

POLYTECHNIC UNIVERSITY OF PUERTO RICO ORLANDO CAMPUS

UNDERGRADUATE & GRADUATE CATALOG

Vol. 20



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POLYTECHNIC UNIVERSITY OF PUERTO RICO

BOARD OF TRUSTEES

Francisco J. Martínez Ubarri, Eng., **Chairman**
 Ricardo Lefranc Morales, Arch., **Vice Chairman**
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 Rafael E. Mullet, JD, **Treasurer**
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 Luis E. González Cognet, MD, **Trustee**
 Ricardo Jaén Presno, MD, **Trustee**
 Angel González Castro, Eng., **Trustee**
 Ernesto R. Vázquez Martínez, BSIE, MBA, **Ex Officio**

POLYTECHNIC UNIVERSITY OF PUERTO RICO

ADMINISTRATIVE OFFICIALS

President

Ernesto R. Vázquez Martínez, BSIE, MBA

Executive Vice President for Finance and Administration

Ernesto R. Vázquez Martínez, BSIE, MBA

Vice President of Operations and Strategic Planning

Sylvia Rivera Schatz, PhD

Vice President for Innovation in Academic Affairs

Carlos J. González Miranda, BSIE, MSIE, PhD, PE

Vice President for Innovation, Retention, Persistence and Student Success

María Véaz, BA, MEd, Ed.D

Vice President for Innovation in Student Services

Agustín III González Castelló, BBA, MBA, JD

Director for Federal and State Grant Funds Administration Office

Pablo J. Salom Portela, BBA, MBA

Dean of Students

Karla M. Torres Zayas, BSW, MEd

Florida Campuses Director

Adriano Parisi, PhD

University Registrar/ Director Student Exchange Program

Mayra I. López, BA, MA

Administrator, Financial Aid Office

Sergio Villoldo, BBA, MBA

Director, Admissions and Promotions Office

Teresa Cardona, BBA

Director, Virtual Education and Innovative Learning Center

Ana M. Lucumi Orostegui, BBA, MA, Ed.D

Director, Human Resources Office

Ana E. Castellano, BBA, MBA

Director, Information Technology Office

Pedro Pérez Dorta, MIS

Director, Library

Digna Delgado López, BS; MLS

Legal Counselor

Pedro A. Barceló, BA, JD

Outcomes and Student Learning Assessment Office

Blanca Tallaj Almánzar, BSCE, MSIE

José A. Martínez, BSCE, MSCE, PE

María M. García Sandoval, BSUE, MEMSE, PhD

Administrative Affairs Coordinator

To be determined

Academic Assistant

Olga López, AS

Financial Aid Officer

Ileana Díaz, BBA, MALR

Registrar Office Coordinator

Silquia Vélez, BS, MBA

Finance Officer

Yazmin Paleo, MBA

Recruitment and Admissions Officer

Nixalis Gotay, BA, MBA

Auxiliary Librarian I

To be determined

POLYTECHNIC UNIVERSITY OF PUERTO RICO

POLYTECHNIC UNIVERSITY OF PUERTO RICO – ORLANDO

Mailing Address

550 N Econlockhatchee Trail
Orlando, Florida 32825

Physical Address

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Internet Home Page: www.pupr.edu/orlando

Phone: (407) 677-7000

Fax: (407) 677-5082

POLYTECHNIC UNIVERSITY OF PUERTO RICO – SAN JUAN

Mailing Address

P.O. Box 192017
San Juan, PR 00919-2017

Physical Address

377 Ponce de León Avenue
San Juan, PR 00918

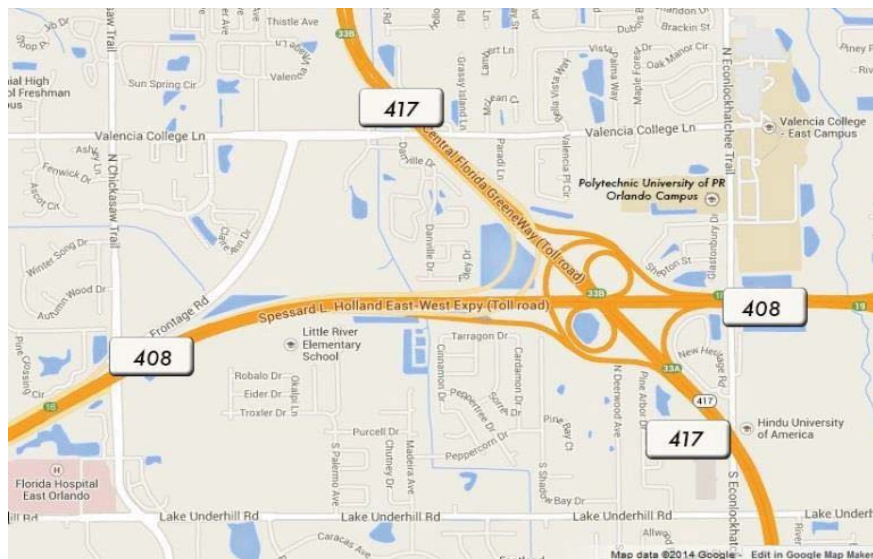
Internet Home Page: <http://www.pupr.edu>

University Switchboard

(787) 754-8000 / (787) 622-8000

LOCATION MAP

POLYTECHNIC UNIVERSITY OF PUERTO RICO – ORLANDO



Directions to Orlando Campus

From downtown Orlando: Take Highway 408 East

1. Take FL-408 E
2. Take exit 17 toward S Chickasaw Trail
3. Turn left onto S Chickasaw Trail
4. Take the 1st right onto Frontage Rd
5. Take the 1st right onto Valencia College Ln
6. Turn right onto N. Econlockhatchee Trail
7. Destination will be on the right

Facilities

Orlando Campus Undergraduate & Graduate Catalog 2025-2026



The Orlando Campus is located on a sixteen-acre property in the Northeast area of Orlando, Florida. The campus consists of a two-story Main Building (M), which houses administrative and faculty offices, classrooms, computer labs, Chemistry Lab, Student Learning Center I and II, student lounge, Tutoring Center, and bathrooms; a three-story Building B which houses engineering and computer labs, Student Success Center, administrative lounge, and bathrooms; an indoor basketball court and outdoor athletic field, gazebo, recreational areas for students, and parking lot.

Academic Calendars

Term Dates 2024-2025

202610 (former OF 25)	August 4, 2025	October 25, 2025
202620 (former OW 25)	November 10, 2025	February 14, 2026
202630 (former OS 26)	March 2, 2026	May 23, 2026
202640 (former OU 26)	June 1, 2026	July 10, 2026

The academic calendars are subject to change for all academic terms.

ACTIVITIES ON THE ACADEMIC CALENDAR

Admissions Deadline

Third Saturday prior to the beginning of the term.

New and Transfer Students Orientation

One week prior to the beginning of the term.

Registration Period

New and Transfer Students – Monday before the beginning of classes.

Regular Students – One week prior to the beginning of classes.

Beginning of the Term (Monday or Tuesday)

Classes begin on Monday or Tuesday after the week of registration. Three credit-hour courses meet twice a week (2 hours per session) for the twelve-week period, equivalent to three-semester credit-hour.

Deadline for Late Registration and Course Changes

Friday of the first week of each term.

Deadline for Completing Pending Projects and to Remove Incomplete Grades:

Tenth (10) week after the end of the preceding term are allowed for this purpose (tenth week of the current term).

Deadline for the First Partial Examination

The fourth week of each term (first third of the term).

Deadline for the Second Partial Examination:

The eighth week of each term (second third of the term).

Deadline for Partial or Total Withdrawal

Students may withdraw totally or partially at the end of classes of each term and receive a grade of "W."

Deadlines for Final Examinations

The last week of each term will be devoted to the total review of course content. Final examinations will comprise all material covered during given term.

Regular Registration Period

The registration period will be held during the recess period between terms. Active students will be notified in advance of their registration day.

FALL 2025 (202610)**AUGUST 5 – OCTOBER 26, 2024**

Registration Dates Begin	July 21 – August 3*
Late Registration with surcharges (late fee)	August 4 -10*
Classes Begin	August 4
Add and Drop Fee Begins	August 6
Total or Partial Withdrawal with a 100% Refund Deadline	August 17*
Faculty Reporting NR (no show students) to Registrar Office Deadline	August 21
First partial test Deadline	August 30
Deadline to pay off the debt contracted by deferred payment	September 4
Faculty Reporting Midterm grades	September 8 -13*
Period for students to evaluate Faculty thru Blackboard	September 22 – October 4
Deadline for Students turn in pending assignments from OS/OU 24 to the Faculty	October 2
Deadline for Faculty Remove Incomplete grades from OS 24/OU 24	October 16*
Partial or total withdrawal with grade “W” Deadline	October 18*
Classes End	October 18
Final examinations period	October 20-25
Faculty Reporting final grades	October 20 -29*
202620 Registration Period	October 30 – November 9*

HOLIDAYS

Labor Day	September 2
Columbus Day	October 14

CLASS RESCHEDULED

Labor Day	September 5
Columbus Day	October 17

Portal will be available until 11:59 p.m.*WINTER 2025 (202620)****NOVEMBER 10, 2024 – FEBRUARY 14, 2025**

Registration Dates Begin	October 30 -November 9*
Late Registration with surcharges (late fee)	November 10 -16*
Classes Begin	November 10
Add and Drop Fee Begins	November 13
Total or Partial Withdrawal with a 100% Refund Deadline	November 26*
Faculty Reporting NR (no show students) to Registrar Office Deadline	November 26
First partial test Deadline	December 6
Deadline to pay off the debt contracted by deferred payment	December 11
Deadline to apply for graduation candidates 2025	December 13
Faculty Reporting Midterm grades	December 15-21*
Christmas Academic Recess	December 22 – January 6
Resume Classes	January 7
Period for students to evaluate Faculty thru Blackboard	January 12 -24

Deadline for Students turn in pending assignments from 202510 to the Faculty	January 22
Deadline for Faculty Remove Incomplete grades from 202510	February 5*
Partial or total withdrawal with grade "W" Deadline	February 7*
Classes End	February 7
Final examinations period	February 9 -14
Faculty Reporting final grades	February 9 -18*
202630 Registration Period	February 19 -28*

HOLIDAYS

Veteran's Day	November 11
Thanksgiving Recess	November 28 -29
Martin Luther King Jr. Day	January 19
President's Day	February 16

CLASS RESCHEDULED

Thursday and Saturday Thanksgiving Recess	December 5
Friday Thanksgiving	December 6
Martin Luther King Jr. Day	January 23

***Portal will be available until 11:59 p.m.**

SPRING 2026 (202630)

MARCH 2 — MAY 23, 2026

Registration Dates Begin	February 19 – March 1*
Late Registration with surcharges (late fee)	March 2 - 8*
Classes Begin	March 2
Add and Drop Fee Begins	March 4
Total or Partial Withdrawal with a 100% Refund Deadline	March 15*
Faculty Reporting NR (no show students) to Registrar Office Deadline	March 19
First partial test Deadline	March 28
Deadline to pay off the debt contracted by deferred payment	April 2
Faculty Reporting Midterm grades	April 6-11*
Period for students to evaluate Faculty thru Blackboard	April 20 – May 2
Deadline for Students turn in pending assignments from 202520 to the Faculty	April 30
Deadline for Faculty Remove Incomplete grades from 202520	May 14*
Partial or total withdrawal with grade "W" Deadline	May 16*
Classes End	May 16
Final examinations period	May 18-23
Faculty Reporting final grades	May 18-27*
202640 Registration Period	May 28 – 31*

HOLIDAYS

Holy Week Break
Memorial Day

April 2 - 4
May 25

CLASS RESCHEDULED

Thursday and Saturday Holy Week Break
Good Friday

April 10
April 11

***Portal will be available until 11:59 p.m.**

SUMMER 2025 (202540)

JUNE 4 – JULY 18, 2025

Registration Dates Begin
Deadline for 2025 graduation candidates to complete their academic record at Registrar's Office
Late Registration with surcharges (late fee)

May 28 – 31*
May 29

Classes Begin

Total or Partial Withdrawal with a 100% Refund Deadline
Faculty Reporting NR (no show students) to Registrar Office Deadline
Deadline to pay off the debt contracted by deferred payment
Partial or total withdrawal with grade "W" Deadline

June 1 - 3*

June 1

June 6*

June 10

July 1

July 7*

Classes End

Final examinations period
Faculty Reporting final grades
202710 Registration Period

July 7

July 8 -10

July 8 -15*

July 16 – August 3*

HOLIDAYS

Juneteenth
Independence Day

June 19
July 4

***Portal will be available until 11:59 p.m.**

POLYTECHNIC UNIVERSITY OF PUERTO RICO

GENERAL INFORMATION

Polytechnic University of Puerto Rico (PUPR) is a private, non-profit, coeducational, nonsectarian institution of Higher Education founded in 1966. At present, it is the largest private Engineering School and the only one in San Juan, capital of Puerto Rico. It is also the large private Hispanic Serving Engineering School in the United States and its territories. PUPR offers licensed and accredited programs at the undergraduate and graduate levels.

MISSION, VISION AND GOALS

Polytechnic University of Puerto Rico fosters learning, scholarship, and service in the core area of liberal arts, and in the professional fields of architecture, business, education, land surveying and engineering.

Preamble

Polytechnic University of Puerto Rico is a private, non-profit university providing access to education through its main campus in San Juan, PR, and branch campuses in Miami and Orlando, FL. Also, PUPR works in partnership with the Instituto Tecnológico de Santo Domingo in the Dominican Republic.

Mission

The Polytechnic University of Puerto Rico provides opportunities to individuals from diverse backgrounds to cultivate their potential for leadership, productivity, and competitiveness with the aim of contributing to society.

PUPR achieves its mission by serving individuals from different academic, economic, geographical, and ethnic contexts through exposure to intellectual, scientific, humanistic, and technological advancement, and by applying innovative methods of delivery.

Vision

The Polytechnic University of Puerto Rico will be recognized as a regional reference, in the formation of professionals in the areas of engineering, architecture, business administration, and related fields, committed to providing tangible solutions to the social challenges of our time. The institution will strive toward becoming a key catalyzer of the symbiotic relationship between the United States and Latin America.

Values

- Excellence: We provide high-quality services to the university's community by incorporating the best practices of higher education into our processes.
- Integrity: We conduct ourselves with honesty, respect, and truthfulness in our thoughts, words, and actions within the institutional framework.
- Social Responsibility: We assume the commitment to pursue the development of a fair and equitable society and the duty to protect the environment.
- Innovation: We cultivate an attitude of continuous improvement in all our constituents to offer innovative solutions to the challenges faced by our society.
- Diversity: We embrace the inclusion of people of different cultures, genders, races, preferences, and opinions that add different perspectives to our community.
- Service: We promote a permanent attitude of collaboration and support towards every representative of the university environment.
- Sustainability: We adopt practices that simultaneously promote quality of life, the conservation of natural resources, and the prosperity of our operations.

Strategic Goals

The following goals guide Polytechnic University in meeting its mission:

1. Developing a learner-centered culture that fosters student success (**Academia**).
2. Encouraging Creativity, Innovation, Research, and an Entrepreneurial ecosystem (**Infrastructure**).
3. Advancing an institutional comprehensive internationalization agenda (**Globalization**).
4. Expanding our community, industry, and government relations (**Social Responsibility**).
5. Strengthening our financial position, sustainability, and stewardship (**Finance**).

Institutional Learning Goals

By the time of graduation, PUPR graduates are expected to attain the following eight competencies:

1. Effective Communication. Express ideas in oral, written, and graphic mode.
2. Scientific and Quantitative Reasoning. Apply scientific and mathematical reasoning to the solution of problems.
3. Critical Thinking. Interpret and question evidence, statements, and graphics, in order to draw justified, educated, reasonable and truthful conclusions.
4. Technological Competence. Use technology and tools to gather, process and analyze information required to solve problems in the field of study.
5. Information Literacy. Acknowledge, locate and evaluate the information needed to accomplish a specific purpose.
6. Lifelong Learning. Recognize the need to engage in lifelong learning.
7. Ethical and Social Responsibility. Be aware of ethical, professional and social responsibilities.
8. Teamwork. Contribute to achieve team goals.

POLYTECHNIC UNIVERSITY OF PUERTO RICO - ORLANDO CAMPUS

Statement of Legal Control

Polytechnic University of Puerto Rico Inc. is a foreign non-profit corporation registered with the Florida Department of State, Division of Corporations, doing business in Orlando, Florida as Polytechnic University of Puerto Rico-Orlando Campus.

The demand for increased higher education services to target Orlando and Miami audiences as well as responding to the State of Florida's big need for increased Baccalaureate degrees prompted university officials to study, analyze and plan for new curriculum and degree programs. Curriculum is designed with a meaningful career choice in mind, and graduates will be able to identify available career opportunities.

Goals

The following goals guide Polytechnic University- Orlando Campus:

- To provide access of higher education for degree and non-degree Floridian population to improve their academic and competitive formation as an enhancement of our community.
- To develop a social contribution by forming an ethical committed professional involved in the economic development of the state.
- To develop the professional characteristics of an individual to be able to apply critical thinking and scientific approach to complex problems.
- To provide the latest technology in the application of engineering and management problem solutions.
- To support the socio-economic development of the state by generating highly qualified professionals dedicated to improving their social responsibility.
- To provide adequate partnerships (Industry, Government, Businesses, and Professional Associations, High Education Institutions) for the student's practical experience development and support the strength of the professional tools for their future.
- To provide the global market skills to develop an international professional with a broader span of knowledge.

UNDERGRADUATE AND GRADUATE OFFERINGS

Traditional on-campus, in-residence, video- conference, hybrids and online courses are offered at the campus during the evening during traditional academic terms throughout the year. Many of the University's courses and programs provide knowledge that may support a student's efforts toward various licensures or certifications. However, these courses and curricula are not necessarily designed to meet various requirements among individual states guidelines. It is the responsibility of each student to check with regional authorities to confirm requirements in preparation for licensures and certifications.

Bachelor's Degrees

- Bachelor in Business Administration with major in Accounting
- Bachelor in Business Administration with major in Construction Management
- Bachelor in Business Administration with major in General Management
- Bachelor in Business Administration with major in Marketing
- [Bachelor of Science in Organizational Management](#)
- [Bachelor of Science in Construction Management](#)
- Bachelor of Science in Civil Engineering
- Bachelor of Science in Computer Engineering
- Bachelor of Science in Computer Science
- Bachelor of Science in Electrical Engineering
- Bachelor of Science in Environmental Engineering
- Bachelor of Science in Mechanical Engineering

Master's Degrees

- Master of Business Administration with an emphasis area in Accounting
- Master of Business Administration with an emphasis area in Computer Information Systems
- Master of Business Administration with an emphasis area in General Business
- Master of Business Administration with an emphasis area in Healthcare Management
- Master of Business Administration with an emphasis area in International Enterprises Management
- Master of Business Administration with an emphasis area in Project Management

- Master in Engineering Management with an emphasis area in Construction Management
- Master in Engineering Management with an emphasis area in Environmental Management
- Master in Engineering Management with an emphasis area in General Engineering Management
- Master in Engineering Management with an emphasis area in Manufacturing Management
- Master in Engineering Management with an emphasis area in Project Management

POLYTECHNIC UNIVERSITY OF PUERTO RICO - ORLANDO

LICENSURE**Commission for Independent Education, Florida Department of Education**

Licensed by the Commission for Independent Education, Florida Department of Education. Lic # 3085

Additional information regarding this institution may be obtained by contacting the Commission at 325 West Gaines Street, Suite 1414, Tallahassee, FL 32399-0400, toll-free telephone number (888) 224-6684.

ACCREDITATIONS**Middle States Commission on Higher Education (MSCHE)**

1007 North Orange Street

4th Floor, MB #166

Wilmington, DE 19801

E-mail: communications@msche.org

PUPR was reaccredited in 2024; the next accreditation will be in 2024-2032.

ABET

111 Market Place, Suite 1050

Baltimore, MD 21202-4012

Telephone: (410) 347-7700

Webpage: <http://www.abet.org>

The following Bachelor of Science programs at PUPR-Orlando are accredited by the Engineering Accreditation Commission of ABET <http://www.abet.org>:

- Civil Engineering
- Computer Engineering
- Computer Science
- Electrical Engineering
- Mechanical Engineering

The Computer Science program is accredited by the Computing Accreditation Commission of ABET, <http://www.abet.org>.

PROFESSIONAL AFFILIATIONS

- Florida Association of Postsecondary Schools and Colleges
- Hispanic Chamber of Commerce
- Hispanic Chamber of Commerce of Metro-Orlando
- International University Network (IUN)
- International Council on Systems Engineering (INCOSE)
- SHPE, the Society of Hispanic Professional Engineers
- Veterans Administration

OUTCOMES AND STUDENT LEARNING ASSESSMENT

The Office of Outcomes and Student Learning Assessment is in charge of the institutional learning assessment program. The objective of this program is to: a) “improve” the performance of all academic programs and administrative offices; b) “prove” by providing evidence that the expected outcomes have been achieved, and c) “inform” or disclose the gathered data to guide the decision-making process institution-wide.

The assessment to “improve” is a short-term cycle, and it is driven by the faculty members or key stakeholders. The development stage starts with the design and planning of courses, course components, and curricula or project/program. During this stage, several improvements should be incorporated while the program or project is implemented. This formative mode of assessment leads to improvements on a continuous basis.

In contrast to the assessment to “improve,” the assessment to “prove” is a long-term cycle. The development stage requires statistical data and final results from already implemented models. The analysis of the data will generate inferences and implications. This summative assessment will provide evidence of the project.

Following the assessment to “prove” the effectiveness of the program, it should identify important stakeholders. The data gathering and its analysis are used to guide the decision-making process, increasing the likelihood of dissemination of information and the institutionalization of the changes made as a result of the assessment of the outcomes.

The assessment of an academic program will be based on the accreditation criteria issued by the corresponding agencies and the institutional mission and academic objectives. The Office of Outcomes Assessment understands that assessment to “improve,” assessment to “prove” and the information disclosure are fundamental stages for the development of an effective outcomes assessment program. The teaching and learning outcomes assessment process impacts directly upon the mission, vision, and goals of the institution. It is an extremely relevant tool to confirm these are met.

GENERAL SERVICES AND FACILITIES

PHYSICAL FACILITIES

The main campus of Polytechnic University of Puerto Rico is located in the Metropolitan Area of San Juan at 377 Ponce de León venue, nearby the financial and economic center of Puerto Rico. The campus consists of nine acres and six buildings housing classrooms, laboratories, academic offices, library, administrative offices, student center, medical services, athletic and other recreational facilities, and parking building.

PUPR has branch campuses in the following cities:

Polytechnic University of Puerto Rico, Miami
8180 NW 36 St.; Suite 401
Miami Florida, USA 33166

Polytechnic University of Puerto Rico, Orlando
550 N. Econlockhatchee Trail
Orlando, Florida USA 32825

Instituto Tecnológico de Santo Domingo (INTEC) (Learning Site)
Ave. Los Próceres, Calle Gala
Postal 342-9 y 249-2, Santo Domingo

LIBRARY

The library of the Polytechnic University of Puerto Rico is an academic unit that offers a virtual space through the access to information resources and services and with the guidance and support of information professionals, the academic community can interact, develop skills, exchange ideas, discover new sources and create new knowledge resulting in an empowering lifelong learning experience. This statement is consonant with the university's mission, and all library services are directed towards achieving it.

The library collection is specialized to support the university's academic programs in Engineering, Land Surveying, Architecture, Landscape Architecture, Education, Management, and Entrepreneurship. The collection includes over 200,000 resources, including books, media, and serial volumes, which are cataloged and searchable through the online catalog. The library is subscribed to thousands of online resources, including full-text electronic books, periodicals, and videos. Remote access to online resources is available through the library's website and blog. All textbooks and core reference books listed in the syllabi are available within the library as a service to students and in compliance with PUPR's mission.

The Information Literacy Program is based on the standards established by the Association of Academic and Research Libraries of the American Library Association. Workshops and orientation are offered online to groups or individuals. The Program promotes the development of skills that position students to become lifelong learners. A professional librarian is the Program Coordinator and works with faculty and department directors to create activities, modules, and guides to integrate into the courses across the curriculum to develop information literacy skills. Information Literacy is one of the eight Institutional Learning Goals. The Orlando campus has an auxiliary librarian to assist students, faculty and visitors.

Professional librarians, as faculty members, are active in the educational process. Along with the library staff, they offer users specialized information assistance and services such as online library guides and modules, interlibrary loans, information literacy, and bibliographic search, among others. The library also has a blog updated with information about library events and services and recommended links to reliable sources.

STUDENT LEARNING CENTER FACILITIES

The Orlando Campus Student Learning Center (SLC) is well-equipped for student use. The administrative and technical procedures are operated by the Main Library in San Juan, assisted by an auxiliary librarian located at the Orlando Campus. The SLC maintains computer-based, basic collections that are strengthened and supported by the Main Library in San Juan, Puerto Rico, which consists of over 65,000 volumes classified according to the Library of Congress Classification System. The Main Library specializes in land

surveying, engineering, architecture and business administration. At the present time, the main library subscribes to over 2,000 periodicals and publications, both general and technical. The SLC is fully automated in services and administrative procedures. As part of its services, the SLC offers access to a Local Area CD Room Network, Internet, and other database services. Also, interlibrary loans through the main library campus are used for resources not owned by SLC. To help students develop information skills and become independent users/researchers, the SLC has a literacy skills program, as well as audiovisual equipment.

Student Online Integrated Services (SOIS)

Student Online Integrated Services Center (SOIS), under the Student Success Center, provides a central location (both physically on campus and virtually) for Orlando campus students to access needed online support services. Ten computer terminals equipped with cameras and headphones are available in the Center for students to connect to the online support services. One of the support services available is the Ticket Platform. The ticketing system is a platform that helps streamline online student support services. The Ticketing platform provides all the context the student needs to resolve enrollment, complaints, virtual education, Blackboard, online services, and other issues. Staff from the correspondent office assist them to complete their registration process and to receive the service they requested.

Another online service that the SOIS Center provides is the Handshake platform. [Handshake](#) is the largest early career network in the United States, helping millions of students from all backgrounds get hired and launch their careers with no connections, experience, or luck required. Various virtual events are available through the Handshake platform.

Also, a Mobile Application for the SOIS Center will be implemented soon. The Mobile App will streamline, centralize, and simplify how PUPR-O students access needed support services such as academic counseling services, financial aid, business office transactions, and even communicating with instructors.

VIRTUAL EDUCATION AND INNOVATIVE LEARNING CENTER (VEIL)

Virtual education is a modality in which the teaching and learning process takes place through the internet. Education is mediated by information and innovative communication technologies, known as ICTs. ICTs at PUPR include a diverse set of technological tools and resources used to transmit, store, create, share, and exchange information. These technological tools and resources include computers, the Internet (websites, blogs, and emails), live broadcasting technologies, and recorded broadcasting technologies (podcasting, audio and video players, and storage devices).

Virtual education is a substantial part of our institution. The Polytechnic University of Puerto Rico and its Center for Virtual Education and Innovative Learning (VEIL) embark on a continuous improvement process to provide faculty with learner-centered educational methodologies and state-of-the-art ICTs for instructional content design and classroom use in face-to-face, hybrid, or online modalities. These innovative technologies motivate and make learning more accessible, attractive, and engaging for students. Our end objective is to increase student academic achievement.

VEIL is responsible for managing, designing, and developing projects from all the academic institutional programs that use distance education as their teaching methodology, in Puerto Rico, Miami and Orlando campuses. In addition, the Center for Virtual Education and Innovative Learning focuses on giving support and training to faculty members who are designing, developing, and delivering technology-enhanced online, hybrid, web, and face-to-face courses and academic programs. Accordingly, VEIL seeks to empower and inspire faculty members to implement modern teaching-learning strategies, methodologies, and cutting-edge technologies to deliver engaging content to students on campus, regionally and internationally. Furthermore, the Institution provides ongoing orientation, training, and technical support services for students taking online/hybrid courses, and technology-enriched on-campus courses through its Virtual Education and Innovative Learning Center.

