year course in English	3
*SPAN 3101	

Basic Course in Spanish I	3
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>PSYC 3001</b>	
Principles of Psychology I	3
*MATH 3171	
Pre-Calculus I	3
<b>PHED ----</b>	
Course in Physical Education	1
<b>PSYC 3050</b>	
Psychology as a Profession	<u>1</u>
	17

**Second Semester**

*ENGL 3---	
First year course in English	3
*SPAN 3102	
Basic Course in Spanish II	3
<b>SOSC 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>PSYC 3002</b>	
Principles of Psychology II	3
<b>MSTA 3101</b>	
Applied Statistics I	3
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	16

**SECOND YEAR**

**First Semester**

<b>ENGL 3--- or ENGL 4---</b>	
Second year course in English	3
<b>SPAN 3--- or SPAN 4---</b>	
Second year course in Spanish	3
<b>PSYC 3006</b>	
Social Psychology	3
<b>SOSC 3145</b>	
Bibliography and Library Research in the Social Sciences	3
<b>MSTA 3102</b>	
Applied Statistics II	3
<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	<u>3</u>
	18

**Second Semester**

<b>ENGL 3--- or ENGL 4---</b>	
Second year course in English	3
<b>SPAN 3--- or SPAN 4---</b>	
Second year course in Spanish	3
<b>BIOS 3032</b>	
Intro. to the Biological Sciences II	3
<b>PSYC ----</b>	
Elective in Psychology	3
<b>ELECTIVE</b>	

Free Elective 3  
15

**THIRD YEAR****First Semester**

**HUMA 3111**  
Intro. to Western Culture I 3  
**PHSC 3011**  
Physical Science  
or  
**CHEM 3001**  
General Chemistry 3 or 4  
**PSYC 3018**  
Physiological Psychology 3  
**PSYC ----**  
Elective in Psychology 3  
**PSYC 4006**  
Experimental Methods in  
Psychology 4  
16 or 17

**Second Semester**

**HUMA 3112**  
Intro. to Western Culture II 3  
**PHSC 3012**  
Physical Science  
or  
**CHEM 3002**  
General Chemistry 3 or 4  
**PSYC ----**  
Elective in Psychology 3  
**PSYC ----**  
Elective in Psychology 3  
**ELECTIVE**  
Free Elective 3  
15 or 16

**FOURTH YEAR****First Semester**

**PHIL 3001**  
Intro. To Philosophy: Major  
or Questions  
or  
**PHIL 3002**  
Intro. To Philosophy:  
Historical Approach 3  
**HIST 3241**  
History of Puerto Rico 3  
**PSYC 4065**  
Seminar on Psychological  
Research 3  
**ELECTIVE**  
Recommended Elective 3  
**ELECTIVE**  
Recommended Elective 3  
**ELECTIVE**  
Free Elective 3  
18

**Second Semester**

**HIST 3242**  
History of Puerto Rico 3  
**PHIL 3155 or PHIL 3156 or  
PHIL 3168 or PHIL 3169 or  
PHIL 4147**  
Elective Course in Philosophy 3  
**PSYC ----**  
Elective in Psychology 3  
**ELECTIVE**  
Recommended Elective 3  
**ELECTIVE**  
Recommended Elective 3  
**ELECTIVE**  
Free Elective 3  
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**

\***ENGL 3---**  
First year course in English 3  
\***SPAN 3101**  
Basic Course in Spanish 3  
**SOSC 3121**  
Intro. to the Study of the  
Social Sciences 3  
**BIOS 3031**  
Intro. to the Biological  
Sciences I 3  
\***MATH 3171**  
Pre-Calculus I 3  
**PHED ----**  
Course in Physical Education 1  
16

**Second Semester**

\***ENGL 3---**  
First year course in English 3

<b>*SPAN 3102</b>	
Basic Course in Spanish	3
<b>SOSC 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>BIOS 3032</b>	
Intro. to the Biological Sciences II	3
<b>MATH 3---</b>	
**Recommended Course in Mathematics	3
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	16

**SECOND YEAR**

**First Semester**

<b>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 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>SOSC 3145</b>	
Bibliography & Library Research in the Social Sciences	3
<b>ELECTIVE</b>	
Introductory Course in any of the Social Sciences	<u>3</u>
	18

**Second Semester**

<b>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 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>MSTA 3015</b>	
Elementary Statistics	3
<b>ELECTIVE</b>	
Introductory Course in any of the Social Sciences	<u>3</u>
	18

**THIRD YEAR**

**First Semester**

<b>SOCI 3265</b>	
Research Methods in the Social Sciences	3
<b>PHCS, CHEM 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	<u>3</u>
	18

**Second Semester**

<b>PHCS, CHEM 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	<u>3</u>
	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**

<b>HIST 3242</b>	
History of Puerto Rico	3
<b>ELECTIVE</b>	
Elective in any of the 4000 level Social Sciences	3
<b>ELECTIVES</b>	
Recommended Electives	6
<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 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>
Total	134

#### FIRST YEAR

##### First Semester

<b>*ENGL ----</b>	
First year course in English	3
<b>*SPAN 3101</b>	
Basic Course in Spanish	3
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>POSC 3011</b>	
Principles of Political Science	3
<b>*MATH 3171</b>	
Pre-Calculus I	3
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	16

##### Second Semester

<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3102</b>	
Basic Course in Spanish	3
<b>SOSC 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>POSC 3025</b>	
Government of the United States of America	3
<b>MATH 3---</b>	
**Recommended Course in Mathematics	3
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	16

#### SECOND YEAR

##### First Semester

<b>ENGL 3---</b>	
Second year course in English	3

##### SPAN 3---

Course above level of basic Spanish	3
<b>HUMA 3111</b>	
Intro. to Western Culture I	3
<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	3
<b>POSC 3035</b>	
Government of Puerto Rico	3
<b>HIST 3201</b>	
History of the Modern World I	<u>3</u>
	18

##### Second Semester

<b>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>HUMA 3112</b>	
Intro. to Western Culture II	3
<b>BIOS 3032</b>	
Intro. to the Biological Sciences II	3
<b>SOSC 3145</b>	
Bibliography and Library Research in Social Science	3
<b>HIST 3202</b>	
Modern World History II	<u>3</u>
	18

#### THIRD YEAR

##### First Semester

<b>POSC 4015</b>	
Comparative Government and Politics	
or	
<b>POSC 3065</b>	
International Relations	3
<b>POSC 4051</b>	
Political Theory	3
<b>MSTA 3015</b>	
Elementary Statistics	3
<b>PHCS, CHEM 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>POSC 4052</b>	
Political Theory	3
<b>PHCS, CHEM or GEOL</b>	
Electives	3
<b>ELECTIVES</b>	



Electives in Political Science	6
<b>ELECTIVES</b>	
Electives in Econ., Soci. or Psychology	3
<b>ELECTIVES</b>	
Electives	<u>3</u>
	18
<b>FOURTH YEAR</b>	
<b>First Semester</b>	
<b>POSC 4155</b>	
Analysis of Political Science	3
<b>HIST 3241</b>	
History of Puerto Rico	3
<b>POSC ----</b>	
Elective in Political Science	3
<b>ELECTIVES</b>	
Recommended Electives	3
<b>ELECTIVES</b>	
Electives	<u>3</u>
	15
<b>Second Semester</b>	
<b>HIST 3242</b>	
History of Puerto Rico	3
<b>POSC ----</b>	
Electives in Political Science	6
<b>ELECTIVES</b>	
Recommended Electives	3
<b>ELECTIVES</b>	
Electives	<u>3</u>
	15
<b>Total credits required: 134</b>	

\*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>
Total	134

**FIRST YEAR**

**First Semester**

<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3101</b>	
Basic Course in Spanish	3
<b>SOSC 3121</b>	
Intro. to the Study of the Social Sciences	3
<b>SOCI 3261</b>	
Introduction to Sociology	3
<b>*MATH 3171</b>	
Pre-Calculus I	3
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	16

**Second Semester**

<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3102</b>	
Basic Course in Spanish	3
<b>SOSC 3122</b>	
Intro. to the Study of the Social Sciences	3
<b>SOCI 3262</b>	
Introduction to Sociology	3
<b>MATH 3---</b>	
**Recommended Course in Mathematics	3
<b>PHED ----</b>	
Course in Physical Education	<u>1</u>
	16

**SECOND YEAR**

**First Semester**

<b>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	3
<b>HIST 3201</b>	
History of the Modern World I	3
<b>MSTA 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>ENGL 3---</b>	
Second year course in English	3
<b>SPAN 3---</b>	
Course above level of basic Spanish	3
<b>BIOS 3032</b>	
Intro. to the Biological Sciences II	3
<b>HIST 3202</b>	
Modern World History II	3
<b>SOSC 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>PSYC 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
<b>PHCS, CHEM or GEOL</b>	
Electives	3
<b>ELECTIVES</b>	
Electives	<u>3</u>
	18

**Second Semester**

<b>PSYC 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>PHCS, CHEM or GEOL</b>	
Electives	3
<b>SOCI ----</b>	
Elective in Sociology	3
<b>ELECTIVES</b>	
Electives	<u>3</u>
	18

**FOURTH YEAR****First Semester****HIST 3241**

History of Puerto Rico	3
<b>SOCI 4135</b>	
Comparative Sociology	3
<b>SOCI 4165</b>	
Social Problems in the Contemp. 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>
Total	134

**FIRST YEAR****First Semester**

<b>*ENGL 3---</b>	
First year course in English	3
<b>*SPAN 3101</b>	
Basic Course in Spanish	3
<b>BIOS 3031</b>	
Intro. to the Biological Sciences I	3
<b>SOSC 3121</b>	

Intro. to the Study of the Social Sciences	3
<b>HIST 3201</b> History of the Modern World I	3
<b>PHED ----</b> Course in Physical Education	<u>1</u> 16
<b>Second Semester</b>	
<b>*ENGL 3---</b> First year course in English	3
<b>*SPAN 3102</b> Basic Course in Spanish	3
<b>BIOS 3032</b> Intro. to the Biological Sciences II	3
<b>SOSC 3122</b> Intro. to the Study of the Social Sciences	3
<b>HIST 3202</b> Modern World History II	3
<b>PHED ----</b> Course in Physical Education	<u>1</u> 16
<b>SECOND YEAR</b>	
<b>First Semester</b>	
<b>ENGL 3---</b> Second year course in English	3
<b>SPAN 3---</b> Course above level of basic Spanish	3
<b>*MATH 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
<b>Second Semester</b>	
<b>ENGL 3---</b> Second year course in English	3
<b>SPAN 3---</b> Course above level of basic Spanish	3
<b>MATH ----</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>PHCS, CHEM 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>SOSC 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>PHCS, CHEM or GEOL</b> Electives	3
<b>ECON 3022</b> Principles of Economics II	3
<b>HIST 4222</b> Historiography and Approachesto History	3
<b>POSC 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                    3  
  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**, *Instructor*, M.S. 1992, Temple University.

**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**, *Assistant Professor*, Ph.D., University of Puerto Rico, Rio Piedras Campus, 1997.

**WALTER DIAZ RODRIGUEZ**, *Assistant Professor*, Ph.D., 1998, University of Michigan.

**MILAGRITOS GONZALEZ**, *Associate 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.

**JUAN E. HERNANDEZ CRUZ**, *Professor*, Ph.D., 1982, New York University.

**ALFONSO R. LATONI**, *Associate Professor*, M.A., 1981, Georgetown University.

**ILEANA MATIAS DEL TORO**, *Associate Professor*, M.A., 1987, George Washington University.

**NELSON MORENO TIRADO**, *Assistant Professor*, Ph.D., 1974, Purdue University.

**MARIA D. MULERO**, *Assistant Professor*, M.S., 1990, University of Virginia.

**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.

**YESENIA PUMARADA CRUZ**, *Assistant Professor*, M.A., 2000, University of Wisconsin, Madison.

**JULIA QUIÑONES**, *Assistant Professor*, M.A., 1986, Center for Puerto Rican Studies.

**ANIBAL RAMIREZ PEREZ**, *Assistant Professor*, M.A., 1986, University of Texas.

**GILBERTO RIOS**, *Associate Professor*, Ed.D., 1990, University of Massachusetts.

**ANA M. RODRIGUEZ WARD**, *Professor*, Ph.D., 1981, Tulane University.

**HAVIDAN RODRIGUEZ RIVERA**, *Professor*, Ph.D., 1991, University of Wisconsin.

**VIRGILIO RODRIGUEZ RIVERA**, *Associate 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**, *Assistant 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**

**ANTHROPOLOGY**

**UNDERGRADUATE COURSES**

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/SOSC 4066. POLITICAL AND CULTURAL ASPECTS OF INDIGENOUS PEOPLES OF LATIN AMERICA. Three credit hours. Three hours of lecture per week. Prerequisite: SOSC 3121 or ANTR 3005.

Indigenous peoples of Latin America: culture areas; history; "indigenismo" and identity; political, economic, and civil rights.

**GEOGRAPHY**

**UNDERGRADUATE COURSE**

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**

**UNDERGRADUATE COURSES**

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.

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.

HIST 4381. HISTORY OF ENGLAND. Three credit hours. Three hours of lecture per week.

The historical development of England since the Middle Ages through the Tudor period. Emphasis is given to the evolution of political institutions, socio-cultural traditions, intellectual foundations and British-European diplomatic relations.

## **POLITICAL SCIENCES**

### **UNDERGRADUATE COURSES**

POSC 3011. PRINCIPLES OF POLITICAL SCIENCE. Three credit hours. Three hours of lecture per week.

Concepts of politics, ideological assumptions, basic problems of politics, general types of national and international political organizations.

POSC 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.

POSC 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.

POSC 3045. INTERNATIONAL ORGANIZATION AND ADMINISTRATION. Three credit hours. Three hours of lecture per week. Prerequisite: POSC 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.

POSC 3065. INTERNATIONAL RELATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: POSC 3011.

The nature of international relations; nationalism, militarism, armaments, history of international relations; foreign policies, functions of democracy; international organizations.



POSC 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.

POSC 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.

POSC 4005. CONSTITUTIONAL LAW. Three credit hours. Three hours of lecture per week. Prerequisites: POSC 3011 and POSC 3025.

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.

POSC 4015. COMPARATIVE GOVERNMENT AND POLITICS. Three credit hours. Three hours of lecture per week. Prerequisite: POSC 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.

POSC 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.

POSC 4025. PUBLIC OPINION. Three credit hours. Three hours of lecture per week. Prerequisite: POSC 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.

POSC 4035. POLITICAL PARTIES. Three credit hours. Three hours of lecture per week. Prerequisite: POSC 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.

POSC 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.

POSC 4045. ELEMENTS OF PUBLIC ADMINISTRATION. Three credit hours. Three hours of lecture per week. Prerequisite: POSC 3035 or POSC 3025.

The role of public administration in modern society; principles of organization, budgeting, management techniques, the public service, and the control of administration.

POSC 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.

POSC 4051-4052. POLITICAL THEORY. Three credit hours per semester. Three hours of lecture per week per semester. Prerequisite: POSC 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.

POSC 4065. INTERNATIONAL LAW. Three credit hours. Three hours of lecture per week. Prerequisite: POSC 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.

POSC 4075. THE POLITICS OF THE DEVELOPING AREAS. Three credit hours. Three hours of lecture per week. Prerequisite: POSC 3011.

Comparative analysis of the political systems of selected world areas in which racial, social, and political changes are actually taking place.

POSC 4085. AMERICAN FOREIGN POLICY. Three credit hours. Three hours of lecture per week. Prerequisite: POSC 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.

POSC 4095. GOVERNMENT AND POLITICS OF THE CARIBBEAN. Three credit hours. Three hours of lecture per week. Prerequisite: POSC 3011.

Study and analysis of the government, political processes and political groups in the Caribbean area, including their relations with outside countries.

POSC 4105. LATIN AMERICAN GOVERNMENT AND POLITICS. Three credit hours. Three hours of lecture per week. Prerequisite: POSC 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.

POSC 4115. LATIN AMERICAN INTERNATIONAL RELATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: POSC 3065 or POSC 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.

POSC 4125. COMMUNIST IDEOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: POSC 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.

POSC 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.

POSC 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.

POSC 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.

POSC 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.

POSC 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.

POSC/PSYC/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.

POSC/PSYC/SOCI 4992. INDEPENDENT STUDY II. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: PSYC 4991 or SOCI 4991 or POSC 4991, respectively, and consent of the Director of the Department.

Research project under the supervision of a faculty member.

## PSYCHOLOGY

### UNDERGRADUATE COURSES

PSYC 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.

PSYC. 3002. PRINCIPLES OF PSYCHOLOGY II. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3001.

Principles of human behavior, including topics such as: personality, stress, psychological disorders, and social behavior.

PSYC 3006. SOCIAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 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.

PSYC 3015. THEORIES OF PERSONALITY. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3002.

Personality analyzed from various psychological perspectives, including psychoanalytic, behavioristic, humanistic, cognitive, and trait theories.

PSYC 3016. ABNORMAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 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.

PSYC 3017. INTRODUCTION TO PSYCHOLOGICAL ASSESSMENT. Three credit hours. Three hours of lecture per week. Prerequisites: PSYC 3002 and MSTA 3102 or MATH 3102.

Principles and techniques in the construction, selection, administration, and interpretation of major psychological tests, including ethical and social considerations.

PSYC 3018. PHYSIOLOGICAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: PSYC 3002 and (BIOS 3002 or BIOS 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.

PSYC 3027. CHILDHOOD PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3002.

Physical and psychosocial development of the individual from the prenatal period to puberty, with special interest in the child's healthy development.

PSYC 3028. PSYCHOLOGY OF ADULTHOOD. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3002.

Physical and psychosocial development of the individual in adulthood.

PSYC 3035. APPLIED PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 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.

PSYC 3036. EDUCATIONAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3002.

Principles of human learning and thinking as applied to the educational environment. Analysis of educational objectives, student characteristics, teaching methods, and learning assessment.

PSYC 3039. PSYCHOLOGY OF ADOLESCENCE. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3002.

Physical and psychosocial development of the individual from puberty to adulthood.

PSYC 3040. PERSONAL DEVELOPMENT. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3002.

Psychological perspectives that facilitate the awareness of the individual's capacity to cope with day-to-day events and challenges.

PSYC 3045. MENTAL HYGIENE. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3002.

A course which aims to provide a general orientation on the subject of mental hygiene; its historical development, scope, and factors contributing to the maintenance of mental health. Special attention is paid to the use of adjustment mechanism, frustrations, psychosis, and psychoneurosis. The processes by which maladjusted individual are restored to normal living will be discussed.

PSYC 3046. HISTORY AND SYSTEMS OF PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3002.

History of psychology emphasizing the development of its various systems.

PSYC 3047. COUNSELING PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: PSYC 3002.

The function of the helping professional as a facilitator of personal growth, the educational process, and vocational development.

PSYC 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.

PSYC 3060. ENVIRONMENTAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3002.

The interrelationship between the behavior of the individual and the natural and anthropogenic environment.

PSYC 3070. INTRODUCTION TO COGNITIVE PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3002.

Psychological foundations of information processing by the individual.

PSYC 3117. FOLK HEALING SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 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.

PSYC 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.

PSYC 4006. EXPERIMENTAL METHODS IN PSYCHOLOGY. Four credit hours. Two hours of lecture and two two-hour laboratories per week. Prerequisites: PSYC 3002 and (MSTA 3102 or MATH 3102).

Application of experimental and quasi-experimental methods to the problems of psychology, including the design, implementation, analysis, and presentation of a research project.

PSYC 4009. INDUSTRIAL/ ORGANIZATIONAL PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3002.

Identification and analysis of the individual, group and organizational variables which help to explain and predict human behavior in the work setting.

PSYC 4010./PHED 4010. PSYCHOLOGICAL ASPECTS OF SPORTS. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3001.

Psychological factors involved in motor performance and in sports.

PSYC 4065. SEMINAR ON PSYCHOLOGICAL RESEARCH. Three credit hours. Three hours of seminar per week. Prerequisite: 18 credit hours in Psychology and/or consent of the Director of the Department.

Planning, design, and implementation of an empirical investigation. An oral presentation and a written report are required.

PSYC 4070. QUALITATIVE RESEARCH IN PSYCHOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3006.

Procedures for planning, conducting, and analyzing qualitative research in psychology such as: interviews, observation, case studies, life-stories, and content analysis.

PSYC 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.

PSYC 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.

PSYC 4116. PSYCHOLOGY OF HUMAN SEXUALITY. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3002.

Human sexuality from a psychosocial perspective.

PSYC 4455. SEMINAR ON PSYCHOLOGICAL RESEARCH. Three credit hours. Three hours of seminar per week. Prerequisite: PSYC 4006.

Planning, design, and implementation of an empirical investigation. An oral presentation and a written report are required.

PSYC/SOCI/POSC 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.

PSYC/SOCI/POSC 4992. INDEPENDENT STUDY II. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: PSYC 4991 or SOCI 4991 or

POSC 4991, respectively, and consent of the Director of the Department.

Research project under the supervision of a faculty member.

### **ADVANCED UNDERGRADUATE COURSE**

PSYC 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**

SOSC 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.

SOSC 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.