VEIL supports online academic programs through its human and technological resources. The Center is composed of a team specialized in Blackboard Use and Management, Instructional Systems Design, Graphic Design, Multimedia Integration, and Instructional Technology. The Center is a course development production site where instructional design principles are used and aligned with Quality Matters™ Standards. Therefore, courses meet the standards of excellence in distance education programs. The institution's Learning Management System (LMS) is Blackboard Learn. Blackboard Learn is an integral part of the teaching process,

enabling continuous access to instructional content. Thus, Blackboard facilitates learning experiences for our students and faculty, empowering them to involve themselves in a more active and hands-on teaching-learning process. This LMS allows faculty to create environments aligned with Learner-Centered Education strategies for online, hybrid, and on-campus courses. Also, the VEIL Center provides training to faculty members in using other technological tools to design and develop modern and innovative learning experiences with engaging content and hands-on practices that students must comply with in their respective fields. Blackboard Learn also allows the institution to create educational communities whose main objective is to share knowledge by taking advantage of all the technological tools the Center has acquired. Some of the LMS's tools are interaction mechanisms such as discussion forums, blogs, and wikis. Finally, the LMS allows the creation of exams, question banks, and tasks that contribute to students' skills and knowledge development.

VEIL provides support services to students, including training on using Blackboard to complete an online/hybrid course successfully. Before enrolling in an online/hybrid course, students must attend one of the Blackboard Students Workshops offered by Virtual Ed multiple times every academic term. Additional training and technical support are provided to students regarding academic integrity tools and other technical aspects associated with successfully participating in online/hybrid courses available through Blackboard. The institution continually improves software and hardware to support greater access and uptime, including portal and server reliability.

Academic Integrity in Distance Education

The Polytechnic University of Puerto Rico seeks to foster a spirit of honesty and integrity. Any work submitted by a student must represent an original work produced by that student. Consequently, to maintain the academic integrity in distance learning courses, the University has developed [a Policy and Procedure to Support the Academic Integrity of Online Courses](#). The Policy and Procedures seek to verify and ascertain the identity of a student enrolled in an online/hybrid course, as well as monitoring performance of students who take remote exams, as required by the Higher Education Opportunity Act of 2008.

Distance Learning Students

Every student who wants to register for online courses is required to possess basic technological knowledge of programs such as word processors, presentation creation, and e-mail management. Also, the student must have skills in searching for information from webpages with a navigator or browser.

It is also the student's responsibility to verify the [minimum systems requirements to access course information residing in Blackboard](#), read the [Policy to Support the Academic Integrity of Online Courses](#) and install the tools needed to verify and ascertain the identity of the student enrolled in the online/hybrid course ([Respondus™ Lockdown Browser](#), among others).

State Authorization for Online Programs and Courses

The State Authorization Reciprocity Agreement (SARA) is an agreement among member states, districts and territories that establishes comparable national standards for interstate offering of postsecondary distance education courses and programs. It is intended to make it easier for students to take online courses offered by postsecondary institutions based in another state. PUPR has been approved by Board of Postsecondary Institutions of Puerto Rico JIPs (in Spanish) to participate in the [National Council for State Authorization Reciprocity Agreements](#).

Complaint Process

It is the goal of PUPR to provide students with an expeditious, fair, equitable, and consistent procedure for resolving their academic grievances. The purpose of an academic grievance is to give students a fair review and an opportunity to be heard. Students are expected to follow the procedures established by the college or academic department in which they are pursuing a course of study; however, academic grievances regarding a course grade must be filed with college or academic department unit in which the course is offered.

Students residing in other states, while enrolled in a course offered by PUPR, are encouraged to utilize the [internal complaint](#) or Virtual Education Student Service Platform <https://studentservice.pupr.edu/> review [policies and procedures](#), typically initiated within the academic department, before filing a complaint with their state agency or agencies. See Institution's Home State SARA Portal Entity listed at <https://www.nc-sara.org/state-portal-entity-contacts>.

COMMUNICATIONS OFFICE

The Communications Office objectives are to coordinate, manage, develop, and provide service in various areas: communications, public relations, and advertising, website and graphic design, social media, and institutional events. It aims to strengthen the administrative, faculty, students, alumni, and academic community.

CAMPUS SECURITY

Polytechnic University of Puerto Rico - Orlando safety and security personnel strive to create and maintain a safe campus environment. Pacific coexistence among all the university components is essential for achieving a teaching/learning environment free from all forms of violence. Such an atmosphere will benefit students, faculty members, visitors, suppliers, and officials from various agencies who participate in our operations.

All students, faculty and visitors must assume primary responsibility for their personal safety and security of their belongings. Precautionary measures are the key. Please visit: <http://www.pupr.edu/orlando/services/security-office/> for more information about safety tips on campus.

University security personnel and campus security authorities are responsible for:

- Preventing incidents
- Investigating incidents
- Management of the identification card system of employees and students.
- Providing guidance to victims and witnesses.
- Gathering of security information data
- Submitting the incident statistical report.
- Guaranteeing absolute confidentiality in investigation processes.

Pursuant to Public Law 101 – 542 “Student Right to Know and Campus Security Act of 1990,” Polytechnic University of Puerto Rico- Orlando disclose crime statistics of incidents occurring within the university campus and in adjacent areas such as streets or avenues close to the institution. The Clery Act requires reporting felonies in seven major categories; these are the following:

1. Criminal Homicide
 - a. Murder and nonnegligent manslaughter
 - b. Negligent manslaughter
2. Sexual Offenses
 - a. Forced
 - b. Non forced
3. Robbery
4. Aggravated Assault
5. Burglary, where:
 - a. There is evidence of domicile violation (intrusion), which may be forced or not involving force.
 - b. Illegal entry must be of a structure - it has four walls, a roof, and a door.
 - c. There is evidence that the entry was made in order to commit a felony or robbery.
6. Motor Vehicles Theft
7. Arson

Schools are also required to report statistics for the following categories of detentions or referrals for a campus disciplinary action (if a detention was not made):

1. Violations Alcoholic Beverage Act
2. Violations Alcoholic Beverage Control Act
3. Illegal Possession of Weapons

Hate crimes should be reported by category of prejudice, including race, gender, religion, sexual orientation, ethnicity and disability. Statistics for four additional crime categories are also needed if the offense is classified as a hate crime:

1. Larceny-theft

2. Simple assault
3. Intimidation
4. Destruction/damage/vandalism of property

Crime Reporting Statistics

Consistent with legal requirements, members of PUPR – Orlando Community will be advised on a timely basis regarding the occurrence of crimes on campus. Orlando Campus Crime Reports are available at: <http://www.pupr.edu/orlando/services/security-office/>.

STUDENT INFORMATION AND SERVICES

VICE PRESIDENCY FOR ENROLLMENT MANAGEMENT AND STUDENT SERVICES

The Vice Presidency for Enrollment Management and Student Services, established in 2004, is the administrative unit in charge of the development of academic life.

Student Services

Polytechnic University offers students the opportunity to seek assistance in various aspects of the university, such as course registration, advisement, career information, and guidance in personal, vocational, and educational aspects that may hinder the students from attaining a college education. The services are aimed at assisting students in making appropriate educational, occupational, and personal choices.

Among other new activities undertaken by the Institution is providing or taking the lead in the following endeavors:

- Academic Advising and Counseling
- Reasonable Accommodation
- Occupational and Career Counseling
- Guidance
- New Students Registration and Enrollment Process
- Tutoring
- Mentoring
- Coaching
- Information Technology Support
- Other Services

GUIDANCE AND CAREER EDUCATION

The Academic Office offers students curriculum assistance, career information, and guidance in the personal, vocational, and academic aspects that may impede the student's attaining a college education. Counselors assist students individually in making appropriate educational, vocational, and personal choices. The office coordinates assisted institutional services for special needs students.

Course selection is critical to student success; therefore, students should make an appointment with either their Program Coordinator, Academic Director or Registrar Officer to confirm proper course selection prior to registration. Previously taken courses and the grades earned will be reviewed and analyzed for proper course placement at Polytechnic University - Orlando Campus.

Career education awareness is presented at workshops, seminars, colloquiums, and receptions with notables. Student publications may also feature stories on career opportunities.

INSTITUTIONAL DEVELOPMENT, EMPLOYMENT, AND INTERNSHIPS & ALUMNI - IDEA CENTER

The IDEA Center builds liaison collaboration in three areas:

Institutional Development

Its purpose is to establish and supervise the implementation of policies designed to maximize the ability to attract diverse funds to the Polytechnic University of Puerto Rico. Primarily, this area conducts meetings with donors and potential donors to create and foster collaborative and contributing relationships. Therefore, it formulates goals and presents strategies for fundraising campaigns and supports institutional initiatives aligned with these purposes. In addition, integrating the university's vice presidencies, schools, departments, and offices into the institutional development efforts becomes part of the projects that foster a culture of collaboration and commitment.

Employment and Internships

Based on the academic programs of Polytechnic University, this area performs activities and identifies cooperative education or co-op opportunities, internships, and jobs for students and graduates within private industry and government agencies. These actions and strategies allow recipients to contribute most effectively and competitively to our society. In addition, this office plans and coordinates events aimed at the professional development of current students and alums.

Current students participating in Co-Op Programs and internships find they can validate these experiences for academic credits through the Professional Practice course (COOP 3010).

Qualifying for our Services - COOP'S and Internships

- Fill out an Application Form
- Attend a group or individual orientation
- Prepare a resume in English prior to any referral for job interviews
- Sign the Program Agreement and Legal Consent to Disclose Information
- Be a third, fourth, or fifth-year student needing at a minimum of 20 credit-hours to graduate, or with at least 90 passed credit-hours
- Have a cumulative academic general grade point average of 2.50 / 4.0 or higher
- Be enthusiastic and responsible
- Participate in employer's interviews
- Present US citizenship or Visa documentation (If required)
- Is registered at the Professional Practice course (COOP3010) three (3) credit-hours/free elective course (If required)

Placement Program Requirements

The Placement Program purpose is to provide students with career-related experiences in business, industry, and government.

- Fill out an Application Form
- Prepare a resume in English prior to any referral for job interviews.
- Sign the Legal Consent to Disclose Information
- Participate in employer's interviews
- Present US citizenship or Visa documentation (If required)

COOP 3010 – PROFESSIONAL PRACTICE

Three credit hours. Prerequisite: 73 credits approved and IDEA Center Director's Approval.

Course with a cocurricular perspective. The student will receive training in soft skills development necessary for an efficient performance in the professional environment. In addition, the student will be exposed to a practical experience in cooperation with private industry or government to be jointly supervised by the academic department, Career & Internship Services Program, and an official or staff member from the industry.

Professional Practice

Course Descriptions

Course Code	Course Title	Type of Course	Prerequisites	Credit - Hours
COOP 3010, Section 39	Professional Practice	Blended (face to face & virtual modality)	a. Completion of at least the first 3 ^{1/2} years of study for engineering or architecture students, 2 years of study for Business Administration students. b. Minimum of 2.50/4.00 GPA	3
COOP 3010 (E), Section 39	Professional Practice Extension	Blended (face to face & virtual modality)	a. Completion of at least the first 3 ^{1/2} years of study for engineering or architecture students, 2 years of study for Business Administration students. b. Minimum of 2.50/4.00 GPA c. Continuing a previous project.	1

Assessment

- Essay based on an article with a focus on a professional environment.
- Technical Project
- Performance Evaluation

Grading

- A** Excellent (4 honor points per credit-hour)
- B** Good (3 honor points per credit-hour)
- C** Satisfactory (2 honor points per credit-hour)
- D** Deficient (1 honor point per credit-hour)
- F** Failure (0 honor point per credit-hour)
- WU** Student abandoned course without authorization (0 honor point per credit-hour)
- I** (with Grade) Incomplete with a grade (Points will be equivalent to the grade that accompanies the Incomplete)

INTERNSHIP AND MENTOR PROGRAMS

Students may be able to participate in local and national work-related experiences pertinent to their course of study. Career awareness and placement activities are incorporated into student life as a pre-step to applying for a summer internship. Internships are optional, but a preferred experience for students. No guarantee of placement shall be made or implied.

Students are eligible for mentor assistance as another form of a personal career guidance opportunity. Community leaders and business professionals collaborate with students on a one-on-one basis as needed, or present vital information at open forums on campus.

Alumni

Includes the following:

- *Fostering relationships between graduates* – Establishing connections between graduates and the academic community encourages collaboration to find innovative solutions to social issues and global challenges. This interaction and the creation of working groups facilitate the exchange of experiences, professional knowledge, contributions, and the development of projects between both parties.
- *Everlasting memories of university days* – Reminiscing academic experiences can strengthen human relationships. The Alumni Association is a place for graduates, and the entire academic community, including faculty members and current students, to meet, inspire each other, and share stories and fields of specialization. Therefore, it contributes to creating a lasting professional relationship between the members of the Association and the Institution.
- *Furthering graduates' professional development* – The IDEA Center, through alliances and collaborations with the public and private sectors, encourages the exchange of information, technology, and particular skills to enable all association members to access the job market. Furthermore, this exchange of knowledge and experience fosters the continuous professional

development of its members. In this way, graduates have the power to become high-level professionals as they achieve a global vision.

STUDENT COUNCIL

The Student Council is the representative body of the students. It aims to express student opinions and promote communication and cooperation among students, faculty, and administrative personnel.

Representatives of the Student Council are voting members in various University Wide Standing Committees such as the Academic Council, Student Learning Center Committee, Student Affairs Committee, Discipline Committee, and others.

ACTIVITIES AND ORGANIZATIONS

There are opportunities for students to reinforce their curricular experience by participating in curricular related activities such as colloquium, workshops, seminars, and one-on-one meetings with notable community leaders.

Campus organizations focus on the adult learner who may be employed and offer a mature level of activity. Events are designed to foster greater career opportunities as well as recognize students for their academic achievement.

REGISTRAR'S OFFICE

The Registrar's Office is primarily concerned with custody of the student's academic record. Given the office's mission of providing registration services, there are several related services that must be attended to assure the integrity of the academic records and recording systems. The related services that are performed by this office are: Registration, Readmission, Withdrawal, Mid-term and Final grades, Certification, Transcripts, Academic Calendar, Graduation Application, and others.

IDENTIFICATION CARDS

A student identification card is issued to students during the registration period.

STUDENTS' RIGHTS

Polytechnic University - Orlando Campus recognizes the rights of students as outlined in the American Association of University Professors' Joint Statement, dated 1967. These rights include the following:

- Freedom of access to higher education
- Freedom of classroom expression
- Confidentiality of records
- Participation in student affairs
- Off-campus freedoms
- Procedural standards in disciplinary proceedings

CODE OF CONDUCT

The University is dedicated to the advancement of knowledge and learning, as well as to the development of responsible personal and social conduct. Each student, by registering, assumes the responsibility of becoming familiar with and abiding by the general standards of conduct expected by the University. Specifically, each student is expected to refrain from:

- Academic dishonesty of any kind with respect to examinations or course work. This includes any form of cheating and plagiarism. (See Academic Dishonesty and Plagiarism section).
- Falsification or alteration of University documents, records, or identification cards.
- Forgery, issuing bad checks, or not paying financial obligations to the University.
- Theft and the deliberate damaging or misuse of property belonging to others and the property of the University.
- The manufacture, possession, use, or distribution of any form of alcoholic beverages or illegal drugs while on University property.

- Possession, display or use of any dangerous instrument; weapon or explosives (law enforcement officers required by their employer to carry a firearm are excluded).
- Disrupting the study of others or of University activities or interfering with the freedom of movement of any member or guest of the University community.
- Deliberate interference with academic freedom and freedom of speech and movement of any member or guest of the University community.
- Participation in any activity which disrupts or interferes with the education of others or the orderly operation of the University.
- Physical abuse, threatening acts, or harassment, toward others.

Expulsion, suspension, or any lesser penalty may be imposed upon any student enrolled who is found to be in violation of these standards of conduct.

ACADEMIC DISHONESTY AND PLAGIARISM

The University seeks to foster a spirit of honesty and integrity. Any work submitted by a student must represent an original work produced by that student. Any source used by a student is to be documented through normal scholarly references and citations, and the extent to which any sources have been used must be apparent to the reader. The University, further, considers dishonesty the resubmission for a subsequent course, partially or entirely of work already submitted and graded for a previous course. It is the student's responsibility to seek clarification from the course instructor about how much help may be received in completing an assignment or exam or project or what sources may be used. Students found guilty of academic dishonesty or plagiarism shall be liable for sanctions up to and including dismissal from the University.

STUDENT GRIEVANCE PROCEDURES

Polytechnic University of Puerto Rico, committed to Academic Excellence, establishes institutional policies that serve as guides for the well-being of the academic community. To promote these policies, several procedures have been established to allow students to know where to file a claim through the appropriate institutional constituencies.

Promotion of these policies is done through the following media: brochures, catalog, and [PUPR web page](#). Among the policies are:

1. [Blackboard System Policy and Procedures](#)
2. [Campus and Workplace Violence Prevention Policy](#)
3. [Crisis Intervention Protocol](#)
4. [Cyberbullying Policy](#)
5. [Drug and Alcohol Policy](#)
6. Change of Program
7. [Grade Review Policy](#)
8. Guide for Institutional Policies
9. [Harassment Prevention on Online Communication](#)
10. [Information Manual](#)
11. [Information Technology Acceptable Use Policy](#)
12. Institutional Policy
13. [Institutional Security Policy](#)
14. [Netiquette Policy](#)
15. [Policy and Procedure to Support Academic Integrity of Online Courses](#)
16. [Procedures to File a Complaint](#)
17. [Sexual Assault Policy](#)
18. [Sexual Harassment Policy](#)
19. [Student Rules and Regulations](#)
20. [Suicide Prevention Protocol](#)

ADMISSIONS

ADMISSIONS POLICY

Polytechnic University of Puerto Rico admissions policy provides an opportunity to: (a) high school graduates; (b) individuals who have passed a state high school equivalency examination, as well as (c) transfer students, (d) USA veterans and beneficiaries and (e) International students, to enroll in PUPR credit courses and programs. Students should avail themselves of the Students Regulations, copies of which are distributed by the Office of the Vice-President of Enrollment Management and Students. The institution reserves the right to admit, on a temporary status, or reject, any applicant who fails to meet a single criterion fully. An admission application and the corresponding fee are valid for two trimesters. A summary of said policies is presented herein.

Freshman Applicants

Students applying for admission to a higher education institution for the first time are classified as First-Time Freshman Applicants. All students applying for admission to the freshman class of Polytechnic University of Puerto Rico must meet the following requirements:

1. File an application for admission. The application for admission form asks for important information which the applicant is responsible for submitting. Any false information given in the application form will be enough reason to reject said application unless the applicant is able to prove to the Registrar or the Director of Admissions that such information was given without malice aforethought.
2. Submit an official academic transcript from high school certifying graduation or the results of the high school equivalency examination. (GED)
3. Pay a thirty dollar (\$30.00) non-refundable application fee.
The application fee will not be applicable towards the student's registration charges. The fee is valid for two consecutive quarters.

Eligibility Criteria

Applicants to Polytechnic University of Puerto Rico will be admitted based on the eligibility criteria presented in tables A and B.

Table A- Undergraduate Programs Eligibility Criteria:

Discipline	Minimum Grade Point Average (GPA)
Engineering	2.50
Business Administration	2.00
Computer Science	2.00

Applicants who do not meet the corresponding high school Grade Point Average can request, in writing, reconsideration by the Admissions Committee. Students submitting GED test results must have a minimum score of 560 in mathematics section to apply for any Engineering Program, and 520 in science. Students interested in the Business Administration Program must receive a minimum overall score of 2,250 or higher.

Course Placement and Exemptions

Students that present Advanced Placement tests scores can request course placement and exemptions. Results from Advanced Placement tests are used to grant course placement and exemptions to students based on the following tables.

Advanced Placement Tests

Test Title	Minimum Score	Equivalent Course
Art History	3	HIST 3050
Biology	3	SCIE 1110
Pre-calculus (US and PR)	3	MATH 1330 & MATH 1340
Calculus AB	3	MATH 1350
Calculus BC	3	MATH 1350

	4	MATH 1350 & MATH 1360
Chemistry	3	SCIE 1211
	4	SCIE 1210 & 1211
English Language and Composition	3	ENGL 1010
	4	ENGL 1020 & 1021
English Literature and Composition	3	ENGL 1020
Macroeconomics	3	ECON 3020
Microeconomics	3	ECON 3010
Physics 1	3	SCIE 1430
Physics 2	3	SCIE 1440
Physics B	3	SCIE 1430
	4	SCIE 1430 & SCIE 1440
Physics C: Electricity and Magnetism	3	PHY SCIE 1440
Physics C: Mechanics	3	SCIE 1430
Psychology	3	PSY 2012
Spanish	3	SPN 0120
Spanish	4	SPN 0120 & SPN 0130

These criteria are also used to evaluate transfer applications.

Achievement Test Scores

College Board or SAT

Mathematics

MATH 0102	200-549
MATH 0106	550-649
MATH 0110	650-699
MATH 1330	700-800

English

ENGL 0100	200-599
ENGL 0110	600-749
ENGL 1020	750-800

ACCUPLACER Test Scores

Mathematics

Arithmetic Test Score

Take MATH 0102	200-229
Take Elementary Algebra Test	230-300

Elementary Algebra Test

Take MATH 0106	200-263
Take MATH 0110	264-282
Take College Level Test	283-300

College Level Test

Take MATH 1330	200-270
Take MATH 1340	271-279
Take MATH 1350	280-300

English**English Language Use**

ENGL 0100	<82
ENGL 0110	82-100
ENGL 1020(College Ready)	>101

ESL Language Listening

ESOL 0100	<50
ESOL 0110	50-69
ESOL 0120	70-89
ENGL 1026 (College Ready)	>90

PERT Test Scores**Mathematics**

MATH 0102	<114
MATH 0106	114-122
MATH 0110	123-150

Reading

ENGL 0100	0-83
ENGL 0110	84-105
ENGL 1020	106-150

Writing

ENGL 0100	0-89
ENGL 0110	90-102
ENGL 1020	103-150

ACT Test Scores**Mathematics**

MATH 0102	<16
MATH 0106	16-18
MATH 0110	>18

Reading

ENGL 0100	<16
ENGL 0110	16-18
ENGL 1101	>18

Writing

ENGL 0100	<14
ENGL 0110	14-16
ENGL 1020	17

Developmental courses may be required in addition to the minimum graduation requirements of any particular undergraduate degree program.

In considering an application, the Director of Admissions of Polytechnic University-Orlando campus will take into account the scholastic record to determine qualification for admission. The University reserves the right to require further information from any applicant.

Undergraduate Developmental Studies

The Mathematics and Sciences Department and the Socio-Humanistic Studies Department, under the School of Arts Sciences and Education, deliver a set of courses designed to help incoming students develop skills in Mathematics, Physics, Spanish and English languages; which are needed for entry-level and advanced university courses. Through these developmental courses, the students will be able not only to generate positive attitudes toward their studies but also to adapt better to the university environment and the demands of an academic program.

Developmental Studies		
Course	Title	Credit-Hours
MATH 0102	Preparatory Math	3
MATH 0106	Elementary Algebra	3
MATH 0110	Intermediate Algebra	3
MATH 1330	Pre-calculus I	3
MATH 1340	Pre-calculus II	3
SCIE 1110	General Biology*	3
SCIE 1111	General Biology Laboratory*	1
ENGL 0100	Preparatory English	3
ENGL 0110	English Grammar	3
ESOL 0100	Beginner English as a Second Language	3
ESOL 0110	Intermediate English as a Second Language	3
ESOL 0120	Advanced English as a Second Language	3

(*) To be taken by students who have not taken a Biology course in High School.

Note: The ESL courses are designed for individuals whose native language is not English and need to improve their proficiency in the language.

Transfer Applicants (Refer to the institutional policy certification CA #01-23)

An applicant who has studied at a recognized institution of higher education may apply for admission as a transfer student. Transfer applicants must have passed no fewer than nine transferable college credit-hours. They will be favorably considered for all academic work completed with a C or higher grade at each prior institution given that every course under consideration is required by the chosen program. Transfer credit-hours are limited to work satisfactorily completed at an accredited institution of higher education within a five-year period immediately preceding the application for admission.

A transfer applicant will not be considered for admission if he or she is on disciplinary suspension during or following the last term at the previous institution; or within one year after dismissal.

All students who have passed nine transferable credit-hours at an accredited institution of higher education prior to applying for admission to Polytechnic University of Puerto Rico must submit:

1. An official transcript from each institution of higher education previously attended. The transcript should be mailed directly from the institution(s), must furnish a statement of good standing. Student copies of official transcripts are not acceptable. The applicant who is actively enrolled in another institution at the time of application should request a current official transcript to be forwarded immediately. An official transcript, including the final grades of the last quarter or semester of attendance, must be requested, and sent to the Admissions Office.
2. Payment of \$30.00 application fee with the completed application form. The application fee is not refundable and will not be applicable toward the student's registration charges.

Candidates from institutions of higher education, who would have met the admission requirements for high school applicants prior to their university experience, will be taken into consideration for transfer admission. **PUPR reserves the right to refuse applications for admission once enrollment limits are reached.**

Any **undergraduate** student applying for admission to Polytechnic University - Orlando Campus should know that only two thirds of the total number of credits required for the degree can be awarded as transfer credits, including no more than half of the specialization's credit requirements. The courses and credits that will be transferred to a student for the program they are enrolling in will be based on the academic program requirement. Transferred grades will not be used for the evaluation of her/his Grade Point Average. All transfer students must complete at Polytechnic University no less than 65% of the credits required for graduation in order to be eligible for academic honors.

Internal Transfer Students - Students transferred between Polytechnic University Campuses

Any student requesting transfer from one campus to another should:

- Complete an Authorization for Internal Transfer form and present it to the transferring campus. Transcript is not required since student's file will be transferred.
- If the student has an inactive status (two consecutive trimester) he or she should apply for readmission and internal transfer.
- The student must complete a minimum of 36 credits of the bachelor's degree at Orlando Campus to be considered for graduation.
- Internal transfer applicants under academic probation will be transferred under the same status.
- Internal transfer applicants will have to appeal to the Admissions Committee in order to be considered if he/she is on disciplinary probation, suspension or dismissal from the previous institution.

All the courses and credits from the previous campus will be evaluated for program he/she is enrolling. The additional course analysis for the completion of the program will be based on the academic program requirements. However, all the attended credits under the same institution will be used to determine the student Grade Point Average.

Non-Degree (Special) Students

Applicants who have studied at an institution of higher education and have been authorized to take courses at Polytechnic University of Puerto Rico to complete requirements from their institution are classified as non-degree seeking students. Also, applicants who are not interested in obtaining an academic degree from PUPR or a grade, except for professional development coursework, are classified as special students. An applicant desiring to enroll as a special student must submit:

1. A completed application for admission form.
2. Payment of \$30.00 non-refundable application fee with the application form.
3. Submit an authorization as Special Student.

If the person wants to change this classification to a Regular Student, he or she will have to fulfill all the requirements of the Admissions Office, take the prerequisites courses, and obtain a grade of C or higher in each one. A Special Student does not qualify for financial aid until the classification to Regular Student has been made.

Audit Students

Audit Students are required to submit an admission application and pay a \$30.00 non-refundable admission fee. These students are not interested in earning credit-hours toward a degree, diploma, or certificate. They may attend classes as auditors after paying the tuition fees, with the authorization of the Faculty Dean and Registrar, but will not receive grades or credit for work done on any subject.

Home Schooling

Polytechnic University of Puerto Rico established a system of academic credential evaluation for each homeschooler applying for admission into an academic program. The purpose is to determine whether the applicant complies with all the criteria for eligibility.

These criteria are the following:

- File an application for admission with the following attached documents:
 - a. Florida Scholl Board or District Certification
 - b. Affidavit of Home School Completion
 - c. School curriculum
 - d. All courses grades
 - e. College Entrance Examination Board (CEEB), SAT, ACT or any other equivalent test results
 - f. Pay the non-refundable application fee

International Students

All instruction and written work at Polytechnic University - Orlando and Miami campuses is in English. Students whose primary language is not English must provide proof of English proficiency. The standard measure of this ability is the TOEFL (Test of English as a Foreign Language). The applicant should provide a minimum score of 79 (internet-based test), 213 (computer-based test), or 550 (paper test) to enter the regular program courses. If TOEFL or an equivalent test is not provided or does not comply with the minimum score, an English proficiency test will be given by the Admission Office to assess his/her abilities and prepare a development plan.

Polytechnic University of Puerto Rico (San Juan, Miami, and Orlando campuses) is authorized by the Immigration and Naturalization Services (INS) to issue a Certificate of Eligibility for Nonimmigrant Student Status (Form I-20) for qualified international students who are not citizens of the United States of America or permanent residents.

Following admission acceptance, the applicant must submit all documentation required by the INS and established in the Applicant's Checklist. Afterward, the Designated Student Officer (DSO) will issue and deliver the Form I-20 to admitted students. The admitted students then deliver the completed Form I-20 to the Bureau of Immigration and Citizenship Services (BICS) of their country of origin in the petition of a Student Visa Number. Subsequent to the BICS authorization of a Student Visa Number, admitted students return this Form I-20 to the DSO. Applicants are classified as international students only after receipt of all required documentation and paid registration fees for the first academic term of full-time enrollment.

Secondary School Graduates

All secondary school graduates interested in applying to PUPR's Orlando campus must:

- Submit an official transcript of all secondary education validated by the Florida Department of Education.

International Students

International Undergraduate Applicants

An applicant desiring to enroll as an international student must fulfill the following documentation:

- Complete the application for admission.
- Pay a \$60.00 non-refundable admission fee.

Non-Resident Applicants/Students Visa

To process the I-20, all applicants must demonstrate financial capacity to complete the required educational program.

- Submit a sworn statement by the person that will cover the applicant's educational costs and living expenses, indicating the annual amount assigned for this purpose.

Transfer Applicants

- Submit an official transcript of the applicant's home country and certified by one of the following agencies: **Educational Credential Evaluators, Inc., World Education Services, Academic Credentials Evaluation, Josef Silny, Inc.**

Transfer Student with Form I-20

1. An application for admission.
2. Payment of sixty dollars (\$60.00) non-refundable application fee.
3. An official transcript from each institution of higher education previously attended. The transcript should be sent directly from the institution of origin to the Admissions Office. Translations should be made and validated by a representative of the Department of State of the country of origin or its consulate in Florida.
4. Evidence of the ability to defray all expenses while studying in Florida. A completed Affidavit of Financial Support form for each sponsor and notarized supporting bank statements showing financial support for the first year of study and complete the form I-134.

Admissions Procedure

Candidate students (i.e., First-time freshman, transfer, special audit and foreign) may apply for admission to any of the three academic terms and summer session available each academic year. Applications for full-time and part-time studies are processed throughout the year. Although applications may be made at any time, candidates for admission to the First Time Freshman class should submit their applications during the final year of high school.

Initial Orientation for Newly Admitted Students

Upon acceptance at the university, all students are required to provide a copy of a current driver's license or photo identification for placement in the files for official records. After the student is admitted, the next step is to coordinate the initial orientation with the admission officer. During this orientation, the student is guided on the processes of getting acquainted with Polytechnic University rules and regulations and is given a package with the Student Guide, Description of Placement Tests, Informative Bulletin, information regarding tuition, fees and costs per credit-hour, and Online Manuals Sheet that includes links to access the following:

- Student Information Manual
- Student Regulation
- Security Policy
- Qualification Review Procedures
- Credit Transfer Validation Policy
- Policy on the Use and Abuse of Controlled Substances
- Sexual Assault Policy
- Agreements between PUPR and other educational institutions

Upon proper completion of all admission requirements as stated in the previous section of the catalog, the applicant will then be admitted, and eligible to register. When registration is complete, and all fees are paid, the student will be officially enrolled at the university. The dates for registration are stated in the Academic Calendar. Counselors are available to help admitted students with academic advising and class scheduling during the registration period.

Additional Admission Criteria

Upon acceptance at the university, all students are required to provide a copy of a current driver's license or photo identification for placement in the files for official records.

FINANCIAL INFORMATION AND SERVICES

TUITION AND FEES SCHEDULE FOR UNDERGRADUATE PROGRAMS

The following schedule of tuition and fees applies to all undergraduate students at Polytechnic University of Puerto Rico. The academic year consists of three consecutive academic periods called terms from August to July of the following year.

Tuition per Credit-Hour		
Tot Codes	Description	Fiscal Year 2024-2025
TBA	Tuition Business Administration	\$365.00
TEN	Tuition Engineering	\$380.00
TGN	Tuition General Courses	\$370.00

General Fees

General Fees (Per Trimester – 12 weeks)* (Summer Term – 6 weeks)*

Tot Codes	Description	
UGF	Undergraduate General Fee	\$385.00

Other Fees

Tot Codes	Description	
ACE	Academic Evaluation Fee	\$15.00
ADB	Application for Admission	\$30.00
ADF	Application for Admission – International Students	\$60.00
IDC	Campus Card/Student ID	\$15.00
CER	Certification Fee	\$10.00
CMP	Change of Academic Concentrations or Programs	\$20.00
RRC	Copy of Registration Report	\$8.00
DPC	Deferred Payment Charge	\$85.00
ADC	Drop Fee/Partial and Total Withdrawal (Per Course)	\$20.00
DDI	Duplicate Diploma	\$80.00
DID	Duplicate ID Card	\$15.00
GRA	Graduation Fee	\$335.00
GRA	Graduation with Late Fee	\$365.00
IFC	Interest Finance Charge (Monthly)	2.5%
LAB	Laboratories	\$335.00
LRE	Late Registration Fee	\$75.00
REA	Readmission	\$30.00
RCF	Return Check Processing	\$65.00
PCOL	Collection Fee – Refer to Collection Agency	\$75.00
TRA	Transcript Fee	\$12.00

*General Fees don't have specific allocation. This charge covers expenses for Students Activities, Library and Technology fees, among others. * *Graduation candidates will pay the graduation fee in effect at the moment of the graduation ceremony.

* TUITION AND FEES SCHEDULE ARE SUBJECT TO CHANGE WITHOUT PREVIOUS NOTICE. OTHER SERVICES CHARGES NOT INCLUDED

Reservation of Rights: The University makes every effort to anticipate local and national developments and adapt as appropriate to continue delivering educational services for students. There may be situations where, for the health, safety and/or wellbeing of our community and as determined by the University in its discretion, we will be required to make changes to methods and timing of instruction, delivery of and access to services and course content, etc., including possibly implementing a full or partial campus closure, temporary suspension of classes and services, and/or switching from on-campus learning and delivery of services to distance or remote

learning and delivery of services. By signing up for classes or otherwise enrolling in or attending classes offered by the University, you understand and agree that such changes may take place to the extent the University determines such changes are necessary for the health, safety, or wellbeing of members of the University community or due to other circumstances outside the University's control. You further understand and agree that the University does not in any way guarantee in-person, on-campus education or services or any other particular format of education or services. Finally, you understand and agree that you are responsible for all tuition and fees, regardless of the format in which education and services are provided, and that no refunds or credits for tuition, fees, or other charges will be provided in the event of such changes, including any changes from on-campus education and/or services to remote services and/or remote learning. Any decision by the University to provide a refund or credit, in whole or in part, of any fee or other charge in the event of a campus closure, suspension, or other change to the delivery format of education and/or services shall be in the University's discretion and shall not create an expectancy that any individual is entitled to such refund or credit or that it will be provided in any other instance.

PAYMENT OF TUITION AND FEES

Every student must pay the total cost of tuition and fees during the registration process. They are responsible for the total cost of tuition, even if they do not attend classes, their scholarship, and/or sponsorship is cancelled, or if a withdrawal is requested.

The University grants the privilege to defer 50% of the total cost to students who choose not to pay in full. Deferred payments are due thirty (30) days after the beginning of the term and involve an additional cost. The validation process of registration is not completed until the student has paid the total cost or 50% of tuition and fees. The validation process of registration can be through Polytechnic University portal <https://mypoly.pupr.edu> or in person. The student is responsible for verifying and keeping track of enrollment, add/drops and defer payments dates, and taking the necessary steps to comply with them.

Students who have requested financial and/or veteran benefits must consult either with the financial aid office or the Institution's Veterans Representative located in the Registrar's office prior to the completion of the registration process.

Students receiving sponsor's benefits should contact the Bursar's Office and submit relevant evidence to determine the corresponding registration cost according to the benefits received.

Payments of tuition and fees, and outstanding balances can be made:

- Through Polytechnic University's Portal: mypoly.pupr.edu (online service) using Banco Popular's ATH, Visa, MasterCard, American Express, Discover, and personal checks.
- In person, with cash, debit cards, Visa, MasterCard, American Express, Discover, money order, manager's checks, and certified or personal checks. Checks should be made payable to Polytechnic University of Puerto Rico or PUPR. (Returned checks will incur additional charges, and the student loses the privilege of using this payment method).
- Polytechnic University of Puerto Rico does not issue credit and/or debit card refunds. If the student pays with a credit/debit card and for some reason requires reimbursement, the Institution will issue a check under the student's name.

Polytechnic University of Puerto Rico reserves the right to revise policies, tuition fees, and other costs.

Financial Delinquency

If a student does not meet its financial obligations within the stipulated dates, the Collection Policy of Polytechnic University of Puerto Rico states that:

1. Tuition and fees from previous terms of study must be paid in full, prior to the student registering for the current trimester.
2. After the deferred date (30 days after the beginning of the term), any outstanding balance will be subject to 2% monthly interest.
3. After 180 days, outstanding balances will be subject to an additional collection fee if the University refers these to legal divisions or collection agencies.
4. If PUPR is obliged to take legal action for the collection of this debt, the student will be responsible for costs, disbursements and other fees incurred in the collection, as determined by the corresponding Court.

5. Debtors will be subject to the jurisdiction of the Court of First Instance, San Juan Municipal Division.
6. Debtor students may be excluded from graduation ceremonies. The University may also withhold grades, issuance of transcripts, degrees, diplomas, certificates of good standing or other official documents to any student whose account is in arrears.

Inactive students may be granted a Payment Plan to pay-off their outstanding balances. This agreement with Polytechnic University of Puerto Rico is held in association with United Credit Bureau. If students fail to comply with the payment plan, they may be referred to legal divisions or collection agencies. Students referred to a legal division or collection agency will be charged additional fees. Sponsored Students are also governed by the policies mentioned above, even if the outstanding balance belongs to the Sponsor.

REFUND POLICIES

The Bursar's Office is responsible for complying with the refund policy established by the Institution. These policies take into consideration institutional and current federal regulations. The student must request a drop/withdrawal in accordance with the Academic Calendar for the refund to be applied. The policies will be applied as follows for any withdrawal (partial or total) requested by a student:

INSTITUTIONAL REFUND POLICY

For any withdrawal (partial or total) requested by a student

Regular Term – 12 Weeks (FALL, WINTER, AND SPRING)

Period of Term	Percentage of Refund
During Regular Registration Process	100%
During first and second week of classes in each term*	100%
Census Date calculated on the last day of week 2**	
During the third week of classes through the withdraw deadline of each term (W grade will be assigned)	0.00%

* Drop Charges will apply. **Census date is the cutoff date for aid calculation.

Summer Term – 6 Weeks (June and July)

Period of Term	Percentage of Refund
During regular registration process	100%
During first week of classes in each term*	100%
During next 3 days of classes*	
Census Date calculated on the last day of week 1**	
During the second week of classes through the withdraw deadline of each term (W grade will be assigned)	0.00%

June Term or July Term – 3 Weeks each

	Percentage of Refund
During regular registration process	100%
During first 1 day of classes	100%
Census Date calculated on the 3 rd day of classes*	
After the 2 nd day of classes through the withdraw deadline of each term	0.00%

* Drop Charges will apply

*General Fees are non-refundable. **Census date is the cutoff date for aid calculation.

FINANCIAL AID OFFICE

The Financial Aid Office provides information to students and their families regarding the available financial aid programs as well as the application process and eligibility requirements. Its mission is to provide accurate and clear consumer information to help students explore the different financial aid resources that can help them obtain the necessary funding to reach their academic goals.

Polytechnic University –Orlando Campus participates in the following financial aid programs from federal, state, institutional and private sources:

- Federal Pell Grant
- Federal Supplemental Educational Opportunity Grant (FSEOG)*
- Benacquisto Scholarship
- Florida Student Assistance Grant Program (FSAG)
- Dual Enrollment Scholarship Program 7/14
- Florida Bright Futures Scholarship
- José Martí Scholarship Challenge Grant
- Honorary Discharged Graduate Assistance Program
- Scholarship for Children and Spouses of Deceased or Disable Veterans
- Federal Work-Study Program (FWSP) *
- Florida Work Experience Program
- Federal Direct Loan Program for Students
- Federal Direct Loan Program for Parents of Undergraduate Students
- Federal Direct Loan Program for Graduate Students
- Private Student Loans
- Private Scholarships

*The availability of the programs will depend on the total funds allotted to the institution each academic year.

Student Consumer Information

The University conforms to the Student Consumer Information Requirements established by the United States Department of Education, and hereby serves notice that the Director of Student Financial Aid and office staff are the persons designated under those requirements to assist the students or prospective student in obtaining information regarding student financial assistance.

General Eligibility Requirements

To be eligible to receive financial aid from most federal, state, and institutional programs, the student must:

- Be enrolled as a regular student
- Be working towards a degree in an eligible program
- Be a U.S. citizen or eligible non-citizen with valid Social Security Number
- Have a high school diploma or its equivalent
- Meet the Standards of Satisfactory Academic Progress
- Demonstrate financial need (except for some loan programs)
- Certify that the federal student aid will only be used for educational purposes. The student must also not be in default or owe money on a federal grant.

In addition to the above basic eligibility requirements, the student could be required to meet additional requirements such as minimum enrollment credits, minimum GPA, state residency status among others, depending on the financial aid program. For the eligibility requirements of a specific program, contact the Financial Aid Office.

Florida Residency Requirement

The Financial Aid Office is responsible for confirming the student's Florida residency status before disbursing any State fund. To be classified as a Florida resident, the student or claimant (student's parent or legal guardian) must present evidence of having established

a legal residence in Florida and maintained that legal residence for 12 consecutive months prior to the term in which the Florida resident classification is sought. A student's residence in Florida must be as a bona fide domiciliary rather than for the purpose of maintaining a mere temporary residence for enrollment in an institution of higher education. The student (and claimant) is required to be a United States citizen, resident alien, parolee, Cuban national, Vietnamese refugee, or other refugee or asylee so designated by the Bureau of Citizenship and Immigration Services.

Students must complete the Florida Residency Declaration and submit it with necessary documentation before the first day of classes of the academic period.

Application Process

To determine student's eligibility for federal aid, the student must complete the Free Application for Federal Student Aid (FAFSA). Some financial aid programs, such as state grants, student loans, and federal work-study require an additional application.

The student must reapply for financial aid every year. Since some federal and state funds are limited, students are encouraged to apply as soon as possible after October 1 of every year. New students should apply for financial aid at least two months before the first day of classes for the period in which they will enroll. Regular students must submit their application before the end of December.

Follow these steps to complete your FAFSA:

1. Obtain an FSA ID for yourself at www.studentaid.gov. If you are a dependent student, one of your parents will need an FSA ID to sign the FAFSA. If you already have an FSA ID, you will use it to renew your FAFSA every year.
2. Collect the following information:
 - Your social security number. If you are a dependent student, you also need your parents' social security numbers, dates of birth, and email address. Married students will need their spouse's information as well.
 - Your driver's license number (if applicable).
 - Prior-prior Income tax returns, W-2 forms, and other records of income earned for yourself and your parents (if dependent) or your spouse (if married).
 - Evidence of untaxed income received during the prior year such as Child Support, veteran's non educational benefits, among others.
 - Information about savings, investments as well as business and farm assets for yourself and your spouse/parents, if applicable.
 - **PUPR's School Code: 014255**
3. Complete the FAFSA at www.studentaid.gov. FAFSA is free! You should not pay for completing this application. If you need assistance to complete the FAFSA, contact the Financial Aid Office.
4. After the FAFSA application is processed by the
5. Department of Education, the Financial Aid Office will receive a report with the student and parent information. If your application is selected for verification, the Financial Aid Officer will request the student to provide documents to confirm the information submitted in your FAFSA. No financial aid disbursement will be processed until the verification process is completed.
6. If your financial aid file is completed, the Financial Aid Office will proceed to the awarding of the aid programs you are eligible for. You will receive electronic communication with instructions on how to accept your student aid awarding.

Transfer Students

Financial aid awards cannot be transferred automatically from one post-secondary institution to another. The student must correct the FAFSA application to include **Polytechnic University's Code: 014255**. After the Financial Aid Office receives your FAFSA results, we can determine your eligibility for the available financial aid programs.

Transfer students with previous student loans can defer paying loan payments if enrolled at least half-time. The deferment will not be automatically granted with enrollment. To defer a student loan, the student must complete an In-School deferment form and submit it to the Registrar's Office. The deferment forms are available at the loan servicers websites.

Awarding Process

The student's eligibility for financial aid programs will be determined after the FAFSA application is received, and the verification process is completed, if selected. The student's Expected Family Contribution (EFC), and the cost of attendance (COA), will be considered when preparing the award package. The student will not be considered for a Student Loan or the Federal Work-Study program unless a proper program application has been completed. For supplemental aid programs, priority will be given to students with economic need, in order of application processing date.

The student will receive an Award Letter listing the student aid programs awarded for the academic year. Initial student aid awards are offered based on full-time enrollment. Awards may then be adjusted, if applicable, to actual enrollment after the add/drop period for each trimester. Other sources of assistance such as merit awards and private and institutional scholarships will be taken into consideration when preparing the student's award package.

****Students repeating a course may not be eligible for financial aid for that specific course. The student will receive payment of federal financial aid for developmental courses up to a maximum of 30 credits.**

Financial Aid Disbursements

Financial aid funds are credited to the student's institution account to cover tuition costs and fees. The student's enrollment status and eligibility for the financial aid program will be verified every trimester before disbursing any money. If there is an excess after funds are paid, a check will be issued to refund the student. If the financial aid is not sufficient to cover all charges, the student is responsible for paying the outstanding balance.

The following are some of the reasons why the student's aid disbursement may be delayed or cancelled:

- Application submitted after deadline
- Not providing all required documentation before deadline
- Not completing the Entrance Counseling and/or Master Promissory Note for Direct Loan borrowers
- Not keeping the minimum academic workload
- Not making Satisfactory Academic Progress towards the program degree
- Being in default on a student loan or owing an overpayment to any Title IV financial aid program

Student Aid Cancellation and Refusals

Students may refuse to accept any financial aid awarding. For this purpose, the student may notify the Financial Aid Office in writing to refuse an awarded aid prior to disbursement. If the student aid has already been disbursed, the student is required to notify in writing within fourteen days of the credit.

Students who do not officially withdraw (unofficial total withdrawal) and receive a WU grade in all enrolled courses will only earn 50% of the federal funds received. The student would be responsible for any pending balances due to the return of Title IV funds.

Return of Financial Aid

Students who drop or withdraw might have to repay a portion or the total amount of financial aid received. Students that enroll but do not attend class may also be required to repay any received financial aid.

If an over award occurs, the student's award package will be reduced which may result in a repayment. To avoid over awards, students must notify the Financial Aid Office of any potential awards such as private scholarships, vocational rehabilitation benefits, etc., that were not included in the Award Letter.

****Refer to the Federal Financial Aid Return Policy for more information on the calculation procedure and for an example of the calculation.**

STANDARD OF SATISFACTORY ACADEMIC PROGRESS FOR STUDENTS WITH FINANCIAL AID

The Standard of Satisfactory Academic Progress of the Financial Aid Office establishes the evaluation criteria to determine the student's academic progress, which is one of the eligibility requirements to participate in student financial aid from Federal, State, Institutional and Private Programs.

The minimum federal components to measure satisfactory academic progress require three specific measures: qualitative, quantitative, and maximum timeframe to receive Federal aid. These three components provide a measure of the reasonable progress the student should have to complete the academic career successfully.

Evaluation Criteria for Undergraduate Students

- **Qualitative Measure** – One of the elements of the Standards of Satisfactory Academic Progress is the qualitative measure. This component consists of the grade point average (GPA) and the total accumulated credits at the end of the academic year. Polytechnic University of Puerto Rico adopts the retention rate (qualitative measure) according to the following chart:

Bachelor's Degrees

Total Earned Credits*	Minimum Required GPA
0 – 36	1.50
37 – 72	1.65
73 – 108	1.80
109 +	2.00

*Total Earned Credits includes transferred credits and completed credits at PUPR.

Credits transferred from other colleges or universities are not taken into consideration to calculate the GPA but are considered to calculate the student's level or year.

- **Quantitative Measure** – The second element of the Standards of Satisfactory Academic Progress is the quantitative measure. This component compares the number of credits attempted by students in the institution, versus the number of approved credits. The student must approve at least 66% of all credits attempted at PUPR. This measure will be cumulative.
- **Maximum timeframe to receive payments from federal financial aid** – All students must complete the graduation requirements within a maximum equivalent to 1.5 times (150%) of the program degree credits required. Developmental courses will not be considered in the evaluation of the maximum time, but all courses attempted at our institution will be included. Transfer credits are also included in this measure. Students who will be unable to complete their degree within the maximum 150% timeframe, will not be eligible to receive financial aid at the moment the school determines that the student will not comply with this provision, not when the student arrives at the 150% timeframe.
 - Maximum timeframe will be determined using credit-hours.
 - The maximum time must be 150% of the credit-hours required to complete the program degree.
 - All attempted credits, even those in which the student did not receive financial aid, count towards the established maximum.
 - This policy includes and measures students who are enrolled half-time or less than half-time.
 - All courses attempted in the institution, except for developmental courses, will be included. Transferred courses will also be included to measure the maximum timeframe.
 - Changes of Major or School (e.g. from Engineering to Architecture), will be measured under the new concentration requirements (total required credits). All courses taken at PUPR, including credits from previous Major/School and credits from the new Major/School will be included.

Example:

- The Accounting Program requires 120 credits to complete the curriculum.
Maximum timeframe (120 credits x 150% = 180 attempted credits)

PROBATION OR SUSPENSION

The student's Satisfactory Academic Progress process is evaluated once a year, at the end of the academic year (June).

If the student does not meet one of the evaluation criteria of the Satisfactory Academic Progress policy, the student will be classified with a status of probation or suspension. The Financial Aid Office will notify the student about the status.

Probation Status

A student who does not comply with the Standards of Satisfactory Academic Progress for the first time is put on probation status. While on probation, the student does not qualify for any Federal, State, or Institutional aid programs. Students on probation are able to appeal the probation status, and if approved, could be eligible to receive Federal, State, and Institutional aid.

Procedure for Appealing a Probation Status

1. The student must complete the Appeal Form and carefully follow the instructions.
2. The Academic Progress Appeal Form and supporting documentation must be received in the Financial Aid Office before the stated deadline.
3. Once submitted, the appeal will be evaluated by the Satisfactory Academic Progress Committee.
 - a. If approved continue to step #4.
 - b. If denied, the student will not be eligible for Federal, State nor Institutional aids, until the student complies with the Standard of Satisfactory Academic Progress.
4. Plan to improve your academic progress:
 - a. Once the appeal is approved, the student will be referred to meet with the Academic Dean, to establish an academic plan for the following term. The academic plan will be established at the beginning of each trimester.
 - b. Sign the academic plan agreement with the Academic Dean.
 - c. Submit the established academic plan to the Financial Aid Office to reactivate your financial aid.
5. The academic plan will be evaluated every trimester by the Academic Dean. While the student complies with the academic plan, the student can continue to be eligible to receive Federal, State, and Institutional aids as long as the student meets the other requirements to receive financial aid. If the student does not meet any of the terms set forth in the academic plan, the student will lose all the Federal, State, and Institutional aids until the student complies with the Standard of Satisfactory Academic Progress.

Suspension Status

A student that does not overcome the probation status, falls in a suspension status. A student in a suspension status does not qualify for Federal, State nor Institutional aid. Students in suspension status cannot appeal to the Satisfactory Academic Progress Committee. A student in a suspension status may be eligible to receive Federal, State, and Institutional aid funds when the student complies with the Standard of Satisfactory Academic Progress.

DEFINITIONS

Attempted Credits – Enrolled credits at PUPR in which the student has obtained grades of I (with grades), A, B, C, D, F or W, WU, WN NR, including all course repetitions.

Academic Progress – Is the measure which shows whether a student is complying with the three criteria of the Satisfactory Academic Progress Standard (Qualitative, Quantitative, and Timeframe).

Academic Term – Typical academic term during which regular courses are offered, and which consists of 12 weeks, beginning on the first day of school and ending on the last day of final examinations. In summer, the academic term is reduced to 6 weeks, doubling the weekly contact hours.

Academic Year – Consists of three academic terms that begin in August and end in May. The summer term is optional.

Developmental Courses (Preparatory or Remedial) – These are basic courses required by the program (including courses in MATH, SCIE, ATUL, SPAN, and others starting with 01xx). These courses will be covered by federal financial aid for up to a maximum of 30 credits.

Earned Credits - Credits of courses attempted at PUPR which obtained grades of A, B, C, D or Pass.

Expired Credits – Courses approved seven or more years ago in this, or other institution will expire at the date of applying for readmission with the exception of those validated by the Department Director and the Faculty Dean. The student must repeat all courses declared outdated or must take other equivalent courses of the existing curriculum, with the approval of the Department Director and the Faculty Dean. These courses are considered for the calculation of the quantitative measure.

Financial Aid Suspension – Students who at the end of the probation period, do not overcome deficiencies with the qualitative or quantitative measure, or who do not comply with the established academic plan, will have their financial aid suspended (this includes any Federal, State or Institutional aid). Also, all aid will be suspended if it is mathematically impossible for a student to complete his program before reaching the maximum timeframe of 150%. All attempted credits and transferred courses will be taken into consideration.

Grade Point Average (GPA) – The measure of academic merit achieved by the student. It is calculated by dividing the total number of accumulated honor points by the number of credits in which the student has received final grades, including F's and WU's, which have not been removed.

No Satisfactory Academic Progress (NPAS – suspension) – Classification that is given to the student who at the end of his Financial Aid Probation period does not overcome the academic deficiencies or has not completed the Academic Plan as agreed. The student does not qualify for any Federal, State, or Institutional aid.

Provisional Grades (Incompletes) – If the Professor gives an incomplete in a course, the student must complete the requirements of the course within the established date in the next academic term. The Professor will remove the incomplete within the established date. If the incomplete is not removed, it will become the provisional grade until the professor changes the grade. Provisional grades are considered in the calculation of the qualitative and the quantitative measures of the Satisfactory Academic Progress Standard.

Courses with W Grade – Course from which the student officially and voluntarily withdraws. These courses will be considered in the calculation of the quantitative measure.

Repeated Courses – Courses that the student has been enrolled in two or more times. For the purpose of determining the Grade Point Average, only the highest grade will be used. Repeated courses will be considered in the quantitative measure of the Satisfactory Academic Progress Standard.

Transferred Credits – Credits taken at other institutions of higher education recognized by accrediting agencies, that were approved with A, B, or C, and which are accepted by the Department Director or by the authorized Dean, in compliance with the standards of PUPR.

STUDENT'S RIGHTS AND RESPONSIBILITIES

The student has the right to receive the following information from the Financial Aid Office:

- Available financial aid programs.
- Application process, deadlines, and eligibility requirements.
- Awarding and disbursement procedures.
- What financial aid must be repaid, the terms and schedules for repayment.
- The terms and conditions of any employment that is part of the financial aid award.
- What is the criterion of maintaining Satisfactory Academic Progress and how to reestablish eligibility?
- Institution's refund policy for the students that withdraw from school.