SOSC 4056. PSYCHO-SOCIAL ASPECTS OF GENDER. Three credit hours. Three hours of lecture per week. Prerequisite: PSYC 3001 and SOSC 3121.

Psycho-social aspects of behavior in women and men in response to the changing perception of their roles.

SOSC/ANTH 4066. Three credit hours. Three hours of lecture per week. Prerequisite: SOSC 3121 or ANTH 3005.

Indigenous peoples of Latin America: culture areas; history, "indigenismo," and identity ; political, economic, and civil rights.

### **SOCIOLOGY**

#### **UNDERGRADUATE COURSES**

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 PSYC 3002 or POSC 3011 or SOSC 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: SOSC 3122 or SOCI 3262 or PSYC 3002 or POSC 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 PSYC 3002 or SOSC 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: SOSC 3122 or SOCI 3262 or PSYC 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 3335. SOCIAL DISORGANIZATION. Three credit hours. Three hours of lecture per week. Prerequisite: SOSC 3122 or PSYC 3002 or ANTR 3015.

A detailed analysis of the most relevant problems of social disorganization with which

our society has to cope, such as discrimination, prostitution, delinquency, and the sexual revolution.

SOCI 3337. JUVENILE DELINQUENCY. Three credit hours. Three hours of lecture per week. Prerequisite: SOSC 3121 or SOCI 3261. Juvenile delinquency as a social phenomenon: its nature, causes, prevention, and treatment. The role of government and community agencies.

SOCI 3345. SOCIAL ORGANIZATION. Three credit hours. Three hours of lecture per week. Prerequisite: SOSC 3121 or SOCI 3261 or PSYC 3002 or ANTR 3015 or ECON 3121 or HIST 3202.

Discussion of major theories of social structure, change, adjustment and social disorganization.

SOCI /EDFI 4000. SOCIOLOGICAL FUNDAMENTALS OF RECREATION AND SPORTS. Three credit hours. Three hours of lecture per week. Prerequisite: SOCI 3261.

The interaction among society, sports, and recreation.

SOCI 4095. PRINCIPLES OF SOCIAL WORK. Three credit hours. Three hours of lecture per week. Prerequisite: SOSC 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 4101-4102. CRIMINOLOGY. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: SOSC 3122 or SOCI 3262 or PSYC 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 PSYC 3002 or POSC 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 4135. COMPARATIVE SOCIOLOGY. Three credit hours. Three hours of lecture per week. Prerequisite: Twelve credits in Sociology.

Comparison of social structures from selected societies. Emphasis will be placed on an evaluative analysis of studies and methodology within the field of comparative sociology.

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 PSYC 3002 or POSC 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/PSYC/POSC 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/PSYC/POSC 4992. INDEPENDENT STUDY II. One to three credit hours. Two to four hours of research per week per credit. Prerequisites: PSYC 4991 or SOCI 4991 or POSC 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 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 the student with the study of mankind, through the arts and sciences.
2. Development of the desire for the search of truth, among students.
3. Strengthening of the democratic form of government by emphasizing the need for businessmen to participate in governmental affairs.
4. Development of the student's abilities to solve business problems, by making available to him the knowledge concerning the operation of business enterprises.

The second objective applies to business management. It hopes to provide business enterprises as well as government 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 the aforesaid goals.

The College of Business Administration is interested in developing academic programs which are relevant to the necessities of Puerto Rico. It is continuously taking steps to maintain good relations with business firms and governmental agencies in order to precise their needs for human resources so that new as well as existing programs may be tuned to their needs.

## FIELDS OF STUDY

The College offers a program of studies leading toward a Bachelor of Science in Business Administration degree with options in the fields of Accounting, Computerized Information Systems, Finance, Industrial Management, Marketing, and Organizational Studies (Human Resources). It also offers a Bachelor in Office Administration.

The curriculum is divided in the following three areas: the area of general education, the core courses in business administration and the professional recommended electives. The first two groups of subjects are more or less common to all majors, while the last group of subjects pursues to provide the student with in depth consideration of his/her selected 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 major is made up of a group of advanced subjects which allows the student to gain proficiency in an area of his/her choice.

### Accounting

This option develops in the student a knowledge of procedures and principles for recording business transactions, preparing State and Federal income tax returns, auditing, and planning and cost control. The option is geared towards the training of professionals in public and private accounting. The program provides adequate training focused on the CPA certification.

#### Summary of credits in program

General Education Courses	50
Core Courses	59
Professional Recommended Electives	23

### Computerized Information Systems

This option provides the student with basic understanding of operational systems and control languages, knowledge of actual business data processing applications, high level languages for

codification of programs, design of algorithms and systems, office automation design, management of information resources, and understanding of decision systems. It seeks to prepare a professional capable of developing and managing a computerized information system oriented to 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.

#### Summary of credits in program

General Education Courses	50
Core Courses	59
Professional Recommended Electives	23

### Finance

Students who choose this option learn financial analysis techniques, international financial mechanisms, the role of financial institutions, sound investments decisions, the impact that the public sector has on business firms, current financial trends, and corporate financial management. This option is of interest to students pursuing a career in banking, government, corporate finance or brokerage firms.

#### Summary of credits in program

General Education Courses	50
Core Courses	62
Professional Recommended Electives	21

### Industrial Management

This option 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 the student to manage operations in manufacturing or service environments.

#### Summary of credits in program

General Education Courses	50
Core Courses	59
Professional Recommended Electives	21

### 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, profit and nonprofit organizations. Students develop skills needed for personal selling, planning and controlling inventories, understanding consumer behavior and concepts within the international markets, and the basic principles of personnel and physical distribution.

#### Summary of credits in program

General Education Courses	50
Core Courses	62
Professional Recommended Electives	21

### Office Administration

Students acquire knowledge of proper administrative procedures, master the use of modern technology and have practical work experience on an office environment. This degree capacitates the student for careers in the industry, service or government.

#### Summary of credits in program

General Education Courses	44
Core Courses in Business	19
Concentration Courses	31
Professional Electives	12
Recommended Electives	6
General Electives	12

### Organizational Studies (Human Resources)

This option develops in students a knowledge of the 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 impacting employees and businesses. Students learn the skills needed to work in the management of human resources in a business or government environment.

#### Summary of credits in program

General Education Courses	50
Core Courses	62
Professional Recommended Electives	21

## 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 the student major field of study.

**COOPERATIVE EDUCATION PROGRAM**

The Cooperative Education Program is a way of combining classroom work and work experience. Each year a selected group of students is allowed to participate in this program. Students selected are employed by different firms in Puerto Rico and the United States. The students will, thus, be able to obtain a work experience concurrently with their academic degree.

Through this program, the students have the opportunity to apply the knowledge learned at the University in practical business situations.

Students who wish to participate must fulfill the following requirements:

- a. completion of first three years of study.
- b. minimum grade index of 2.50.

Students selected will be required to comply with the following conditions:

- a. to work in the firm assigned during the specified period.
- b. to be enrolled at the University in the cooperative education course assigned.

**INTERNSHIP PROGRAM**

The Internship Program provides the student with supervised work experience in his or her option, in a business enterprise under the supervision of a faculty member; in coordination with an immediate supervisor at the site of work.

The student receives academic credit and the opportunity to apply the knowledge learned in other courses at the University.

To participate in the program, the student:

- a. must work a minimum of four (4) hours per week, per credit during 15 weeks.
- b. will be able to register in the course more than once up to a maximum of six (6) credits.
- c. can take additional courses at the University considering the available time.
- d. must have the required prerequisite according to his/her option and obtain the consent of the Dean of Business Administration.

**PROGRAMS OF STUDY**

**Curriculum in Accounting**

**FIRST YEAR**

**First Semester**

Number	Course	Credits
SOSC 3121	Intro. to the Study of the Social Sciences	3
*MATH 3171	Pre-Calculus I	3
*SPAN 3101	Basic Course in Spanish	3
*ENGL 3101	First year course in English	3
ACCO 3005	ELEMENTARY ACCOUNTING I	4
PHED ----	Physical Education Elective	<u>1</u>
		17

**Second Semester**

SOSC 3122	Intro. to the Study of the Social Sciences	3
MATH 3000	Finite Mathematics	3
*SPAN 3102	Basic Course in Spanish	3
*ENGL 3102	First year course in English	3
ACCO 3006	ELEMENTARY ACCOUNTING II	4
ADMI 3007	Intro. to Computer Data Processing	<u>3</u>
		19

**SECOND YEAR**

**First Semester**

*ENGL 3201	Second year course in English	3
STAT 3001	Business Statistics I	3
ECON 3021	Principles of Economics I	3
MATH 3049	Mathematical Analysis for Management Sciences	3
ACCO 4018	INTERMEDIATE ACCOUNTING I	3
HRMA 4006	Principles of Management	<u>3</u>
		18

**Second Semester**

*ENGL 3202	Second year course in English	3
STAT 3002	Business Statistics II	3
ECON 3022	Principles of Economics II	3
ACCO 4035	COST ACCOUNTING	4
ACCO 4019	INTERMEDIATE ACCOUNTING II	3
MARK 3115	Principles of Marketing	<u>3</u>
		19

**THIRD YEAR**

**First Semester**

FINA 4029	Financial Markets I	3
FINA 3006	Business Finance	3

SPAN 3215	Expression and Communication	3
ACCO 4015	ADVANCED ACCOUNTING PROBLEMS	4
ACCO 4009	INCOME TAX OF PUERTO RICO	3
ELECTIVE	Elective in the Natural Sciences	<u>3</u>
		19

**Second Semester**

FINA 4035	Financial Markets II	3
ADMI 4016	The Environment of Organizations	3
HRMA 4008	Intro. to Personnel Administration and Industrial Relations	3
ACCO 4017	AUDITING	3
ELECTIVE	Free Elective	3
ELECTIVE	Elective in the Natural Sciences	<u>3</u>
		18

**FOURTH YEAR**

**First Semester**

ADMI 4001	Business Law I	3
MANA 4007	Operations Management	3
HUMA 3111	Intro. to Western Culture I	3
ELECTIVE	Free Elective	3
ELECTIVE	Free Elective	3
PHED ----	Physical Education Elective	<u>1</u>
		16

**Second Semester**

ADMI 4002	Business Law II	3
HRMA 4026	Administrative Policy	3
HUMA 3112	Intro. to Western Culture II	3
ELECTIVE	Free Elective	3
ACCO 4016	CONTEMPORARY THEORY OF ACCOUNTING	3
ECON 3085	Economy of Puerto Rico	<u>3</u>
		18

OPTION COURSES IN CAP 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
SOSC 3121	Intro. to the Study of the Social Sciences	3

*MATH 3171	Pre-Calculus I	3
*SPAN 3101	Basic Course in Spanish	3
*ENGL 3101	First year course in English	3
ACCO 3005	Elementary Accounting I	4
ELECTIVE	Physical Education Elective	<u>2</u>
		18

**Second Semester**

SOSC 3122	Intro. to the Study of the Social Sciences	3
MATH 3000	Finite Mathematics	3
*SPAN 3102	Basic Course in Spanish	3
*ENGL 3102	First year course in English	3
ACCO 3006	Elementary Accounting II	4
ADMI 3007	Intro. to Computer Data Processing	<u>3</u>
		19

**SECOND YEAR**

**First Semester**

ECON 3021	Principles of Economics I	3
MATH 3049	Mathematical Analysis for Management Sciences	3
STAT 3001	Business Statistics I	3
*ENGL 3201	Second year course in English	3
ACCO 4006	Managerial Accounting PROGRAM	3
COSY 3051	DEVELOPMENT I	<u>3</u>
		18

**Second Semester**

ECON 3022	Principles of Economics II	3
SPAN 3215	Expression and Communication	3
STAT 3002	Business Statistics II	3
*ENGL 3202	Second year course in English	3
HRMA 4006	Principles of Management PROGRAM DEVELOPMENT II	<u>3</u>
COSY 3052		18

**THIRD YEAR**

**First Semester**

MANA 4007	Operations Management	3
ADMI 4016	The Environment of Organizations	3
FINA 4029	Financial Markets I	3
ECON 3085	Economy of Puerto Rico	3
COSY 4085	INFORMATION SYSTEMS ANALYSIS METHODS	3
ELECTIVE	Elective in the Natural Sciences	<u>3</u>
		18

**Second Semester**

HRMA 4008	Intro. to Personnel Administration and Industrial Relations	3
FINA 3006	Business Finance	3
FINA 4035	Financial Markets II	3
MARK 3115	Principles of Marketing	3
COSY 4087	STRUCTURED INFORMATION	

	SYSTEM ANALYSIS AND DESIGN	3
ELECTIVE	Elective in the Natural Sciences	<u>3</u>
		18

**FOURTH YEAR**

**First Semester**

ADMI 4001	Business Law I	3
HUMA 3111	Intro. to Western Culture I	3
COSY 4095	DATA BASE PROGRAM DEVELOPMENT	3
ELECTIVE	Elective in Computerized Information Systems	3
ELECTIVES	Electives	<u>6</u>
		18

**Second Semester**

ADMI 4002	Business Law II	3
HUMA 3112	Intro. to Western Culture II	3
COSY 4097	SYSTEMS DEVELOPMENT	2
ELECTIVE	Elective in Computerized Information Systems	3
ELECTIVES	Electives	<u>6</u>
		17

OPTION COURSES IN CAP LETTERS.

**Total credits required for program: 144**

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

**RECOMMENDED ELECTIVES**

ACCO 4009	Income Tax of Puerto Rico
ACCO 4037	Accounting Information Systems
ADMI 3100	New Business Development
ADMI 4997	Business Practice for Coop Students
COEG 4029	Compiler Construction
COEG 4035	Data Structures
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
COSY 3056	Structured Languages
COSY 3057	Data Structures
COSY 3058	Programming In C Language
COSY 4088	Analysis, Design and Management of an Information Network
COSY 4140	Office Automation

COSY 4144	Business Programming Languages
COSY 4145	Software and Hardware Concepts
COSY 4155	Decision-Making Systems
COSY 4157	Advanced Database Concepts
COSY 4167	Distributed Data Processing
COSY 4168	Electronic Data Processing Auditing
COSY 4169	Information Systems Planning
COSY 4170	Information Resources Management
COSY 4990	Information Systems Internship
ENGL 3191	Conversational English
FINA 3005	Principles of Insurance
HRMA 4025	Organizational Behavior
INTD 4000	Congressional Internship-Córdova Program
INTD 4010	Academic Seminar-Washington Center
PHIL 3178	Business Ethics
POSC 3045	International Organization and Administration
SPAN 3208	Composition

**Curriculum in Finance**

**FIRST YEAR**

**First Semester**

Number	Course	Credits
SOSC 3121	Intro. to the Study of the Social Sciences	3
*MATH 3171	Pre-Calculus I	3
*ENGL 3101	First year course in English	3
*SPAN 3101	Basic Course in Spanish	3
HUMA 3111	Intro. to Western Culture I	3
ELECTIVE	Elective in the Natural Sciences	<u>3</u>
		18

**Second Semester**

SOSC 3122	Intro. to the Study of the Social Sciences	3
MATH 3000	Finite Mathematics	3
*ENGL 3102	First year course in English	3
*SPAN 3102	Basic Course in Spanish	3
HUMA 3112	Intro. to Western Culture II	3
ELECTIVE	Elective in the Natural Sciences	<u>3</u>
		18

**SECOND YEAR**

**First Semester**

ACCO 3005	Elementary Accounting I	4
STAT 3001	Business Statistics I	3
*ENGL 3201	Second year course in English	3

ECON 3021	Principles of Economics I	3
MATH 3049	Mathematical Analysis for Management Sciences	3
PHED ----	Physical Education Elective	<u>2</u>
		18

**Second Semester**

ADMI 3007	Intro. to Computer Data Processing	3
ACCO 3006	Elementary Accounting II	4
STAT 3002	Business Statistics II	3
ECON 3022	Principles of Economics II	3
*ENGL 3202	Second year course in English	3
MARK 3115	Principles of Marketing	<u>3</u>
		19

**THIRD YEAR****First Semester**

FINA 4029	FINANCIAL MARKETS I	3
SPAN 3215	Expression and Communication	3
HRMA 4006	Principles of Management	3
FINA 3006	BUSINESS FINANCE	3
ACCO 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
HRMA 4008	Intro. to Personnel Administra- tion 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
MANA 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
HRMA 4026	Administrative Policy	3
ADMI 4002	Business Law II	3
ELECTIVE	Recommended Elective	3
ELECTIVE	Electives	<u>3</u>
		18

OPTION COURSES IN CAP LETTERS.

**Total credits required for program: 145**

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

**RECOMMENDED ELECTIVES**

ACCO 4007	Federal Income Tax
ACCO 4009	Income Tax of Puerto Rico
ACCO 4018- ACCO4019	Intermediate Accounting I-II
ACCO 4037	Accounting Information Systems
ADMI 3100	New Business Development
ADMI 4996	Small Business Advising
ADMI 4997	Business Practice for Coop Students
COMP 3010	Introduction to Computer Programming I
ECON 4055	History of Economic Thought
ECON 4085	International Economics
ECON 4196	Economics of Industrial Organization
ENGL 3191	Conversational English
ENGL 3195	Professional Conversation
ENGL 3196	Group Communication
ENGL 3197	Professional Presentations
ENGL 3198	Professional Interviews
ENGL 3231	English Expository Writing
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
FREN 3142	French II
HRMA 4025	Organizational Behavior
HRMA 4028	Interpersonal Communication Applied To Engineering,
HRMA 4030	Training and Development of Human Resources
INTD 4000	Congressional Internship- Córdova Program
INTD 4010	Academic Seminar-Washington Center
MANA 4009	Production Planning and Control
MARK 3117	Personal Selling
MARK 4065	Marketing in the International Environment
PHIL 3157	Introduction to Logic
PHIL 3178	Business Ethics
POSC 3045	International Organization and Administration
PSYC 3002	Principles Of Psychology II

PSYC 3006 Social Psychology  
 Science, And Business Careers  
 SPAN 3208 Composition

**Curriculum in Industrial Management**

**FIRST YEAR**

**First Semester**

Number	Course	Credits
SOSC 3121	Intro. to the Study of the Social Sciences	3
*MATH 3171	Pre-Calculus I	3
*ENGL 3101	First year course in English	3
*SPAN 3101	Basic Course in Spanish	3
HUMA 3111	Intro. to Western Culture I	3
ELECTIVE	Elective in the Natural Sciences	<u>3</u>
		18

**Second Semester**

SOSC 3122	Intro. to the Study of the Social Sciences	3
MATH 3000	Finite Mathematics	3
*ENGL 3102	First year course in English	3
*SPAN 3102	Basic Course in Spanish	3
HUMA 3112	Intro. to Western Culture II	3
ELECTIVE	Elective in the Natural Sciences	<u>3</u>
		18

**SECOND YEAR**

**First Semester**

ACCO 3005	Elementary Accounting I	4
STAT 3001	Business Statistics I	3
*ENGL 3201	Second year course in English	3
HRMA 4006	Principles of Management	3
ECON 3021	Principles of Economics I	3
MATH 3049	Mathematical Analysis for Management Sciences	<u>3</u>
		19

**Second Semester**

ACCO 3006	Elementary Accounting II	4
STAT 3002	Business Statistics II	3
*ENGL 3202	Second year course in English	3
MARK 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
MANA 4021	PRODUCTION MANAGEMENT I	3
SPAN 3215	Expression and Communication	3
FINA 3006	Business Finance	3
PHED ----	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
HRMA 4008	Intro. to Personnel Administration and Industrial Relations	3
MANA 4022	PRODUCTION MANAGEMENT II	3
ACCO 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
MANA 4008	QUANTITATIVE METHODS IN MANAGEMENT	3
MANA 4009	PRODUCTION PLANNING AND CONTROL	3
ELECTIVE	Elective	<u>3</u>
		15

**Second Semester**

ADMI 4057	SEMINAR	3
HRMA 4026	Administrative Policy	3
ADMI 4002	Business Law II	3
MANA 4028	MATERIALS MANAGEMENT	3
ELECTIVE	Elective	3
ELECTIVE	Recommended Elective	<u>3</u>
		18

OPTION COURSES IN CAP LETTERS.