It will be the student's responsibility to:

- Comply with deadlines.
- Provide all required documents in a timely manner.
- Provide the Financial Aid Office with information on changes in a family's household, income, or enrollment status.
- Inform the Financial Aid Office of any outside scholarships, tuition assistance, VA benefits or any other benefits that the student will be receiving during the academic year.
- Use any financial aid received from Federal, State, or Institutional funds, for expenses related to their education.
- Notify any change in name, social security, citizenship status, address, phone number or email address.
- Understand and comply with the policies regarding refunds, repayments, and satisfactory academic progress.
- Complete the Exit Counseling for Federal Student Loan program before departure from college or if registering as less than half time student in any term.

PRIVACY NOTICE

The Financial Aid Office ensures the confidentiality of students' records. For this reason, confidential information will not be released by email or phone to students. In addition, no information will be released to any third party, unless legally required to do so, without written authorization from the student. This includes parents, spouses, siblings, or friends.

ACADEMIC INFORMATION AND SERVICES

The student should familiarize thoroughly with: (1) this section of the catalog, (2) the section containing the academic requirements for the degree he/she plans to earn, (3) the offerings of his/her major program of study, and (4) any changes published after the publication of this Catalog.

A degree will be awarded only to a student who has satisfied all the academic and administrative requirements of Polytechnic University of Puerto Rico.

Program Curriculum Sequence Continuity

Polytechnic University of Puerto Rico provides students with the program curriculum sequence aligned with the academic time length and course prerequisites. The student is responsible for following the curriculum sequence to accomplish the graduation requirements within the corresponding schedule.

If the student is not able to follow the curriculum sequence, he/she must coordinate and develop the most effective program sequence with his/her mentor to comply with the graduation timeframe. The department is in charge of providing courses based on the program curriculum sequence. If the course has low enrollment, the department will develop course alternatives for students that comply with the program curriculum sequence.

Polytechnic University reserves the right to make changes in the curricula and degree requirements.

Academic Program Continuity

Polytechnic University of Puerto Rico will reserve the right to close or postpone an academic program based on low student enrollment. To ensure that the student is not affected by this decision, the institution will provide the necessary course alternatives to allow program completion.

Academic Schedule

Registration for all students is held prior to the beginning of each trimester on designated days, as specified in the Academic Calendar. Completion of registration for each trimester is a prerequisite of class attendance. The academic year consists of three terms, and three summer sessions. Fall, winter, and spring classes are scheduled from 4 p.m. to 10:30 p.m., Monday through Thursday, and Friday from 4:00 p.m. to 8:00 p.m., and Saturday from 9 a.m. to 1 p.m. Depending on the term selected, students may be required to make up class contact hours lost due to days observed as holidays.

Changes in Class Schedule

During the first week of class, a student may add or drop courses online using the student portal or in person at the Integrated Student Services Center (CESI).

Add Policy

A student may add a course during the official Add/Drop period; a class which has been dropped will not appear in his/her permanent record. Approval of the student's Director is necessary before any course change is made. For withdrawal after the Add/Drop period, consult the Withdrawal Policy.

Academic Load

The minimum full-time load per term is twelve (12) credit-hours. To register for sixteen (16) credit-hours or above, the student must seek the approval of the Department Director and Dean. Credit-hours will not be awarded for courses in which the student is not properly registered.

Withdrawals

The process for partial and total withdrawals is the same; both must be completed online through the student portal on or before the deadline stipulated in the Academic Calendar.

Polytechnic University of Puerto Rico does not encourage withdrawals from courses. However, if a student considers withdrawing from a course or all courses, consultation with a professor, counselor or mentor is recommended to discuss possible options rather than withdrawal.

The W is a grade, and it will stay permanently on the academic transcript.

Students cannot withdraw from any course identified with "NR." (See: Class Attendance section for NR explanation). Remember that withdrawing from a course does not exempt the student from paying the cost of it.

Veteran students must present evidence of activation or mobilization orders to the Veterans Coordinator at the Registrar's Office.

Abandoning a Course

Whenever a student leaves the course and does not request an official withdrawal will receive a "WU" grade to allow the institution to differentiate between a student who failed to complete its academic responsibility and a student who failed as a result of course abandonment.

Grading System: Grades with Honor Points

Polytechnic University of Puerto Rico utilizes an alphanumeric grading system. (Honor points are the equivalences assigned arbitrarily to a letter grade) The grades that must appear on the midterm and final reports are as follows:

A	Excellent (4 honor points per credit-hour)
B	Good (3 honor points per credit-hour)
C	Satisfactory (2 honor points per credit-hour)
D	Deficient (1 honor point per credit-hour)
F	Failure (0 honor point per credit-hour)
WU	Student abandoned course without authorization (0 honor point per credit-hour)
I (with Grade)	Incomplete with a grade (Points will be equivalent to the grade that accompanies the Incomplete)

Grade Point Average

Grade Point Average is the measure of academic achievement. It is computed as follows:

The total number of credit-hours corresponding to all courses taken, counted once, and having a grade of A, B, C, D, F or WU, is obtained (T).

The credit-hours of each course are multiplied by 4, 3, 2, 1 or 0, according to grades A, B, C, D, F or WU, respectively. These products are added (**S**) and identified as honor point.

S is divided by **T** to obtain the grade point average.

A student may be allowed to repeat a course passed with a “D,” before taking the next course in the sequence if the corresponding Department Head considers that the case has sufficient merit to receive authorization. In computing Grade Point Average, the highest grade obtained in a repeated course will be used whenever it is higher than the original grade. If the grade obtained in the repeated course is lower than the original grade, the original grade will prevail.

Grades with no Corresponding Honor Points

AU	Audit (class audited only)
R	Repeated course
W	(Withdrawals) Indicates that the student, after obtaining proper authorization from PUPR's Officers, receives permission to withdraw from a course without penalty.
WM	Military Withdrawal
P	Pass, only for specified courses
NP	Not passed, only for specified courses
WN	Unofficial withdrawal of a student who takes a (P/NP, or S/NS) course that does not carry a grade

Face-to-Face Class Attendance

The fact that classes are scheduled is evidence that attendance is important. Students should maintain regular attendance if they are to attain maximum success in the pursuit of their studies. Students who have not attended any classes during the first two (2) weeks of the academic term are automatically disqualified from charging tuition fees to federal funds and are responsible for their payment. This course will be identified with an “NR” (No Record/Show). The instructor via email the names of all such students to the Registrar's Office. ([Policy of Class Attendance](#))

It is recognized that the record of class attendance may vary according to the student, the instructor, or the course. On occasions, it may be necessary for the student to be absent from scheduled classes or laboratories for health or other reasons. In this case, the student is responsible for contacting the instructor and for all work completed or assigned.

Online Class Attendance

Student attendance in online courses is defined as active participation in the course as described in each course syllabus. The faculty members must certify that students are actively attending an online course, or a hybrid course according to the procedures established by the Center for Distance Education. Students will be required to complete at least one (1) of the following activities during the first two (2) weeks of the academic term for each online or hybrid course.

1. Submit an assignment online;
2. take an online assessment;
3. participate in an online discussion about academic matters;
4. complete an online interactive tutorial or computer-assisted instruction that is trackable; or
5. initiate contact with the faculty member to ask a question about the academic subject studied in the course.

Students who fail to complete any of these activities during the first two (2) weeks of the academic term are automatically disqualified from receiving federal funds for tuition and fees and are responsible for their payment. This course will be identified with an “NR” (No Record/Show). The instructor will submit via email the names of all such students to the Registrar's Office.

On occasions the student may not be able to access the online/hybrid course due to health or other reasons. In this case, the student is responsible for contacting the instructor, providing documentation that supports the need for late submission of a graded activity.

As a component of course attendance, students are expected to check their course email regularly (preferably daily), course announcements, and discussion forums. The student is responsible for checking updates related to the course. Log on at least three

(3) times a week – it is recommended to complete weekly assignments, assessments, discussions, or other weekly deliverables as directed by the instructor and outlined in the course syllabus.

STUDENTS WITH VETERAN'S BENEFITS

Students with veteran's benefits should provide the Certificate of Eligibility and the DD-214 form. If the student needs assistance to complete this document, he/she must contact the Veterans Coordinator in the Registrar's office.

Students eligible for Veterans benefits are required to make their financial arrangements in line with the policies of the University for all students.

MILITARY TRAINING

Polytechnic University students may request consideration of credit award for documented military training. The Academic Director has the responsibility of working with the student to evaluate the request and to determine if the credit option is appropriate.

For Post 9/11 GI Bill® (Ch 33) students and VA Vocational Rehabilitation and Employment (Ch 31) students, our tuition policy complies with 38 USC 3679(e) which means Post 9/11 and Vocational Rehabilitation and Employment students will not be charged or otherwise penalized due to a delay in VA tuition and fee payments. For eligibility consideration, a Post 9/11 GI Bill® student must submit a VA Certificate of Eligibility (COE) and a Vocational Rehabilitation Student must provide a VAF 28-1905 form. Also, should provide the DD-214 form. If the student needs assistance to complete this document, he/she must contact the Veterans Coordinator in the Registrar's office. For more information, refer to the following link: <https://www.govinfo.gov/content/pkg/PLAW-115publ407/pdf/PLAW-115publ407.pdf>

GI Bill® is a registered trademark of the U.S. Department of Veterans Affairs (VA). More information about education benefits offered by VA is available at the official U.S. government website at www.benefits.va.gov/gibill. Students eligible for Veterans benefits are required to make their financial arrangements in line with the policies of the University for all students.

GENERAL POLICY AND PROCEDURES TO EVALUATE STUDENT ACADEMIC ACHIEVEMENT

The policy and procedures for student retention, probationary status, suspension, and permanent dismissal are established mechanisms that allow for the evaluation of a student's academic achievement.

Polytechnic University of Puerto Rico requires every student to demonstrate academic progress in the number of academic credit-hours completed and the grade point average the student maintains.

DEFINITIONS

Credit-Hour

A credit-hour for Federal programs, including the Federal Student Financial Assistance programs, is defined as follows: (34CFR 600.02 of final regulations) An amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency that reasonably approximates not less than:

1. One hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one-quarter hour of credit, or the equivalent amount of time; or
2. At least an equivalent amount of work as required in paragraph (1) of this definition for other academic activities as established by the institution, including laboratory work, internships, practice, studio work, and other academic work leading to the award of credit-hours.

PUPR'S Adopted Definition of Credit-Hour

One credit-hour corresponds to fifteen (15) contact hours per term for a lecture course, and thirty (30) to forty-five (45) contact hours per term for a laboratory practicum course. Additionally, it includes a minimum of 2.5 hours of out-of-class student work each week for the twelve-week term.

Attempted Credit-Hours

Credit hours the student has registered at PUPR, and in which he/she has obtained I (with a grade), A, B, C, D, F, WU or W, WN, including all course repetitions.

Transferred Credit-Hours

Credit hours taken at other accredited institutions, which the student has passed with A, B, or C grades, and that are accepted by the Department Director of the corresponding Dean, in accordance with PUPR policy.

Passed Credit-Hours

Attempted credit-hours taken at PUPR, in which A, B, C, or D grades are obtained, except in those specific cases defined by the departments.

Grade Point Average (GPA)

The measure of academic merit achieved by the student. It is calculated by dividing the total accumulated honor points by the number of credit-hours in which the student has received final grades, including outstanding F's and WU's.

Dismissal for Academic Deficiency

A student who systematically fails to satisfy the achievement index may be permanently dismissed from PUPR, for academic deficiency.

Academic Progress

The measure that shows whether the student passes 66% of the attempted credit-hours with a grade point average equal to, or higher than, the retention index. See Table A or Table B, whichever applies.

Repeated Courses

Undergraduate courses in which a student has been enrolled two or more times. For the purpose of determining the Grade Point Average, only the highest grade obtained will be used.

Academic Year and Term

Academic Year consists of three consecutive academic periods called terms, from August 1 to July 31 of the following year. Academic Term refers to the twelve (12) weeks period during running from the first day at classes to the last day of final tests as defined on Page 11. The summer academic period is optional, and the grades will be added to the previous academic period of study. There is a one six-week summer session, and two six weeks accelerated terms within each academic twelve-week term.

Expired Credits

Courses approved seven or more years ago in this, or other institution will expire at the date of applying for readmission with the exception of those validated by the Department Director and the Faculty Dean. The student must repeat all courses declared outdated or must take other equivalent courses of the existing curriculum, with the approval of the Department Director and the Faculty Dean. These courses are considered for the calculation of the quantitative measure.

Retention Index

PUPR adopts the required retention index as seen in Table A, in accordance with the number of completed credit-hours and transferred credit-hours. Students are required to obtain a minimum grade point average of 2.00/4.00 in concentration courses for graduation purposes. This constitutes the Institutional Policy, administered by the Registrar's Office.

Retention Index (Qualitative Measure)

The institutional policy applicable to students without Federal Financial Aid is shown in the following table:

Table A. – Retention Index (Qualitative Measure) for Undergraduate Programs

Transferred Credit-Hours	Passed Credit-Hours at PUPR	Total Accumulated Credit- Hours Range	Minimum Grade Point Average (MGPA)
(1)	(2)	(1+2) 0 – 36	1.50/4.00

37 – 72	1.65/4.00
73 – 108	1.80/4.00
109 and more	2.00/4.00

Transferred credit-hours will not be used to compute the grade point average but will be counted to determine the level or year to which the student belongs.

Maximum Time Allowed to Complete Academic Degree while Receiving Federal Financial Aid (Quantitative Measure)

The second element of the Standard of Satisfactory Academic Progress is the quantitative measure. This component compares the number of credits attempted by the student in the institution, versus the number of approved credits. The student must approve at least 66% of all the credits attempted at PUPR. This measure will be cumulative.

Maximum Time to Receive Payments from Federal Financial Aid

All students must complete the graduation requirements within a maximum equivalent to 1.5 times (150%) of the program degree credits. Developmental courses will not be considered in the evaluation of the maximum time, but all courses attempted at our institution will be included. Transfer credits are also included in this measure.

Students who will be unable to complete their degree within the maximum 150% timeframe will not be eligible to receive financial aid. Students must complete graduation requirements within a maximum time equivalent to 150% of the credit-hours required by the academic degree program in which enrolled. Students who will be unable to complete their degree within the maximum 150% timeframe will not be eligible to receive financial aid at the moment the school determines that the student will not comply with this provision, not when the student arrives at the 150% timeframe.

Veterans receiving benefits must complete graduation requirements within the program's schedule time of completion (100%). Veteran's educational benefits will finish at the program's schedules time of completion of the 150% of the credit-hours required. In the event that the veteran does not complete the graduation requirements within the 150% limit, the student will not be able to continue receiving the veteran's benefits or any other federal financial aid. However, the student may receive any other financial aid available. The academic records of the veterans are always kept under the custody of the Registrar within the premises of Registrar's Office.

Probationary and Suspension Status

Students whose academic progress does not satisfy the qualitative elements will begin a probationary period that will begin a probationary period that will not exceed two consecutive academic years before being suspended for one year. After the suspension is effective, the student may return under a probationary status for a maximum period of one (1) additional academic year, at the end of which he/she may be suspended for a period of three academic years. A student may be admitted once again under probationary status for one academic year. In the event he/she does not succeed, he/she will be permanently dismissed.

Incomplete (I) with a Grade

A professor may deem necessary to give the student an incomplete (I) with a provisional grade when for justifiable reasons the student was impeded to satisfy all the course requirements. The grade is calculated by assigning a grade of "0" for the part of the work not finished. When a student completes the course requirements by the date indicated in the academic calendar, the instructor changes the provisional grade to the final grade and reports this change to the Registrar. If the instructor does not report any change within the required period, the provisional grade becomes final.

RIGHT TO APPEAL

Every student has the right to appeal the probation or suspension, issued by the Registrar's Office. The student may send an online request for reconsideration to the Academic Achievement Committee, within ten (10) labor days after notification of the decision. The student must go to www.pupr.edu, to complete the Appeal for Probation Form and supporting documentation, if needed, and carefully follow the instructions.

The request for reconsideration should state clearly the decision referred to, give a brief statement of facts, and state and justify the basis for the requested change or restitution. Once the Academic Achievement Committee makes the decision, it will be final.

ACADEMIC PROGRESS REVIEW PROCEDURES BY REGISTRAR

The academic progress of students will be measured using the qualitative element which will be verified during the summer of each academic year.

The retention index (qualitative element) will be determined according to Table A. The GPA will be computed only with credit-hours taken at PUPR. Probation, suspension, or dismissal will be determined, employing the following procedure:

1. When the accumulated index is lower than the established index as given in Table A, an academic probation period (P1) will be granted for one academic year. The Registrar's Office will notify the student of the academic status in a certified letter. At the same time, the Counseling Office will be notified to ensure the required follow-up.
2. During the probation period (P1), the student must raise the grade point average to a value equal to or higher than the corresponding index in Table A.
3. If after this probation period the student does not comply with the established condition in item 2 and does not remediate his/her academic deficiencies, he/she will be granted a second one academic year probation (P2). Whenever a student fails to succeed the probation (P2), the student will be suspended for one academic year. The Registrar's Office will notify the suspended student via certified letter.
4. After the one (1) academic year suspension, the student may be readmitted in a third probationary period (P3) for one academic year. In the event a student fails to raise the GPA above the retention index after the third probationary period (P3), the student is suspended for a period of three (3) academic years; afterward, the student may request readmission. A student may be admitted again under a fourth probationary period (P4) for one academic year. In the event he/she does not succeed, he/she will be permanently dismissed.

ACADEMIC PROGRESS REVIEW PROCEDURES FOR STUDENTS WITH FINANCIAL AID

The academic achievement of all students who qualify and receive federal financial aids will be evaluated employing, two indexes, as follow:

1. Retention Index (Qualitative Element) - This index is defined as shown in Table A.
2. Retention Index (Quantitative Element) - The minimum percentage of passed credit-hours required from each student receiving financial aid is not less than 66% of all credit-hours attempted every academic year. This means that the student must complete all the graduation requirements within the timeframe of 150% of the total credit-hours of the program chosen. The calculation of 150% takes into consideration the student's academic history. The student is not qualified to receive any further financial aid when the student is unable to complete their degree within the maximum 150% timeframe.

EXAMINATIONS

Final examinations are regularly scheduled and administered at the end of each term. Dates of final examination schedules will be published and placed on the bulletin boards of the institution.

It is the responsibility of the instructor to give two or more summative examinations each term in compliance with the syllabus, as well as a comprehensive final examination, which is compulsory for all students in a class. Besides these, the instructor may administer several other formative tests as deemed necessary in compliance with the Outcomes Assessment Plan.

READMISSION POLICY

Students who are not active during two or more consecutive terms, or who are under suspension for disciplinary or academic reasons, and wish to continue their studies, must apply for readmission to the institution.

Regular students who have discontinued their studies for one year or more will be readmitted under the procedure in effect. The applicable curriculum will be the one outlined in the Catalog in effect at the time of readmission. Each applicant will be evaluated by the Director of the Department to which the student is seeking readmission. Readmission applications must be submitted at least a

month prior to the next registration period. If a student does not register during the period requested, the application will remain active for one (1) additional term.

Procedure for Readmission

- The student will complete and submit the readmission application to the Registrar's Office.
- The student will pay a nonrefundable readmission fee.
- Upon payment of the readmission fee, the Finance Office will notify the student of any outstanding debt with the institution.
- If the student is indebted to the institution, the process of readmission is held up until the student pays the debt and receives clearance from the Finance Office.
- Registrar's Office will apply the following criteria to evaluate the readmission application:
 - Study any evidence of disciplinary measures taken or non-compliance with University regulations, and any stipulations made.
 - Verify that the student complies with the minimum GPA according to Table A (Retention Index)
 - Confirm that the student complies with the required suspension time limit.
- A student whose readmission application has been denied may appeal to the Readmission Committee through the Registrar's Office. The student will receive instructions regarding the procedure to follow in order to request reconsideration by the committee.
- If a student has a lower grade point average than required, or if the required suspension time limit has not expired and the Committee rules in favor of the student, readmission will be granted on a probationary basis.
- The conditions of the probation period will be:
 - Students must pass all courses, for which they are registered, with a grade of "C" or higher.
 - The academic load will be limited to a maximum of twelve (12) credit-hours per term.
 - The GPA should be increased or improved according to what has been established.
 - The student is obliged to repeat courses with a grade of D, F and/or WU.
- Students who have voluntarily interrupted their studies at PUPR, and during this inactive period have attended other institution(s) without prior permission from the Department Director, will have no right to request the transfer of credit-hours taken at other institution.
- The decision of the Readmission Committee will be sent to the student's email from the Registrar's Office. The decision is final.

APPLICATION FOR GRADUATION

Candidates for baccalaureate degree who have completed 80% or more of the credit-hours required must apply for graduation. The application must be completed, and a graduation fee paid no later than the date specified in the academic calendar. Applications are obtained at the Registrar's Office. The application should be returned to Registrar's Office after clearance by the Student Learning Center, Financial Aid Office and Finance Offices confirming nonexistence of debts and payment of the non-refundable graduation fee. Any alleged error in the analysis of academic records should be reported to the Registrar within a week after it has been received by the student.

Graduation Requirements

Polytechnic University of Puerto Rico reserves the right to make changes in the curricula and degree requirements whenever, in its judgment, the same are considered beneficial both for the institution and the students. As a rule, a student is entitled to graduate under the curriculum requirements in force at the time of admission to the institution. However, students who fail to fulfill the graduation requirements within the regular period assigned to their corresponding curricula, and students who re-enroll after a period of one year or more of absence are governed by the requirements applicable to the class in which they will graduate.

To receive a graduation diploma from Polytechnic University of Puerto Rico, candidates must meet the following conditions or requirements:

1. Apply for graduation after passing 80% of the program credit-hours required by filling in an application form at the Registrar's Office on the day specified in the academic calendar.

2. Pay the graduation fee and satisfy all other financial obligations to the University not later than the date specified in the academic calendar.
3. Students completing requirements in the Spring Term are required to attend the Commencement Exercises unless excused by the Dean of the corresponding academic department. Students completing requirements during the summer, next year fall and winter terms are invited to participate in next year summer commencement exercises.
4. The student should have taken the final credit-hours for the degree at PUPR with the understanding that these credit-hours correspond to at least the total credit-hours of the last year of the program as specified and described in the Catalog.
5. The student must attain a minimum cumulative grade point average of 2.00/4.00 in the student's major department courses (for engineering, major courses includes both general engineering and concentration courses), as well as a minimum cumulative grade point average of 2.00/4.00. It is highly recommended that students repeat if possible; all concentration courses passed with "D" in order to improve their GPA and assure a better dominion of the subjects.
6. For graduation with honors, the student must satisfy all the following additional criteria:
 - a. Must have completed at PUPR no less than 65% of the program credit-hours required for graduation.
 - b. Must have earned at PUPR (including all attempted credit-hours) an overall grade point average of 3.250 to 3.499 for Cum Laude; 3.500 to 3.899 for Magna Cum Laude; 3.900 to 4.000 for Summa Cum Laude.
 - c. Must be recommended by the Honors and Academic Distinctions Committee, composed of the President of the University and four members of the Academic Council appointed by the President.
7. The University celebrates Commencement Exercises once every academic year during the summer term, at which time all degrees and certificates are awarded.

CURRICULAR CHANGES

When the curriculum of any one program is revised, the Registrar will automatically initiate the transfer process of every student enrolled in said program to the revised curriculum. The student will be moved horizontally and will be required to take all the necessary courses of a level higher than that at which he/she actually is until he/she completes the number of credit-hours specified in the old curriculum. Under no circumstances will the student be asked to go and take any new courses of lower codification added to the revised curriculum. By the same token, the Department Director and the Registrar will do everything within their power to help the student transfer smoothly without the penalty of taking an excessive number of new courses.

TRANSFER OF CREDITS TO OTHER EDUCATIONAL INSTITUTIONS

Most colleges and universities accept transfer credits from regionally accredited universities, subject to limitations on elapsed time and number of credits. Although the University is regionally accredited, it remains the responsibility of the student to confirm the transferability of Polytechnic University credits to another college or university program.

CERTIFICATIONS AND TRANSCRIPTS

Whenever a student files an application with the Registrar's Office for a program of study certification, transcripts or any other official statement, the same will usually be issued by the Registrar within two weeks after filling the request. However, when a request is made at the beginning or the end of the term, a longer period for issuance may be required.

To transfer credit-hours to other colleges and universities and to supply information to certifying agencies and prospective employers, official transcripts are issued in a confidential manner. These are mailed directly to the addresses designated by the student and are never given to the student or any other individual. Students may also obtain an official copy of the transcript marked as Student Copy. Any alleged errors in the transcript should be reported to the Registrar within ten (10) days of receipt. A transcript and certification fee is charged for each transcript. All services are denied to debtor students.

DIPLOMAS

The Registrar's Office will contact graduates once the Diplomas are ready to be claimed.

CHANGE OF ADDRESS

A student may submit a change of address at any time at the Registrar's Office. If a change of address is not indicated, the University will not be responsible for correspondence it sends which is not received by the student. Any notice, official or otherwise, mailed to a student's address as it appears in the records shall be deemed enough notice in case of any claim.

STANDARDIZED EXAMINATIONS

The University will accept a maximum of 30 credit hours of standardized testing credit. All such credit will be listed on the student's transcript and will not be removed once it has been recorded. Students may receive credit after successfully completing any of the following standard examinations: College Level Examination Program (CLEP) and/or Defense Activity for Non-Traditional Educational Support (DANTES).

AGREEMENT BETWEEN HILLSBOROUGH COMMUNITY COLLEGE AND**POLYTECHNIC UNIVERSITY OF PUERTO RICO – ORLANDO CAMPUS**

The courses a student completes at HCC meet PUPR requirements in each general education category or elective category on a course-by-course basis. Where no comparable courses exist, the space for the course name is left blank. Articulated with: PUPR Bachelor in Business Administration and Bachelor of Science in Civil, Electrical, Mechanical, Environmental, or Computer Engineering.

Bachelor in Business Administration Track
General Education Courses

Course	Title	Credit-Hours
ENC 1101	Composition I	3
ENC 1102	Composition II	3
SPC 1608	Introduction to Public Speaking	3
Humanities	Elective	6
Mathematics	MATH 0110 / College Algebra	6-7
Science	Biological / Physical Science	Up to 8
Social Science	ECO 2013/ Psychology / History / Political Science	9
ACG 2021	Financial Accounting	3
ACG 2071	Managerial Accounting	3
MGMT 2020	Business Law I	3
CGS 1000	Introduction to Computers and Technology	3
ECON 3010	Microeconomics	3
FINA 2010	Principles of Finance	3
MAN 2021	Principles of Management	3
MARK 1010	Marketing	3

Bachelor of Science in Civil Engineering Track
General Education Courses

Course	Title	Credit-Hours
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ENC 1101	Composition I	3
ENC 1102	Composition II	3
SPC 1608	Introduction to Public Speaking	3
Humanities	Elective	6
MAC 2311	Calculus/Analytic Geometry	5
MAC 2312	Calculus/Analytic Geometry II	5
PHY 2048	Physics with Calculus I	4
PHY 2048	Physics with Calculus I lab	1
Biological Science		3-4
Social Science	ECO 2013 / Psychology / History or Political Science	9
General Education Electives		6
CGS 1000	Introduction to Computers and Technology	3
CHM 2045	General Chemistry I	3
CHM 2045L	General Chemistry I Lab	1
MAC 2313	Calculus/Analytic Geometry III	5
PHY 2049	Physics with Calculus II	4
PHY 2949L	Physics with Calculus II Lab	1

Bachelor of Science in Environmental Engineering Track

Course	Title	Credit Hours
ENC 1101	English Composition I	3
ENC 1102	English Composition II	3
SPC 1608	Introduction to Public Speaking	3
Humanities	ELECTIVE	6
MAC 2311	Calculus/Analytic Geometry	5
MAC 2312	Calculus/Analytic Geometry II	5
PHY 2048	Physics with Calculus I	4
PHY 2048	Physics with Calculus I lab	1
Biological Science		3-4
Social Science	ECO 2013 / Psychology / History or Political Science	9
General Education Electives		6
EVS 2893C	Environmental Sampling and Analysis I	5
EVS 2894C	Environmental Sampling and Analysis II	5
EVS 2895C	Environmental Sampling and Analysis III	5
MET 2010C	Meteorology	3
GIS 1041	Survey of Geographic Information Systems and Global Positioning (GPS)	1
EVS 1026	Chemistry and Biology of Natural Waters	4

Bachelor of Science in Mechanical Engineering Track

Course	Title	Credit Hours
ENC 1101	English Composition I	3
ENC 1102	English Composition II	3
SPC 1608	Introduction to Public Speaking	3
Humanities	Elective	6
MAC 2311	Calculus/Analytic Geometry	5
MAC 2312	Calculus/Analytic Geometry II	5
MAC 2312	Calculus/Analytic Geometry II	5
MAP 2302	Differential Equations	3
PHY 2048	Physics with Calculus I	4
PHY 2048	Physics with Calculus I lab	1

Biological Science		3-4
Social Science	ECO 2013 / Psychology / History or Political Science	9
General Education Electives		6
ETD 1320C	Computer-Aided Drafting for Engineering	3
PMT 1250C	Computer Numerical Control (CNC) I	3
PMT 2254	Computer Numerical Control (CNC) II	3
ETS 2527	Electromechanical Components and Mechanisms	3
ETS 1535	Automated Process Control	3
ETI 1420	Manufacturing Processes & Materials	3
ETM 1010C	Mechanical Measurement and Instrumentation	3
Group A:		3
ETI 1110	Introduction to Quality	
ETI 1622	Concepts of Lean and Six Sigma	
ETI 1644	Production and Inventory Control	
ETI 1701	Industrial Safety	
ETI 1802	Introduction to Process Technology	
ETI 1810C	Introduction to Electricity and Electronics	
ETI 1843	Motors and Controls	
Group B:		3
ETM 2315	Hydraulic and Pneumatic Systems	
ETM 2315L	Hydraulic and Pneumatic Lab	
Group C:		3
ETD 2364C	Introduction to 3D Computer Aided Design	
EGN 2122C	Geometric Dimensioning & Tolerance	
ETS 1540	Industrial Applications Using PLC's and Robotics	

Bachelor of Science in Computer Engineering and Electrical Engineering Track

Course	Title	Credit Hours
ENC 1101	English Composition I	3
ENC 1102	English Composition II	3
SPC 1608	Introduction to Public Speaking	3
Humanities	Elective	6
MAC 2311	Calculus/Analytic Geometry	5
MAC 2312	Calculus/Analytic Geometry II	5
PHY 2048	Physics with Calculus I	4
PHY 2048L	Physics with Calculus I Lab	1
Biological Science		3-4
Social Science	ECO 2013 / Psychology / History or Political Science	9
General Education Electives		6
CGS 1000	Introduction to Computers and Technology	3
CHM 2045	General Chemistry I	3
CHM 2045L	General Chemistry I Lab	1
MAC 2313	Calculus/Analytic Geometry III	5
PHY 2049	Physics with Calculus II	4
PHY 2949L	Physics with Calculus II Lab	1

**AGREEMENT BETWEEN VALENCIA COMMUNITY COLLEGE
AND POLYTECHNIC UNIVERSITY OF PUERTO RICO – ORLANDO CAMPUS**

The courses a student completes at VC meet the PUPR requirements in each general education category or elective category on a course-by-course basis. Where no comparable courses exist, the space for the course name is left blank. Articulated with: PUPR Bachelor of Science in Civil, Electrical, Mechanical, Environmental, or Computer Engineering

**Bachelor of Science in Civil and Environmental Engineering Track
General Education Courses**

Course	Title	Credit Hours
ENC 1101	English Composition I	3
ENC 1102	English Composition II	3
SPC 1608	Fundamentals of Speech	3
PHI 2600	Ethics and Critical Thinking (HUM inst. GR)	3
One (1) Gen. Ed. Humanities course (core)		3
One (1) Gen. Ed. Social Science (core)		3
SLS 1122	New Student Experience	3
Social Science Gen. Ed. institutional (GR)		3
CHM 1025	Introduction to General Chemistry*	4
MAC 2311	Calculus and Analytic Geometry I*	4
MAC 2312	Calculus and Analytic Geometry II*	4
MAC 2313	Calculus and Analytic Geometry III*	4
MAP 2302	Differential Equations*	3
PHY2049C	General Physics with Calculus II*	4
EGN 2440	Probability and Statistics for Eng.*	3
EGN 2312	Engineering Analysis Statics*	3
EGN 1007C	Engineering Concepts & Methods*	1
EGN 2322	Engineering Analysis Dynamics*	3
EGS 2373	Principles of Electrical Eng.* OR	3
EGS 2004	Electrical Networks*	

Bachelor of Science in Mechanical Engineering Track

Course	Title	Credit Hours
ENC 1101	English Composition I	3
ENC 1102	English Composition II	3
SPC 1608	Fundamentals of Speech	3
PHI 2600	Ethics and Critical Thinking (HUM inst. GR)	3
One (1) Gen. Ed. Humanities course (core)		3
One (1) Gen. Ed. Social Science (core)		3
SLS 1122	New Student Experience	3
Social Science Gen. Ed. institutional (GR)		3
CHM 1025C	Introduction to General Chemistry*	4
MAC 2311	Calculus and Analytic Geometry I*	4
MAC 2312	Calculus and Analytic Geometry II*	4
MAC 2313	Calculus and Analytic Geometry III*	4
MAP 2302	Differential Equations*	3
PHY 2049C	General Physics with Calculus II*	4

EGN 2440	Probability and Statistics for Eng.*	3
EGN 2312	Engineering Analysis Statics*	3
EGN 1007C	Engineering Concepts & Methods*	1
EGN 2322	Engineering Analysis Dynamics*	3
EGS 2373	Principles of Electrical Eng.* OR	3
GS 2004	Electrical Networks*	

Bachelor of Science in Computer Engineering and Electrical Engineering Track

Course	Title	Credit Hours
ENC 1101	English Composition I	3
ENC 1102	English Composition II	3
SPC 1608	Fundamentals of Speech	3
PHI 2600	Ethics and Critical Thinking (HUM inst. GR)	3
One (1) Gen. Ed. Humanities course (core)		3
One (1) Gen. Ed. Social Science (core)		3
SLS 1122	New Student Experience	3
Social Science Gen. Ed. institutional (GR)		3
CHM 1025C	Introduction to General Chemistry*	4
MAC 2311	Calculus and Analytic Geometry I*	4
MAC 2312	Calculus and Analytic Geometry II*	4
MAC 2313	Calculus and Analytic Geometry III*	4
MAP 2302	Differential Equations*	3
PHY 2049C	General Physics with Calculus II*	4
EGN 2440	Probability and Statistics for Eng.*	3
EGS 2004	Electrical Networks*	3
COP 2220C	Programming*	3
EGN 1007C	Engineering Concepts & Methods*	1
COP 2800C	Java Programming*	3

MATHEMATICS AND SCIENCE DEPARTMENT

The Mathematics and Science Department continually reassess its standards, encouraging excellence in instruction, academic performance, and service to the surveying, business administration, architecture, and engineering, and education programs. A strong foundation in mathematics and sciences is essential for the study of computer science, engineering, management, and education. The specific requirements for each major program are given in the sections devoted to the departments. Science and mathematics requirements should be completed to the fullest extent possible during the freshman and sophomore years. Skills and competencies developed in the courses are applicable in the courses to be taken in each program. High School algebra, geometry, and trigonometry or the equivalent and a satisfactory score on the mathematics placement test are prerequisites to all credit-hour courses in the department. Superior students in mathematics, regardless of their major preference, are encouraged to consult with the department before registration concerning the possibility of advanced placement. To meet the special needs of the students, the department offers classes from 8:00 a.m. to 10:30 p.m.

Department Mission

To provide academic background in mathematics and sciences essential to the study of surveying, business administration, architecture, and engineering, and education. Mathematics courses provide students the language to express properly based on

logical reasoning and reflective thought and promote the use of tools and techniques to solving problems. Science courses, through the promotion of scientific-based knowledge, allow the employment of fundamental principles and the use of elements of the scientific method to explain physical or natural phenomena or behavior.

Department Academic Objectives

The Department of Mathematics and Science will empower the students to acquire the skills and competencies needed toward the completion of their respective academic programs. The students will be able to:

1. Apply the fundamental principles and concepts of mathematics and science required by the chosen program.
2. Identify, formulate, and solve problems using mathematical methods, technological tools and fundamental principles of science required by the program chosen.
3. Communicate effectively with others orally and in writing, specifically in scientific and mathematical terms.
4. Engage appropriately in a teamwork environment using cooperative and collaborative approach toward the solution of a problem.
5. Understand and be aware of the importance of mathematics and science in a global, economic, environmental, and societal context.
6. Recognize the elements of the Scientific methods necessary to develop scientific research.

Department Expected Outcomes

The Department of Mathematics and Sciences is committed to demonstrating that students served will be able to:

1. Apply knowledge of mathematics and science.
2. Conduct research or experiments, as well as analyze data and draw conclusions.
3. Work as part of a team.
4. Identify, formulate, and solve problems.
5. Communicate effectively in scientific and mathematical terms.
6. Recognize the elements of the Scientific Method.

Laboratories

Laboratory facilities are available for chemistry, physics, mathematics, biology, and microbiology science courses. The facilities include equipment and materials necessary to develop skills through hands-on laboratory experiences.

Developmental Studies Component

The Mathematics and Science Department offers the following developmental courses.

Math/Science and Math Developmental Courses		
Course	Title	Credit-Hours
MATH 0102	Preparatory Mathematics	3
MATH 0106	Elementary Algebra	3
MATH 0110	Intermediate Algebra	3
MATH 1330	Precalculus I	3
MATH 1340	Precalculus II	3
SCIE 1110	General Biology	3
SCIE 1111	General Biology Laboratory	1
MATH 1350	Calculus I	4
MATH 1360	Calculus II	4
MATH 1370	Calculus III	4
MATH 1371	Seminar in Applied Math	1
MATH 2350	Differential Equations	3

SCIE	1210	Principles of Chemistry	3
SCIE	1211	Principles of Chemistry Laboratory	1
SCIE	1214	General Chemistry I	3
SCIE	1215	General Chemistry I Laboratory	1
SCIE	1220	General Chemistry II	3
SCIE	1221	General Chemistry II Laboratory	1
SCIE	1230	Organic Chemistry	3
SCIE	1231	Organic Chemistry Laboratory	1
SCIE	1430	Physics I	4
SCIE	1431	Physics I Laboratory	1
SCIE	1440	Physics II	4
SCIE	1441	Physics II Laboratory	1
SCIE	2110	Environmental Microbiology	3
SCIE	2111	Environmental Microbiology Laboratory	1
SCIE	2410	General Physics I	3

COURSE DESCRIPTIONS - MATHEMATICS AND SCIENCE DEPARTMENT

MATH 0102 – PREPARATORY MATHEMATICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: Placement by Admissions Office.

Study of basic operations on natural, whole integers, rational, irrational numbers. Includes also fundamental properties of arithmetic, percent, ratio and proportion, elements of algebra and basic operations.

MATH 0106 – ELEMENTARY ALGEBRA

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: MATH 0102 or equivalent; placement by Admissions Office or at least 70% in the departmental placement test.

Study of elements of algebra; polynomial-basic operations; algebraic fractions; exponents and radicals and applications. Introduces properties of real numbers; fundamental operations and elements of algebra; factoring, fractions, exponents; roots and radicals.

MATH 0110 – INTERMEDIATE ALGEBRA

Three credit-hours. Prerequisites: MATH 0106 or Placement Test by Admission Office

A detailed introduction to the fundamental concepts of algebra. Topics include linear and quadratic equations, graphing, functions, inequalities, rational expressions, radicals, and system of equations. The course emphasizes critical thinking and problem-solving skills.

MATH 1310 – APPLIED MATHEMATICS FOR BUSINESS I

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: MATH 0110 or equivalent; placement by Admissions Office.

This course is designed for students enrolled in Business Administration options. It includes the study of linear, exponential and logarithmic functions, and its applications to areas related to business and depreciation, average rate of change, marginal cost, simple and compound interest, investments and others. Also, it includes systems of linear equations and matrices, Gauss-Jordan method, linear programming, and the simplex method.

MATH 1320 – APPLIED MATHEMATICS FOR BUSINESS II

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: MATH 1310 or equivalent; placement by Admissions Office.

This course includes the study of those topics related to the principles of accounting, basic probability theory, permutations and combinations, introduction to differential and integral calculus, and its applications to continuous interest, marginal analysis, curve sketching, optimization functions of cost, revenue and profit, areas under curves.

MATH 1330 – PRECALCULUS I

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: MATH 0110 or equivalent; Placement by Admissions Office or at least 70% in the departmental placement test.

Relations and functions; linear and quadratic functions; curve sketching, rational functions, polynomial functions, synthetic division, remainder and factor theorems; zeros of polynomials; graphs; trigonometric functions and graphs; sine and cosine laws, solutions of right and oblique triangles, identities and trigonometric equations; and inverse functions.

MATH 1340 – PRECALCULUS II

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: MATH 1330 or equivalent; Placement by Admissions Office or at least 70% in the departmental placement test.

This course includes the study of trigonometry and its applications, complex numbers operations and De Moivre's Theorem, matrix and linear algebra, study of systems of linear equations, determinants and Cramer's Rule; vectors; analytic geometry and the conic sections, exponential and logarithmic functions and their applications.

MATH 1350 – CALCULUS I

Four credit-hours. Two two and a half-hour lecture periods per week. Prerequisites: MATH 1340 or equivalent; Placement by Admissions Office or at least 70% in the departmental placement test.

This course will acquaint the student with the concepts of limits and their properties, the derivative and its applications; finding derivatives by means of rules; chain rule, higher order derivatives; maxima and minima; related rates of changes; curve sketching using derivatives, definite and indefinite integral; area under a curve, differentiation and integration of logarithmic, exponential and other transcendental functions; Inverse trigonometric functions; differentiation and integration; area between curves, volumes of solids of revolutions; arc length, surfaces of revolution; moments, centers of mass and centroids.

MATH 1360 – CALCULUS II

Four credit-hours. Two two and half-hour lecture periods per week. Prerequisite: MATH 1350 or equivalent; Placement by Admissions Office.

This course will acquaint the student with the concepts of: Integration techniques, indeterminate forms and L'Hospital's Rule; improper integrals. Includes the study of infinite sequences and infinite series; Taylor and Maclaurin polynomials, power series; conics; parametric equations: area, length of a curve and, surface area; polar coordinates and polar graphs, area and length in polar coordinates; vectors in the plane, space coordinates and vectors in space, dot and cross product; lines, planes, surfaces in space, cylindrical and spherical coordinates.

MATH 1370 – CALCULUS III

Four credit-hours. Two two and half-hour lecture periods per week. Prerequisite: MATH 1360

This course will acquaint the student with the concepts of vectors-valued functions: differentiation and integration velocity and acceleration, tangent and normal vectors, arc length and curvature. Includes the study of function of several variables: limit, continuity, partial derivatives and their applications, Lagrange multipliers; multiple integrals and their applications, change of variables: polar coordinates, cylindrical and spherical coordinates, vector fields, line integrals, conservative vector fields, Stokes's, Green's and Gauss's Theorems.

MATH 1371 – SEMINAR IN APPLIED MATH

One credit-hours. One one and half-hour lecture period per week. Prerequisite: MATH 1370

Topics are limited to those which are not part of the content of regular courses offered by the department. Credit-hours earned can fulfill the requirement for mathematics component credit-hours and which would serve to stimulate further advanced studies in Mathematics.

MATH 2350 – DIFFERENTIAL EQUATIONS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: MATH 1360, SCIE 1430

Includes the solution and applications of first-order differential equations, linear differential equations of higher order and applications, differential equations with variable coefficients, Laplace transforms, and its applications.

SCIE 1110 – GENERAL BIOLOGY

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None. Corequisite: SCIE 1111

Introduction to biological concepts as a vital tool for understanding our world and for meeting many of the personal and global challenges that student confronts today. It includes topics such as: heredity and evolution; the study of living beings with a particular emphasis on human biology; eco-systems and their characteristics.

SCIE 1111 – GENERAL BIOLOGY – LABORATORY

One credit-hour. One three-hour laboratory periods per week. Prerequisite: None. Corequisite: SCIE 1110

This laboratory course complements the biological concepts being studied in class. Laboratory exercises involving the basic principles of biology, in particular, to how they relate everyday life, health and the environment.

SCIE 1210 – PRINCIPLES OF CHEMISTRY

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MATH 1330. Corequisite: SCIE 1211

Introduction to the fundamental principles of chemistry with an emphasis in the principles of matter and its properties, atomic structures, molecular structure, chemical bonding, Stoichiometry, Laws of Gases, chemical reactions, chemical composition of compounds, solutions, gases, acids, and bases.

SCIE 1211 – PRINCIPLES OF CHEMISTRY – LABORATORY

One credit-hour. Two two-hour laboratory periods per week. Prerequisite: MATH 1330, Corequisite: SCIE 1210

This laboratory course complements the concepts being studied in class. It includes hands-on experience experiments such as: 1. Safety in the Lab, 2. Mass, Volume and Density, 3. Molecular Structure and Covalent Bonding, 4. Colligative Properties and 5. Acids, Bases, and Titration.

SCIE 1214 – GENERAL CHEMISTRY I

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MATH 1330. Corequisite: SCIE 1215

This course emphasizes in the Principles of matter and its properties, atomic structures, molecular structures, chemical bonding, Stoichiometry, Laws of Gases, chemical reactions, chemical composition of compounds, solutions, acids and bases, gases, and thermochemistry.

SCIE 1215 – GENERAL CHEMISTRY I LABORATORY

One credit-hour. Two two-hour laboratory periods per week per week. Prerequisite: MATH 1330. Corequisite: SCIE 1214

This laboratory course complements the concepts being studied in class. It includes hands-on experience such as safety, matter and measurement, density, molecular structure and covalent bonding, titrations, gas laws, colligative properties, and calorimetry.

SCIE 1220 – GENERAL CHEMISTRY II

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: SCIE 1214, SCIE 1215, MATH 1340. Corequisite: SCIE 1221

This course emphasizes the following topics: intermolecular forces, solution, kinetics, equilibrium, oxidation and reduction reactions, acids and bases; electrochemistry, thermodynamics, and organic principles.

SCIE 1221 – GENERAL CHEMISTRY II – LABORATORY

One credit-hour. Two two-hour laboratory periods per week. Prerequisites: SCIE 1214, SCIE 1215, MATH 1340. Corequisite: SCIE 1220.

This laboratory course complements the concepts being studied in class. It includes hands-on experience in chemical equilibrium and equilibrium constant, solutions, Aspirin synthesis, colligative properties, acids and bases, and titrations.

SCIE 1230 – ORGANIC CHEMISTRY

Three credit-hours. Two two-hour laboratory periods per week. Prerequisites: SCIE 1220, SCIE 1221, MATH 1350. Corequisites: SCIE 1231, MATH 1360

This course emphasizes the study of functional groups and their reactions, conformation, structure, properties, nomenclature, reaction mechanism and synthesis.

SCIE 1231 – ORGANIC CHEMISTRY LABORATORY

One credit-hours. Two two-hour laboratory periods per week. Prerequisites: SCIE 1220, SCIE 1221, MATH 1350. Corequisites: SCIE 1230, MATH 1360

This laboratory course complements the concepts being studied in class. It includes hands-on experience in molecular structure, synthesis, separation and purification techniques and analysis for product characterization.

SCIE 1430 – PHYSICS I

Four credit-hours. Two two-and-a-half-hour lecture periods per week. Prerequisite: MATH 1350. Corequisite: SCIE 1431

A calculus-based course emphasizing the principles and applications of mechanics, concept and principles of fluid mechanics, oscillations, and waves. Includes kinematic in one, two and three dimensions, Newton's Laws, work and energy, rotation, gravity, static equilibrium of a rigid body, and conservation of momentum. Concepts and principles of fluid mechanics such as density, specific gravity, pressure, Pascal's principles, Archimedes' principles, Continuity Equation and Bernoulli's Equation.

Concepts and principles of simple harmonic oscillation, damped oscillation, forced oscillation, mechanical waves, stationary waves, sound waves, and Doppler's effect.

SCIE 1431 – PHYSICS I – LABORATORY

One credit-hour. One three-hour laboratory period per week. Prerequisite: MATH 1350. Corequisite: SCIE 1430

The first of a sequence of two laboratory courses, the experiences in this laboratory are designed to complement the Physics I course.

SCIE 1440 – PHYSICS II

Four credit-hours. Two two and a half-hour lecture periods per week. Prerequisites: SCIE 1430, SCIE 1431, MATH 1360. Corequisite: SCIE 1441.

A calculus-based course emphasizing the principles and applications of electricity and magnetism such as electric fields, electric potential, capacitance, dielectrics and electrostatic energy, electric current, direct current circuits, magnetic field Gauss' Law and sources, and magnetic induction Maxwell's Equations and Electromagnetic Waves. Include also principles and applications of general thermodynamics such as heat, temperature, Zero Law of Thermodynamics, thermal equilibrium, First Law of Thermodynamics, Second Law of Thermodynamics, Thermodynamics process, and Carnot's cycle.

SCIE 1441 – PHYSICS II – LABORATORY

One credit-hour. One three-hour laboratory period per week. Prerequisites: SCIE 1430, SCIE 1431, MATH 1360. Corequisite: SCIE 1440

A continuation of Physics Laboratory Experiments on the fundamental laws of physics to complement the Physics II course.

SCIE 2110 – ENVIRONMENTAL MICROBIOLOGY

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: SCIE 1214, SCIE 1215. Corequisite: SCIE 2111

A course designed to introduce the basic concepts and principles of microbiology, roles microorganisms play in such fields as food production, engineering; microbiology and public health; how microorganisms contribute to the quality of life and the industrial processes; how certain microorganisms respond to environmental stimuli.

SCIE 2111 – ENVIRONMENTAL MICROBIOLOGY LABORATORY

One credit-hour. One three-hour laboratory period per week. Prerequisites: SCIE 1214, SCIE 1215. Corequisite: SCIE 2110

Laboratory experiments involving the basic principles of microbiology as they affect engineering problems encountered in connection with water supplies, sewage systems, and the overall environment.

SCIE 2410 – GENERAL PHYSICS I

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MATH 1340.

Introduction to mechanics: Newton's Laws, motion and equilibrium, work and energy, physical properties of solids, fluids and heat. Laboratory demonstrations are used in class to provide further explanation of topics. A course designed for Surveying and Architecture students only.

FACULTY

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SOCIO-HUMANISTIC STUDIES DEPARTMENT

The course contents of the Socio-Humanistic Studies Department are suitable, rigorous, and span a wide variety of contemporary issues to support Engineering, Surveying and Geomatics Science, Architecture, Management, and Education programs.

Through our program, students will be able to attain college-level proficiency in global culture and literature, oral and written communication skills, critical thinking, ethics, and information literacy competencies.

Program Mission

To contribute, as a supportive academic department, in developing a well-rounded education in the fields of Engineering, Land Surveying, Architecture, Management Entrepreneurship, and Education by providing a comprehensive and meaningful Socio-Humanistic knowledge toward the development of a socially responsible professional.

Program Educational Objectives

Educate students in such a manner that they:

1. Develop a significant learning of general culture.
2. Develop reflective and critical thinking.
3. Develop basic language skills in both Spanish and English.
4. Recognize the importance of world literature.
5. Practice a foreign language.
6. Recognize the usefulness of literacy information.
7. Evaluate the importance of social, legal, ethics of contemporary issues.

Program Expected Outcomes

The students will be able to:

1. Demonstrate their ability and knowledge about global culture.
2. Demonstrate ability to understand their social and ethical responsibility.
3. Develop and apply critical thinking skills.
4. Demonstrate oral, listening, written, and reading competencies.
5. Develop and practice foreign language communication skills.
6. Develop lifelong learning abilities.
7. Recognize and analyze the influence of contemporary issues.
8. Judge the ethical component of contemporary issues.

Developmental Studies Component

The Socio-Humanistic Studies Department offers the following developmental courses.

Developmental Courses

Course	Title	Credit-Hours
ENGL 0100	Preparatory English	3
ENGL 0110	English Grammar	3
ESOL 0100	Beginner English as a Second Language	3
ESOL 0110	Intermediate English as a Second Language	3
ESOL 0120	Advanced English as a Second Language	3

General Education Humanities
 (15 Credit-Hours)

Course	Title	Credit-Hours
ENGL 1020	English Composition I	3
ENGL 1021	English Composition II	3
ETH 2020	Ethics in Engineering	3
ENGL 1026	Fundamentals of Speech Communications	3
WOHI 2012	World Civilization I	3

General Education Humanities Electives
 (3 Credit-Hours)

Course	Title	Credit-Hours
SOHU 3060	Selected Topics in Socio-Humanistic Studies	3
SOHU 2010	Socio-Humanistic Studies I	3
ENGL 2010	Analysis of World Literature	3
HIST 3050	History and Art Appreciation	3
SPAN 0120	Elementary Spanish I	3
SPAN 0130	Elementary Spanish II	3

General Education Social Science Electives
 (3 Credit-Hours)

Course	Title	Credit-Hours
PSYC 1010	Introduction to Psychology	3
SOHU 3060	Selected Topics in Socio-Humanistic Studies	3
SOHU 2010	Socio-Humanistic Studies I	3

COURSE DESCRIPTIONS**ENGL 0100 – PREPARATORY ENGLISH**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: Placement by Admissions Office.

The course is designed to develop basic written and oral skills. It promotes oral communication and personal expression, giving special emphasis to the development of vocabulary. By performing language functions, students acquire the basic skills of the English language.

ENGL 0110 – ENGLISH GRAMMAR

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: Placement by Admissions Office or ENGL 0100.

Fundamental course in language designed to provide students with grammar skills in English for listening and writing, with emphasis on increasing student's capability of developing logical thinking both in speaking and writing.

ENGL 1020 – ENGLISH COMPOSITION I

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENGL 0110.

A course designed to develop reading and thinking skills necessary to comprehend a reading text in a meaningful way. It focuses on oral and written answers of discussion questions and summaries of selections discussed in class.

ENGL 1021 – ENGLISH COMPOSITION II

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENGL 1010

This is a required general education course in college level writing and builds on the foundation of English Composition I. Further development of student's skills in composition, essay, communication, and research are included.

ENGL 1026 – FUNDAMENTALS OF SPEECH COMMUNICATION

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENGL 1010, ESL 0120 or Placement by Admissions Officer.

Students will be able to demonstrate understanding of the principles of oral communication between sender and receiver. Students will be able to prepare and orally present a message according to specific assignment guidelines. Students will be able to listen with literal and critical comprehension, including self-assessment and peer assessment of oral presentations.

ENGL 2010 – ANALYSIS OF WORLD LITERATURE

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENGL 1010.

A comprehensive study of fiction, poetry, and drama to help students achieve a global understanding and comprehension of literary works.

ESOL 0100 – BEGINNER ENGLISH AS A SECOND LANGUAGE

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None. Placement by Admissions Office.

This is the first course of a sequence of three levels ESL courses. In this first level, the student will improve listening, speaking and pronunciation skills in English. Emphasis is on developing students' ability to listen and understand. Through interactive activities, students will develop fluency in their verbal communication skills. The verbs tense to be discussed are simple present, simple past, present continuous, future with "going to".

ESOL 0110 – INTERMEDIATE ENGLISH AS A SECOND LANGUAGE

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None. Placement by Admissions Office.