**Total credits required for program: 142**

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

**RECOMMENDED ELECTIVES**

ACCO 4009	Income Tax of Puerto Rico
ADMI 3015	Introduction to International Business
ADMI 3100	New Business Development

ADMI 4039	Research Methods in Business	HRMA 4030	Training and Development of Human Resources
ADMI 4058	Comparison of Administrative Systems among Enterprises in Puerto Rico and other countries	INTD 4000	Congressional Internship-Córdoba Program
ADMI 4996	Small Business Advising	INTD 4010	Academic Seminar-Washington Center
ADMI 4997	Business Practice for Coop Students	ITAL 3072	Italian II
COSY 3051	Program Development I	JAPA 3112	Japanese II
COSY 3052	Program Development II	MANA 4030	Contemporary Aspects of Industrial Management
COSY 4085	Information Systems Analysis Methods	MANA 4995	Industrial Management Internship
COSY 4140	Office Automation	MARK 3117	Personal Selling
COSY 4144	Business Programming Languages	MARK 4065	Marketing in the International Environment
COSY 4155	Decision-Making Systems	MARK 4075	Marketing Research
COSY 4157	Advanced Database Concepts	MARK 4217	Consumer Behavior
COSY 4169	Information Systems Planning	MARK 4218	Management of Physical Distribution
COSY 4170	Information Resources Management	PHIL 3157	Introduction to Logic
ECON 4006	Business Cycles	PHIL 3178	Business Ethics
ECON 4015	Economic Development	POSC 3045	International Organization and Administration
ECON 4016	Managerial Economics	POSC 3065	International Relations
ECON 4028	Economics of Natural Resources	POSC 4015	Comparative Government and Politics
ECON 4045	Comparative Economic Systems	POSC 4105	Latin American Government and Politics
ECON 4046	Input-Output Analysis	PSYC 3002	Principles Of Psychology II
ECON 4056	Environmental Economics	PSYC 3006	Social Psychology
ECON 4085	International Economics	PSYC 4009	Industrial/Organizational Psychology
ECON 4185	Economic Problems of Latin America	SOCI 3262	Introduction to Sociology II
ECON 4196	Economics of Industrial Organization	SPAN 3208	Composition
ECON 4225	Labor Economics		
ECON 4307	Project Evaluation		
ENGL 3191	Conversational English		
ENGL 3195	Professional Conversation		
ENGL 3196	Group Communication		
ENGL 3197	Professional Presentations		
ENGL 3198	Professional Interviews		
ENGL 3231	English Expository Writing		
FINA 3005	Principles of Insurance		
FINA 4028	International Finance		
FINA 4037	Investments		
FINA 4047	Investment Analysis and Portfolio Selection		
FREN 3142	French II		
GERM 3042	German II		
HIST 4117	History of Labor in the United States of America		
HRMA 4009	Human Resources Administration		
HRMA 4016	Industrial Relations		
HRMA 4019	Wage and Salary Administration		
HRMA 4025	Organizational Behavior		
HRMA 4028	Interpersonal Communication Applied to Engineering, Science, and Business Careers		

**Curriculum in Marketing**

**FIRST YEAR**

**First Semester**

Number Credits	Course	
SOSC 3121	Intro. to the Study of the Social Sciences	3
*MATH 3171	Pre-Calculus I	3
*ENGL 3101	First year course in English	3
*SPAN 3101	Basic Course in Spanish	3
HUMA 3111	Intro. to Western Culture I	3
ELECTIVE	Elective in the Natural Sciences	<u>3</u>
		18

**Second Semester**

SOSC 3122	Intro. to the Study of the Social Sciences	3
MATH 3000	Finite Mathematics	3
*ENGL 3102	First year course in English	3
*SPAN 3102	Basic Course in Spanish	3



HUMA 3112	Intro. to Western Culture II	3
ELECTIVE	Elective in the Natural Sciences	<u>3</u>
		18

**SECOND YEAR**

**First Semester**

ACCO 3005	Elementary Accounting I	4
STAT 3001	Business Statistics I	3
*ENGL 3201	Second year course in English	3
HRMA 4006	Principles of Management	3
MATH 3049	Mathematical Analysis for Management Sciences	3
ECON 3021	Principles of Economics I	<u>3</u>
		19

**Second Semester**

ACCO 3006	Elementary Accounting II	4
STAT 3002	Business Statistics II	3
*ENGL 3202	Second year course in English	3
SPAN 3215	Expression and Communication	3
MARK 3115	PRINCIPLES OF MARKETING	3
ECON 3022	Principles of Economics II	<u>3</u>
		19

**THIRD YEAR**

**First Semester**

ACCO 4006	Managerial Accounting	3
FINA 4029	Financial Markets I	3
MARK 4217	CONSUMER BEHAVIOR	3
MANA 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
HRMA 4008	Intro. to Personnel Administration and Industrial Relations	3
MARK 4009	PROMOTION AND ADVERTISING	3
ADMI 4016	The Environment of Organizations	3
PHED ----	Physical Education Elective	<u>2</u>
		17

**FOURTH YEAR**

**First Semester**

ECON 3085	Economy of Puerto Rico	3
ADMI 4001	Business Law I	3
MARK 4215	RETAIL SALES MANAGEMENT	3
ELECTIVES	Electives	6
ELECTIVE	Recommended Elective	<u>3</u>
		18

**Second Semester**

ADMI 4057	SEMINAR	3
HRMA 4026	Administrative Policy	3

ADMI 4002	Business Law II	3
MARK 4218	MANAGEMENT OF PHYSICAL DISTRIBUTION	3
ELECTIVES	Electives	<u>6</u>
		18

OPTION COURSES IN CAP LETTERS.

**Total credits required for program: 145**

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

**RECOMMENDED ELECTIVES**

ACCO 4009	Income Tax of Puerto Rico
ADMI 3100	New Business Development
ADMI 4039	Research Methods in Business
COSY 4085	Information Systems Analysis Methods
ECON 4085	International Economics
ECON 4196	Economics of Industrial Organization
ENGL 3191	Conversational English
ENGL 3195	Professional Conversation
ENGL 3196	Group Communication
ENGL 3197	Professional Presentations
ENGL 3198	Professional Interviews
ENGL 3231	English Expository Writing
FINA 3005	Principles of Insurance
FREN 3142	French II
HRMA 4025	Organizational Behavior
HRMA 4028	Interpersonal Communication Applied To Engineering, Training and Development of Human Resources
HRMA 4030	Congressional Internship-Córdova Program
INTD 4000	Academic Seminar-Washington Center
INTD 4010	Production Planning and Control
MANA 4009	Materials Management
MANA 4028	Personal Selling
MARK 3117	Marketing in the International Environment
MARK 4065	Marketing Research
MARK 4075	Marketing Internship
MARK 4995	Introduction to Logic
PHIL 3157	Business Ethics
PHIL 3178	International Organization and Administration
POSC 3045	Principles Of Psychology II
PSYC 3002	Social Psychology
PSYC 3006	Theories of Personality
PSYC 3015	Science, And Business Careers

SOCI 4155	Social and Cultural Change	PHED_____	Elective in Physical Education	2
SPAN 3208	Composition	ELECTIVE	PROFESSIONAL ELECTIVE	3
		ELECTIVE	FREE ELECTIVE	<u>3</u>
				15

**Second Semester**

**Curriculum in Office Administration**

**FIRST YEAR**

**First Semester**

Number	Course	Credits
OFMA 3016	KEYBOARDING AND ITS APPLICATIONS I	3
ELECTIVE	Elective in Natural Sciences	3
SOSC 3121	Intro. to the Study of the Social Sciences	3
SPAN 3101	Basic Course in Spanish	3
ENGL_____	First year Course in English	<u>3</u>
		15

**Second Semester**

OFMA 3017	KEYBOARDING AND ITS APPLICATIONS II	3
ADMI 3007	Introduction to Computer Data Processing	3
ELECTIVE	Elective in Natural Sciences	3
SOSC 3122	Intro. to the Study of the Social Sciences	3
SPAN 3102	Basic Course in Spanish	3
ENGL_____	First year Course in English	<u>3</u>
		18

**SECOND YEAR**

**First Semester**

ADMI 4040	Business Documents	3
OFMA 4005	ELECTRONIC PRODUCTION OF DOCUMENTS	3
OFMA 4065	INTRO. OF WORD PROCESSING	3
ENGL_____	Second year course in English	3
ELECTIVE	PROFESSIONAL ELECTIVE	<u>3</u>
		15

**Second Semester**

OFMA 3009	RECORDS MANAGEMENT	3
ENGL_____	Second year course in English	3
ELECTIVE	PROFESSIONAL ELECTIVE	3
MATH3086+	Mathematical Reasoning	3
HRMA 4006	Principles of Management	<u>3</u>
		15

**THIRD YEAR**

**First Semester**

OFMA 3105	INTRO. TO OFFICE ADMINISTRATION	3
ACCO 3005	Elementary Accounting I	4

OFMA 4019	ADMINISTRATIVE OFFICE PROCEDURES	3
ELECTIVE	Free Elective	3
ELECTIVE	PROFESSIONAL ELECTIVE	3
ELECTIVE	RECOMMENDED ELECTIVE	3
ELECTIVE	ELECTIVE IN ENGLISH	<u>3</u>
		15

**FOURTH YEAR**

**First Semester**

OFMA 4020	TRAINING IN ELECTRONIC EQUIPMENT	3
OFMA 4080	TRAINING AND SEMINAR PLANNING	3
ADMI 4001	Business Law I	3
ELECTIVE	Elective in Humanities	3
ELECTIVE	Free Elective	<u>3</u>
		15

**Second Semester**

OFMA 4025	OFFICE ADMINISTRATION INTERNSHIP	4
ECON 3021	Principles of Economic: Microeconomics	3
ELECTIVE	Elective in Humanities	3
ELECTIVE	Recommended Elective	3
ELECTIVE	Free Elective	<u>3</u>
		16

OPTION COURSES IN CAP LETTERS.

**Total credits required for program: 124**

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

+The course is in process of being created.

**COURSES IN ENGLISH**

ENGL 3191	Conversational English
ENGL 3195	Professional Conversation
ENGL 3196	Group Communication
ENGL 3197	Professional Presentations
ENGL 3198	Professional Interviews
ENGL 3227	Phonetics Of English
ENGL 3231	English Expository Writing
ENGL 3236	Technical Report Writing
ENGL 3250	Public Speaking

**COURSES IN HUMANITIES**

ARTS 3226 History Of Art In Puerto Rico  
 ARTS 4271 Art History to the Renaissance  
 ARTS 4272 Art History to the Renaissance  
 ARTS 4311 Art Criticism  
 ARTS 4331 Comparative Arts  
 ARTS 4332 Comparative Arts  
     Culture II  
 FREN 3141 French I  
 FREN 3142 French II  
 GERM 3041 German I  
 GERM 3042 German 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  
 ITAL 3071 Italian I  
 ITAL 3072 Italian II  
 JAPA 3111 Japanese I  
 JAPA 3112 Japanese II  
 LITE 3005 Literature Appreciation  
 LITE 3025 Literary Theory  
 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  
 PHIL 3155 Introduction To Ethics  
 PHIL 3156 Modern And Contemporary Ethics  
 PHIL 3157 Introduction to Logic  
 PHIL 3178 Business Ethics  
 THEA3051 Introduction To Theater Art  
 THEA 3052 Introduction To Theater Art

**PROFESSIONAL ELECTIVES**

OFMA 3005 Abbreviated Writing System In  
     Spanish  
 OFMA 3007 Abbreviated Writing System In  
     English  
 OFMA 3107 Office Concepts, Systems  
     &Technology  
 OFMA 3115 Telecommunications in the  
     Modern Office  
 OFMA 3125 Legal Office Administration  
 OFMA 4015 Spanish Transcription  
 OFMA 4017 English Transcription  
 OFMA 4055 Interpersonal Relations  
 OFMA 4067 Transcription of Magnetic  
     Methods  
 OFMA 4070 Integration of Office Systems  
 OFMA 4075 Integration of Information  
     Processing Programs  
 OFMA 4077 Design and Processing of  
     Documents

**RECOMMENDED ELECTIVES**

ACCO 3006 Elementary Accounting II  
 ACCO 4006 Managerial Accounting  
 ADMI 3015 Introduction to International  
     Business  
 ADMI 3100 New Business Development  
 ADMI 4002 Business Law II  
 ADMI 4016 The Environment of Organizations  
 EDFO 3001 Human Growth and Development I  
 EDFO 3002 Human Growth and Development II  
 EDFO 3007 Social Foundations of Education  
 EDFO 4019 Philosophical Foundations Of  
     Education  
 FINA 3005 Principles Of Insurance  
 HRMA 4007 Organizational Theory  
 HRMA 4008 Introduction to Personnel  
     Administration and Industrial  
     Relations  
 HRMA 4009 Human Resources Administration  
 HRMA 4010 Women and Work  
 HRMA 4025 Organizational Behavior  
 HRMA 4028 Interpersonal Communication  
     Applied To Engineering, Science,  
     And Business Careers  
 MARK 3115 Principles Of Marketing  
 MARK 3117 Personal Selling  
 PHIL 3178 Business Ethics  
 PSYC 3001 Principles Of Psychology I  
 PSYC 3002 Principles Of Psychology II  
 SOCI 3261 Introduction To Sociology I  
 SOCI 3262 Introduction To Sociology II  
 SPAN 3295 Spanish Grammar

**Curriculum in Organizational Studies  
(Human Resources)**

**FIRST YEAR**

**First Semester**

Number	Course	Credits
SOSC 3121	Intro. to the Study of the Social Sciences	3
*MATH 3171	Pre-Calculus I	3
*ENGL 3101	First year course in English	3
*SPAN 3101	Basic Course in Spanish	3
HUMA 3111	Intro. to Western Culture I	3
ELECTIVE	Elective in the Natural Sciences	<u>3</u>
		18

**Second Semester**

SOSC 3122	Intro. to the Study of the Social Sciences	3
MATH 3000	Finite Mathematics	3
*ENGL 3102	First year course in English	3
*SPAN 3102	Basic Course in Spanish	3
HUMA 3112	Intro. to Western Culture II	3
ELECTIVE	Elective in the Natural Sciences	<u>3</u>
		18

**SECOND YEAR**

**First Semester**

ACCO 3005	Elementary Accounting I	4
STAT 3001	Business Statistics I	3
*ENGL 3201	Second year course in English	3
HRMA 4006	PRINCIPLES OF MANAGEMENT	3
ECON 3021	Principles of Economics I	3
MATH 3049	Mathematical Analysis for Management Sciences	<u>3</u>
		19

**Second Semester**

ACCO 3006	Elementary Accounting II	4
STAT 3002	Business Statistics II	3
*ENGL 3202	Second year course in English	3
ECON 3022	Principles of Economics II	3
HRMA 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	

ACCO 4006	Organizations	3
HRMA 4008	Managerial Accounting	3
	INTRO. TO PERSONNEL ADMINISTRATION AND INDUSTRIAL RELATIONS	3
PHED ----	Physical Education Elective	<u>2</u>
		17

**Second Semester**

HRMA 4009	HUMAN RESOURCES ADMINISTRATION	3
FINA 4035	Financial Markets II	3
MANA 4007	Operations Management	3
MARK 3115	Principles of Marketing	3
SPAN 3215	Expression and Communication	3
HRMA 4016	INDUSTRIAL RELATIONS	<u>3</u>
		18

**FOURTH YEAR**

**First Semester**

ECON 3085	Economy of Puerto Rico	3
ADMI 4001	Business Law I	3
HRMA 4025	ORGANIZATIONAL BEHAVIOR	3
ELECTIVE	Recommended Elective	3
ELECTIVES	Electives	<u>6</u>
		18

**Second Semester**

ADMI 4057	SEMINAR	3
HRMA 4026	ADMINISTRATIVE POLICY	3
ADMI 4002	Business Law II	3
ELECTIVES	Electives	6
ELECTIVE	Recommended Elective	<u>3</u>
		18

OPTION COURSES IN CAP LETTERS.

**Total credits required for program: 145**

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

**RECOMMENDED ELECTIVES**

ACCO 4009	Income Tax of Puerto Rico
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
COSY 3051	Program Development I
COSY 3052	Program Development II

COSY 4085	Information Systems Analysis Methods	POSC 4015	Comparative Government and Politics
COSY 4087	Structured Information System Analysis and Design	POSC 4025	Public Opinion
COSY 4095	Database Program Development	POSC 4065	International Law
COSY 4097	Systems Development	POSC 4105	Latin American Government and Politics
COSY 4140	Office Automation	PSYC 3002	Principles Of Psychology II
COSY 4155	Decision-Making Systems	PSYC 3006	Social Psychology
COSY 4167	Distributed Data Processing	PSYC 3015	Theories of Personality
COSY 4169	Information Systems Planning	PSYC 4009	Industrial/Organizational Psychology
COSY 4170	Information Resources Management	SOCI 3262	Introduction to Sociology II
ECON 4006	Business Cycles	SOCI 3265	Research Methods in the Social Sciences
ECON 4015	Economic Development	SOCI 3335	Social Disorganization
ECON 4056	Environmental Economics	SOCI 3345	Social Organization
ECON 4085	International Economics	SOCI 4155	Social and Cultural Change
ECON 4185	Economic Problems of Latin America	SOCI 4165	Social Problems in the Contemporary World
ECON 4196	Economics of Industrial Organization	SPAN 3208	Composition
ECON 4225	Labor Economics		
ENGL 3191	Conversational English		
ENGL 3195	Professional Conversation		
ENGL 3196	Group Communication		
ENGL 3197	Professional Presentations		
ENGL 3198	Professional Interviews		
ENGL 3231	English Expository Writing		
FINA 3005	Principles of Insurance		
FREN 3142	French II		
FREN 3151	Business French I		
FREN 4036	Business French II		
GERM 3042	German II		
HIST 4117	History of Labor in the United States of America		
HRMA 4010	Women and Work		
HRMA 4019	Wage and Salary Administration		
HRMA 4028	Interpersonal Communication Applied To Engineering, Science, And Business Careers		
HRMA 4030	Training and Development of Human Resources		
HRMA 4995	Organizational Studies Internship		
INTD 4000	Congressional Internship-Córdova Program		
INTD 4010	Academic Seminar-Washington Center		
ITAL 3072	Italian II		
JAPA 3112	Japanese II		
MARK 3117	Personal Selling		
MARK 4065	Marketing in the International Environment		
PHIL 3157	Introduction to Logic		
PHIL 3178	Business Ethics		
POSC 3045	International Organization and Administration		
POSC 3065	International Relations		

## 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**, *Instructor*, 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**, *Instructor*, 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**, *Assistant Professor*, Ph.D., 1997, University of Pittsburgh.

**JUAN F. DE JESUS MEDINA**, *Instructor*, M.B.A., 1994, University of Puerto Rico, Mayagüez Campus.

**GAIL DIAZ**, *Associate Professor*, M.S., 1983, North Carolina State University.

**MARIA FERNANDEZ DIAZ**, *Professor*, Ph.D., 1990, University of Puerto Rico.

**LUCYANN FERNANDEZ VANCLEVE**, *Professor*, M.S., 1980, Texas A&M University.

**HAYDEE FIGARELLA**, *Professor*, M.A., 1974, Columbia University of the City of 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**, *Associate Professor*, M.B.A., 1978, Monterrey Technological Institute.

**DIGNA HERNANDEZ DE VELEZ**, *Associate Professor*, M.B.A., 1978, University of Florida.

**DAFNE JAVIER**, *Assistant Professor*, M.B.A., 1986, University of Puerto Rico, Río Piedras Campus.

**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**, *Assistant Professor*, M.E.S., 1992, University of Puerto Rico, Mayagüez Campus.

**DAVID F. MUÑOZ**, *Instructor*, M.B.A., 1993, University of Puerto Rico, Mayagüez Campus.

**WANDA NEGRON**, *Instructor*, M.S., 1988, University of Wisconsin, Madison.

**MARISOL OLIVER**, *Associate 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**, *Assistant 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.

**CANDIDO PEREZ OMS**, *Professor*, M.S.Acc., 1985, University of Massachusetts.

**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, San Antonio.

**JOSE M. ROMAGUERA CASABLANCA**, *Professor*, M.B.A., 1980, University of Connecticut.

**YOLANDA RUIZ**, *Assistant Professor*, Ph.D. 2000, University of Texas-Pan American.

**MIGUEL A. SEGUI FIGUEROA**, *Associate Professor*, L.L.M., 1994, Pontifical Catholic University of Puerto Rico.

**JAIME SEPULVEDA**, *Assistant 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 4001. BUSINESS LAW I. Three credit hours. Three hours of lecture per week. Prerequisite: SOSC 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), surety-ship, 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 4015. SOCIAL RESPONSIBILITY OF FREE ENTERPRISE. Two credit hours. Two hours of lecture per week.

Confrontation of the student with a specific concept of man, vital to fulfill his responsibility in the society. Analysis of social, political, legal, and economical thoughts and formulae. The students are challenged to organize these complexities in a frame of moral reference that should guide the individual as well as the enterprise to contribute toward greater social justice.

ADMI 4016. THE ENVIRONMENT OF ORGANIZATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: SOSC 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 4037. INTRODUCTION TO COMPUTER PROGRAMMING IN BUSINESS. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 3007 or MATH 3010 or COMP 3010 or GEEG 3025.

Introduction to the methods and techniques of programming: preparation, coding, and processing of programs using business-oriented languages.

ADMI 4038. COMPUTER PROGRAMMING USING A SCIENTIFIC LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 3007 or MATH 3010 or COMP 3010.

Introduction to the methods and techniques of programming: preparation, coding and processing of programs using scientific-oriented language.

ADMI 4039. RESEARCH METHODS IN BUSINESS. Three credit hours. Three hours of lecture per week. Prerequisites: STAT 3002 and MATH 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: SPAN 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: STAT 3002 and twelve credits in option 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 4695. FINANCIAL AND ECONOMIC STRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3022.

Basic financial and economic structures of Puerto Rico and the U.S., with special emphasis on primary and secondary data sources used in business research.

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

OFMA 3005. ABBREVIATED WRITING SYSTEM IN SPANISH. Four credit hours. Four hours of lecture per week. Prerequisite: SPAN 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.