This is the second course of a sequence of three levels ESL courses. In this second level, the student will intensively practice and develop their English language writing, grammar, reading, speaking, listening, and vocabulary skills in English. The instructor teaches students the skills of self-monitoring in the context of situations, which require the use of English for communication. The verbs tense to be discussed are past perfect, past perfect continuous, and passive simple present. Through interactive activities, students will develop fluency in their verbal communication skills.

ESOL 0120 – ADVANCED ENGLISH AS A SECOND LANGUAGE

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None. Placement by Admissions Office.

This is the third and last course of a sequence of three levels ESL courses. In this third level the student will enhance the listening, speaking and pronunciation skills in English. Students self-monitor in formal and informal situations, which require communication. Through interactive activities, students will develop fluency in their verbal communication skills. The verbs tense to be discussed are, Modals related to past events, future perfect, causative verb forms, past conditional and passive.

ETH 2020 – ETHICS IN ENGINEERING

Three credit-hours. Two two-hour lecture periods per week Prerequisite: None

Study of the philosophical and legal aspects of ethics and their application to professional responsibility in the field of engineering.

HIST 3050 – HISTORY AND ART APPRECIATION

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None.

Brief history of art since the prehistoric era to present. Appraisal of works of art through the study of the principles of art appreciation and visual analysis.

PSYC 1010 – INTRODUCTION TO PSYCHOLOGY

Three credit- hours. Two two-hour lecture periods per week. Prerequisites: None

This course is designed to be an overview of the field of psychology. It provides a basic understanding of human behavior.

SOHU 2010 – SOCIO-HUMANISTIC STUDIES I

Three credit – hours. Two two-hour lecture periods per week. Prerequisite: None

Analysis of fundamental concepts and problems common to the humanities and the social sciences from a historical perspective. The following topics are analyzed: the conceptual framework of the humanities and the social sciences, the human organization in society, the human being and his environment, the science of human behavior, methods of study and analysis of personality.

SOHU 2030 – INTRODUCTION TO SOCIOLOGY

Three credit-hour. Two two-hour lecture periods per week. Prerequisite: None

An overview of society with emphasis on the relationships between human culture and the individual. It looks at cultural norms, the organization of society, human behavior in groups, social institutions, and the implications of social change.

SOHU 3060 – SELECTED TOPICS IN SOCIO-HUMANISTIC STUDIES

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Intensive analysis of special topics related to the field of humanities and/or social sciences.

SPAN 0120 – SPAN 0130 (ELEMENTARY SPANISH I & II)

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

A course designed for beginners to acquire proficiency in the basic skills of Spanish listening/understanding, speaking, reading, and writing. Emphasis is placed on vocabulary and pronunciations.

WOHI 2012 – WORLD CIVILIZATION

Three credit hours. Two two-hour lecture periods per week. Prerequisites: None

A survey course emphasizing world civilizations from the prehistoric period to the 18th century. Discussion traces events which have shaped our cultural history.

FACULTY

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UNDERGRADUATE PROGRAMS

SCHOOL OF ENGINEERING, SURVEYING, AND GEOSPATIAL SCIENCE DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING AND LAND SURVEYING

The Department of Civil & Environmental Engineering and Land Surveying offers three undergraduate programs leading to a bachelor's degree. These are the Bachelor of Science in Civil Engineering, the Bachelor of Science in Environmental Engineering and the Bachelor of Science in Land Surveying and Mapping. The Civil Engineering program is accredited by the Engineering Accreditation Commission of ABET (www.abet.org). The Land Surveying and Mapping Program is accredited by the Applied and Natural Science Accreditation Commission of ABET. The Department also offers a program that leads to an Associate Degree in Land Surveying. The Bachelor of Science in Land Surveying and Mapping and the Associate Degree in Land Surveying are offered only in the San Juan Campus, although some of the courses may be offered in the Orlando Campus as Technical Electives.

CIVIL ENGINEERING PROGRAM

Civil engineers are responsible for providing the world's infrastructure facilities, which are basic to the existence of modern society. These facilities can be large and complex, thus requiring the civil engineers to be broadly trained and able to deal with the latest technologies. The goal of the Civil Engineering Program at Polytechnic University of Puerto Rico is to develop in the students a professional knowledge of the technology needed to enter into these highly competitive fields and to prepare the graduates to pursue a productive civil engineering career that is characterized by continued professional growth. The student develops the ability to apply pertinent knowledge to the practice of engineering design in the major discipline areas of civil engineering: Structural Engineering, Geotechnical Engineering, Highway and Transportation Engineering, Water Resources and Environmental Engineering, and Construction Engineering. This engineering design experience is built upon the fundamental concepts of mathematics, basic sciences, engineering sciences, and the humanistic and social sciences. This will provide civil engineers a healthy self-image, a well-rounded knowledge of their role in society, the ability to communicate and to develop their creativity to apply engineering design with originality. The graduates of the Bachelor of Science in Civil Engineering Program will have the theoretical and conceptual knowledge, the capability to use modern technologies effectively, and the basic technical skills to successfully work as engineers, to pursue graduate studies, to become engineers in training, and to continue their professional development and education on their way to become practicing professional civil engineers with a sense of social responsibility.

Program Mission

The mission of the Civil Engineering Program is to prepare and motivate students from diverse backgrounds to achieve excellence through intellectual, humanistic, scientific, and technological advancement on their way to becoming practicing professional civil engineers with a sense of social responsibility.

Program Educational Objectives

Within a few years of graduation, the PUPR Civil Engineering Program graduates are expected to attain the following:

1. Establish themselves as practicing professionals in the industry and government of their communities in accordance with the standards and ethics of the profession.
2. Demonstrate professional competence by holding positions of increasing responsibility in a civil engineering field.
3. Contribute to their organizations by serving as liaisons in a bilingual (Spanish-English) environment, performing as effective leaders and as active members of a professional team.
4. Enhance their professional knowledge through a lifetime of continuing education and through active participation in professional societies.

Student Outcomes

The graduates of the Civil Engineering Program will have:

1. an ability to identify, formulate, analyze, and solve complex engineering problems in at least four civil engineering technical areas (structural, geotechnical, transportation, water resources, environmental, and construction engineering) by applying principles of engineering, basic sciences, mathematics through differential equations, and probability and statistics

2. an ability to apply engineering principles and basic concepts in project management, business, and public policy to design a system, component, or process in at least two civil engineering technical areas to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional licensure responsibilities in civil engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, societal, and sustainability contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze, and interpret data in at least two civil engineering technical areas, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Career Opportunities

Civil engineers are involved in almost all aspects of public works and utilities infrastructure development. They provide the engineering design of a multistory building, a highway, a bridge, a retaining wall, a water supply system, a storm sewer, a sanitary sewer system, a dam, among other things. They may analyze the hydrologic conditions of a particular area, the mechanical properties of soils, the transportation needs of a community, or the expected behavior of a structure. They may also plan, overview, and manage the execution of the jobs previously mentioned.

Degree Offered

The Department of Civil and Environmental Engineering and Land Surveying offers undergraduate instruction leading to the degree of Bachelor of Science in Civil Engineering (BSCE). To earn the degree, the student must complete the following minimum requirements:

Minimum Graduation Requirements

15	Credit-hours in Mathematics
14	Credit-hours in Basic Sciences
21	Credit-hours in Socio-Humanistic Studies and Languages
16	Credit-hours in General Engineering
17	Credit-hours in Civil and Environmental Engineering
60	Credit-hours in Civil Engineering
6	Credit-hours in Technical Elective
149	Total Credit-hours

Developmental Studies

All students that are admitted to the Civil Engineering Program must show evidence that they have acquired the academic abilities and skills necessary to progress through this major. Those not demonstrating the complete acquisition of these abilities and skills (as reflected by the results of their GDE test results, SAT, Accuplacer, PERT, ACT, College Entrance Examination Board test, PUPR's placement test, previous university experience, or other tests or criteria) will be required to take developmental courses. These courses are designed to help them overcome deficiencies in languages, mathematics, and science. These developmental courses are in addition to the 149 credit-hours of the Civil Engineering Program. Developmental courses are the following:

Developmental Studies Component (Maximum of 30 Credit-Hours)		
Course	Title	Credit-Hours
MATH 0102	Preparatory Mathematics	3
MATH 0106	Elementary Algebra	3
MATH 0110	Intermediate Algebra	3

MATH 1330	Precalculus I	3
MATH 1340	Precalculus II	3
ENGL 0100	Preparatory English	3
ENGL 0110	English Grammar	3
ESOL 0100	Beginner English as a Second Language	3
ESOL 0110	Intermediate English as a Second Language	3
ESOL 0120	Advanced English as a Second Language	3

Laboratories

The Civil Engineering Curriculum requires the following laboratory courses: Principles of Chemistry Laboratory, two Physics Laboratories, Fluid Mechanics Laboratory, Algorithms, Programming, and Numerical Analysis Laboratory, Principles of Surveying for Engineers Laboratory, Structural Engineering Laboratory, two Geotechnical Engineering Laboratories, Highway and Transportation Engineering Laboratory, Environmental Engineering Laboratory, and Construction Materials Laboratory. Two additional courses (Introduction to Civil Engineering and Civil Engineering Senior Design Project I) also have laboratory experiences.

Student Organizations

There are three active student chapters at the Department of Civil and Environmental Engineering, which are especially attractive to civil engineering students:

- American Society of Civil Engineers (ASCE)
- American Concrete Institute (ACI)
- Associated General Contractors of America (ACG)

Students may participate in any or all student chapters. These chapters provide opportunities to get involved and participate in conferences, seminars, field trips, and other social and academic activities. These types of activities allows the development of leadership and teamwork skills and get the student more involved in academic life and extra-curricular activities. The Civil Engineering Program encourages its students to participate actively in these chapters. In addition, there are other student chapters at the University, such as the Society of Hispanic Professional Engineers, in which civil engineering students are enrolled.

CIVIL ENGINEERING CURRICULUM

(149 Credit-Hours)

Mathematics Component

(15 Credit-Hours)

Course	Title	Credit-Hours
MATH 1350	Calculus I	4
MATH 1360	Calculus II	4
MATH 1370	Calculus III	4
MATH 2350	Differential Equations	3

Basic Sciences Component

(14 Credit-Hours)

Course	Title	Credit-Hours
SCIE 1210	Principles of Chemistry	3
SCIE 1211	Principles of Chemistry Laboratory	1
SCIE 1430	Physics I	4
SCIE 1431	Physics I Laboratory	1
SCIE 1440	Physics II	4
SCIE 1441	Physics II Laboratory	1

Socio-Humanistic Studies and Languages Component
(21 Credit-Hours)

Course	Title	Credit-Hours
ENGL 1020	English Composition I	3
ENGL 1021	English Composition II	3
ENGL 1026	Fundamentals of Speech Com	3
ETH 2020	Ethics in Engineering	3
WOHI 2012	World Civilization	3
	Humanities Elective	3
	Social Science Elective	3

General Engineering Component
(16 Credit-Hours)

Course	Title	Credit-Hours
ENGI 2110	Engineering Mechanics-Statics	3
ENGI 2120	Mechanics of Materials	3
ENGI 2260	Engineering Economics	3
ENGI 2410	Engineering Mechanics-Dynamics	3
ENGI 2420	Fluid Mechanics	3
ENGI 2421	Fluid Mechanics Laboratory	1

Civil and Environmental Engineering Component
(17 Credit-Hours)

Course	Title	Credit-Hours
CEE 1010	Engineering Graphics for Civil and Environmental Engineers	4
CEE 2110	Engineering Geology	3
CEE 2210	Probability and Statistics for Civil and Environmental Engineers	3
CEE 2310	Algorithms, Programming, and Numerical Analysis	3
CEE 2311	Algorithms, Programming, and Numerical Analysis Laboratory	1
CEE 3410	Water Resources and Hydraulic Engineering	3

Civil Engineering Component
(60 Credit-Hours)

Course	Title	Credit-Hours
SURV 2095	Principles of Surveying for Engineers Laboratory	1
CE 1011	Introduction to Civil Engineering	1
CE 2510	Construction Materials	3
CE 2511	Construction Materials Laboratory	1
CE 3110	Structural Analysis I	3
CE 3120	Structural Analysis II	3
CE 3121	Structural Engineering Laboratory	1
CE 3130	Steel Structures Design	3
CE 3210	Geotechnical Engineering I	3
CE 3211	Geotechnical Engineering Laboratory	1
CE 3220	Geotechnical Engineering II	3
CE 3221	Geomechanics Laboratory	1
CE 3310	Route Location and Geometric Design	3

CE 3320	Highway Engineering	3
CE 3330	Transportation Engineering and Urban Planning	3
CE 3331	Highway and Transportation Engineering Laboratory	1
CEE 3420	Design of Aqueducts and Sanitary Sewer Systems	3
CE 3520	Construction Project Management	3
CE 4140	Concrete Structures Design	3
CE 4150	Foundation Engineering	3
CEE 3430	Water Quality and Treatment	3
CEE 3440	Municipal Wastewater Treatments and Disposal	3
CEE 4411	Environmental Engineering Laboratory I	1
CE 4530	Construction Methods and Productivity Improvement	3
CE 4911	Civil Engineering Senior Design Project I	1
CE 4920	Civil Engineering Senior Design Project II	3

Technical Elective Component
(6 Credit-Hours)

Course	Title	Credit-Hours
	Technical Elective Course (*)	3
	Technical Elective Course (*)	3

(*)Technical Elective Course: any Civil Engineering (CE) elective course; or any Civil and Environmental Engineering (CEE) elective course; or an Environmental Engineering (ENVE) course approved by the Department Head; or a Land Surveying (SURV) course approved by the Department Head; or a Geomatic Science (GEOM) course approved by the Department Head; or any of the following General Engineering courses: ENGI 2320-Principles of Electrical Engineering, ENGI 2430-Engineering Thermodynamics, or ENGI 3510-Engineering Materials; or a technical course approved by the Department Head. Those students enrolled in the Combined Bachelor's-Master's Degree Program may take a graduate-level course as a Technical Elective Course with the approval of the Department Head and the Coordinator of the Graduate Program.

Civil Engineering Elective Courses

Course	Title	Credit-Hours
CE 5010	Principles of Architecture for Civil Engineers	3
CE 5108	Prestressed Concrete Structures Design	3
CE 5116	Design of Wood Structures	3
CE 5208	Soil Improvement	3
CE 5220	Pavement Design	3
CE 5308	Urban Transportation Planning	3
CE 5312	Public Transportation	3
CE 5510	Planning, Scheduling, and Cost Estimates	3
CE 5516	Construction Project Administration	3
CE 5522	Construction Documents for Civil Engineering	3

Civil and Environmental Engineering Elective Courses

Course	Title	Credit-Hours
CEE 1012	Advanced AutoCAD for Civil and Environmental Engineers	3
CEE 5002	Civil and Environmental Engineering Practice	3

CEE 5020	Environmental Laws and Regulations	3
CEE 5030	Advanced Hydraulics	3
CEE 5050	Civil and Environmental Engineering Undergraduate Research	3
CEE 5052	Civil and Environmental Engineering Undergraduate Research II	3
CEE 5090	Special Topics in Civil and Environmental Engineering	3

CIVIL ENGINEERING PROGRAM CURRICULUM SEQUENCE

(149 Credit-Hours)

First Year**First Quarter**

Course	Title	Credit-Hours
MATH 1350	Calculus I	4
SCIE 1210	Principles of Chemistry	3
SCIE 1211	Principles of Chemistry Laboratory	1
CEE 1010	Engineering Graphics for Civil and Environmental Engineers	4
Total		12

1st Year - Second Quarter

Course	Title	Credit-Hours
MATH 1360	Calculus II	4
SCIE 1430	Physics I	4
SCIE 1431	Physics I Laboratory	1
ENGL 1020	English Composition I	3
CE 1011	Introduction to Civil Engineering	1
Total		13

1st Year - Third Quarter

Course	Title	Credit-Hours
MATH 1370	Calculus III	4
SCIE 1440	Physics II	4
SCIE 1441	Physics II Laboratory	1
ENGL 1021	English Composition II	3
Total		12

Second Year**First Quarter**

Course	Title	Credit-Hours
MATH 2350	Differential Equations	3
ENGL 1026	Fundamentals of Speech Comm	3
ENGI 2110	Engineering Mechanics-Statics	3
CEE 2310	Algorithms, Programming, and Numerical Analysis	3
CEE 2311	Algorithms, Programming, and Numerical Analysis Laboratory	1
Total		13

2nd Year - Second Quarter

Course	Title	Credit-Hours
WOHI 2012	World Civilization	3

ENGI 2120	Mechanics of Materials	3
ENGI 2410	Engineering Mechanics-Dynamics	3
CEE 2210	Probability and Statistics for Civil and Environmental Engineers	3
Total		12

2nd Year - Third Quarter

Course	Title	Credit-Hours
ENGI 2260	Engineering Economics	3
ENGI 2420	Fluid Mechanics	3
SURV 2095	Principles of Surveying for Engineers Laboratory	1
CE 2510	Construction Materials	3
CE 2511	Construction Materials Laboratory	1
CEE 2110	Engineering Geology	3
Total		14

Third Year

First Quarter

Course	Title	Credit-Hours
ENGI 2421	Fluid Mechanics Laboratory	1
CE 3110	Structural Analysis I	3
CE 3210	Geotechnical Engineering I	3
CE 3211	Geotechnical Engineering Laboratory	1
CE 3310	Route Location and Geometric Design	3
ETH 2020	Ethics in Engineering	3
Total		14

3rd Year - Second Quarter

Course	Title	Credit-Hours
CE 3120	Structural Analysis II	3
CE 3121	Structural Engineering Laboratory	1
CE 3220	Geotechnical Engineering II	3
CE 3221	Geomechanics Laboratory	1
CE 3320	Highway Engineering	3
CEE 3410	Water Resources and Hydraulic Engineering	3
Total		14

3rd Year - Third Quarter

Course	Title	Credit-Hours
CE 3130	Steel Structures Design	3
CE 3330	Transportation Engineering and Urban Planning	3
CE 3331	Highway and Transportation Engineering Laboratory	1
CEE 3420	Design of Aqueducts and Sanitary Sewer Systems	3
CE 3520	Construction Project Management	3
Total		13

Fourth Year

First Quarter

Course	Title	Credit-Hours
CE 4140	Concrete Structures Design	3
CEE 3430	Water Quality and Treatment	3
CE 4530	Construction Methods and Productivity Improvement	3
	Humanities Elective	3
Total		12

4th Year - Second Quarter

Course	Title	Credit-Hours
CE 4150	Foundation Engineering	3
CEE 3440	Municipal Wastewater Treatment and Disposal	3
CEE 4411	Environmental Engineering Laboratory I	1
CE 4911	Civil Engineering Senior Design Project I	1
	Technical Elective	3
Total		11

4th Year - Third Quarter

Course	Title	Credit-Hours
CE 4920	Civil Engineering Senior Design Project II	3
	Technical Elective	3
	Social Science Elective	3
Total		10

ENVIRONMENTAL ENGINEERING PROGRAM

The Environmental Engineering Program leads to the Bachelor of Science degree in Environmental Engineering. The program offers knowledge in environmental engineering subjects that will allow the students to understand and subsequently acquire additional knowledge in their specialized areas of interest, according to personal inclination and available opportunities. Throughout the curriculum, the student develops the ability to apply pertinent knowledge to the practice of engineering design in the major discipline areas of environmental engineering. The program includes courses in the fields of water supply engineering, wastewater engineering, groundwater pollution control, air pollution control, solid and hazardous waste management, occupational safety and health, environmental impact assessment, environmental toxicology, and pollution prevention engineering. Elective courses in the specialization component are also offered. The engineering design experience is built upon the fundamental concepts of mathematics, basic sciences, engineering sciences, and the humanistic and social sciences. This will provide environmental engineers with a healthy self-image, a well-rounded knowledge of their role in society, the ability to communicate and to develop their creativity to apply engineering design with originality.

The graduates of the Bachelor of Science in Environmental Engineering Program will have the theoretical and conceptual knowledge, the capability to use modern technologies effectively, and the basic technical skills to successfully work as engineers, to pursue graduate studies, to become engineers in training, and to continue their professional development and education on their way to become practicing professional civil engineers with a sense of social responsibility.

Program Mission

The mission of the Environmental Engineering Program is to prepare and motivate students from diverse backgrounds to achieve excellence through intellectual, humanistic, scientific, and technological advancements on their way to becoming practicing professional environmental engineers with a sense of social responsibility.

Program Educational Objectives

Within a few years of graduation, the PUPR Environmental Engineering Program graduates are expected to attain the following:

1. Establish themselves as practicing professionals in the industry and government of their communities in accordance with the standards and ethics of the profession.
2. Demonstrate professional competence by holding positions of increasing responsibility in an environmental engineering field.
3. Contribute to their organizations by serving as liaisons in a bilingual (Spanish-English) environment, performing as effective leaders and as active members of a professional team.
4. Enhance their professional knowledge through a lifetime of continuing education and through the active participation in professional societies.

Student Outcomes

Graduates of the Environmental Engineering Program will have:

1. an ability to identify, formulate, analyze, and solve complex environmental engineering problems by applying principles of engineering, basic sciences, mathematics through differential equations, and probability and statistics
2. an ability to apply advanced principles and practice to design environmental engineering systems that include considerations of risk, uncertainty, sustainability, life-cycle principles, and environmental impacts to formulate material and energy balances, and analyze the fate and transport of substances in and between air, water, and soil phases in order to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional practice responsibilities in environmental engineering situations understanding the concepts of project management and the roles and responsibilities of public institutions and private organizations pertaining to environmental policy and regulations, and making informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, societal, and sustainability contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. an ability to develop and conduct appropriate experimentation, analyze, and interpret data in at least two environmental engineering focus areas (water supply, wastewater management, air pollution, and solid waste management) and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Career Opportunities

Modern engineering is one of the great pillars of economic and social development. But development must not occur at the expense of environmental degradation. Therefore, the engineering design of urban, agricultural, and industrial facilities must have environmental protection mechanisms or systems built in. The environmental engineer is the professional who is academically prepared to design these environmental protection mechanisms and systems, and to collaborate with other professionals in the creation of environmentally sound engineering works. The graduates from this program will have their place in government agencies with regulatory, construction, or maintenance responsibilities; in design and consulting engineering firms; and in the industrial sector, especially in the type of industry that, because of its industrial operations, results in significant environmental impact. On the other hand, environmental engineering alumni will be much better prepared to pursue successfully graduate degrees in this field if they so desire.

Degree Offered

The Civil and Environmental Engineering, and Land Surveying Department offers undergraduate instruction leading to the degree of Bachelor of Science in Environmental Engineering (BSEnE).

To obtain the degree the student must complete the following minimum requirements:

Minimum Graduation Requirements

- 15 Credit-hours in Mathematics
- 26 Credit-hours in Basic Sciences

- 21 Credit-hours in Socio-Humanistic Studies and Languages
- 13 Credit-hours in General Engineering
- 17 Credit-hours in Civil and Environmental Engineering
- 49 Credit-hours in Environmental Engineering
- 6 Credit-hours in Technical Elective

147 Total Credit-hours

Developmental Studies

All students that are admitted to the Environmental Engineering Program must show evidence that they have acquired the academic abilities and skills necessary to progress through this major. Those not demonstrating the complete acquisition of these abilities and skills (as reflected by the results of their College Entrance Examination Board tests, results in PUPR's placement test, previous university experience, and other tests or criteria) will be required to take developmental courses. These courses are designed to help students overcome deficiencies in languages, mathematics, and science. These developmental courses are in addition to the 147 credit-hours of the Environmental Engineering Program. Developmental courses are the following:

Developmental Studies Component (Maximum of 34 Credit-Hours)		
Course	Title	Credit-Hours
MATH 0102	Preparatory Mathematics	3
MATH 0106	Elementary Algebra	3
MATH 0110	Intermediate Algebra	3
MATH 1330	Precalculus I	3
MATH 1340	Precalculus II	3
SCIE 1110	General Biology (*)	3
SCIE 1111	General Biology Laboratory (*)	1
ENGL 0100	Preparatory English	3
ENGL 0110	English Grammar	3
ESOL 0100	Beginner English as a Second Language	3
ESOL 0110	Intermediate English as a Second Language	3
ESOL 0120	Advanced English as a Second Language	3

(*) To be taken by students who have not taken a Biology course in High School.

Laboratories

The Environmental Engineering Curriculum requires the following laboratory courses: two General Chemistry and one Organic Chemistry Laboratories, two Physics Laboratories, Environmental Microbiology Laboratory, Fluid Mechanics Laboratory, Algorithms, Programming, and Numerical Analysis Laboratory, and two Environmental Engineering Laboratories. Two additional courses (Introduction to Environmental Engineering and Environmental Engineering Senior Design Project I) also have laboratory experiences.

Student Organizations

There are three active student chapters at the Department of Civil and Environmental Engineering, and Land Surveying which are especially attractive to environmental engineering students:

- American Society of Civil Engineers (ASCE)
- American Concrete Institute (ACI)
- Associated General Contractors of America (ACG)

Students may participate in any of the student chapters. These chapters provide opportunities to get involved and participate in conferences, seminars, field trips, and other social and academic activities. These types of activities allows the development of leadership and teamwork skills and get the student more involved in academic life and extra-curricular activities. The Environmental

Engineering Program encourages its students to participate actively in these chapters. In addition, there are other student chapters at the University, such as the Society of Hispanic Professional Engineers, in which environmental engineering students are enrolled.

ENVIRONMENTAL ENGINEERING CURRICULUM

(147 Credit-Hours)

Mathematics Component

(15 Credit-Hours)

Course	Title	Credit-Hours
MATH 1350	Calculus I	4
MATH 1360	Calculus II	4
MATH 1370	Calculus III	4
MATH 2350	Differential Equations	3

Basic Sciences Component

(26 Credit-Hours)

Course	Title	Credit-Hours
SCIE 1214	General Chemistry I	3
SCIE 1215	General Chemistry I Laboratory	1
SCIE 1220	General Chemistry II	3
SCIE 1221	General Chemistry II Laboratory	1
SCIE 1230	Organic Chemistry	3
SCIE 1231	Organic Chemistry I Laboratory	1
SCIE 1430	Physics I	4
SCIE 1431	Physics I Laboratory	1
SCIE 1440	Physics II	4
SCIE 1441	Physics II Laboratory	1
SCIE 2110	Environmental Microbiology	3
SCIE 2111	Environmental Microbiology Laboratory	1

Socio-Humanistic Studies and Languages Component

(21 Credit-Hours)

Course	Title	Credit-Hours
ENGL 1020	English Composition I	3
ENGL 1021	English Composition II	3
ENGL 1026	Fundamentals of Speech Comm	3
ETH 2020	Ethics in Engineering	3
WOHI 2012	World Civilization	3
ELEC	Humanities Elective	3
ELEC	Social Science Elective	3

General Engineering Component

(13 Credit-Hours)

Course	Title	Credit-Hours
ENGI 2260	Engineering Economics	3
ENGI 2420	Fluid Mechanics	3
ENGI 2421	Fluid Mechanics Laboratory	1
ENGI 2430	Engineering Thermodynamics	3
ENGI 2910	Engineering Mechanics-Statics and Dynamics	3

Civil and Environmental Engineering Component
(17 Credit-Hours)

Course	Title	Credit-Hours
CEE 1010	Engineering Graphics for Civil and Environmental Engineers	4
CEE 2110	Engineering Geology	3
CEE 2210	Probability and Statistics for Civil and Environmental Engineers	3
CEE 2310	Algorithms, Programming, and Numerical Analysis	3
CEE 2311	Algorithms, Programming, and Numerical Analysis Laboratory	1
CEE 3410	Water Resources and Hydraulic Engineering	3

Environmental Engineering Component
(49 Credit-Hours)

Course	Title	Credit-Hours
ENVE 1011	Introduction to Environmental Engineering	1
ENVE 3010	Environmental Engineering Operations and Processes	3
ENVE 3110	Environmental Toxicology	3
ENVE 3210	Fundamentals of Air Pollution	3
ENVE 3220	Air Pollution Control Design	3
ENVE 3310	Solid Waste Management	3
ENVE 3320	Hazardous Waste Management	3
CEE 3420	Design of Aqueducts and Sanitary Sewer Systems	3
CEE 3430	Water Quality and Treatment	3
CEE 3440	Municipal Wastewater Treatment and Disposal	3
ENVE 3450	Groundwater Pollution Control	3
ENVE 4460	Industrial Wastewater Treatment, Reuse, and Disposal	3
CEE 4411	Environmental Engineering Laboratory I	1
ENVE 4413	Environmental Engineering Laboratory II	1
ENVE 4610	Environmental Impact Assessment	3
ENVE 4710	Pollution Prevention Engineering	3
ENVE 4810	Occupational Safety and Health	3
ENVE 4911	Environmental Engineering Senior Design Project I	1
ENVE 4920	Environmental Engineering Senior Design Project II	3

Technical Elective Component
(6 Credit-Hours)

Course	Title	Credit-Hours
ELEC	Technical Elective Course (*)	3
ELEC	Technical Elective Course (*)	3

(*) Technical Elective Course: any Environmental Engineering (ENVE) elective course; or any Civil and Environmental Engineering (CEE) elective course; or a Civil Engineering (CE) course approved by the Department Head; or a Land Surveying (SURV) course approved by the Department Head; or a Geomatic Science (GEOM) course approved by the Department Head; or any of the following General Engineering courses: ENGI 2120-Mechanics of Materials, ENGI 2320-Principles of Electrical Engineering, or ENGI 3510-Engineering Materials; or a technical course approved by the Department Head. Those students enrolled in the Combined Bachelor's-Master's Degree Program may take a graduate level course as a Technical Elective Course with the approval of the Department Head and the Coordinator of the Graduate Program.

Environmental Engineering Elective Courses

Course	Title	Credit-Hours
ENVE 5620	Environmental Audits	3

ENVE 5670	Environmental Remediation	3
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Civil and Environmental Engineering Elective Courses

Course	Title	Credit-Hours
CEE 1012	Advanced AutoCAD for Civil and Environmental Engineers	3
CEE 5002	Civil and Environmental Engineering Practice	3
CEE 5020	Environmental Laws and Regulations	3
CEE 5030	Advanced Hydraulics	3
CEE 5050	Civil and Environmental Engineering Undergraduate Research	3
CEE 5052	Civil and Environmental Engineering Undergraduate Research II	3
CEE 5090	Special Topics in Civil and Environmental Engineering	3

ENVIRONMENTAL ENGINEERING PROGRAM CURRICULUM SEQUENCE**First Year**

First Quarter

Course	Title	Credit-Hours
MATH 1350	Calculus I	4
SCIE 1214	General Chemistry I	3
SCIE 1215	General Chemistry I Lab	1
CEE 1010	Engineering Graphics for Civil and Environmental Engineers	4
Total		12

1st Year - Second Quarter

Course	Title	Credit-Hours
MATH 1360	Calculus II	4
SCIE 1220	General Chemistry II	3
SCIE 1221	General Chemistry II Laboratory	1
SCIE 1430	Physics I	4
SCIE 1431	Physics I Laboratory	1
ENVE 1011	Introduction to Environmental Engineering	1
Total		14

1st Year - Third Quarter

Course	Title	Credit-Hours
MATH 1370	Calculus III	4
SCIE 1230	Organic Chemistry	3
SCIE 1231	Organic Chemistry Laboratory	1
SCIE 1440	Physics II	4
SCIE 1441	Physics II Laboratory	1
Total		13

Second Year

First Quarter

Course	Title	Credit-Hours
MATH 2350	Differential Equations	3
SCIE 2110	Environmental Microbiology	3
SCIE 2111	Environmental Microbiology Laboratory	1
ENGI 2910	Engineering Mechanics-Statics and Dynamics	3
CEE 2310	Algorithms, Programming, and Numerical Analysis	3
CEE 2311	Algorithms, Programming, and Numerical Analysis Laboratory	1
Total		14

2nd Year - Second Quarter

Course	Title	Credit-Hours
ENGL 1020	English Composition I	3
ENGI 2420	Fluid Mechanics	3
CEE 2110	Engineering Geology	3
CEE 2210	Probability and Statistics for Civil and Environmental Engineers	3
Total		12

2nd Year - Third Quarter

Course	Title	Credit-Hours
ENGL 1021	English Composition II	3
WOHI 2012	World Civilization	3
ENGI 2260	Engineering Economics	3
ENGI 2421	Fluid Mechanics Laboratory	1
ENGI 2430	Engineering Thermodynamics	3
Total		13

Third Year

First Quarter

Course	Title	Credit-Hours
ENGL 1026	Fundamentals of Speech Comm	3
CEE 3410	Water Resources and Hydraulic Engineering	3
ENVE 3010	Environmental Engineering Operations and Processes	3
ENVE 3110	Environmental Toxicology	3
Total		12

3rd Year - Second Quarter

Course	Title	Credit-Hours
ENVE 3210	Fundamentals of Air Pollution	3
ENVE 3310	Solid Waste Management	3
CEE 3420	Design of Aqueducts and Sanitary Sewer Systems	3
CEE 3430	Water Quality and Treatment	3
Total		12

3rd Year - Third Quarter

Course	Title	Credit-Hours
ENVE 3220	Air Pollution Control Design	3
ENVE 3320	Hazardous Waste Management	3

CEE 3440	Municipal Wastewater Treatment and Disposal	3
ENVE 3450	Groundwater Pollution Control	3
Total		12

Fourth Year**First Quarter**

Course	Title	Credit-Hours
	Humanities Elective	3
ENVE 4460	Industrial Wastewater Treatment, Reuse, and Disposal	3
CEE 4411	Environmental Engineering Laboratory I	1
ENVE 4610	Environmental Impact Assessment	3
Total		10

4th Year - Second Quarter

Course	Title	Credit-Hours
ETH 2020	Ethics in Engineering	3
ENVE 4413	Environmental Engineering Laboratory II	1
ENVE 4710	Pollution Prevention Engineering	3
ENVE 4911	Environmental Engineering Senior Design Project I	1
	Technical Elective	3
Total		11

4th Year - Third Quarter

Course	Title	Credit-Hours
ENVE 4810	Occupational Safety and Health	3
ENVE 4920	Environmental Engineering Senior Design Project II	3
	Technical Elective	3
	Social Science Elective	3
Total		12

COURSE DESCRIPTIONS**General Engineering Courses****ENGI 2110 – ENGINEERING MECHANICS-STATICS**

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: MATH 1360 and SCIE 1430. Corequisite: MATH 1370

Analysis of force systems. Vectors. Laws of equilibrium of particles and rigid bodies. Structural analysis of trusses, frames, and machines. Centers of gravity and moments of inertia. Internal forces. Friction.

ENGI 2120 – MECHANICS OF MATERIALS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENGI 2110

Introduction to the mechanics of deformable bodies. Study and analysis of stresses and strains on connections and bar elements subjected to axial, torsional, and transverse loads. Internal forces as stress resultants; shear force and bending moment diagrams. Analysis of structural elements subjected to combined stresses. Transformation of stresses, Mohr's Circle. Column stability analysis and buckling.

ENGI 2910 – ENGINEERING MECHANICS - STATICS AND DYNAMICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: MATH 1360 and SCIE 1430. Corequisite: MATH 1370

Examines vector representation of force and moment, equivalent force systems, centroids and centers of gravity, distributed forces, free body diagrams and equations of equilibrium, applications to trusses, and beams. Examines fundamentals of dynamics, kinematics of particles, and kinetics of particles using force, mass, and acceleration.

Civil and Environmental Engineering Courses

CEE 1010 – ENGINEERING GRAPHICS FOR CIVIL AND ENVIRONMENTAL ENGINEERS

Four credit-hours. Two two-and half-hour lecture periods per week. Prerequisite: None

An introduction to the field of engineering graphics and descriptive geometry as a design and documentation tool. Topics include orthographic projection, pictorial drawings, dimensioning, feature control symbols, and tolerancing. Use of a computer-aided design (CAD) system to create engineering drawings.

CEE 1012 – ADVANCED AUTOCAD FOR CIVIL AND ENVIRONMENTAL ENGINEERS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CEE 1010

Introduction to the knowledge of graphical vocabulary for the preparation of construction documents, including the technical specifications and their development by computer assisted tools. The topics include AutoCAD used as a tool for the preparation of civil engineering construction documents. Use of tridimensional drawings using Sketchup and Civil 3D in the development of grading and presentation technics. Includes the evaluation of technical specifications for the civil engineering area and the relation with the drawings.

CEE 2110 – ENGINEERING GEOLOGY

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: SCIE 1210 or SCIE 1214, or Academic Department Authorization

Evolution of geology principles through history. The rock cycle. Mineral characteristics and rock formations. Rock types. Rock characteristics and engineering issues. Volcanism. Plate tectonics. Soil formation. Rock weathering. Mass movements. Seismology. Structural geology. Overview of the hydrological cycle. The relation of surface and groundwater hydrology to engineering geology.

CEE 2210 – PROBABILITY AND STATISTICS FOR CIVIL AND ENVIRONMENTAL ENGINEERS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: MATH 2350, CEE 2310 and CEE 2311

An introduction to the role of probability and statistics in civil and environmental engineering. Fundamentals of probability theory. Random variables. Probability distributions. Functions of random variables. Sampling. Hypothesis testing and confidence intervals. Regression and correlation analysis.

CEE 2310 – ALGORITHMS, PROGRAMMING, AND NUMERICAL ANALYSIS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: MATH 1370 and CE 1011 or ENVE 1011. Corequisite: CEE 2311

An introduction to programming and algorithms applied to numerical analysis. The most commonly used numerical methods in civil and environmental engineering practice are introduced. Roots of equations, systems of linear equations, curve fitting techniques, numerical differentiation and integration, and ordinary differential equations.

CEE 2311 – ALGORITHMS, PROGRAMMING, AND NUMERICAL ANALYSIS LABORATORY

One credit-hour. Two two-hour lecture and laboratory periods per week. Prerequisites: MATH 1370 and CE 1011 or ENVE 1011. Corequisite: CEE 2310

An introduction to programming and algorithms applied to numerical analysis. Programming of numerical methods commonly used in civil and environmental engineering practice, using Visual Basic for Applications within Excel as the programming environment.

CEE 3410 – WATER RESOURCES AND HYDRAULIC ENGINEERING

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENGI 2420, CEE 3420, CEE 2310, and CEE 2311

Fundamental concepts of hydrology and hydraulics. Hydrologic processes and the elements of the hydrologic cycle. Rainfall-runoff relationship. Hydrograph and unit hydrograph theory. Frequency analysis. Design of storm sewer systems. Reservoir: yield, capacity, and sedimentation. Open channel flow. Performance and design of culverts. Groundwater hydrology concepts. Well hydraulics.

CEE 3420 – Design of Aqueducts and Sanitary Sewer Systems

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: SCIE 1210, SCIE 1211, and CEE 3410

Water supply sources. Demand and use of water. Physical, chemical, and biological characteristics of water. Safe Drinking Water Act and other water quality regulations. Water treatment: rapid mix, flocculation, sedimentation, filtration, disinfection, softening, and other processes. Design of a water distribution system: configuration and requirements, losses, analysis of flow, pipe materials, pumps, and pumping stations

CEE 3430 – WATER QUALITY AND TREATMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: CEE 3410 and ENVE 3010

Physical, chemical, and biological characteristics of water. Drinking Water Standards. Water sources. Characteristics and design of the water treatment processes. Rapid mixing, chemical feeding, flocculation, sedimentation, filtration, disinfection, and other operations and processes. Processing and disposal of sludge generated at the water treatment plants.

CEE 3440 – MUNICIPAL WASTEWATER TREATMENT AND DISPOSAL

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CEE 3430

Wastewater sources. Physical, chemical, and biological characteristics of wastewater. Design of wastewater treatment processes: a) preliminary treatment: screening, coarse solids reduction, grit removal, flow equalization, odor control and coagulation/flocculation; b) primary treatment: sedimentation; c) secondary treatment: activated sludge, trickling filters, stabilization ponds, aerated lagoons, and rotating biological contactors; d) advanced treatment: filtration, adsorption, ion exchange, air stripping, nitrification-denitrification, reverse osmosis, microfiltration and ultrafiltration, chemical precipitation, and phosphorus removal. Disinfection. Post-aeration. Effluent disposal and reuse alternatives. Dissolved oxygen sag analysis. Design of facilities for the treatment and disposal of sludge. The Clean Water Act. Regulatory agencies and their requirements.

CEE 4411 – ENVIRONMENTAL ENGINEERING LABORATORY I

One credit-hour. Two two-hour lecture and laboratory periods per week. Prerequisites: ENVE 3210 and CEE 3440

Experiments focused on process monitoring and control as part of the environmental engineering design processes. 1. Laboratory techniques to determine the properties of water and wastewater. Sampling: collection, storage, and preservation. Tests for physical characteristics: color, turbidity, temperature, and solids content (total, settleable, suspended, volatile, and fixed). Tests for chemical characteristics: pH, alkalinity, hardness, chlorine, conductivity, dissolved oxygen, BOD, COD, nitrogen, and phosphorus. Tests for biological characteristics: fecal and total coliform. Jar tests. 2. Meteorological factors measurements. 3. Air quality measurements and analysis: CO₂, CO, NO_x, and SO_x. 4. Noise pollution tests.

CEE 5002 – CIVIL AND ENVIRONMENTAL ENGINEERING PRACTICE

Three credit-hours. By agreement. Prerequisite: Approval of the Department Head

Civil and environmental engineering design procedures are applied to the solution of problems under the supervision of a non-faculty member. The problem may deal with any of the fields of civil and environmental engineering, as determined by the instructor.

CEE 5020 – ENVIRONMENTAL LAWS AND REGULATIONS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CEE 3440 or ENVE 4610

Introduction to the technical, economic, political, administrative, and social forces that influence the environmental quality regulations and the use of natural resources. Review of federal and state laws, regulations, and programs enacted to minimize air, land, and water pollution. Review of public participation mechanisms.

CEE 5030 – ADVANCED HYDRAULICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CEE 3410

Advanced hydraulics for the design and analysis of systems concerned with the use and control of water, storage, water transmission; design of open channels and pressure conduits. Design of storm and sewer systems. Performance and design of culverts. Sediment transport and sedimentation in reservoirs. Groundwater hydraulics and well hydraulics.

CEE 5050 – CIVIL AND ENVIRONMENTAL ENGINEERING UNDERGRADUATE RESEARCH

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: Approval of the Department Head

Introduction to research methodologies including title and objectives development, literature review, research justification, experiment or analytical design, and proposal preparation. Open-ended research project in a specific area of Civil and Environmental Engineering.

CEE 5052 – CIVIL AND ENVIRONMENTAL ENGINEERING UNDERGRADUATE RESEARCH II

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CEE 5050

Continuation of the research project started in CEE 5050. Detailed literature review. Research cost estimates. Application of probability and statistics. Selection of instrumentation and tests. Experimentation or analytical development. Results manipulation and evaluation. Development of scientific publication and report presentation.

CEE 5090 – SPECIAL TOPICS IN CIVIL AND ENVIRONMENTAL ENGINEERING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: According to special topics to be covered.

Special topics in any of the areas of specialization in civil engineering (structural engineering, geotechnical engineering, transportation engineering, water resources engineering, and construction engineering), environmental engineering (water supply engineering, wastewater engineering, air pollution control, solid and hazardous waste management, occupational safety and health, environmental toxicology, environmental impact assessment, and pollution prevention engineering), or related fields relevant to engineering practice.

Civil Engineering Courses

CE 1011 – INTRODUCTION CIVIL ENGINEERING

One credit-hour. Two two-hour lecture and laboratory periods per week. Prerequisite: CEE 1010

An introduction to the civil engineering profession, design philosophy, techniques, theory, methodology, and creative problem solving with emphasis on teamwork, as well as on design issues and practices in the profession. The course includes several design cases. Project design explicitly concerns technical approaches as well as consideration of the existing built environment, natural environment, economic, social, and cultural factors. Critical thinking and logic presentation of an engineering analysis.

CE 2510 – CONSTRUCTION MATERIALS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENGI 2120 and CEE 2210. Corequisite: CE 2511

Application of the physical, mechanical, and chemical properties of materials such as concrete, aggregate, ferrous metals, nonferrous metals, timber, plastics, and asphalt cements. Selection of materials and their behavior in civil engineering practice. Test principles and methods applied to construction materials and failure analysis in accordance with the ASTM.

CE 2511 – CONSTRUCTION MATERIALS LABORATORY

One credit-hour. Two two-hour lecture and laboratory periods per week. Prerequisites: ENGI 2120 and CEE 2210. Corequisite: CE 2510

Laboratory techniques and procedures to determine properties of concrete, coarse and fine aggregates, wood, and steel. Design and preparation of concrete mixes. Tests on concrete specimens.

CE 3110 – STRUCTURAL ANALYSIS I

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENGI 2120

Analytical model of structural systems. Analysis of gravity load distribution. Determination of earthquake and wind loads according to actual code provisions. Stability and determinacy of structures. Approximate analysis of statically indeterminate structures. Analysis of statically indeterminate structures by the Force Method.

CE 3120 – STRUCTURAL ANALYSIS II

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: CE 3110, CEE 2310, and CEE 2311. Corequisite: CE 3121

Analysis of statically indeterminate structures by the Stiffness Method and by the Moment Distribution Method. Computer Assisted Structural Analysis. Stiffness. Center and shear force distribution.

CE 3121 – STRUCTURAL ENGINEERING LABORATORY

One credit-hour. Two two-hour lecture and laboratory periods per week. Prerequisites: CE 3110, CEE 2310, and CEE 2311. Corequisite: CE 3120

Verify theoretical results with simple laboratory experiences on bars under axial and torsional loads, beams, columns, trusses, and frames. Measurement of deflections, angle of twist, support reactions, internal forces, and strains as the structural response of interest under specified applied loads.

CE 3130 – STEEL STRUCTURE DESIGN

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CE 3110

Design of structural steel members. Structural steel properties. Tension and compression members. Design of beams with and without lateral support. Combined axial compression and bending. Bolted and welded connections for tension. Introduction to buildings design.

CE 3210 – GEOTECHNICAL ENGINEERING I

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENGI 2120, ENGI 2420, CEE 2110, CEE 2310, and CEE 2311. Corequisite: CE 3211

Soils as engineering materials. Local soil types. Description and identification of soils. Index properties. Mineralogical composition of clays. Compaction. The effect of water on soil behavior. Effective stress concept. Flow nets. Stresses in a soil mass. Elastic settlement of soils.

CE 3211 – GEOTECHNICAL ENGINEERING LABORATORY

One credit-hour. Two two-hour lecture and laboratory periods per week. Prerequisites: ENGI 2120, ENGI 2420, CEE 2110, CEE 2310, and CEE 2311. Corequisite: CE 3210

Laboratory techniques to determine the basic properties of soils including soil sampling and description, relationships among soil phases, consistency limits, and grain size distribution. Soil classification systems, compaction, and field density. Coefficient of permeability.

CE 3220 – GEOTECHNICAL ENGINEERING II

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: CE 3210 and CE 3211. Corequisite: CE 3221

Compressibility of soils, consolidation settlements, rate of consolidation. Subsoil exploration and sampling. Soil strength parameters and their use in the evaluation of pressure on retaining structures, soil bearing capacity, and slope stability. Basic concepts of deep foundations.

CE 3221 – GEOMECHANICS LABORATORY

One credit-hour. Two two-hour lecture and laboratory periods per week. Prerequisites: CE 3210 and CE 3211. Corequisite: CE 3220

Consolidation test of fine soil samples. Preparation of soil profile including physical properties. Determination of soil shear strength parameters for common geotechnical engineering applications. Unconfined compression, direct and triaxial shear tests performed on SPT-retrieved samples to obtain total stress parameters. Evaluation of soil stiffness. Application problems.

CE 3310 – ROUTE LOCATION AND GEOMETRIC DESIGN

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: SURV 2095, CEE 2310, and CEE 2311

Route study. Horizontal alignment and simple and compound circular curves. Profile alignment and vertical parabolic curves. Spiral curve and superelevation. Introduction to traffic engineering safety. Earthwork.

CE 3320 – HIGHWAY ENGINEERING

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: CE 2510, CE 3210, and CE 3310

Roadside design principles. Traffic control devices. Pavement design. Traffic flow theory principles. Capacity and level of service of two-lane highways. Capacity and level of service of multilane highways. Capacity and level of service of basic freeway segments. Freeway weaving analysis. Interchange design principles. At-grade intersection design principles.

CE 3330 – TRANSPORTATION ENGINEERING AND URBAN PLANNING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CE 3320. Corequisite: CE 3331

Intersection capacity and level of service. Planning and design aspects of transportation systems. Urban transportation planning models. Development principles of transportation facilities. Design and operational analysis of pedestrian and bicycle facilities. Public transportation.

CE 3331 – HIGHWAY AND TRANSPORTATION ENGINEERING LABORATORY

One credit-hour. Two two-hour lecture and laboratory periods per week. Prerequisite: CE 3320. Corequisite: CE 3330

Data collection techniques and use of equipment associated with different types of transportation studies. Application of statistics and probability in transportation data presentation and analysis. Application of computer software.

CE 3520 – CONSTRUCTION PROJECT MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENGI 2260, CE 2510, and CE 2511

The course discusses management of construction projects from site investigation, planning, and design to construction and application of controls. Topics include project administration, organizations, project costs estimation, bidding of contracts and awards, planning and scheduling techniques, labor relations, claim and dispute resolution, safety, and risk management.

CE 4140 – CONCRETE STRUCTURES DESIGN

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: CE 3120, CE 3121, and CE 3130

Design of reinforced concrete structures using the Ultimate Strength Design Method. Design for flexure and shear. Continuous beams and one-way slab systems. Development of reinforcing bars. Introduction to column design.

CE 4150 – FOUNDATION ENGINEERING

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: CE 3220, CE 3221, and CE 4140

Evaluation of sub-soil conditions as they affect the behavior, proportions, and choice of type foundation. Combined and strap footing. Retaining walls. Sheet piling walls. Pile group and pile cap design. Mat foundations

CE 4530 – CONSTRUCTION METHODS AND PRODUCTIVITY IMPROVEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CE 3520

This course discusses technical aspects of the construction process, and how they can be improved. Construction methods for heavy and building construction will be studied. Also, organizing a project with productivity improvement as a goal will be studied. Students will learn how to calculate and measure worker productivity. In addition, various models and methods for improving productivity will be studied and applied to construction problems.

CE 4911 – CIVIL ENGINEERING SENIOR DESIGN PROJECT I

One credit hour. Two two-hour lecture and laboratory periods per week. Prerequisites: CE 3330, CE 4140, [CEE 3430](#), and CE 4530

First part of a two-period open-ended design project that involves most areas of Civil Engineering. The project allows correlating the different areas of Civil Engineering, to apply the principles of engineering design and science at a high level, and to develop awareness of social and economic effects of engineering projects. This first course will concentrate in the site analysis, in all the laboratory and field studies required by the specific project (i.e., topography, as-built, structure inventory, soil exploration, traffic study, among others), in the development of a project proposal, and in the site design and environmental evaluation of the proposal.

CE 4920 – CIVIL ENGINEERING SENIOR DESIGN PROJECT II

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: CE 4150, [CEE 3440](#), and CE 4911

A continuation of CE 4911. Second part of a two-period open-ended design project that involves most areas of Civil Engineering. The project allows correlating the different areas of Civil Engineering, to apply the principles of engineering design and science at a high level, and to develop awareness of social and economic effects of engineering projects. This second course will concentrate in the detailed analyses and designs required by the specific project, with a clear identification of hypothesis and assumptions, limitations of the study, design criteria, methods and tools, costs, safety, feasibility, and design parameters adopted for each design. Oral presentations and written reports will be used to develop the objectives.

CE 5010 – PRINCIPLES OF ARCHITECTURE FOR CIVIL ENGINEERS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: CEE 1010 and CE 1011

Introduce civil engineering students to architectural concepts. It is a morphological study of the essential elements of form, space, organization, circulation, proportion, scale, and ordering principles. The course emphasizes the element of form as the primary tool of the designer. The relationship between architecture, nature, urban context, culture, history, social, and political issues are included.

CE 5108 – PRESTRESSED CONCRETE STRUCTURES DESIGN

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CE 4140

General design principles of prestressed concrete members. Pretensioning vs. Postensioning. Prestressing materials: steel and concrete. Design for shear and torsion. Deflection computation and control. Prestress losses. Indeterminate structures and slabs. Construction methods.

CE 5116 – DESIGN OF WOOD STRUCTURES

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: CE 2510 and CE 3110

Wood buildings and design criteria. Properties of wood and lumber grades. Vertical design loads and lateral forces. Design of beams and columns for vertical loads. Design of horizontal diaphragms and shear walls for lateral forces. Connection design, including the overall tying together of the vertical and lateral force-resisting systems.

CE 5208 – SOIL IMPROVEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: CE 3220 and CE 3221

Current ground modification techniques to improve soil stability, reduce deformation, control seepage, and increase erosion resistance.

CE 5220 – PAVEMENT DESIGN

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: CE 3220, CE 3221, CE 3320, CE 4140, and CEE 3410

Stress and deformation of flexible and rigid pavements, traffic loading, material parameters, drainage design. Pavement performance and reliability concepts. Design of flexible and rigid pavements, overlay design, Superpave, new developments in pavement design. Computerized pavement design.

CE 5308 – URBAN TRANSPORTATION PLANNING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CE 3330

Urban transportation planning modeling. Origin and destination trip assessment. Transportation mode use analysis. Traffic forecasting and assignment. Impact analysis.

CE 5312 – PUBLIC TRANSPORTATION

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CE 3330

Transit modes. Transit planning. Passenger demand, route choice, and assignment. Frequency and headway determination. Scheduling. Network analysis, level of service, and reliability control.

CE 5510 – PLANNING, SCHEDULING, AND COST ESTIMATES

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CE 3520

This course comprises the work plan development process and the use of several scheduling techniques such as precedence diagrams, progress schedules, the critical path method (CPM), program evaluation and review technique (PERT), crashing and delay analysis. Project cost controls, earned value principles, cost estimate studies for construction projects from conceptual and preliminary to detailed estimates are also studied.

CE 5516 – CONSTRUCTION PROJECT ADMINISTRATION

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CE 3520

This course discusses the project lifecycle and the corresponding administration strategies, as well as the project procedures and documents, as developed by American Institute of Architects and the Engineers Joint Contract Documents Committee. It also addresses practical issues related to negotiations, claims, value engineering, safety, risk allocation, and liability.

CE 5522 – CONSTRUCTION DOCUMENTS FOR CIVIL ENGINEERING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CE 3520

A comprehensive coverage of documents generated before and during the construction process, including the origin and format of construction documents, which ones are used and why. Globalization aspects on how documents are utilized and how they work together as a system. Contract forms, contract conditions, and specifications are the main core for study. Construction drawings and technical specifications are studied as a design and construction tool into the process. Bidding requirements are discussed as part of the project manual.

Environmental Engineering Courses**ENVE 1011 – INTRODUCTION TO ENVIRONMENTAL ENGINEERING**

One credit-hour. Two two-hour lecture and laboratory periods per week. Prerequisites: MATH 1350, SCIE 1214, SCIE 1215, and CEE 1010

An introduction to the environmental engineering field, presenting to the students a historical background on the profession, as well as basic knowledge on environmental impacts on the atmosphere, soil, and water, and the mitigation technologies available for the environmental engineer. The course includes laboratory activities to illustrate distinct monitoring techniques for impact and compliance assessment, as well as field visits to water and wastewater treatment plants and to solid waste handling facilities.