OFMA 3007. ABBREVIATED WRITING SYSTEM IN ENGLISH. Four credit hours. Four hours of lecture per week. Prerequisite: ENGL 3102 or ENGL 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 or the abbreviated: grammar, punctuation, spelling and word division.

OFMA 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.

OFMA 3016. ELEMENTARY TYPEWRITING. 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.

OFMA 3017. INTERMEDIATE TYPEWRITING. Three credit hours. Three

hours of lecture with practice per week. Prerequisite: OFMA 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.

OFMA 3025. ELEMENTARY SPANISH SHORTHAND. Three credit hours. Three hours of lecture per week. Co-requisite: SPAN 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.

OFMA 3026. INTERMEDIATE SPANISH SHORTHAND. Three credit hours. Three hours of lecture per week. Prerequisite: OFMA 3025 and SPAN 3101.

Improvement of skills acquired in OFMA 3025. Learning and development of shorthand principles and skills will be continued.

OFMA 3027. ELEMENTARY ENGLISH SHORTHAND. Three credit hours. Three hours of lecture per week. Co-requisite: ENGL 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.

OFMA 3028. INTERMEDIATE ENGLISH SHORTHAND. Three credit hours. Three hours of lecture per week. Prerequisites: OFMA 3027 and ENGL 3101.

Improvement of skills acquired in OFMA 3027. Learning and development of shorthand principles and skills will be continued.

OFMA 4005. ELECTRONIC DOCUMENT PRODUCTION. Three credit hours. Three hours of lecture with practice per week. Prerequisite: OFMA 3017.

Application of previously learned typewriting techniques in the production of office documents. Development of these skills and techniques to an expert level.

OFMA 4015. SPANISH TRANSCRIPTION. Four credit hours. Four hours of lecture with practice per week. Prerequisites: OFMA 3026 or OFMA 3005 and OFMA 3017. Co-requisite: OFMA 4005.

Improvement of shorthand, typewriting, and language skills. Letters of simple to average degree of difficulty will be dictated, at a reasonable speed. Application of typewriting techniques, language skills, punctuation, spelling, and word division to transcribe acceptably using different equipment.

OFMA 4016. ADVANCED SPANISH TRANSCRIPTION. Three credit hours. Three hours of lecture with practice per week. Prerequisites: OFMA 4015 and OFMA 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.

OFMA 4017. ENGLISH TRANSCRIPTION. Four credit hours. Four hours of lecture with practice per week. Prerequisites: OFMA 3028 or OFMA 3007 and OFMA 3017 and ENGL 3102 or ENGL 3104. Co-requisite: OFMA 4005.

Improvement of shorthand, typewriting, and language skills. Letters of simple to average degree of difficulty will be dictated in English at a reasonable speed. Application of typewriting techniques, language skills, punctuation, spelling, and word division to transcribe acceptably using different equipment.

OFMA 4018. ADVANCED ENGLISH TRANSCRIPTION. Three credit hours. Three hours of lecture with practice per week. Prerequisites: OFMA 4017 and OFMA 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.

OFMA 4019. ADMINISTRATIVE OFFICE PROCEDURES. Three credit hours. Three hours of lecture per week. Prerequisite: OFMA 3017.

The study of the procedures, techniques, and protocols utilized in the office to accomplish different tasks. Communication and human relation problems.

OFMA 4020. TRAINING IN ELECTRONIC EQUIPMENT. Three credit hours. Three hours of lecture with practice per week. Prerequisites: OFMA 3017 and ADMI 3007.

Theoretical and practical study of different types of equipment used in an automated office.

OFMA 4025. OFFICE ADMINISTRATION INTERNSHIP. Four credit hours. Six hours of practice per week. Prerequisites: OFMA 3009, OFMA 4016, OFMA 4018, OFMA 4019, and OFMA 4020.

Practical experience in office administration in cooperation with private industry and government.

OFMA 4065. INTRODUCTION OF WORD PROCESSING. Three credit hours. Three hours of lecture with practice per week. Prerequisites: OFMA 3016 or SESC 3049.

Basic concepts of word and information processing systems and their applications. Utilization of different word processing programs in a microcomputer.

### **Secretarial Sciences**

SESC 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**

ACCO 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.

ACCO 3006. ELEMENTARY ACCOUNTING II. Four credit hours. Four hours of lecture per week. Prerequisite: ACCO 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.

ACCO 4006. MANAGERIAL ACCOUNTING. Three credit hours. Three hours of lecture per week. Prerequisite: ACCO 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.

ACCO 4007. FEDERAL INCOME TAX. Three credit hours. Three hours of lecture per week. Prerequisite: ACCO 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.

ACCO 4009. INCOME TAX OF PUERTO RICO. Three credit hours. Three hours of lecture per week. Prerequisite: ACCO 4006 or ACCO 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.

ACCO 4015. ADVANCED ACCOUNTING PROBLEMS. Four credit hours. Four hours of lecture per week. Prerequisite: ACCO 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.

ACCO 4016. CONTEMPORARY THEORY OF ACCOUNTING. Three credit hours. Three hours of lecture per week. Prerequisite: ACCO 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.

ACCO 4017. AUDITING. Three credit hours. Three hours of lecture per week. Prerequisite: ACCO 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.

ACCO 4018-4019. INTERMEDIATE ACCOUNTING I-II. Three credit hours per semester. Three hours of lecture per week each semester. Prerequisite: ACCO 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.

ACCO 4027. ANALYSIS AND COST CONTROL. Three credit hours. Three hours of lecture per week. Prerequisite: ACCO 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.

ACCO 4035. COST ACCOUNTING. Four credit hours. Four hours of lecture per week. Prerequisite: ACCO 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.

ACCO 4037. ACCOUNTING INFORMATION SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: ADMI 3007 and either ACCO 4035 or ACCO 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.

ACCO 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: ACCO 4019, ACCO 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.

### **Organizational Studies (Human Resources)**

HRMA 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.

HRMA 4006. PRINCIPLES OF MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: SOSC 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.

HRMA 4007. ORGANIZATIONAL THEORY. Three credit hours. Three hours of lecture per week. Prerequisite: ORST 4006 or HRMA 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.

HRMA 4008. INTRODUCTION TO PERSONNEL ADMINISTRATION AND INDUSTRIAL RELATIONS. Three credit hours. Three hours of lecture per week.

Prerequisite: ORST 4006 or HRMA 4006 or INEG 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.

HRMA 4009. HUMAN RESOURCES ADMINISTRATION. Three credit hours. Three hours of lecture per week. Prerequisite: ORST 4008 or HRMA 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.

HRMA 4010. WOMEN AND WORK. Three credit hours. Three hours of lecture per week. Prerequisite: ORST 4008 or HRMA 4008 or INEG 4035 or SOCI 3262 or PSYC 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.

HRMA 4016. INDUSTRIAL RELATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: ORST 4008 or HRMA 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.

HRMA 4019. WAGE AND SALARY ADMINISTRATION. Three credit hours. Three hours of lecture per week. Prerequisite: ORST 4008 or HRMA 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.

HRMA 4025. ORGANIZATIONAL BEHAVIOR. Three credit hours. Three hours of lecture per week. Prerequisite: ORST 4006 or HRMA 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.

HRMA 4026. ADMINISTRATIVE POLICY. Three credit hours. Three hours of lecture per week. Prerequisite: MANA 4007 or MANA 4022 and twelve credits in area of specialization.

Case analysis of contemporary business problems.

HRMA 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

HRMA 4030. TRAINING AND DEVELOPMENT OF HUMAN RESOURCES. Three credit hours. Three hours of lecture per week. Prerequisite: ORST 4008 or HRMA 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.

HRMA 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: (ORST 4007 or HRMA 4007), (ORST 4009 or HRMA 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

STAT 3001. BUSINESS STATISTICS I. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3172 or MATH 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.

STAT 3002. BUSINESS STATISTICS II. Three credit hours. Three hours of lecture per week. Prerequisite: STAT 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: STAT 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: ACCO 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: ACCO 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

MANA 4007. OPERATIONS MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisites: MATH 3049 or MATH 3021 and STAT 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.

MANA 4008. QUANTITATIVE METHODS IN MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: MANA 4007 or MANA 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 deterministic 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.

MANA 4009. PRODUCTION PLANNING AND CONTROL. Three credit hours. Three hours of lecture per week. Prerequisite: MANA 4007 or MANA 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.

MANA 4018. ECONOMIC PROBLEMS OF MANUFACTURING. Three credit hours. Three hours of lecture per week. Prerequisite: MANA 4007 or MANA 4022.

Economic analysis of some of the most important industries of the Western World, with special emphasis on those industries represented on the Puerto Rican industrial scene. The most

important economic problems of each industry are considered, including problems of technological changes, competition, and problems of economic concentration.

MANA 4021. PRODUCTION MANAGEMENT I. Three credit hours. Three hours of lecture per week. Prerequisites: MATH 3049, ORST 4006 or HRMA 4006, STAT 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.

MANA 4022. PRODUCTION MANAGEMENT II. Three credit hours. Three hours of lecture per week. Prerequisite: MANA 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.

MANA 4026. INTERNATIONAL MANAGEMENT STRATEGY. Three credit hours. Three hours of lecture per week. Prerequisite: ORST 4006 or HRMA 4006.

Studies the nature of managing international firms, their problems and strategies to deal with them, such as the relations with host societies, transmission of resources and technology, and labor strategies. Analyzes the concept of planning, organization, and control as related to international operations. Studies the concept of the multinational corporation and its implications. Analyzes various approaches to cross cultural managerial comparisons.

MANA 4028. MATERIALS MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: MANA 4007 or MANA 4022.

Economic, legal and environmental problems encountered in the acquisition and management of inventories; application of modern business methods to their solution.



MANA 4029. MANAGEMENT GAME. Two credit hours. Two hours of lecture per week. Prerequisite: junior or senior year standing.

Computer simulation of business situations encountered in modern enterprises under competition.

MANA 4030. CONTEMPORARY ASPECTS OF INDUSTRIAL MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: MANA 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.

MANA 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: MANA 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

MARK 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.

MARK 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.

MARK 4009. PROMOTION AND ADVERTISEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: MARK 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.

MARK 4065. MARKETING IN THE INTERNATIONAL ENVIRONMENT. Three credit hours. Three hours of lecture per week. Prerequisites: MARK 3115 and ORST 4006 or HRMA 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.

MARK 4075. MARKETING RESEARCH. Three credit hours. Three hours of lecture per week. Prerequisites: MARK 3115 and STAT 3002.

Systematic gathering, recording and analysis of data about problems relating to the marketing of goods and services.

MARK 4215. RETAIL SALES MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: MANA 4007 or MANA 4022 or MARK 4217.

Examination of the philosophy, concepts and techniques underlying the planning and control of inventories and sales in retail businesses.

MARK 4217. CONSUMER BEHAVIOR. Three credit hours. Three hours of lecture per week. Prerequisites: MARK 3115 and ORST 4006 or HRMA 4006.

Nature of consumer behavior through an analysis of consumer needs, attitudes, environment, and business influence.

MARK 4218. MANAGEMENT OF PHYSICAL DISTRIBUTION. Three credit hours. Three hours of lecture per week. Prerequisites: MARK 3115, and MANA 4007 or MANA 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.

MARK 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: MARK 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**

COSY 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.

COSY 3052. PROGRAM DEVELOPMENT II. Three credit hours. Three hours of lecture per week. Prerequisite: COSY 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.

COSY 3056. STRUCTURED LANGUAGES. Three credit hours. Three hours of lecture per week. Prerequisite: COSY 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.

COSY 3057. DATA STRUCTURES. Three credit hours. Three hours of lecture per week.

Prerequisite: COSY 3052 and either COSY 3056 or COSY 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.

COSY 3058. PROGRAMMING IN C LANGUAGE. Three credit hours. Three hours of lecture per week. Prerequisite: COSY 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++.

COSY 4085. INFORMATION SYSTEMS ANALYSIS METHODS. Three credit hours. Three hours of lecture per week. Prerequisite: COSY 3051.

System development life cycle. Process flow, data structure and flow: file and input/output design; program specifications. Collection and reporting activities.

COSY 4087. STRUCTURED INFORMATION SYSTEM ANALYSIS AND DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: COSY 3052 and COSY 4085.

Structured analysis and design strategies for dealing with complex information systems.

COSY 4088. ANALYSIS, DESIGN AND MANAGEMENT OF AN INFORMATION NETWORK. Three credit hours. Three hours of lecture per week. Prerequisite: COSY 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.

COSY 4095. DATABASE PROGRAM DEVELOPMENT. Three credit hours. Three

hours of lecture per week. Prerequisite: COSY 4085.

Program development for the use of the databases with emphasis on loading, modification, and validation of database.

**COSY 4097. SYSTEMS DEVELOPMENT.** Two credit hours. One hour of lecture per week and two hours of supervised workshop. Prerequisites: COSY 4087 and COSY 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.

**COSY 4140. OFFICE AUTOMATION.** Three credit hours. Three hours of lecture per week. Prerequisite: COSY 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.

**COSY 4144. BUSINESS PROGRAMMING LANGUAGES.** Three credit hours. Three hours of lecture per week. Prerequisite: COSY 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.

**COSY 4145. SOFTWARE AND HARDWARE CONCEPTS.** Three credit hours. Three hours of lecture per week. Prerequisite: COSY 3052.

Technical topics related to computer systems emphasizing the relationship between hardware and software design in the development of business application programs.

**COSY 4155. DECISION-MAKING SYSTEMS.** Three credit hours. Three hours of lecture per week. Prerequisites: ADMI 3007 and STAT 3002.

Specialized information systems used by business managers to support decision-making.

**COSY 4157. ADVANCED DATABASE CONCEPTS.** Three credit hours. Three hours of lecture per week. Prerequisite: COSY 4095.

Investigation and application of advanced database concepts; management, technology, selection and acquisition of the system.

**COSY 4167. DISTRIBUTED DATA PROCESSING.** Three credit hours. Three hours of lecture per week. Prerequisite: COSY 4095.

Centralized, decentralized and distributed data processing systems. Hardware and software technology implications in the design, development and implementation of distributed data processing systems.

**COSY 4168. ELECTRONIC DATA PROCESSING AUDITING.** Three credit hours. Three hours of lecture per week. Prerequisites: ADMI 3007, and COSY 4087 or ACCO 4017.

Electronic data processing auditing; techniques, controls and auditing types.

**COSY 4169. INFORMATION SYSTEMS PLANNING.** Three credit hours. Three hours of lecture per week. Prerequisite: COSY 4087.

Financial, technical and strategic information systems planning. Relationship between the firm's information systems and its objectives, policies and plans. Sources of hardware, software and services.

**COSY 4170. INFORMATION RESOURCES MANAGEMENT.** Three credit hours. Three hours of lecture per week. Prerequisite: COSY 4087.

Planning, organization and control of computer information systems.

**COSY 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: COSY 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 present technological education, and of the changing and diverse nature of the needs of modern industry.

The engineering curricula, accordingly, emphasize 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 his or her 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 the whole of a person's private life.

## STUDENT CHAPTERS OF HONORARY AND PROFESSIONAL SOCIETES

- 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 Profs. Cap. Estudiantil
- Society of Automotive Engineers
- Society of Women Engineers
- Water Pollution Control Federation

## **PUBLICATIONS**

The Technical Information Center is part of the Office of the Associate Dean for Academic Affairs and Research of the College of Engineering. The Center regularly publishes the "Boletín de Avances Técnicos" which provides information specifically gathered and written for industry on the Island and abroad.

The results of research work done by the Faculty of Engineering are published as technical bulletins which are distributed to the professional community on the Island, and to libraries in Puerto Rico and in the mainland.

## **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, and a Technical Information Center.

The Department of General Engineering provides and is responsible for the administration of 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, respectively.

The College of Engineering offers graduate education leading to the degrees of Master of Science and Masters of Engineering in Chemical, Mechanical, Civil and Electrical. In addition, Masters of Engineering in Management Systems and Computer Engineering are offered. Also, the

College of Engineering offers a Doctor of Philosophy degree in Civil 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 the 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, 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 so that he or she benefits from a multitude of learning opportunities available in business, industry, and public agencies which hence become an integral part of a more comprehensive career-oriented college education.

The 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 the maximum program effectiveness.

The requirements to enter the program are: 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 grade point average of 2.50 or higher.

Cooperative education benefits the student, the participating employer and the university.

*Benefits to students:*

1. The student can evaluate his/her chosen major.
2. Classroom theory and principles become more meaningful through practical application in work assignment.
3. The student earns six (6) academic credits.
4. Upon graduation the student will have the advantage of professional experience to help him/her in the job market.
5. The student earns money to help finance his/her academic career.

*Benefits to employers:*

1. The employer and the student can observe each other for several months at work, rather than in a short job interview.
2. Upon returning to campus, the student provide contacts for the employer with other prospective employees.
3. Employees reduce their training costs.

*Benefits to the University:*

1. Promotes better relationship of the industry and university.
2. The program creates ties with the governmental, business and industrial community.
3. Provides faculty members the opportunity to gain additional information about their subject matter.
3. 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. This is because all engineering disciplines rest on a common foundation, and 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**, *Instructor*, M.Arch., 1996, Universidad Autónoma de Guadalajara.

**MARCO A. AROCHA**, *Associate Professor*, Ph.D., 1995, University of California.

**JOSE R. ARROYO CARABALLO**, *Assistant 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**, *Instructor*, M.S.I.E., 1990, University of Puerto Rico.

**ISIDORO COUVERTIER REYES**, *Associate Professor*, Ph.D., 1996, Louisiana State University.

**MIGUEL A. CRUZ AROCHO**, *Professor*, M.S. Env. E., 1977, Georgia Institute of Technology.

**ALFRED FREILICH**, *Associate Professor*, P.E., 1973, Columbia University.

**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**, *Assistant 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.

**MARIO RIVERA BORRERO**, *Assistant Professor*, Ph.D., 1997, Virginia Polytechnic Institute.

**WILMA SANTIAGO**, *Instructor*, M. Arch., 1992, University of Wisconsin.

**MAREK RYSZ**, *Professor*, Ph.D., 1981, Technical University of Cracow (Poland).

**JEANNETTE SANTOS CORDERO**, *Assistant Professor*, Ph.D., 1995, Louisiana State University.

**BASIR SHAFIQ**, *Assistant 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**, *Associate 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.

## COURSES OF INSTRUCTION

### GENERAL ENGINEERING

GEEG 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.

GEEG 3012. ENGINEERING GRAPHICS II. Two credit hours. Two two-hours of lecture-drawing periods per week. Prerequisite: GEEG 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.

GEEG 3016. ALGORITHMS AND COMPUTER PROGRAMMING. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3031 or MATH 3144 or MATH 3183.

Development of algorithms and their implementation in a structured high level language. Programming techniques applied to

the solution of engineering and mathematical problems.

GEEG 3017. COMPUTER AIDED GRAPHICS. Two credit hours. Two two-hours of lecture-laboratory periods per week. Prerequisites: GEEG 3011 and GEEG 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.

GEEG 3025. INTRODUCTION TO COMPUTERS. Three credit hours. Two hours of lecture and two hours of computation per week. Prerequisite: MATH 3031 or MATH 3144 or MATH 3183.

Fundamental principles of programming and use of computers with special emphasis on digital computers. Application to engineering problems.

GEEG 3031. ENGINEERING MECHANICS-STATICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3031 or MATH 3144 or MATH 3183.

Analysis of force systems; the laws of equilibrium; analysis of simple frames and cables, distributed forces; friction, centroids and moments of inertia.

GEEG 3032. ENGINEERING MECHANICS-DYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisites: GEEG 3031 and (PHCS 3161 or PHCS 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.

GEEG 3035. ENGINEERING MECHANICS. Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3031 or MATH 3144 or MATH 3183. Co-requisite: PHCS 3161 or PHCS 3171.

Analysis of force systems; the laws of equilibrium; friction; centroids and moments of inertia. Kinematics and dynamics of particles and rigid bodies; vibrations.

GEEG 3045. MATERIALS SCIENCE FOR ELECTRICAL ENGINEERS. Three credit hours. Three hours of lecture per week. Prerequisite: CHEM 3002. Co-requisite: PHCS 3162 or PHCS 3172.

Principles that determine the properties of conductors, semiconductors, and insulators. Electromechanical properties; diffusion, electrical conduction, thermal conduction; magnetic and optical properties.

GEEG 4001. ENGINEERING MATERIALS. Three credit hours. Three hours of lecture per week. Prerequisites: (CHEM 3002 or CHEM 3042) and (PHCS 3161 or PHCS 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.

GEEG 4011. MECHANICS OF MATERIALS I. Three credit hours. Three hours of lecture per week. Prerequisites: GEEG 3031 and (MATH 3032 or MATH 3184).

Stresses and strains due to axial loads; torsional loads; stresses due to flexion; shear and moment diagrams.

GEEG 4012. MECHANICS OF MATERIALS II. Three credit hours. Three hours of lecture per week. Prerequisite: GEEG 4011 and (MATH 3063 or MATH 3185).

Analysis of statically determinate and indeterminate beams; three moments theorem; stresses due to combined loads; column theory; dynamic loads.

GEEG 4015. FLUID MECHANICS. Three credit hours. Three hours of lecture per week. Prerequisites: GEEG 3032 and (MATH 3063 or MATH 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.

GEEG 4016. FLUID MECHANICS LABORATORY. One credit hour. One three-hour laboratory period per week. Co-requisite: GEEG 4015.

Laboratory work supplementing classroom instruction in mechanics of fluid phenomena, measuring devices and techniques, and the testing of fluid machinery.

GEEG 4035. NUMERICAL METHODS APPLIED TO ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: (MATH 3063 or MATH 3185) and GEEG 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.

GEEG 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory 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 COURSE

GEEG 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 by means of a general methodology for solving complex problems which can not be treated mathematically. The methodology includes: problem formulation, information management, evaluation and

selection of alternatives, implementation of solutions and monitoring their performance.

## DEPARTMENT OF CHEMICAL ENGINEERING

Chemical Engineering is the branch of engineering that serves those industries that 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 the natural resources.

The education of the chemical engineer is broad, he or she becomes concerned with 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. He or she may also be concerned with such other activities as product sales, management, consulting, patent law and environmental planning.

Chemical engineers play an important role in today's world to solve problems in various 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.

## PROGRAM OF STUDY

### CHEMICAL ENGINEERING

#### FIRST YEAR

First Semester

Number	Credits	Course
*MATH 3005	5	Pre-Calculus
CHEM 3041	4	General Chemistry
ELECTIVE	3	**Sociohumanistic Elective
*ENGL 3---	3	First year course in English
*SPAN 3101	3	Basic Course in Spanish
	18	

## Second Semester

MATH 3031	4	Calculus I
CHEM 3042	4	General Chemistry
*ENGL 3---	3	First year course in English
*SPAN 3102	3	Basic Course in Spanish
GEEG 3011	2	Engineering Graphics I
PHED---	2	Physical Education Elective
	18	

**SECOND YEAR**

## First Semester

MATH 3032	4	Calculus II
PHCS 3171	4	Physics I
PHCS 3173	1	Physics Laboratory I
CHEM 3450	5	Fundamentals of Organic Chemistry
ENGL 3---	3	Second year course in English
ELECTIVE	1	Free Elective
	18	

## Second Semester

MATH 3063	3	Calculus III
PHCS 3172	4	Physics II
PHCS 3174	1	Physics Laboratory II
ENGL 3---	3	Second year course in English
CHEM 3055	4	Analytical Chemistry
GEEG 3016	3	Algorithms and Computer Programming
	18	

**THIRD YEAR**

## First Semester

GEEG 3031	3	Engineering Mechanics-Static
ECON 3021	3	Principles of Economics I
MATH 4009	3	Ordinary Differential Equations
CHEM 4041	3	Physical Chemistry I
CHEG 4005	4	Materials and Energy Balances
ELECTIVE	2	Free Elective
	18	

## Second Semester

CHEM 4042	3	Physical Chemistry II
CHEM 4101	1	Physical Chemistry Laboratory I
CHEG 4008	3	Mathematical Analysis of Chemical Eng. Problems
CHEG 4010	4	Momentum Transfer Operations
CHEG 4011	3	Chemical Engineering Thermodynamics I
ELECTIVE	3	Free Elective
	17	

**FOURTH YEAR**

## First Semester

CHEM 4102	1	Physical Chemistry Laboratory II
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CHEM ----	3	Elective in Chemistry
CHEG 4001	4	Heat Transfer Operations
CHEG 4012	3	Chemical Engineering Thermodynamics II
ELECTIVE	3	**Sociohumanistic Elective
ELEG 4075	3	Fundamentals of Electrical Engineering
	17	

## Second Semester

CHEG 4002	4	Mass Transfer Operations
CHEG 4017	4	Chemical Eng. Kinetics and Catalysis
CHEG 4034	2	Chemical Engineering Laboratory I
CHEG ----	3	Elective in Chemical Engineering
GEEG 4001	3	Materials Engineering
	16	

**FIFTH YEAR**

## First Semester

CHEG 5030	2	Chemical Engineering Laboratory II
CHEG 4027	1	Chemical Engineering Seminar
CHEG 5021	3	Chemical Engineering Process Design I
CHEG 5025	3	Analysis and Control of Processes
CHEG ----	3	Elective in Chemical Engineering
ELECTIVES	6	**Sociohumanistic Electives
	18	

## Second Semester

CHEG 5022	3	Chemical Engineering Process Design II
CHEG ----	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**, *Assistant Professor*, Ph.D., 1993, University of Akron.

**JULIO G. BRIANO PERALTA**, *Professor*, Ph.D., 1983, University of Pennsylvania.

**CONCEPCION BURGOS RUBIO**, *Assistant Professor*, Ph.D., 1997, Purdue University.

**REINALDO CABAN GIOVANETTI**, *Professor*, Ph.D., 1976, University of Wisconsin.

**NELSON CARDONA MARTINEZ**, *Professor*, Ph.D., 1989, University of Wisconsin.

**GUILLERMO COLON BURGOS**, *Professor*, Ph.D., 1986, University of Massachusetts.

**JOSE A. COLUCCI RIOS**, *Professor*, Ph.D., 1985, University of Wisconsin.

**LUIS ANTONIO ESTEVEZ DE VIDTS**, *Professor*, Ph.D., 1983, University of California.

**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.

**RICARDO J. PRIETO IRIZARRY**, *Assistant Professor*, Ph. D., 1995, Texas A&M University.

**CARLOS A. RAMIREZ QUIÑONES**, *Professor*, Sc.D., 1979, Massachusetts Institute of Technology.

**ABRAHAM RODRIGUEZ RAMIREZ**, *Professor*, Ph.D., 1973, New York University.

**LORENZO SALICETI PIAZZA**, *Associate Professor*, Ph.D., 1996, Purdue University.

**LAKSHMI N. SRIDHAR**, *Associate Professor*, Ph.D., 1991, Clarkson University.

**MADELINE TORRES LUGO**, *Instructor*, M.S., 1999, Purdue University.

**GILBERTO VILLAFANE RUIZ**, *Professor*, Ph.D., 1974, Tulane University.

**CARLOS VELAZQUEZ FIGUEROA**, *Assistant Professor*, Ph. D., 1993, University of Connecticut.

## COURSES OF INSTRUCTION

### CHEMICAL ENGINEERING

CHEG 4001. HEAT TRANSFER OPERATIONS. Four credit hours. Four hours of lecture per week. Prerequisites: CHEG 4010 and CHEG 4011.

Heat transfer principles, including multidimensional flow and unsteady state conditions, radiation heat transfer, design of exchangers, empirical relations.

CHEG 4002. MASS TRANSFER OPERATIONS. Four credit hours. Four hours of lecture per week. Prerequisites: CHEG 4001 and CHEG 4012.

Phase equilibria and equilibrium stage operations, with particular emphasis on distillation, gas absorption, humidification, and liquid-liquid extraction.

CHEG 4003. UNIT OPERATIONS III. Four credit hours. Four hours of lecture per week. Prerequisite: CHEG 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.

CHEG 4004. UNIT OPERATIONS LABORATORY III. One credit hour. One three-hour laboratory per week. Co-requisite: CHEG 4003.

Experimental studies on crystallization, drying of solids, fermentation, sterilization, validation, extraction, and filtration, using pilot plant equipment.

CHEG 4005. MATERIALS AND ENERGY BALANCES. Four credit hours. Three hours of lecture and one two-hour discussion period per week. Prerequisites: (MATH 3063 or MATH 3048) and GEEG 3016. Co-requisite: CHEM 4041.

An introduction to chemical engineering calculations involving the laws of conservation of mass and energy.

CHEG 4008. MATHEMATICAL ANALYSIS OF CHEMICAL ENGINEERING PROBLEMS. Three credit hours. Three hours of lecture per week. Prerequisites: CHEG 4005 and MATH 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.

CHEG 4010. MOMENTUM TRANSFER OPERATIONS. Four credit hours. Four hours of lecture per week. Prerequisite: CHEG 4005. Co-requisite: MATH 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.

CHEG 4011. CHEMICAL ENGINEERING THERMODYNAMICS I. Three credit hours. Three hours of lecture per week. Prerequisites: CHEG 4005 and CHEM 4041 and (MATH 4009 or MATH 3048).

Thermodynamic principles; applications of the first and second laws of thermodynamics to the solution of chemical engineering problems; thermodynamic properties of fluids.

CHEG 4012. CHEMICAL ENGINEERING THERMODYNAMICS II. Three credit hours. Three hours of lecture per week. Prerequisites: CHEG 4011 and CHEM 4042.

Emphasis on thermodynamic functions, properties of solutions, phase equilibria, and chemical reaction equilibria.

CHEG 4016. PLASTICS TECHNOLOGY. Three credit hours. Three hours of lecture per week. Prerequisites: (CHEM 3031 or CHEM 3450) and CHEG 4005.

The properties, production, and fabrication of natural and synthetic resins and polymers of industrial importance.

CHEG 4017. CHEMICAL ENGINEERING KINETICS AND CATALYSIS. Four credit hours. Four hours of lecture per week. Prerequisites: CHEG 4001 and CHEG 4012.

The principles of chemical kinetics and catalysis, and their application to reactor design and industrial processes.

CHEG 4027. CHEMICAL ENGINEERING SEMINAR. One credit hour. One and one-half hour of seminar per week. Prerequisite: CHEG 4002.

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.

CHEG 4028. PETROLEUM TECHNOLOGY. Three credit hours. Three hours of lectures per week. Prerequisites: CHEG 4002 and CHEM 3031.

The conversion of petroleum to useful derivatives, with emphasis on the chemical engineering operations and equipment involved. Problems, trips.

CHEG 4034. CHEMICAL ENGINEERING LABORATORY I. Two credit hours. Two three-hour laboratories per week. Prerequisite: CHEG 4001.

Experimental studies on fluid flow and heat transfer using pilot plant equipment.

CHEG 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.

CHEG 4077. UNIT OPERATIONS IN FOOD PROCESSING. Three credit hours. Three hours of lecture per week. Prerequisites: CHEG 4001 and CHEG 4012. Co-requisite: CHEG 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.

CHEG 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.

CHEG 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory 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**

CHEG 5005. PROCESS HEAT TRANSFER. Three credit hours. Three hours of lecture per week. Prerequisite: CHEG 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.

CHEG 5006. MATHEMATICAL TOPICS IN CHEMICAL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: (MATH 4009 or MATH 3048) and CHEG 4005.

Statistical analysis of experimental data, curve fitting, and sampling theory; nomography; problem solving with digital computers. Emphasis is given to chemical engineering applications.

CHEG 5008. COMPUTER SIMULATION OF PROCESSES AND UNITS. Three credit hours. Three hours of lecture per week. Prerequisites: GEEG 3016, CHEG 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.

CHEG 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.

CHEG 5015. FUNDAMENTALS OF AIR POLLUTION. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 4008 or Co-requisite: CHEG 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.

CHEG 5018. AIR POLLUTION CONTROL. Three credit hours. Three hours of lecture per week. Prerequisite: CHEG 4010 or Co-requisite: CIEG 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.

CHEG 5019. INDUSTRIAL WASTE CONTROL. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 4008 or Co-requisite: CHEG 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.

CHEG 5021. CHEMICAL ENGINEERING PROCESS DESIGN I. Three credit hours. Three hours of lecture per week. Prerequisite: ECON 3021. Co-requisites: CHEG 4002 and CHEG 4017.

Principles of economic evaluation, cost estimation, mathematical techniques and process simulation as applied to chemical engineering design.

CHEG 5022. CHEMICAL ENGINEERING PROCESS DESIGN II. Three credit hours. Three hours of lecture per week. Prerequisites: CHEG 4017 and CHEG 4002. Co-requisite: CHEG 5021.

Application of the principles of economic evaluation, cost estimation, mathematical techniques, and simulation to the chemical engineering design of processes and/or equipment.

CHEG 5025. ANALYSIS AND CONTROL OF PROCESSES. Three credit hours. Three hours of lecture per week. Prerequisites: CHEG 4002 and CHEG 4017.

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.

CHEG 5026. MICROCLIMATE AND DISPERSION OF AIR POLLUTANTS. Three credit hours. Three hours of lecture per week. Prerequisite: CHEG 4002 or CIEG 4008.

Discussion of the elements of microclimate in urban, rural, and valley environments.

Dispersion of air pollutants in these environments.

CHEG 5027. EQUILIBRIUM STAGE PROCESSES. Three credit hours. Three hours of lecture per week. Prerequisites: CHEG 4002 and GEEG 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.

CHEG 5028. ADVANCES IN CHEMICAL ENGINEERING. Two credit hours. Two hours of lecture per week. Prerequisite: CHEG 4002. Co-requisite: CHEG 4027.

Discussion of chemical engineering topics in which recent advances are particularly striking.

CHEG 5030. CHEMICAL ENGINEERING LABORATORY II. Two credit hours. Two three-hour laboratory periods per week. Prerequisite: CHEG 4002 and CHEG 4017.

Experimental studies on mass transfer, process control, fermentation, kinetics and catalysis using pilot plant equipment at the Unit Operations Laboratory.

CHEG 5035. BIOCHEMICAL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: CHEG 4017 or (CHEM 4042 and CHEM 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.

CHEG 5036. PARTICULATE SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: CHEG 4002.

Creation, characterization, separation and agglomeration of particles. Sizing, fractionation of powders, surface area and pore size determinations. Pulverization, crystallization, agglomeration, tableting and granulation.

CHEG 5037. MEMBRANE SEPARATION PROCESSES. Three credit hours. Two hours of lecture and one hour of discussion per week. Prerequisite: CHEG 4002.

Study of the principles on 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.

CHEG 5045. TRANSPORT PHENOMENA. Three credit hours. Three hours of lecture per week. Prerequisites: (CHEG 4008 and CHEG 4010) or CIEG 4008.

Momentum, energy, and mass transport. Emphasis is given in the understanding of basic physical principles and their mathematical description.

CHEG 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 degree of Bachelor of Science in Civil Engineering and Surveying which is administered by the Civil Engineering and Surveying Department.

### PROGRAM EDUCATIONAL OBJECTIVES:

Our vision is to provide society with people-serving, problem-solvers in civil engineering and

surveying. Our slogan is CES=(PS)<sup>2</sup> (Civil Engineers and Surveyors = People-serving, problem solvers).

The Civil Engineering Program educational objectives are the following:

### Our Civil Engineering graduates will ...

1. Address the challenges that they will face in their careers.
2. Pursue life-long 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.

### We expect our students to 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. The understanding of the importance of compliance with professional practice and ethical issues, such as: bidding; procurement; professional interaction, and professional licensure, among others.
9. The 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. The commitment to engage in lifelong learning.
11. The necessary awareness of contemporary social, cultural, economic, artistic, aesthetic, environmental, and engineering issues.

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 (in short, the country's infrastructure) are some examples of the work performed by a civil engineer. Each has an impact upon the daily living of most people. The civil engineer, therefore, is called upon to consider in an integrated manner the social as well as the physical factors that affect the planning, design, construction, operation, and maintenance of our total infrastructures.

The B.S. program precedes a well coordinate graduate study program, which offers Master and Ph.D. degrees in Civil Engineering.

The Master 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 plus 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 center provide administrative support to these initiatives the Civil Infrastructure Research Center, the Natural Hazards Mitigation Institute, the Transportation Technology Transfer Center, and the Computer Aided Instruction and Research Laboratory. Undergraduate students participate in research experience, both in-campus and off-campus. Many students participate in summer internship programs in prestigious universities in the United States of America.

This program is fully accredited by ABET, the Accreditation Board for Engineering and Technology.

## PROGRAMS OF STUDY

### CIVIL ENGINEERING CURRICULUM

#### FIRST YEAR

First Semester

Number	Credits	Course
*MATH 3005	5	Pre-Calculus
CHEM 3001	4	General Chemistry
*ENGL 3---	3	First year course in English
*SPAN 3101	3	Basic Course in Spanish



GEEG 3011 2 Engineering Graphics I  
 PHED ---- 1 Elective Course in Physical  
 18 Education

Second Semester

MATH 3031 4 Calculus I  
 CHEM 3002 4 General Chemistry  
 \*ENGL 3--- 3 First year course in English  
 \*SPAN 3102 3 Basic Course in Spanish  
 GEEG 3012 2 Engineering Graphics II  
 PHED ---- 1 Elective in Physical Education  
 17

**SECOND YEAR**

First Semester

MATH 3032 4 Calculus II  
 PHCS 3171 4 Physics I  
 PHCS 3173 1 Physics Laboratory I  
 ENGL 3--- 3 Second year course in English  
 GEEG 3031 3 Applied Mechanics-Static  
 GEEG 3016 3 Algorithms and Computer  
 18 Programming

Second Semester

MATH 3063 3 Calculus III  
 PHCS 3172 4 Physics II  
 PHCS 3174 1 Physics Laboratory II  
 ENGL 3--- 3 Second year course in English  
 GEEG 3032 3 Applied Mechanics-Dynamics  
 GEEG 4011 3 Mechanics of Materials I  
 17

**THIRD YEAR**

First Semester

MATH 4009 3 Ordinary Differential Equations  
 CIEG 4001 3 Surveying I  
 CIEG 4095 2 Mathematical Methods in Civil  
 Eng.  
 GEEG 4012 3 Mechanics of Materials II  
 GEEG 4001 3 Materials Engineering  
 ELEG 4075 3 Fundamentals of Electrical  
 17 Engineering

Second Semester

CIEG 4021 3 Structural Analysis I  
 CIEG 4035 3 Civil Engineering Materials  
 CIEG 4002 3 Surveying II  
 CIEG 4136 2 Applied Statistics for Civil Eng.  
 GEEG 4015 3 Fluid Mechanics  
 GEEG 4016 1 Fluid Mechanics Laboratory  
 GEOL 4015 3 Geology for Engineers  
 18

**FOURTH YEAR**

First Semester

CIEG 4007 3 Highway Location and Curve  
 Design  
 CIEG 4008 3 Introduction to Environmental  
 Eng.  
 CIEG 4011 3 Structural Steel Design  
 CIEG 4022 3 Structural Analysis II  
 ECON 3021 3 Principles of Economics I  
 ELECTIVE 3 \*\*Sociohumanistic Elective  
 18

Second Semester

CIEG 4139 4 Intro. to Geotechnical Engineering  
 CIEG 4012 3 Reinforced Concrete Design  
 CIEG 4138 3 Water Resources Engineering  
 CIEG 4137 3 Intro. to Transportation  
 Engineering  
 ELECTIVE 6 \*\*Sociohumanistic Elective  
 19

**FIFTH YEAR**

First Semester

CIEG 4049 3 Foundations  
 CIEG 4026 3 Highway Engineering  
 CIEG 4145 3 Waterworks and Sewerage  
 Design  
 ELECTIVE 3 \*\*Sociohumanistic Elective  
 ELECTIVE 6 Free Elective  
 18

Second Semester

CIEG 4950 3 Integrated Civil Engineering  
 Project  
 CIEG 4055 3 Project Control and Management  
 CIEG 4019 1 Civil Engineering Seminar  
 ELECTIVE 3\*\*Sociohumanistic Elective  
 CIEG ---- 3 Civil Engineering Electives  
 ELECTIVES 6 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. There are specific requirements on the Sociohumanistic courses based on basic or advance level, and the are of concentration.

## SURVEYING AND TOPOGRAPHY

The College of Engineering offers a four-year degree of Bachelor of Science in Surveying and Topography which is administered by the Civil Engineering Department.

The Department of Civil Engineering has the following mission:

- Provide our society with citizens having a strong technical and professional education in civil engineering and surveying; with rich cultural background, ethical values, and social sensitivity; with capacity for critical thinking; and the managerial and entrepreneurial skills needed to solve civil engineering and surveying problems facing society.
- Search for new knowledge to solve civil engineering and surveying problems.
- Serve the local and international community by making new and existing knowledge available to all.

Our vision is to provide society with people-serving, problem-solvers in civil engineering and surveying. Our Slogan is CES=(PS)<sup>2</sup> (Civil Engineers and Surveyors-People-serving, problem solvers).

The Surveying and Topography Program specific academic objectives are:

- 1 Must have the ability to properly apply his/her knowledge of mathematics, science, and surveying engineering sciences;
- 2 Must be able to properly analyze data, legal documents, and field evidence;
- 3 Must be able to design measurement criteria to meet minimum accuracy standards in a given job or situation;
- 4 Must have the desired personality traits that will allow him to efficiently work as a leader or a member of a team, not only in field parties but in interdisciplinary teams as well;
- 5 Must be capable of aspiring to achieve the highest standards of his/her profession, both technically and ethically;
- 6 Must be able to communicate efficiently with others, laymen and professionals, by graphical, and oral and written means (in English and in Spanish);
- 7 Should show a thirst for knowledge which will help him/her to pursue further studies

and/or, at all times keep abreast of contemporary issues at both levels: technological and worldwide;

- 8 Should show a willingness to become involved in the solution of problems and issues, both technological and social;
- 9 Must be willing to engage in, and capable of attaining life-long learning experiences.

The very high cost of real estate on the Island and the highly sophisticated modern instrumentation in use today make this program mandatory in order to get better qualified professionals in surveying.

The 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 the laboratory sessions and the 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 OF STUDY

#### SURVEYING AND TOPOGRAPHY CURRICULUM

##### FIRST YEAR

###### First Semester

Number	Credits	Course
*MATH 3005	5	Pre-Calculus
CHEM 3001	4	General Chemistry
*ENGL 3---	3	First year course in English
*SPAN 3101	3	Basic course in Spanish
GEEG 3011	2	Engineering Graphics I
PHED ----	$\frac{1}{18}$	Elective in Physical Education

###### Second Semester

MATH 3031	4	Calculus I
CHEM 3002	4	General Chemistry
*ENGL 3---	3	First year course in English
*SPAN 3102	3	Basic course in Spanish
GEEG 3012	2	Engineering Graphics II
PHED ----	$\frac{1}{17}$	Elective in Physical Education

**SECOND YEAR**

## First Semester

MATH 3032	4	Calculus II
ENGL 3---	3	Second year course in English
PHCS 3171	4	Physics I
PHCS 3173	1	Physics Laboratory I
ECON 3021	3	Principles of Economics I
GEEG 3031	<u>3</u>	Engineering Mechanics-Static
	18	

## Second Semester

MATH 3063	3	Calculus III
ENGL 3---	3	Second year course in English
PHCS 3172	4	Physics II
PHCS 3174	1	Physics Laboratory II
GEEG 3032	3	Engineering Mechanics-Dynamics
GEEG 3025	3	Introduction to Computers
CIEG 4001	<u>3</u>	Surveying I
	20	

**THIRD YEAR**

## First Semester

MATH 4009	3	Ordinary Differential Equations
ASTR 4005	3	Astronomy I
CIEG 4135	3	Elements of Optics in Surveying and Photogrammetry
GEOL 4017	3	Elementary Geomorphology
CIEG 4002	3	Surveying II
INEG 4007	<u>3</u>	Industrial Organization and Management
	18	

## Second Semester

CIEG 4078	2	Topographic Drawing
CIEG 4081	3	Photogrammetry I
CIEG 4051	3	Geodesy I
CIEG 4007	3	Highway Location and Curve Design
ELECTIVE	3	Sociohumanistic Elective
ELECTIVE	<u>3</u>	Free Elective
	17	

**SUMMER**

CIEG 4018	4	Topographic Practice
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**FOURTH YEAR**

## First Semester

CIEG 4071	3	Adjustment Computation I
CIEG 4085	3	Theory of Map Projections
CIEG 4061	3	Legal Aspects I
CIEG 4087	3	Special Surveys
ELECTIVE	3	Free Elective
ELECTIVE	<u>3</u>	Sociohumanistic Elective
	18	

## Second Semester

CIEG 4086	3	Introduction to Physical Geodesy
CIEG 4059	3	Geodetic Astronomy
ELECTIVES	6	Free Electives
ELECTIVES	<u>6</u>	Technical Electives
	18	

**Total credits required for this program: 148**

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

**DEPARTMENTAL FACULTY**

**FELIPE ACOSTA COSTA**, *Instructor*, Ph.D., 1999, Georgia Institute of Technology.

**ERNESTO ARROYO MORA**, *Instructor*, 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.

**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.

**JOSE L. FLORES MALAVE**, *Assistant Professor*, M.S.C.E., 1994, Purdue University.

**LUIS A. GODOY**, *Professor*, Ph.D., 1979, University of London.

**ANTONIO A. GONZALEZ QUEVEDO**, *Professor*, Ph.D., 1991, Purdue University.

**SERGIO 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**, *Assistant 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 VILLAFAYE**, *Professor*, D.E., 1981, Rensselaer Polytechnic Institute.

**JOSE A. MARTINEZ CRUZADO**, *Associate Professor*, Ph.D., 1993, University of California.

**INGRID Y. PADILLA CESTERO**, *Assistant Professor*, Ph.D., 1998, University of Arizona.

**ISMAEL PAGAN TRINIDAD**, *Associate Professor*, M.S.C.E., 1977, University of Puerto Rico.

**RICARDO RAMOS CABEZA**, *Assistant Professor*, Ph.D., 1999, Rensselaer Polytechnic Institute.

**JORGE RIVERA SANTOS**, *Associate Professor*, Ph.D., 1988, University of Colorado.

**ROQUE A. ROMAN SEDA**, *Professor*, Ph.D., 1981, Vanderbilt University.

**ALI SAFFAR**, *Associate 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.

**NING HSI TANG**, *Professor*, Ph.D., 1969, Vanderbilt University.

**DIDIER M. VALDES DIAZ**, *Assistant Professor*, Ph.D., 1999, Texas at Austin.

**LINDA VELEZ**, *Associate 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

**CIEG 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.

**CIEG 4001. SURVEYING I.** Three credit hours. One hour of lecture and two two-hour periods of laboratory of computation per week. Prerequisites: GEEG 3012 and (MATH 3032 or MATH 3184).

Measurement of distances, angles and elevation, the transit and the level; measurement and computation of traverses; stadia surveying.

**CIEG 4002. SURVEYING II.** Three credit hours. One hour of lecture and two two-hour periods of laboratory or computation per week. Prerequisite: CIEG 4001. Corequisite: GEEG 3016.

Random errors, basic triangulation, meridian determination, coordinate systems, topography.

**CIEG 4005. AGRICULTURAL SURVEYING.** Three credit hours. Two hours of lecture and one-three hour laboratory per week. Prerequisites: GEEG 3011 and (MATH 3172 or MATH 3174 or MATH 3005 or MATH 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.

**CIEG 4006. SURVEYING PRACTICE.** Two credit hours. One session of fifteen working days of field work. Prerequisite: CIEG 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.

CIEG 4007. HIGHWAY LOCATION AND CURVE DESIGN. Three credit hours. Two hours of lecture and three hours of computation per week. Prerequisite: CIEG 4002.

Highway location surveys; study and design of simple and compound circular, parabolic, and transition curves; earthwork; special project.

CIEG 4008. INTRODUCTION TO ENVIRONMENTAL ENGINEERING. Three credit hours. Two hours of lecture and three hours of computation per week. Prerequisites: (GEEG 4015 or CHEG 4010) and (CHEM 3002 or CHEM 3042).

Water and wastewater treatment, water quality measurement and wastewater pollution effects on receiving waters; solid waste management and air pollution control.

CIEG 4011. STRUCTURAL STEEL DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 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.

CIEG 4012. REINFORCED CONCRETE DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 4021 and CIEG 4035.

Basic methods of stress analysis and design of reinforced concrete elements subjected to bending, shear, combined bending and axial loads.

CIEG 4013. STRUCTURAL DESIGN. Three credit hours. Two hours of lecture and one hour computation per week. Prerequisites: CIEG 4012 and CIEG 4022.

Types of buildings, bridges, floor and roof systems. Design for torsion. Structural design problems. Complete design of a simple structure by the students.

CIEG 4018. TOPOGRAPHIC PRACTICE. Four credit hours. Six weeks during the Summer. Prerequisite: CIEG 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.

CIEG 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.

CIEG 4021. STRUCTURAL ANALYSIS I. Three credit hours. Three hours of lecture per week. Prerequisites: GEEG 4012 and CIEG 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.

CIEG 4022. STRUCTURAL ANALYSIS II. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 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.

CIEG 4026. HIGHWAY ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisites: CIEG 4137 and CIEG 4007.

Classification, planning and administration of highway systems. Geometric design; traffic engineering; subgrade structure; flexible and rigid pavement design.

CIEG 4028. GEOMETRIC DESIGN OF HIGHWAYS. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 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.

CIEG 4032. SOIL MECHANICS II. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 4139.

The theory of consolidation; settlements and contact pressure; stress analysis; stability of slopes; soil compaction and stabilization.

CIEG 4035. CIVIL ENGINEERING MATERIALS. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: GEEG 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.

CIEG 4049. FOUNDATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 4139.

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.

CIEG 4051. GEODESY I. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 4002.

Triangulations, spherical coordinates computation. Legendre's theorem, traverses, leveling, and orthometric and dynamic elevations.

CIEG 4052. GEODESY II. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 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.

CIEG 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.

CIEG 4056. CONSTRUCTION METHODS AND EQUIPMENT. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 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.

CIEG 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.

CIEG 4059. GEODETIC ASTRONOMY. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisites: CIEG 4051 and ASTR 4005.

Geodetic methods for determining latitude, longitude, and azimuth of second and third order.

CIEG 4061. LEGAL ASPECTS I. Three credit hours. Three hours of lecture per week. Co-requisite: CIEG 4001.

Laws of the Institute of Engineers and Surveyors of Puerto Rico and its Board of Examiners; Property Registry Law; regulations of the Planning Board and the Administration of Regulations and Permits.

CIEG 4062. LEGAL ASPECTS II. Three credit hours. Three hours of lecture per week. Co-requisite: CIEG 4002.

A study of those laws of Puerto Rico which rule land ownership, land transfer, and land use.

CIEG 4071. ADJUSTMENT COMPUTATION I. Three credit hours. Three hours of lecture per week. Prerequisites: CIEG 4051 and (MATH 3063 or MATH 3185).

Theory and analysis of random errors, normal distribution, adjustment of simple triangulation and leveling networks by condition and observation equations, least squares.

CIEG 4072. ADJUSTMENT COMPUTATION II. Three credit hours. One lecture and two two-hour periods of computation per week. Prerequisite: CIEG 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.

CIEG 4078. TOPOGRAPHIC DRAWING. Two credit hours. One hour of lecture and three-hour laboratory or computation per week. Prerequisite: CIEG 4002.

The plane table, drawing, interpretation and utilization of topographic maps; volume computation.

CIEG 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.

CIEG 4081. PHOTOGRAMMETRY I. Three credit hours. Three hours of lecture per week. Prerequisites: CIEG 4002 and CIEG 4135.

Geometry of aerial photographs, determination of distances and coordinates, elevations by radial displacement, stereoscopy, and parallax.

CIEG 4082. PHOTOGRAMMETRY II. Three credit hours. One hour of lecture and two two-hour periods of computation or laboratory per week. Prerequisite: CIEG 4081.

Flight planning and photographic control; theory of stereo plotters of the second and third order; introduction to analytical photogrammetry.

CIEG 4085. THEORY OF MAP PROJECTIONS. Three credit hours. Three hours of lecture per week. Prerequisites: CIEG 4051 and (MATH 3063 or MATH 3185).

Mathematical analysis of map projections, the Lambert conformal conic projection of Puerto Rico.

CIEG 4086. INTRODUCTION TO PHYSICAL GEODESY. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 4071.

The shape of the earth, the geoid, gravimetry, Stokes' theorem applied to the determination of the shape of the earth, isostatic equilibrium.

CIEG 4087. SPECIAL SURVEYS. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 4002.

Techniques and equipment used in topographic surveys, hydrography, mine surveys, optical leveling, electronic distance measurements.

CIEG 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.

CIEG 4095. MATHEMATICAL METHODS IN CIVIL ENGINEERING. Two credit hours. Two one-hour lectures per week. Prerequisite: GEEG 3016 and (MATH 3063 or MATH 3185).

Numerical methods applied to Civil Engineering with computer use.

CIEG 4125. INTRODUCTION TO LAND INFORMATION SYSTEMS. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisite: CIEG 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 data bases in a LIS. Emphasis in vector based systems. Observe the benefits of a land information system in Puerto Rico.

CIEG 4135. ELEMENTS OF OPTICS IN SURVEYING AND PHOTOGRAMMETRY.

Three credit hours. Three hours of lecture per week. Prerequisite: PHCS 3162 or PHCS 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.

CIEG 4136. APPLIED STATISTICS FOR CIVIL ENGINEERING. Two credit hours. Two hours of lecture per week. Prerequisite: MATH 3063 or MATH 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.

CIEG 4137. INTRODUCTION TO TRANSPORTATION ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 4136.

Basic concepts in transportation: demand, service and equilibrium; transportation planning process and economics; components, operation and design of transportation systems.

CIEG 4138. WATER RESOURCES ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: GEEG 4015 or CHEG 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.

CIEG 4139. INTRODUCTION TO GEOTECHNICAL ENGINEERING. Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisites: GEEG 4011 and (GEEG 4015 or CHEG 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.

CIEG 4145. WATERWORKS AND SEWERAGE DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 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.

CIEG 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.

CIEG 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.

CIEG 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory 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

**CIEG 5005. CONSTRUCTION COST ESTIMATES.** Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 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.

**CIEG 5006. APPLIED HYDRAULICS.** Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 4138.

Dimensional analysis and modeling; hydraulic machinery and structures; steady conduit and open channel flow; pipe network system.

**CIEG 5007. SOLID WASTE MANAGEMENT.** Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 4008.

The solid waste problem: volume reduction and storage of solid wastes, design and optimization of collection systems, recycling, integrated treatment and disposal systems.

**CIEG 5008. INTRODUCTION TO HYDROLOGY.** Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 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.

**CIEG 5009. FUNDAMENTALS OF AIR POLLUTION.** Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 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.

**CIEG 5012. APPLIED SANITARY ENGINEERING CHEMISTRY.** Four credit hours. Three hours of lecture and one three-hour laboratory per week. Prerequisite: CIEG 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.

**CIEG 5015. WATER TREATMENT AND POLLUTION CONTROL.** Three credit hours. Two lectures and one three-hour laboratory per week. Prerequisite: CIEG 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.

**CIEG 5017. PRESTRESSED CONCRETE STRUCTURES.** Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 4012. Co-requisite: CIEG 4022.

Prestressing systems and materials; stress losses, design of beams of flexure, bond, shear and bearing; specifications and economics of design.

**CIEG 5018. MATRIX ANALYSIS OF STRUCTURES I.** Three credit hours. Three hours of lecture per week. Prerequisites: CIEG 4022 and Consent of the Director of the Department.

Use of matrix methods in the analysis of structures; flexibility and stiffness methods.

**CIEG 5026. BRIDGE DESIGN.** Three credit hours. Three hours of lecture per week. Prerequisites: CIEG 4012 and CIEG 4022.

Bridge analysis and design; bridge types, characteristics; design problems.

CIEG 5027. MODEL ANALYSIS OF STRUCTURE. Three credit hours. Two hours of lecture and one three-hour laboratory per week. Prerequisite: CIEG 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.

CIEG 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.

CIEG 5047. INTRODUCTION TO ROCK MECHANICS. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 4139 or CIEG 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.

CIEG 5049. GEOSYNTHETICS IN CIVIL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 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.

CIEG 5055. DESIGN OF TIMBER STRUCTURES. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 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.

CIEG 5056. STRUCTURAL ANALYSIS III. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 4022.

Application of methods for analysis of statically indeterminate structures. Moment distribution. Slope deflection and energy theorems.

CIEG 5075. PLANNING AND SCHEDULING OF CONSTRUCTION PROJECTS. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 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.

CIEG 5146. INTRODUCTION TO TRAFFIC ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: CIEG 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.

CIEG 5995. SPECIAL TOPICS. One to three credit hours. One to three meetings per week. Prerequisite: Consent of the Director of the Department.

Topics to be presented mainly by visiting professors and members of the department who are specialists in the field to be covered. Description and number of credits to be submitted prior to the offering of the course. Selection and emphasis of the topics may be made to conform the interests and needs of the students.

CIEG 5996. 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 Civil Engineering or related fields. Open to outstanding students in the field of Civil Engineering.

## DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

### ELECTRICAL ENGINEERING PROGRAM

Electronic devices and systems, electrical machinery, power generation and transmission, applied electromagnetics, telecommunications and signal processing are some of the areas encompassed by the electrical engineering profession. Electronic devices developed in recent years have almost unlimited application to industrial and consumer uses: automation, computers, communication systems, radar, space vehicle components, missile tracking systems, solid-state devices, etc. Computer systems, networking, software development, and signal processing are some of the areas encompassed by the computer engineering profession. Computer systems dominate our daily lives in areas ranging from home automation, medical devices, electronic communications, financial systems, and entertainment.

The Department of Electrical and Computer Engineering offers undergraduate programs leading to the degrees of Bachelor of Science in the areas of Electrical and Computer Engineering. Several computing and research laboratories are available to be used in the undergraduate courses and research projects. More information on our programs may be found at: <http://www.ece.uprm.edu>.

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 that complete their formation.

- Expand the frontiers of knowledge within the electrical and computer engineering fields and related areas.

Provide the benefits obtained via the teaching and research activities to the service of the academic community and 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 electrical and computer engineers in the Puerto Rico and United States labor markets, and the only 5-year Bachelor's degree program (not dual or multi-institutional) in the ambit of the United States.

#### Research Facilities

The Electrical and Computer Engineering Department has a network consisting of Windows Nt, Linux and Solaris servers running on multiprocessor computers. Our user workstations are Nt, Linux, Solaris, and Windows 95/98. All of these resources are connected through a structured high-performance hierarchical star network, which we call CEENET, which in turn is connected to the Campus network, and ultimately to the Internet. The vast majority of our facilities are network-enabled and our workstations have complete access to the Internet.

The Department currently manages over \$14 Million in research. Among its faculty members there is a recipient Presidential Early Career Award for Scientists and Engineers (PECASE) which is the highest honor bestowed by the US government to faculty in the beginning of their careers and two recipients of the prestigious CAREER awards from the National Science Foundation (NSF). The Departments has two major research centers: the Tropical Center for Earth and Space Studies (TCESS), and the Center for Computing Research and Development (CECORD). Our Department is member of the Center for Power Electronic

Systems (CPES), a NSF Engineering Research Center located at the Virginia Polytechnic Institute. Also, the Department is a member of the outreach program of the NSF ERC Packaging Research Center at Georgia Institute of Technology.

Among the research laboratory facilities available for graduate level work are:

- Atmospheric Phenomena Laboratory
- Electric Energy Processing Systems Laboratory
- Human Computer Interaction Laboratory
- Ionospheric Radar Laboratory
- Laboratory for Applied Remote Sensing and Image Processing
- Microwave and Antenna's Laboratory
- Optoelectronic Systems Research Laboratory
- Power Electronics Laboratory
- Space Information Laboratory
- Process Control Laboratory

Electrical engineers also utilize electronic devices in instrumentation for research in virtually all areas of the physical and life sciences. Electrical engineers have designed and developed island wide networks of transmission lines, public and private power plants, lighting devices and systems, and electrical machinery of all types.

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
*MATH 3005	5	Pre-Calculus
CHEM 3001	4	General Chemistry
GEEG 3011	2	Engineering Graphics I
*SPAN 3101	3	Basic Course in Spanish
*ENGL 3---	3	First year course in English
PHED ----	<u>1</u>	Course in Physical Education
	18	

##### Second Semester

MATH 3031	4	Calculus I
CHEM 3002	4	General Chemistry
*SPAN 3102	3	Basic Course in Spanish
*ENGL 3---	3	First year course in English
PHED ----	<u>1</u>	Course in Physical Education
	15	

#### SECOND YEAR

##### First Semester

MATH 3032	4	Calculus II
PHCS 3171	4	Physics I
PHCS 3173	1	Physics Laboratory
	3	INGE 3016 Algorithms and Computer Programming
ENGL 3---	3	Second year course in English
GEEG 3035	<u>3</u>	Engineering Mechanics
	18	

##### Second Semester

MATH 3063	3	Calculus III
PHCS 3172	4	Physics II
PHCS 3174	1	Physics Laboratory II
GEEG 3045	3	Materials Science for Electrical Eng.
ELEG 3105	3	Electrical Systems Analysis I
ENGL 3---	<u>3</u>	Second year course in English
	17	

#### THIRD YEAR

##### First Semester

MATH 4009	3	Ordinary Differential Equations
ELEG 4102	3	Electrical Systems Analysis II
ELEG 4201	3	Electronics I
ELEG 4205	3	Logic Circuits
ELEG 4151	3	Electromagnetic I
ELEG 4115	<u>1</u>	Electrical Measurements
	16	Laboratory

##### Second Semester

MATH 4061	3	Numerical Analysis I
ELEG 4103	3	Electrical Systems Analysis III
ELEG 4202	3	Electronics II
ELEG 4211	1	Electronics Laboratory I
ELEG 4152	3	Electromagnetic II
ELEG 4206	<u>3</u>	Microprocessors
	16	

#### FOURTH YEAR

##### First Semester

INEG 4010	3	Probability and Statistics for Engineers
ELEG 4405	3	Electric Machines
ELEG 4301	3	Communications Theory I
ELEG 4505	3	Introduction to Control Systems
ELEG 4212	1	Electronics Laboratory II
ELECTIVE	<u>3</u>	Elective
	16	

## Second Semester

MEEG 4045	3	General Thermodynamics for Engineers
ECON 3021	3	Principles of Economics I
ELEG 4406	1	Electric Machines Laboratory
ELEG ----	6	**Electrical Engineering Electives
ELECTIVE	<u>3</u>	***Sociohumanistic Elective
	16	

**FIFTH YEAR**

## First Semester

INEG 4015	3	Engineering Economic Analysis
ELEG ----	6	**Electrical Engineering Electives
ELECTIVES	6	***Sociohumanistic Electives
ELECTIVES	<u>3</u>	Elective
	18	

## Second Semester

ELEG ----	6	**Electrical Engineering Electives
ELECTIVES	6	***Sociohumanistic Electives
ELECTIVES	<u>6</u>	Electives
	18	

**Total credits required for this program: 168**

- \* 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 Digital Signal Processing, and (e) Applied Electromagnetics. Course selection will be made by the student with the advisor's approval and must satisfy the following requirements:
1. At least twelve (12) credit hours must be selected from one area of emphasis. These must include a three credit hours design course.

2. A total design content of ten (10) credit hours. A minimum of seven (7) credits must be in the area of emphasis.

\*\*\* 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.

**COMPUTER ENGINEERING PROGRAM**

Computers have become an integral part of our society and are now used in all facets of society including scientific research, industry, business, commerce, and even in the home with calculators and computer-controlled appliances. With this increasing use comes an increasing demand for people who understand the design, construction, operation, and application of computers.

The Computer Engineering program encompasses all aspects of design, theory and practice relating 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; introduction to information processing systems, including the practical and theoretical aspects of hardware and software; and specialized study in selected areas of computer engineering. This 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
*MATH 3005	5	Pre-Calculus
CHEM 3001	4	General Chemistry
*ENGL 3---	3	First year course in English
*SPAN 3101	3	Basic Course in Spanish
GEEG 3011	2	Engineering Graphics I
PHED ----	<u>1</u>	Physical Education Elective
	18	

## Second Semester

MATH 3031	4	Calculus I
CHEM 3002	4	General Chemistry
*ENGL 3---	3	First year course in English
*SPAN 3102	3	Basic Course in Spanish
ECON 3021	3	Principles of Economics I
PHED ----	<u>1</u>	Physical Education Elective
	18	

**SECOND YEAR**

## First Semester

MATH 3032	4	Calculus II
PHCS 3171	4	Physics I
PHCS 3173	1	Physics Laboratory I
GEEG 3016	3	Algorithms and Computer Programming
GEEG 3035	3	Engineering Mechanics
ENGL 3---	<u>3</u>	Second year course in English
	18	

## Second Semester

MATH 3063	3	Calculus III
PHCS 3172	4	Physics II
PHCS 3174	1	Physics Laboratory II
GEEG 4001	3	Engineering Materials
ENGL 3---	3	Second year course in English
ELEG 3105	<u>3</u>	Electrical System Analysis I
	17	

**THIRD YEAR**

## First Semester

COEG 4015	3	ADVANCED PROGRAMMING
ELEG 4102	3	ELECTRICAL SYSTEMS ANALYSIS II
ELEG 4115	1	ELECTRICAL MEASUREMENTS LABORATORY
ELEG 4201	3	ELECTRONICS I
ELEG 4205	3	LOGIC CIRCUITS
MATH 4009	<u>3</u>	Ordinary Differential Equations
	16	

## Second Semester

COEG 4035	3	DATA STRUCTURES
ELEG 4206	3	MICRO-PROCESSORS

ELEG 4207	3	DIGITAL ELECTRONICS
ELEG 4211	1	ELECTRONICS LABORATORY I
INEG 4011	3	Probability Theory for Engineers
MEEG 4045	<u>3</u>	General Thermodynamics for Engineers
	16	

**FOURTH YEAR**

## First Semester

COEG 4036	3	PROGRAMMING LANGUAGES FOR ENGINEERS
ELEG 4217	3	MICRO-PROCESSOR INTERFACING
ELEG 4225	1	DIGITAL ELECTRONICS LABORATORY
ELEG 4301	3	COMMUNICATIONS THEORY I
MATH 4061	3	Numerical Analysis I
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	16	

## Second Semester

COEG 5007	4	OPERATING SYSTEMS PROGRAMMING
ELEG 4215	3	COMPUTER ARCHITECTURE AND ORGANIZATION
ELEG 4307	3	COMMUNICATION BETWEEN COMPUTERS
ELECTIVE	3	**Sociohumanistic Elective
ELECTIVE	<u>3</u>	Elective
	16	

**FIFTH YEAR**

## First Semester

INEG 4015	3	Engineering Economic Analysis
COEG 4009	3	SOFTWARE ENGINEERING
COEG/ELEG	3	TECHNICAL ELECTIVE
ELECTIVE	6	**sociohumanistic Electives
ELECTIVE	3	Elective
	18	

## Second Semester

COEG/ELEG	6	TECHNICAL ELECTIVES
ELECTIVE	3	**SocioHumanistic Elective
ELECTIVES	6	Electives
	15	

**Courses in option 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**, *Assistant 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**, *Instructor*, M.S.E.E., 1996, Ohio State University.

**JOSE COLOM USTARIZ**, *Assistant Professor*, Ph.D., 1998, Pennsylvania State University.

**JORGE A. CRUZ EMERIC**, *Professor*, U.P.R., Ph.D., 1976, University of Florida.

**SANDRA CRUZ POL**, *Assistant Professor*, Ph.D., 1998, Pennsylvania State University.

**JOSE L. CRUZ RIVERA**, *Associate Professor*, Ph.D., 1996, Georgia Institute of Technology.

**BRAULIO DUEÑO LEARY**, *Emeritus Professor*, Ph.D., 1955, Cornell University.

**JAVIER R. ECHAUZ ORTIZ**, *Associate Professor*, Ph.D., 1995, Georgia Institute of Technology.

**RAFAEL FERNANDEZ SEIN**, *Professor*, M.E.E., 1968, Cornell University.

**SHAWN HUNT**, *Associate 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**, *Assistant Professor*, Ph.D., 1999, Michigan State University.

**LUIS O. JIMENEZ RODRIGUEZ**, *Associate Professor*, Ph.D., 1996, 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.

**THOMAS L. NOACK**, *Professor*, Ph.D., 1963, Iowa State University.

**EFRAIN O'NEIL CARRILLO**, *Assistant 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.

**MANUEL PEREZ QUIÑONES**, *Associate Professor*, D.Sc., 1996, The George Washington University.

**JOSE A. RIVERA CARTAGENA**, *Associate Professor*, Ph.D., 1992, The City University of New York.

**DOMINGO A. RODRIGUEZ**, *Professor*, Ph.D., 1988, City University of New York.

**NESTOR J. RODRIGUEZ RIVERA**, *Professor*, Ph.D., 1988, University of Wisconsin.

**RAFAEL RODRIGUEZ SOLIS**, *Assistant Professor*, Ph.D., 1997, Pennsylvania State University.

**JULIO A. SANTIAGO PEREZ**, *Professor*, M.S.E.E., 1970, Rensselaer Polytechnic Institute.

**NAYDA G. SANTIAGO SANTIAGO**, *Instructor*, M.E., 1990, Cornell University.

**MANUEL TOLEDO**, *Assistant Professor*, Ph.D., 1995, Boston University.

**RAUL TORRES MUNIZ**, *Assistant Professor*, Ph.D., 1998, University of Virginia.

**RAMON E. VASQUEZ ESPINOSA**, *Professor*, Ph.D., 1984, Louisiana State University.

**BIENVENIDO VELEZ**, *Assistant Professor*, Ph.D., 1999, Massachusetts Institute of Technology.

**MIGUEL VELEZ REYES**, *Associate Professor*, Ph.D., 1992, Massachusetts Institute of Technology.

**KRISHNASWAMY VENKATESAN**, *Professor*, Ph.D., 1974, University of Roorkee.

## COURSES OF INSTRUCTION

### ELECTRICAL ENGINEERING

**ELEG 3105. ELECTRICAL SYSTEMS ANALYSIS I.** Three credit hours. Three hours of lecture per week. Prerequisite: MATH 3032 or MATH 3184. Co-requisites: (PHCS 3172 or PHCS 3162) and (MATH 3063 or MATH 3185).

Analysis of direct current and alternating current linear electric circuits; laws and concepts that characterize their behavior.

**ELEG 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.

**ELEG 4075. FUNDAMENTALS OF ELECTRICAL ENGINEERING.** Three credit hours. Three hours of lecture per week. Prerequisites: (MATH 3063 or MATH 3185) and (PHCS 3172, PHCS 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.

**ELEG 4076. FUNDAMENTALS OF ELECTRONICS.** Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4075. (Not for electrical or computer engineering students.)

Fundamentals and applications of analog and digital electronics.

**ELEG 4077. BASIC ELECTRONICS LABORATORY.** One credit hour. One three-hour laboratory per week. Co-requisite: ELEG 4076. (Not for electrical or computer engineering students.)

Description and use of basic equipment for electrical measurements in digital and analog circuits.

**ELEG 4085. FUNDAMENTALS OF TRANSFORMERS AND ELECTRIC MACHINERY.** Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4075. Not for electrical or computer engineering students.

Electromechanical energy converters such as transformers; induction, synchronous and direct current machines; distribution systems where these converters are used.

**ELEG 4086. TRANSFORMERS AND ELECTRIC MACHINERY LABORATORY.** One credit hour. One three-hour laboratory per week. Co-requisite: ELEG 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.

ELEG 4102. ELECTRICAL SYSTEMS ANALYSIS II. Three credit hours. Three hours of lecture per week. Prerequisites: ELEG 4211 and (PHCS 3172 or PHCS 3162) and GEEG 3016. Co-requisite: ELEG 4115 and MATH 4009.

Network functions; circuit analysis by Laplace transforms and Fourier series; two-port networks; Butterworth and Chebyshev filters; computer-aided analysis of these systems.

ELEG 4103. ELECTRICAL SYSTEMS ANALYSIS III. Three credit hours. Three hours of lecture per week. Prerequisites: MATH 4009, ELEG 4102 and ELEG 4151.

Analysis of magnetic circuits and polyphase balanced systems; transformers; power transmission lines; computer-aided analysis of their systems.

ELEG 4115. ELECTRICAL MEASUREMENTS LABORATORY. One credit hour. One two-hour laboratory per week. Co-requisite: ELEG 4201 and ELEG 3105.

Experiments with electronic components and equipment; measurement techniques.

ELEG 4146. IONOSPHERIC RADIO WAVES PROPAGATION. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 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.

ELEG 4151. ELECTROMAGNETICS I. Three credit hours. Three hours of lecture per week. Prerequisites: (MATH 3063 or MATH 3185) and (PHCS 3172 or PHCS 3162). Co-requisite: MATH 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.

ELEG 4152. ELECTROMAGNETICS II. Three credit hours. Three hours of lecture per week. Prerequisites: MATH 4009 and ELEG 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.

ELEG 4201. ELECTRONICS I. Three credit hours. Three hours of lecture per week. Prerequisites: ELEG 3105 and (PHCS 3172 or PHCS 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.

ELEG 4202. ELECTRONICS II. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4201 and ELEG 4102.

Analysis and design of multi-stage amplifiers, wave generation and power circuits; operational amplifier characteristics and applications.

ELEG 4205. LOGIC CIRCUITS. Three credit hours. Three hours of lecture per week. Prerequisite: GEEG 3016. Co-requisite: ELEG 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.

ELEG 4206. MICROPROCESSORS. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4205 and ELEG 4201.

Architecture, organization and operation of microprocessors and their supporting devices; design of microprocessor-based systems.

ELEG 4207. DIGITAL ELECTRONICS. Three credit hours. Three hours of lecture per week. Prerequisites: ELEG 4201 and ELEG 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.

ELEG 4211. ELECTRONICS LABORATORY I. One credit hour. One three-hour laboratory per week. Prerequisites: ELEG 4115 and ELEG 4205. Co-requisite: ELEG 4201.

Experiments with basic amplifiers and digital circuits. Design and testing of simple electronic circuits.

ELEG 4212. ELECTRONICS LABORATORY II. One credit hour. One three-hour laboratory per week. Prerequisites: ELEG 4211. Co-requisite: ELEG 4202.

Experiments and projects with electronic circuits emphasizing their design.

ELEG 4215. COMPUTER ARCHITECTURE AND ORGANIZATION. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 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.

ELEG 4217. MICROPROCESSOR INTERFACING. Three credit hours. Three hours of lecture per week. Prerequisites: ELEG 4206 and ELEG 4207.

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.

ELEG 4225. DIGITAL ELECTRONICS LABORATORY. One credit hour. One three-hour laboratory per week. Prerequisites: ELEG 4211. Co-requisite: ELEG 4207.

Experiments with digital electronic circuits and analog gates.

ELEG 4301. COMMUNICATIONS THEORY I. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 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.

ELEG 4305. TELECOMMUNICATIONS ELECTRONICS I. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisites: ELEG 4201. Corequisite: ELEG 4202.

Impedance matching circuits; radio frequency amplifiers; filters; oscillators; mixer circuits.

ELEG 4307. COMMUNICATION BETWEEN COMPUTERS. Three credit hours. Three hours of lecture per week. Prerequisites: ELEG 4301, ELEG 4206 and (INEG 4010 or INEG 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.

ELEG 4405. ELECTRIC MACHINES. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4103.

Electromechanical energy conversion; induction, synchronous and direct current machines.

ELEG 4406. ELECTRIC MACHINES LABORATORY. One credit hour. One three-hour laboratory per week. Prerequisites: ELEG 4115 and ELEG 4103. Co-requisite: ELEG 4405.

Magnetic circuits; single phase transformers; three phase systems: load and transformers; single-phase and three-phase induction motors.

ELEG 4407. ELECTRICAL SYSTEMS DESIGN I. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4103.

Design of electrical systems for buildings; wiring systems, illumination, protection and grounding.

ELEG 4408. ELECTRICAL SYSTEMS DESIGN II. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4103.

Design of electrical systems for buildings: exterior illumination, signal systems, and emergency/standby power equipment.

ELEG 4415. POWER SYSTEM ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4103.

Formulation of bus admittance and bus impedance matrices, symmetrical components, symmetrical and unsymmetrical faults, load flow, economic operation of power system.

ELEG 4416. POWER ELECTRONICS. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4202.

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.

ELEG 4505. INTRODUCTION TO CONTROL SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 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.

ELEG 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.

ELEG 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory 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**

ELEG 5205. INSTRUMENTATION. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4206 and ELEG 4202.

Signals from transducers; signal conditioning, data conversion and transmission; effects of noise. Data storage and display; use of microprocessors in instrumentation.

ELEG 5206. DIGITAL SYSTEMS DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4207.

Design methods in combinational and sequential systems. Use of programmable logic devices in digital systems design. Analysis and design of system controllers.

ELEG 5305. ANTENNA THEORY AND DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4152 and ELEG 4301.

Radiation mechanism. Types of antennas; impedance; radiation patterns; arrays. Antenna measurements.

ELEG 5306. MICROWAVE ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4152.

Rectangular and circular waveguides; passive components; tubes, and solid-state devices used in microwave systems.

ELEG 5307. OPTICAL COMMUNICATIONS. Three credit hours. Three hours of lecture per week. Prerequisites: ELEG 4301 and ELEG 4152.

Optical communication principles; transmitter and receiver design; fiber optic channels.

ELEG 5309. DIGITAL SIGNAL PROCESSING. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4301.

Signal classification; Z-transform and discrete Fourier transform; matrix representation of digital filters and digital systems; digital filter design; discrete Fourier transform algorithms.

ELEG 5315. THEORY OF COMMUNICATIONS II. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4011 and ELEG 4301.

Information theory; coding theory; signal design; noise and probability of error.

ELEG 5325. COMMUNICATION SYSTEM DESIGN: CIRCUITS AND ANTENNAS. Three credit hours. One hour of lecture and two two-hour laboratories per week. Prerequisite: ELEG 5305 or ELEG 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.

ELEG 5326. COMMUNICATION SYSTEM DESIGN: SIGNAL PROCESSING. Three credit hours. One hour of lecture and two two-hour laboratories per week. Prerequisite: ELEG 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.

ELEG 5407. COMPUTER AIDED POWER SYSTEM DESIGN. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4415.

Design of power systems using digital computers; load flow, economic load dispatch, symmetrical and unsymmetrical faults. Selection of breakers.

ELEG 5408. ELECTRICAL MOTORS CONTROL. Three credit hours. Three hours of

lecture per week. Prerequisites: ELEG 4405, ELEG 4416 and ELEG 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.

ELEG 5505. LINEAR SYSTEM ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 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.

ELEG 5506. PROCESS INSTRUMENTATION AND CONTROL ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4206 and ELEG 4505.

Design of process instrumentation and control systems, based on analog and digital instruments and mini or microcomputers. Standards and practical considerations emphasized.

ELEG 5508. DIGITAL CONTROL SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisites: ELEG 4505.

Analysis and design of digital control systems; stability, controllability and observability of discrete systems. Practical considerations when implementing a digital control system.

ELEG 5516. AUTOMATION AND ROBOTICS. Three credit hours. Three hours of lecture per week. Prerequisite: ELEG 4206 or INEG 4057.

Analysis and design of automated pneumatic systems using programmable controllers. Programming of industrial robots.

ELEG 5995. SPECIAL PROBLEMS. One to six credit hours. One to three laboratory periods per week.

Investigations and special problems in electrical engineering or related fields, open to outstanding electrical engineering students.

## COMPUTER ENGINEERING

COEG 4009. SOFTWARE ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: COEG 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.

COEG 4015. ADVANCED PROGRAMMING. Three credit hours. Two hours of lecture and two hours of computation per week. Prerequisite: GEEG 3016.

Advanced programming techniques applied to the solution of engineering problems; extensive use of subprograms, logical and specifications statements. Principles of multiprogramming, multiprocessing, and real-time systems.

COEG 4017. COMPUTER-BASED INFORMATION SYSTEMS. Three credit hours. Three hours of lecture per week. Prerequisite: COEG 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.

COEG 4029. COMPILER CONSTRUCTION. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisite: COEG 4036.

Techniques involved in the analysis of source languages and the generation of efficient object codes with emphasis on the components of a compiler.

COEG 4035. DATA STRUCTURES. Three credit hours. Two hours of lecture and three hours of laboratory per week. Prerequisite: COEG 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.

COEG 4036. STRUCTURE AND PROPERTIES OF PROGRAMMING LANGUAGES. Three credit hours. Three hours of lecture per week. Prerequisite: COEG 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.

COEG 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory 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

COEG 5007. OPERATING SYSTEMS PROGRAMMING. Four credit hours. Three hours of lecture and one-three hour laboratory per week. Prerequisites: COEG 4035 and ELEG 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.

COEG 5015. ARTIFICIAL INTELLIGENCE. Three credit hours. Three hours of lecture per week. Prerequisite: COEG 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 main purpose of the Industrial Engineering program at UPRM is to prepare professionals for the practice of Industrial Engineering in Puerto Rico and elsewhere. Graduates from the Industrial Engineering program at the Mayagüez Campus of the University of Puerto Rico are instrumental in the planning, designing, implementing and evaluating products, services, and systems that 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 in mathematics and the physical, social, physiological and computer sciences together with principles and methods of engineering analysis and design.

The Industrial Engineering program students with the skills to:

- apply the concepts and techniques relevant to the analysis and solution of challenges in the field of Industrial Engineering.
- possess and adequately utilize the fundamental knowledge in the technological and socio-humanistic aspects of the profession.
- maintain an attitude of service to society and to the ethical practice of the profession.
- maintain professional competency throughout their careers.
- be competent in the use of computers, information systems, and telecommunications relevant to the profession.
- work as part of a team in the solution of engineering challenges.
- communicate adequately to present the results of professional work.
- become leaders within the field.

Graduates from this program are equipped to work in manufacturing, service and governmental organizations. Examples of present and potential employers of our 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
*MATH 3005	5	Pre-Calculus
CHEM 3001	4	General Chemistry
*ENGL 3---	3	First year course in English
*SPAN 3101	3	Basic Course in Spanish
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	18	

###### Second Semester

MATH 3031	4	Calculus I
CHEM 3002	4	General Chemistry
*ENGL 3---	3	First year course in English
*SPAN 3102	3	Basic Course in Spanish
PHED ----	1	Physical Education Elective
GEEG 3011	<u>2</u>	Engineering Graphics I
	17	

##### SECOND YEAR

## First Semester

MATH 3032	4	Calculus II
PHCS 3171	4	Physics I
PHCS 3173	1	Physics Laboratory I
ENGL 3---	3	Second year course in English
GEEG 3031	3	Engineering Mechanics-Static
GEEG 3016	3	Algorithms and Computer
	18	Programming

## Second Semester

MATH 3063	3	Calculus III
PHCS 3172	4	Physics II
PHCS 3174	1	Physics Laboratory II
ENGL 3---	3	Second year course in English
GEEG 3032	3	Engineering Mechanics-Dynamics
GEEG 4011	3	Mechanics of Materials I
PHED ----	1	Physical Education Elective
	18	

**THIRD YEAR**

## First Semester

INEG 4010	3	Probability and Statistics for Engineers
MATH 4009	3	Ordinary Differential Equations
MEEG 4045	3	General Thermodynamics for Engineers
GEEG 4001	3	Engineering Materials
ELEG 4075	3	Fundamentals of Electrical Engineering
ELECTIVE	3	**Sociohumanistic Elective
	18	

## Second Semester

MEEG 4055	3	Manufacturing Processes
MEEG 4056	1	Manufacturing Processes Laboratory
ELEG 4076	3	Fundamentals of Electronics
ELEG 4077	1	Basic Electronics Laboratory
INEG 4020	3	Applied Statistics in Industry
ECON 3021	3	Principles of Economics I
ELECTIVE	3	**Sociohumanistic Elective
	17	

**FOURTH YEAR**

## First Semester

INEG 4057	3	Real Time Process Control
INEG 4015	3	Engineering Economic Analysis
INEG 4021	3	Deterministic Models in Operations Research
INEG 4078	3	Statistical Quality Control
INEG 4077	4	Work Systems Design
	16	

## Second Semester

INEG 4085	3	Accounting for Engineers
INEG 4039	3	Production Planning and Control I
INEG 4009	4	Work Measurement
INEG 4022	3	Probabilistic Models in Operations Research
ELECTIVE	3	**Sociohumanistic Elective
	16	

**FIFTH YEAR**

## First Semester

INEG 4086	3	Cost Analysis and Control
INEG 4040	3	Facility Layout and Design
INEG 4075	3	Production Planning and Control II
ELECTIVE	3	Industrial Engineering Elective
ELECTIVES	6	Free Electives
	18	

## Second Semester

INEG 4079	3	Design Project
INEG 4035	3	Human Resources Planning or
INEG 4029	3	Human Behavior in Work Organizations
ELECTIVE	3	Industrial Engineering Elective
ELECTIVE	3	**Sociohumanistic Elective
ELECTIVES	6	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**, *Assistant Professor*, Ph. D., 1998, University of Wisconsin, Madison.

**JOSE R. DELIZ ALVAREZ**, *Professor*, Ph.D., 1971, New York University.

**MERBIL GONZALEZ MARTINEZ**, *Professor*, Ph.D., 1984, Rensselaer Polytechnic Institute.

**WILLIAM HERNANDEZ RIVERA**, *Assistant Professor*, Ph.D., 1996, Texas A&M University.

**MARIA DE LOS A. IRIZARRY SERRANO**, *Assistant Professor*, Ph.D., 1996, North Carolina State University.

**OMELL PAGAN PARES**, *Assistant Professor*, Doctor in Engineering, 1995, Universidad Politécnica de Madrid.

**NAZARIO RAMIREZ BELTRAN**, *Professor*, Ph.D., 1988, 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.

**JOSE LUIS ZAYAS CASTRO**, *Professor*, Ph.D., 1983, Rensselaer Polytechnic Institute.

## COURSES OF INSTRUCTION

### INDUSTRIAL ENGINEERING

**INEG 4007. INDUSTRIAL ORGANIZATION AND MANAGEMENT.** Three credit hours. Three hours of lecture per week. Prerequisites: (MATH 3063 or MATH 3185) and ECON 3021.

Principles of design and control; decision models in engineering and industrial systems.

**INEG 4009. WORK MEASUREMENT.** Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisites: INEG 4077 and (INEG 4012 or INEG 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.

**INEG 4010. PROBABILITY AND STATISTICS FOR ENGINEERS.** Three credit hours. Three hours of lecture per week. Prerequisites: (MATH 3032 or MATH 3184) and GEEG 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.

**INEG 4015. ENGINEERING ECONOMIC ANALYSIS.** Three credit hours. Three hours of lecture per week. Prerequisites: INEG 4010 or INEG 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.

**INEG 4016. INDUSTRIAL SAFETY.** Three credit hours. Three hours of lecture per week. Prerequisite: INEG 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.

**INEG 4017. COMPUTER-BASED INFORMATION SYSTEMS.** Three credit hours. Three hours of lecture per week. Prerequisites: INEG 4077 and GEEG 3016.

Analysis and design of computer-based management information systems; database logical models; database physical models and programming data language; communications and networking; user interface; Internet; common applications.

**INEG 4018. SYSTEMS SIMULATION WITH DIGITAL COMPUTERS.** Three credit hours. Three hours of lecture per week. Prerequisite: INEG 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.

INEG 4020. APPLIED INDUSTRIAL STATISTICS. Three credit hours. Three hours of lecture per week. Prerequisites: (INEG 4010 or INEG 4011) and (MATH 3063 or MATH 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.

INEG 4021. DETERMINISTIC MODELS IN OPERATIONS RESEARCH. Three credit hours. Three hours of lecture per week. Prerequisite: INEG 4010 or INEG 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.

INEG 4022. PROBABILISTIC MODELS IN OPERATIONS RESEARCH. Three credit hours. Three hours of lecture per week. Prerequisite: (INEG 4012 or INEG 4020).

Simulation techniques; queuing theory; application to industrial systems problems.

INEG 4027. DESIGN AND ANALYSIS OF ENGINEERING EXPERIMENTS. Three credit hours. Three hours of lecture per week. Prerequisite: INEG 4012 or INEG 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.

INEG 4029. HUMAN BEHAVIOR IN WORK ORGANIZATIONS. Three credit hours. Three

hours of lecture per week. Prerequisite: INEG 4077.

Cognitive theories and behavioral principles which attempt to explain, predict, and control individual and group behavior in work organizations.

INEG 4035. HUMAN RESOURCES PLANNING. Three credit hours. Three hours of lecture per week. Prerequisite: INEG 4077.

Selection, training, utilization and control of human resources.

INEG 4039. PRODUCTION PLANNING AND CONTROL I. Three credit hours. Three hours of lecture per week. Prerequisites: INEG 4021 and (INEG 4012 or INEG 4020). Co-requisite: INEG 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.

INEG 4040. FACILITY LAYOUT AND DESIGN. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisites: INEG 4039 and INEG 4009. Co-requisite: INEG 4015.

Planning facility layout and materials handling systems. Analytical and computerized solution of problems in the design of physical facilities.

INEG 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.

INEG 4057. REAL TIME PROCESS CONTROL. Three credit hours. Two hours of

lecture and one two-hour laboratory per week. Prerequisites: GEEG 3016 and ELEG 4076. Co-requisites: MEEG 4055 and (ELEG 4077 or MEEG 4031).

Use of computer-based controllers to control processes using digital and analog signals.

INEG 4075. PRODUCTION PLANNING AND CONTROL II. Three credit hours. Three hours of lecture per week. Prerequisite: INEG 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.

INEG 4077. WORK SYSTEMS DESIGN. Four credit hours. Three hours of lecture and one two-hour laboratory per week. Prerequisite: INEG 4010 or INEG 4011. Co-requisite: MEEG 4055.

Strategies and models used in work systems design: motion studies, design of methods, human factors, environmental conditions and implementation of design.

INEG 4078. STATISTICAL QUALITY CONTROL. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisites: INEG 4010 or INEG 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.

INEG 4079. DESIGN PROJECT. Three credit hours. Two hours of independent study and one one-hour laboratory per week. Prerequisites: INEG 4075, INEG 4015, INEG 4022 and INEG 4040.

Development and presentation of a system design project.

INEG 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.

INEG 4086. COST ANALYSIS AND CONTROL. Three credit hours. Three hours of lecture per week. Prerequisite: INEG 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.

INEG 4805. INTERDISCIPLINARY EXPERIENCE IN MANUFACTURING. Three credit hours. Three hours of lecture per week. Prerequisite: INEG 4009.

Design and implementation of a manufacturing project with the participation of a multidisciplinary group of students and professors. The project will require the definition of a need or market, development of mockups, construction of a functional model, and the development of a business plan for the product. Development of written and oral communication skills and teamwork.

INEG 4810. CONCURRENT ENGINEERING. Three credit hours. Three hours of lecture per week. Prerequisite: INEG 4077 or ELEG 4206 or MEEG 4011 or CHEG 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

INEG 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: INEG 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.

INEG 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.

INEG 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to twenty-four hours of laboratory 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**

INEG 5505. TOTAL QUALITY MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: INEG 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.

INEG 5559. ENGINEERING STATISTICS. Three credit hours. Three hours of lecture per week. Prerequisites: MATH 3032 and GEEG 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.

INEG 5565. MEASUREMENT AND PREDICTION OF PRODUCT RELIABILITY. Three credit hours. Three hours of lecture per week. Prerequisite: INEG 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.

INEG 5575. SEQUENCING AND SCHEDULING OF RESOURCES. Three credit hours. Three hours of lecture and/or discussion per week. Co-requisite: INEG 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**

Mechanical Engineering is characterized by the application of mathematics, science and technology to the analysis, design and realization of products and processes. From (A)irplanes-to-(Z)ippers, all physical problem is a mechanical engineering problem. A major area concerning mechanical engineering is the conversion of energy for use in the manufacturing of goods, providing of services, and the control and protection of the environment. The University of Puerto Rico's mechanical engineering program prepares graduates to work professionally in both thermal and mechanical systems areas. The program focuses on the design, analysis and control of mechanical, electromechanical, thermal, and hydraulic systems; the analysis and control of related natural phenomena; and the management of industrial activities. The graduate program enhances the undergraduate program by exposing student to research and the development of new scientific discoveries and inventions to the benefit of mankind.

This program is fully accredited by ABET, the Accreditation Board for Engineering and Technology.

**PROGRAM OF STUDY****MECHANICAL ENGINEERING CURRICULUM****FIRST YEAR**

## First Semester

Number	Credits	Course
*SPAN 3101	3	Basic Course in Spanish
*ENGL 3---	3	First year course in English
GEEG 3011	2	Engineering Graphics I
CHEM 3001	4	General Chemistry
*MATH 3005	5	Pre-Calculus
PHED ----	<u>1</u>	Physical Education Elective
	18	

## Second Semester

*SPAN 3102	3	Basic Course in Spanish
*ENGL 3---	3	First year course in English
CHEM 3002	4	General Chemistry
MATH 3031	4	Calculus I
PHED----	1	Physical Education Elective
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	18	

**SECOND YEAR**

## First Semester

MATH 3032	4	Calculus II
ENGL 3---	3	Second year course in English
GEEG 3031	3	Engineering Mechanics-Static
GEEG 3016	3	Algorithms and Computer Programming
PHCS 3171	4	Physics I
PHCS 3173	<u>1</u>	Physics Laboratory I
	18	

## Second Semester

ENGL 3---	3	Second year course in English
MATH 3063	3	Calculus III
GEEG 3032	3	Engineering Mechanics-Dynamics
GEEG 3017	2	Computer Aided Graphics
PHCS 3172	4	Physics II
PHCS 3174	<u>1</u>	Physics Laboratory II
	18	

**THIRD YEAR**

## First Semester

MEEG 4001	3	Thermodynamics I
MATH 4009	3	Ordinary Differential Equations
GEEG 4011	3	Mechanics of Materials I
MATH 4061	3	Numerical Analysis I
ECON 3021	3	Principles of Economics I
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	18	

## Second Semester

MEEG 4005	3	Mechanism Design
MEEG 4002	3	Thermodynamics II
GEEG 4012	3	Mechanics of Materials II
GEEG 4001	3	Engineering Materials
GEEG 4015	3	Fluid Mechanics
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	18	

**FOURTH YEAR**

## First Semester

GEEG 4016	1	Fluid Mechanics Laboratory
ELEG 4075	3	Principles of Electrical Engineering
MEEG 4011	3	Analysis of Machine Elements I
MEEG 4015	3	Heat Transfer
MEEG 4007	3	Metallurgy for Engineers
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	16	

## Second Semester

MEEG 4003	3	Thermodynamics III
ELEG 4076	3	Fundamentals of Electronics
INEG 4007	3	Industrial Organization and Management
MEEG 4012	3	Analysis of Machine Elements I
MEEG 4055	3	Manufacturing Processes
ELECTIVE	<u>3</u>	**Sociohumanistic Elective
	18	

**FIFTH YEAR**

## First Semester

MEEG 4031	1	Mechanical Engineering Lab. I
MEEG 4009	3	Automatic Controls
MEEG 4057	4	Engineering Design
ELEG 4085	3	Fundamentals of Transformers and Electric Machinery
ELEG 4086	1	Transformers and Electric Machinery Lab.
ELECTIVES	<u>6</u>	Free Electives
	18	

## Second Semester

MEEG 4032	1	Mechanical Engineering Lab. II
MEEG ----	3	Mechanical Engineering Elective
MEEG ----	3	Design Elective
MEEG 4058	3	Computer Aided Design
MEEG 4056	1	Manufacturing Processes Lab.
ELECTIVES	6	Free Electives
	17	

**PAUL A. SUNDARAM**, *Professor*, Ph.D., 1988, Ohio State University.

**MIGUEL A. TORRES FEBUS**, *Associate Professor*, Ph.D., 1993, Massachusetts Institute of Technology.

**NELLORE VENKATARAMAN**, *Professor*, Ph.D., 1970, Purdue University.

**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.

**SANDRA COUTIN**, *Assistant Professor*, Ph.D., 1996, Kansas State

**HAMID DAVOODI**, *Professor*, Ph.D., 1988, Worcester Polytechnic Institute.

**DAVID B. DOONER**, *Associate Professor*, Ph.D., 1991, The University of Florida.

**JORGE E. GONZALEZ CRUZ**, *Associate Professor*, Ph.D., 1994, Georgia Institute of Technology.

**FREDERICK A. JUST AGOSTO**, *Assistant Professor*, Ph.D., 1997, Virginia Polytechnic Institute.

**ARSHAD Y. KHAN**, *Professor*, Ph.D., 1988, Kansas State University.

**NESTOR L. PEREZ BARRIOS**, *Associate Professor*, Ph.D., 1988, University of Idaho.

**FERNANDO E. PLA BARBY**, *Professor*, Ph.D., 1978, University of Texas.

**LOURDES M. ROSARIO**, *Professor*, Ph.D., 1988, University of Rhode Island.

**ALI SABZEVARI**, *Professor*, Ph.D., 1967, Case Institute of Technology.

**DAVID SERRANO**, *Professor*, Sc.D., 1987, Massachusetts Institute of Technology.

## COURSES OF INSTRUCTION

### MECHANICAL ENGINEERING

**MEEG 3810. PRODUCT DISSECTION.** Two credit hours. One hour of lecture and two hours of workshop per week. Prerequisite: GEEG 3011.

Product dissection uses hand-on dissection exercises to develop in students the ability to understand a machine in not only its functionality but also in terms of its history, social impact, the design methodology, the market constraints, and the customer needs. Use of proper technical vocabulary to describe mechanical and electrical components. Learn oral, written, and drafting communication skills.

**MEEG 4001. THERMODYNAMICS I.** Three credit hours. Three hours of lecture per week. Prerequisites: CHEM 3002 and PHCS 3174 and PHCS 3172.

A study of the first and second laws of thermodynamics; properties, equations of state, and thermodynamic relations.

**MEEG 4002. THERMODYNAMICS II.** Three credit hours. Three hours of lecture per week. Prerequisite: MEEG 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.

**MEEG 4003. DESIGN OF THERMAL AND FLUID SYSTEMS.** Three credit hours. Three hours of lecture per week. Prerequisites: MEEG 4001 and MEEG 4015.

Analysis and design of piping, ventilation, and heat exchanger systems. Study of pump and

compressor characteristics and operation. Simulation and optimization of these systems.

MEEG 4005. MECHANISM DESIGN. Three credit hours. Three hours of lecture per week. Prerequisites: GEEG 3032 and GEEG 3017.

Fundamental concepts in the design of mechanisms including synthesis and kinematic and kinetic analysis. Mechanisms to be studied include linkages, cams, gears, gear trains, and flexible connectors.

MEEG 4006. DYNAMICS OF MACHINERY. Three credit hours. Two hours of lecture and one two-hour computation or demonstration period per week. Prerequisites: MATH 4009 and MEEG 4005.

A study of static and inertia forces in machinery; free and forced vibration isolation; balancing of rotors; critical speed of shafts.

MEEG 4007. METALLURGY FOR ENGINEERS. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisites: MEEG 4001 and GEEG 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.

MEEG 4008. AERODYNAMICS. Three credit hours. Three hours of lecture per week. Prerequisites: MATH 4009, MEEG 4001 and GEEG 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.

MEEG 4009. AUTOMATIC CONTROLS. Three credit hours. Two hours of lecture and one two-hour laboratory per week. Prerequisites: MATH 4009, GEEG 3032, ELEG 4075 and either ELEG 3105 or ELEG 4005.

Use, 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.

MEEG 4011. DESIGN OF MACHINE ELEMENTS I. Three credit hours. Three hours of lecture per week. Prerequisites: GEEG 4012 and GEEG 4001.

Application of the fundamentals of statics dynamics, strength of material, and materials science to the design of machine members and other mechanical elements.

MEEG 4012. DESIGN OF MACHINE ELEMENTS II. Three credit hours. Three hours of lecture per week. Prerequisite: MEEG 4011.

Analysis and design of specific machine components including screws, nuts, springs, gears, bearings, shafts, brakes, clutches, and couplings.

MEEG 4015. HEAT TRANSFER. Three credit hours. Three hours of lecture per week. Prerequisites: GEEG 4015, MATH 4009, GEEG 3016 and MEEG 4001 or MEEG 4045.

Fundamentals of steady and unsteady conduction, forced and natural convection and radiation. Introduction to heat exchangers.

MEEG 4018. ENERGY CONVERSION. Three credit hours. Three hours of lecture per week. Prerequisites: MEEG 4015, ELEG 4076 and MEEG 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.

MEEG 4019. ENERGY AUDITING AND MANAGEMENT. Three credit hours. Three hours of lecture per week. Prerequisite: MEEG 4001 or CHEG 4011.

Fundamental concepts of energy engineering; principles and methods related to the use, conservation, auditing and management of energy sources.

MEEG 4027. POWER PLANT ENGINEERING. Three credit hours. Two hours of lecture and three of computation per

week. Prerequisites: MEEG 4002 and MEEG 4015.

The application of fundamental concepts of thermal sciences and economics to the analysis of power generating stations; emphasis on steam and gas systems.

MEEG 4028. FLUID MACHINERY. Three credit hours. Two hours of lecture and one two-hour computation period per week. Prerequisites: GEEG 4015 and MEEG 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.

MEEG 4029. NUCLEAR POWER REACTOR. Three credit hours. Three lectures per week. Prerequisites: PHCS 3172, MEEG 4002, MEEG 4015.

A study of nuclear power reactor types; radiation hazards and shielding; waste disposal, heat transfer and cooling systems; problems of design, construction and materials used; economics of nuclear power.

MEEG 4031. MECHANICAL ENGINEERING LABORATORY I. One credit hour. One three-hour laboratory per week. Prerequisites: MEEG 4015, ELEG 4076 and MEEG 4002.

Principles and application of the data acquisition planning. Instrumentation technique; analysis and reduction of data and technical report writing.

MEEG 4032. MECHANICAL ENGINEERING LABORATORY II. One credit hour. One three-hour laboratory per week. Prerequisite: MEEG 4031.

Continuation of MEEG 4031. Experiments and projects in Mechanical Engineering and related fields.

MEEG 4035. REFRIGERATION AND AIR CONDITIONING. Three credit hours. Three hours of lecture per week. Prerequisites: MEEG 4015 and MEEG 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.

MEEG 4037. INTERNAL COMBUSTION ENGINES. Three credit hours. Three hours of lecture per week. Prerequisite: MEEG 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.

MEEG 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.

MEEG 4045. GENERAL THERMODYNAMICS FOR ENGINEERS. Three credit hours. Three hours of lecture per week. Prerequisites: CHEM 3002 and either PHCS 3172 or PHCS 3162 or PHCS 3012.

Fundamental laws and principles of thermodynamics and their application in engineering. Thermodynamic and energetic concepts, properties of pure substances, heat transfer, heat engines.

MEEG 4055. MANUFACTURING PROCESSES. Three credit hours. Three hours of lecture per week. Prerequisite: GEEG 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.

MEEG 4056. MANUFACTURING PROCESSES LABORATORY. One credit hour. One three-hour laboratory per week. Co-requisite: MEEG 4055.

Demonstrations and operation of machine-tools in modern manufacturing.

MEEG 4057. ENGINEERING DESIGN. Four credit hours. Two hours of lecture and two three-hour periods of computation per week. Prerequisites: MEEG 4002, MEEG 4007, MEEG 4012, and MEEG 4015.

Formulation, design and analysis of engineering projects; creative aspects of design; design methodology, safety, liability and patents. Technical presentations, both oral and written.

MEEG 4058. COMPUTER AIDED ENGINEERING DESIGN. Three credit hours. Two hours of lecture and two hours of computation per week. Prerequisites: MEEG 4012 and GEEG 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.

MEEG 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.

MEEG 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.

MEEG 4998. UNDERGRADUATE RESEARCH. One to six credit hours. Three to

twenty-four hours of laboratory 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

MEEG 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.

MEEG 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.

MEEG 5007. SOLAR ENERGY APPLICATIONS. Three credit hours. Three hours of lecture per week. Prerequisite: MEEG 4015 or CHEG 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.



MEEG 5008. CORROSION. Three credit hours. Three hours of lecture per week. Prerequisite: MEEG 4007.

Electrochemical principles and corrosion mechanisms; protection and prevention of corrosion in metals; the effects of temperature, environment, and metallurgical factors.

MEEG 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.

MEEG 5018. MATERIALS FAILURE ANALYSIS. Three credit hours. Three hours of lecture per week. Prerequisites: MEEG 4012 and MEEG 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.

MEEG 5025. METALS FATIGUE. Three credit hours. Three hours of lecture per week. Prerequisite: MEEG 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.

MEEG 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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