ENVE 3010 – ENVIRONMENTAL ENGINEERING OPERATIONS AND PROCESSES

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: SCIE 1230, SCIE 2110, ENGI 2430, CEE 2210, and ENVE 1011

This course presents to the students an interface between the scientific knowledge acquired in previous courses and their applications in environmental unit processes and operations, specifically to physical and chemical operations and processes.

ENVE 3110 – ENVIRONMENTAL TOXICOLOGY

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: SCIE 1230, SCIE 2110, and ENGI 2430

Nature, sources, pathways of toxic substances in the environment and their impact on humans and other life forms. Biochemical Mechanisms of toxicity. Cellular mechanisms of environmental causes of disease. Dose-Response relationships. Xenobiotic metabolism. Phase I and Phase II Reactions. Biodegradation and Bioaccumulation. Quantitative toxicology.

ENVE 3210 – FUNDAMENTALS OF AIR POLLUTION

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENVE 3010 and ENVE 3110

Definition and general listing of air pollutants. Sources and effects of air pollutants. Federal legislation and regulatory trends. Meteorology. Dispersion of pollutants in the atmosphere. General control methods for particulate matter, gases, and vapors, sulfur oxides, nitrogen oxides and trace metals. Atmospheric photochemical reactions: ozone formation and smog. Emission standards for mobile sources. General odor control methods.

ENVE 3220 – AIR POLLUTION CONTROL DESIGN

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENVE 3210

Engineering principles applied to the solution of air pollution problems. Characteristics and design considerations: a) incinerators for control of VOC emissions, b) fixed bed absorbers, c) flue gas desulphurization systems, d) systems for the control of nitrogen oxides, e) cyclonic devices, f) electrostatic precipitators, and g) fabric filters. Cost estimation methodology in air pollution control.

ENVE 3310 – SOLID WASTE MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENVE 3010 and ENVE 3110

Sources, types, composition, and properties of municipal solid waste. Solid Waste generation and collection. Disposal of Solid Wastes; the landfill method. Design, operation, and closure of landfills. Control of gases and leachate in landfills. Materials separation and

processing technologies. Thermal, biological, and chemical conversion technologies. Recycling of materials found in municipal solid wastes. Solid waste management and planning issues.

ENVE 3320 – HAZARDOUS WASTE MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENVE 3310

Definitions and characterization of hazardous waste. Environmental legislation: TSCA, RCRA and CERCLA. Site Assessment. Partitioning, sorption, and exchange at surfaces. Dynamics of transport away from the source. Approaches to hazardous waste minimization, resources recovery, remediation, treatment, and disposal. Design of selected pathway applications. Bioremediation technologies.

ENVE 3450 – GROUNDWATER POLLUTION CONTROL

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: CEE 2110 and CEE 3430

Overview of groundwater hydrology. Groundwater pollution sources. Pollutant transport and fate considerations. Flow and solute transport modeling. Pollutant source prioritization. Groundwater monitoring, planning and analysis. Groundwater pollution control: physical, chemical, biological and innovative treatment technologies. Groundwater quality management.

ENVE 4460 – INDUSTRIAL WASTEWATER TREATMENT, REUSE, AND DISPOSAL

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: CEE 3440

Sources and characteristics of industrial wastewater. Unit operations and processes used in the pre-treatment or treatment of industrial wastewater: equalization, neutralization, sedimentation, oil separation, flotation, coagulation and chemical precipitation, aeration systems, air stripping, activated sludge, trickling filtration, rotating biological contactors, stabilization basins, anaerobic processes, nutrient removal processes, adsorption, ion exchange, chemical oxidation, filtration, membrane processes, and land treatment. Sludge handling and disposal. Effluent reuse and disposal alternatives. Regulatory agencies and their requirements.

ENVE 4413 – ENVIRONMENTAL ENGINEERING LABORATORY II

One credit-hour. Two two-hour lecture and laboratory periods per week. Prerequisites: ENVE 3220, ENVE 3320, and CEE 4411

This course introduces concepts of experimental design applied to environmental engineering. Experiments will include the characterization of dissolved solids in wastewater, the physical characterization of solid wastes, the measurement of chemical properties of soils, and monitoring of particulates in air, soil properties, and activated carbon adsorption. The analysis of experimental data and the preparation of reports will be emphasized.

ENVE 4610 – ENVIRONMENTAL IMPACT ASSESSMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENVE 3220, ENVE 3320, CEE 3440, and ENVE 3450

Analysis, evaluation, coordination, and preparation of environmental impact studies. Identification and description of the environmental setting, applicable environmental regulations, impact prediction, evaluation of the impacts, mitigation measures and environmental monitoring. Decision methods for the evaluation of alternatives. Public participation in environmental decision-making processes and environmental justice principles.

ENVE 4710 – POLLUTION PREVENTION ENGINEERING

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENVE 3220, ENVE 3320, and ENVE 4460

An introduction to the theory, principles, and practices related to pollution prevention, environmental legislation, resources usage and conservation, and environmentally benign design for products, processes, and manufacturing systems. Environmental impacts of waste from manufacturing operations and life-cycle assessment that include post-use product disposal, environmental cycles of materials, sustainability, and principles of environmental economics will be thoroughly covered. Principles of process design and economic analysis are integrated in the solution of improved manufacturing processes, and technologies that can be used to minimize pollution. Environmental Accounting and Financial Analysis of pollution prevention projects are presented to assess the effectiveness of proposed process modifications for capital budgeting considerations and managerial decision-making. Several computer projects

involving numerical solutions for modification of process design, waste accountability, resource recovery, and financial accounting models are required.

ENVE 4810 – OCCUPATIONAL SAFETY AND HEALTH

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENVE 3220 and ENVE 3320

System safety. Safety management and regulations. Psychology. Industrial hygiene. Ergonomics. Workers' compensation. Accident causation and investigation. Fire science. Hazardous materials. Workplace violence. Training.

ENVE 4911 – ENVIRONMENTAL ENGINEERING SENIOR DESIGN PROJECT I

One credit-hour. Two two-hour lectures and laboratory periods per week. Prerequisites: ENGI 2260, CEE 3420, and ENVE 4610

First part of a two-period open-ended design project to correlate all areas of Environmental Engineering to apply, at a high level, the principles of engineering design and science studied in previous courses and to develop awareness of social and economic effects of engineering projects. Projects are equivalent to those normally experienced by a beginning professional. Computer laboratory sessions, oral presentations, and written reports will cover alternatives to be considered at the initial stage of the preliminary design.

ENVE 4920 – ENVIRONMENTAL ENGINEERING SENIOR DESIGN PROJECT II

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENVE 4911

A continuation of ENVE 4911. Second part of a two-period open-ended design project that involves most areas of Environmental Engineering. The project allows correlating the different areas of Environmental Engineering, to apply the principles of engineering design and science at a high level, and to develop awareness of social and economic effects of engineering projects. This second course will concentrate in the detailed analyses and designs required by the specific project, with a clear identification of hypothesis and assumptions, limitations of the study, design criteria, methods and tools, costs, safety, feasibility, and design parameters adopted for each design. Oral presentations and written reports will be used to develop the objectives.

ENVE 5620 – ENVIRONMENTAL AUDITS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENVE 4610

This course is an introduction to the principles of environmental auditing and to give to the students experience in the use of key methods and techniques. During the course, students will be able to understand the practice behind environmental management systems, gain experience of carrying out environmental management system techniques in the professional environment and conduct an environmental audit with a partner organization.

ENVE 5670 – ENVIRONMENTAL REMEDIATION

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENVE 4610

Environmental remediation, design, and applications to emphasize the engineering aspects of using remediation process for the treatment of contaminated soils, sludge, and groundwater. Learn the fundamental techniques for the degradation of hazardous compounds, coupled with design and operational techniques for remediation process. Predict the basic hydrodynamic relationships of contaminant transport phenomena in subsurface environments. Identify the best treatment alternative for each contaminant. Interpret, calculate, and compare alternatives for remediation design.

Land Surveying Course

SURV 2095 – PRINCIPLES OF SURVEYING FOR ENGINEERS

One credit-hour. Two two-hour lectures and laboratory periods per week. Prerequisites: ENGI 1140, CEE 2210

Through conferences and field practices, the student will learn the basic surveying concepts applicable for the design and construction of routes.

FACULTY

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ELECTRICAL & COMPUTER ENGINEERING AND COMPUTER SCIENCE (ECECS) DEPARTMENT

Our society is increasingly dependent on the generation and smart distribution of energy in the form of electricity and continues to develop at an accelerated pace, electronic communication devices, and computers designed to capture, create, process, transform, display, and distribute information. Electrical Engineering is one of the disciplines supporting the development and operation of this critical infrastructure. It has evolved from the study of fundamental electrical principles to encompass sophisticated communication and computation techniques, thus helping spawn new disciplines in Computer Engineering and Computer Science. The ECECS Department offers students an opportunity to meet their learning goals and to be key contributors to our information society by pursuing one of the three Bachelor of Science degrees available in our program. These are Electrical Engineering, Computer Engineering, and Computer Science.

Students with interests in smart grid power systems, communications, signal processing, automatic controls, industrial automation, and computer hardware and software, will find a wide variety of subjects shared among the three programs when choosing their intended field of study to achieve their career goals. In addition, students can enrich their undergraduate program by participating in the BS-MS combined program, thus being able to take advanced graduate courses for credit.

ELECTRICAL ENGINEERING PROGRAM

This four-year program develops the required knowledge, skills, and dispositions to face the dynamics of technological environment in contemporary society. Throughout the program, theoretical and practical experiences are interwoven with socio-humanistic studies, mathematics, basic science, engineering science, and engineering design experience.

The design experience begins during the first year of studies with an introductory course in engineering design, which aims to develop students' creativity and problem-solving skills. This focus on design continues throughout the curriculum culminating in a significant design experience within a final Capstone Course. Real-life complex engineering problems are defined and solved by integrating the fundamental elements of modern design theory, methodology and tools.

The Electrical Engineering Program offers two areas of interest: a) Smart Grid Power Systems, and b) Communications, Signals, and Controls Systems. The Smart Grid Power Systems area of interest prepares students for planning, design, and operation of centralized and distributed generation, smart grid transmission and distribution, and end-user electrical systems. The Communications, Signals and Controls Systems area of interest prepares students for the design of analog and digital electronics, industrial process automation and control, and wireless cellular communications networks. Students selecting the Smart Grid Power Systems area of interest are required to take twenty-four (24) credit-hours from the required area courses, and nine (9) credit-hours from a pool of elective area courses, for a total of thirty-three (33) credit-hours. Students selecting the Communications, Signals and Controls Systems area of interest are required to take eleven (11) credit-hours as required area courses, and twenty-two (22) credit-hours from a pool of elective area courses, for a total of thirty-three (33) credit-hours. The students set their educational objectives for Electrical Engineering when they select one of these main areas of interest.

Program Mission

"To educate graduates with a broad background in computers, mathematics, science, and electrical engineering capable of performing successfully as electrical engineers and pursuing graduate studies."

Program Educational Objectives

Within a few years of graduation, the PUPR Electrical Engineering program graduates are expected to attain the following:

1. Establish themselves as practicing professionals in PR or USA integrating rapidly to changing job demands and gradually obtaining leadership positions.
2. Hold positions of increasing responsibility in an electrical engineering field or related area, demonstrating professional competence and ethical behavior.
3. Contribute to their organization or discipline as an active member of a professional team or as a technical liaison in a bilingual (Spanish-English) environment.
4. Continue their professional development through independent learning, involvement in advanced professional studies in electrical engineering or related areas or enrolling in graduate school.

Student Outcomes

By the time of graduation, students of the Electrical Engineering program at PUPR are expected to have attained the following:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Load

The minimum full-time load per trimester is twelve (12) credit-hours. To register for sixteen (16) credit-hours or above, the student must obtain the approval of the department head and dean. Credits will not be awarded for courses in which the student is not properly registered.

Duration

The program's format offers career-minded professionals the unique opportunity to earn a Bachelor of Science in Electrical Engineering in four years while continuing to work in their current positions. It is also suitable for full-time students who have the desire to commit to a more demanding academic schedule. The program may be completed in four years by enrolling in about eleven (11) to fourteen (14) credits per term.

Academic Schedule

Registration for all students is held prior to the beginning of each term on designated registration days, as stipulated on the Academic Calendar. Completion of registration for each term is required prior to class attendance. The academic year consists of three terms, and three summer sessions. One summer session for engineering courses, and two summer sessions for arts and sciences courses. Fall, winter, and spring classes are scheduled from 8:00 a.m. to 10:30 p.m., Monday through Thursday, and from 8:00 a.m. to 5:00 p.m. on Fridays and Saturdays. Students are required to make-up class contact hours lost because of holidays.

Career Opportunities

The alignment of the Electrical Engineering program with industry requirements assures that graduates of this program will remain in high demand. Today, our electric power industry constituents face challenges for providing an efficient and economical energy supply to satisfy increasing exigencies by applying traditional schemes as well as using smart power distribution and control technologies, and new alternative energy sources. Other constituents of the communication industry have also been undergoing sweeping changes (i.e., wireless technology, 5G-cellular, optic fiber, etc.), forever transforming people's lives and culture. Increasing demands for efficiency, productivity, and multiple bottom-line goals in the modern enterprise require the smart application of automation, controls, and ubiquitous interconnectedness while preserving ethical, environmental, and humanistic goals. The demands of these and other related fields of human endeavor assure the availability of highly satisfying, high impact jobs for our well-equipped graduates in the foreseeable future.

Developmental Studies

All students that request admission and are admitted to the Electrical Engineering Program must show evidence that they have acquired the academic abilities and skills necessary to progress through this major. Those not demonstrating the complete acquisition of these abilities and skills will be required to take some of these developmental courses. Abilities and skills are demonstrated through the results of the College Entrance Examination Board Test, results of PUPR's placement test, previous university experience, and other tests or criteria. The courses are designed to help students overcome deficiencies in languages, mathematics, and science. These

developmental courses are in addition to the 150 credits of the Electrical Engineering Program. The courses are awarded their corresponding credits according to contact hours. The courses are the following:

Developmental Studies Component
(Maximum of 30 Credit-Hours)

Course	Title	Credit-Hours
ENGL 0100	Preparatory English	3
ENGL 0110	English Grammar	3
ESOL 0100	Beginner English as a Second Language	3
ESOL 0110	Intermediate English as a Second Language	3
ESOL 0120	Advanced English as a Second Language	3
MATH 0102	Preparatory Mathematics	3
MATH 0106	Elementary Algebra	3
MATH 0110	Intermediate Algebra	3
MATH 1330	Precalculus I	3
MATH 1340	Precalculus II	3

Laboratories

The ECECS Department provides undergraduate teaching and/or research laboratories in the following subjects: Electrical Measurements, Electronics, Power Electronics, Communications, Logic Circuits, Process Control & Instrumentation, Electromechanical Energy Conversion, Power System Analysis, Power System Protection, Computer Programming, Computer Interfacing, Computer Architecture, Computer Networks, Real Time Digital Signal Processing, Fundamentals of Digital Signal Processing, Automation Engineering, Robotic Engineering, and Plasma Engineering.

Student Organizations

The students enrolled in the department may become members of any of the following organizations:

- a. IEEE Student Branch – This is an organization for undergraduates currently enrolled in electrical engineering programs. Branches are organized under the Institute of Electrical and Electronics Engineers, Inc., the world's largest professional engineering society.

Degree Offered

PUPR offers a Bachelor of Science in Electrical Engineering (BSEE) degree. In order to earn the BSEE degree, the student must complete the following requirements:

Minimum Graduation Requirements

15	Credit-hours in Mathematics
14	Credit-hours in Basic Sciences
21	Credit-hours in Socio-Humanistic Studies and Languages
12	Credit-hours in Engineering Sciences
52	Credit-hours in Basic Electrical Engineering Component
33	Credit-hours in Smart Grid Power Systems or Communications, Signals & Controls Systems Track Options
3	Credit-hours in Free Electives
150	Total Credit-hours

ELECTRICAL ENGINEERING CURRICULUM
(150 Credit-Hours)

Mathematics Component

(15 Credit-Hours)

Course	Title	Credit-Hours
MATH 1350	Calculus I	4
MATH 1360	Calculus II	4
MATH 1370	Calculus III	4
MATH 2350	Differential Equations	3

Basic Sciences Component**(14 Credit-Hours)**

Course	Title	Credit-Hours
SCIE 1210	Principles of Chemistry	3
SCIE 1211	Principles of Chemistry Laboratory	1
SCIE 1430	Physics I	4
SCIE 1431	Physics I Laboratory	1
SCIE 1440	Physics II	4
SCIE 1441	Physics II Laboratory	1

Socio-Humanistic Studies and Languages Component**(21 Credit-Hours)**

Course	Title	Credit-Hours
ENGL 1020	English Composition I	3
ENGL 1021	English Composition II	3
ETH 2020	Ethics in Engineering	3
ENGL 1026	Fundamentals of Speech Communications	3
WOHI 2012	World Civilization I	3
ELEC	General Education Humanities Elective	3
ELEC	General Education Social Sciences Elective	3

Engineering Sciences Component**(12 Credit-Hours)**

Course	Title	Credit-Hours
ENGI 2260	Engineering Economics	3
ENGI 2270	Engineering Probability & Statistics	3
ENGI 2910	Engineering Mechanics, Statics & Dynamics	3
ENGI 3440	Thermo-Fluids	3

Electrical Engineering Basic Core Component**(52 Credit-Hours)**

Course	Title	Credit-Hours
CECS 2200	Computer Programming Fundamentals	1
CECS 2202	Computer Programming I	4
CECS 2203	Computer Programming I Laboratory	0
COE 2300	Logic Circuits	3
COE 2301	Logic Circuits Laboratory	1
EE 1130	Freshman Design for Electrical & Computer Engineers	3
EE 2000	Circuit Analysis I	3
EE 2001	Electrical Measurements Laboratory	1
EE 2010	Computational Methods in Electrical & Computer Engineering	3

EE	2020	Circuit Analysis II	3
EE	2030	Electromagnetics Theory	3
EE	2402	Electromechanical Energy Conversion	3
EE	2403	Electromechanical Energy Conversion Laboratory	1
EE	2500	Electronics I	3
EE	2501	Electronics I Laboratory	1
EE	3002	Signals & Systems	3
EE	3600	Automatic Controls	3
EE	3610	Automation Engineering	3
EE	3611	Automation Engineering Laboratory	1
EE	4220	Fundamentals of Software Processes, Databases, and Networking	3
EE	4002	Capstone Design Course I	3
EE	4022	Capstone Design Course II	3

Free Electives
(3 Credit-Hours)

Select any three credit-hours, except electrical engineering courses offered as service course for non-electrical engineering students.

Program Electives Component

Communications, Signals & Controls Systems Area of Interest
(Must take 33 Credit-Hours)

Must select 11 credit-hours in required area courses in the “Communications, Signals & Controls Systems Area of Interest”, and other 22 credit-hours in elective area courses. CECS courses will also be available as department electives. Of the program electives, a total of 14 credit-hours must be in EE or COE 4th year level, or CECS 3rd year level. No CS courses will be accepted. At least two credit-hours, or their equivalent in laboratory experience must be included. Elective courses must amount to at least eight credit-hours of design.

Required Area Courses
(Must take 11 Credit-Hours)

Course	Title	Credit-Hours
COE 3320	Microprocessors	3
COE 3321	Microprocessors Laboratory	1
EE 3510	Electronics II	3
EE 3511	Electronics II Laboratory	1
EE 3702	Fundamentals of Wireless Communications and Cellular Networks	3

Elective Area Courses
(Must take 22 credits, at least 14 credits in EE 4XXX or CECS 3XXX Level Courses)

Course	Title	Credit-Hours
CECS 3216	Machine Learning	3
CECS 3218	Data Engineering for Machine Learning I	3
CECS 3234	UNIX Operating System	3
CECS 3302	Data Communications	3
CECS 4224	Deep Learning	3
CECS 4232	Data Engineering for Machine Learning II	3
CECS 4240	Real-Time Operating Systems	3

COE	3302	Digital System Design with VHDL	3
COE	3303	Digital Systems Design with VHDL Laboratory	1
COE	4340	Microcomputer Interfacing	4
COE	4341	Microcomputer Interfacing Laboratory	0
COOP	3010	Professional Practice	3
EE	3220	Software Applications for Electrical Engineering	3
EE	3412	Electric Machines Control	3
EE	3413	Electric Machines Control Laboratory	1
EE	3512	Power Electronics	3
EE	3513	Power Electronics Laboratory	1
EE	3710	Random Processes	3
EE	4010	Electromagnetics Theory II	3
EE	4030	Electromagnetic Compatibility (EMC/EMI)	3
EE	4031	Electromagnetic Compatibility (EMC/EMI) Laboratory	1
EE	4602	Process Control & Instrumentation	3
EE	4603	Process Control & Instrumentation Laboratory	1
EE	4606	Digital Control Systems	3
EE	4612	Control System Design	3
EE	4620	Robotic Engineering Design	4
EE	4621	Robotic Engineering Design Laboratory	0
EE	4622	Industrial Automation	3
EE	4640	Avionics Systems	3
EE	4706	Fiber Optics System Design	3
EE	4720	Digital Signal Processing	3
EE	4724	Digital Data Transmission Systems	3
EE	4736	Communication Systems, Simulation & Design	3
EE	4742	Advanced Mobile Networks and Technologies	3
EE	4902	Undergraduate Research in Electrical Engineering	3
EE	4904	Undergraduate Research in Electrical Engineering II	3
EE	4911	Electrical Engineering Seminar I	1
EE	4912	Electrical Engineering Seminar II	1
EE	4990/4991	Special Topics in Electrical Engineering	3
MATH	2360	Linear Algebra	3

Note: Availability of courses EE 4902, EE 4904 and EE 4990, EE 4991, as well as CS 4990, and COE 4990 for the Electrical Engineering Program students, will be determined by the department head, depending on the specific teaching or research topic.

Program Electives Component

Smart Grid Power Systems Area of Interest

(Must take 33 Credit-Hours)

Must select 24 credit-hours in required area courses in the “Smart Grid Power Systems Area of Interest”, and other nine credit-hours in elective area courses. CECS courses will also be available as department electives. Of the program electives area courses, a total of 14 credit-hours must be in courses EE or COE 4th year level. No CS courses will be accepted. At least two credit-hours, or their equivalent in laboratory experience must be included. Elective courses must include at least eight credit-hours of design.

Required Area Courses

(Must take 24 Credit-Hours)

Course	Title	Credit-Hours
EE 3412	Electric Machines Control	3
EE 3413	Electric Machines Control Laboratory	1
EE 3420	Power Systems Analysis I	3
EE 3440	Electric System Design I	3

EE	3512	Power Electronics	3
EE	3513	Power Electronics Laboratory	1
EE	4400	Power Systems Analysis II	3
EE	4401	Power Systems Analysis Laboratory	1
EE	4438	Smart Distribution Systems Engineering	3
EE	4452	Alternative Generation Systems	3

Elective Area Courses

(Must take nine credits, at least four credits in EE 4XXX Level Courses)

Course	Title	Credit-Hours
COOP 3010	Professional Practice	3
EE 3220	Software Applications for Electrical Engineering	3
EE 4422	Electric Power Quality	3
EE 4432	Power System Protection	3
EE 4433	Power System Protection Laboratory	1
EE 4442	Lighting Fundamentals Design	3
EE 4444	Electric System Design II	3
EE 4462	Electrical Construction Project Management	3
EE 4464	Generation Control Systems	3
EE 4466	Renewable Energy Systems	3
EE 4602	Process Control & Instrumentation	3
EE 4603	Process Control & Instrumentation Laboratory	1
EE 4622	Industrial Automation	3
EE 4902	Undergraduate Research in Electrical Engineering	3
EE 4904	Undergraduate Research in Electrical Engineering II	3
EE 4911	Electrical Engineering Seminar I	1
EE 4912	Electrical Engineering Seminar II	1
EE 4990/4991	Special Topics in Electrical Engineering	3

Note: Availability of courses EE 4902, EE 4904 and EE 4990, EE 4991, as well as CS 4990, and COE 4990 for the Electrical Engineering Program students, will be determined by the department head, depending on the specific teaching or research topic.

ELECTRICAL ENGINEERING PROGRAM CURRICULUM SEQUENCE

(150 Credit-Hours)

First Year**1st Year - First Quarter**

Course	Title	Credit-Hours
MATH 1350	Calculus I	4
ENGL 1020	English Composition I	3
WOHI 2012	World Civilization I	3
EE 1130	Freshman Design for Electrical & Computer Engineers	3
Total		13

1st Year - Second Quarter

Course	Title	Credit-Hours
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MATH	1360	Calculus II	4
SCIE	1430	Physics I	4
SCIE	1431	Physics I Laboratory	1
SCIE	1210	Principles of Chemistry	3
SCIE	1211	Principles of Chemistry Laboratory	1
Total			13

1st Year -Third Quarter

Course		Title	Credit-Hours
MATH	1370	Calculus III	4
SCIE	1440	Physics II	4
SCIE	1441	Physics II Laboratory	1
CECS	2200	Computer Programming Fundamentals	1
ENGI	2270	Engineering Probability & Statistics	3
Total			13

Second Year

2nd Year - First Quarter

Course		Title	Credit-Hours
MATH	2350	Differential Equations	3
EE	2000	Circuit Analysis	3
EE	2030	Electromagnetics Theory	3
CECS	2202	Computer Programming I	4
CECS	2203	Computer Programming I Laboratory	0
Total			13

2nd Year - Second Quarter

Course		Title	Credit-Hours
COE	2300	Logic Circuits	3
COE	2301	Logic Circuits Laboratory	1
EE	2001	Electrical Measurements Laboratory	1
EE	2020	Circuit Analysis II	3
EE	2402	Electromechanical Energy Conversion	3
Total			11

(Only for Students in Smart Grid Power Systems Area of Interest)

2nd Year - Third Quarter

Course		Title	Credit-Hours
EE	2010	Computational Methods in Electrical & Computer Engineering	3
EE	2403	Electromechanical Energy Conversion Laboratory	1
EE	2500	Electronics I	3
EE	2501	Electronics I Laboratory	1
EE	3412	Electric Machines Control	3
EE	3420	Power Systems Analysis I	3
Total			14

Third Year

3rd Year - First Quarter

Course		Title	Credit-Hours
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EE	3413	Electric Machines Control Laboratory	1
EE	3512	Power Electronics	3
EE	3513	Power Electronics Laboratory	1
EE	3610	Automation Engineering	3
EE	3611	Automation Engineering Laboratory	1
EE	4220	Fundamentals of Software Processes, Databases & Networking	3
Total			12

3rd Year - Second Quarter

Course	Title		Credit-Hours
EE	3002	Signals & Systems	3
EE	3440	Electric System Design I	3
ENGI	2260	Engineering Economics	3
ENGL	1021	English Composition II	3
Total			12

3rd Year - Third Quarter

Course	Title		Credit-Hours
EE	3600	Automatic Controls	3
EE	4400	Power Systems Analysis II	3
EE	4401	Power Systems Analysis Laboratory	1
EE	4438	Smart Distribution Systems Engineering	3
ETH	2020	Ethics in Engineering	3
Total			13

Fourth Year

4th Year - First Quarter

Course	Title		Credit-Hours
EE	4452	Alternative Generation Systems	3
ENGI	2910	Engineering Mechanics, Statics & Dynamics	3
ENGL	1026	Fundamentals of Speech Communications	3
ELEC		General Education Humanities Elective	3
Total			12

4th Year - Second Quarter

Course	Title		Credit-Hours
EE	4002	Capstone Design Course I	3
ENGI	3440	Thermo-Fluids	3
EE ELEC		EE Smart Grid Power Technical Electives	6
Total			12

4th Year - Third Quarter

Course	Title		Credit-Hours
EE	4022	Capstone Design Course II	3
EE ELEC		EE Smart Grid Power Technical Electives	3
ELEC		General Education Social Science Elective	3
ELEC		Free Elective	3
Total			12

(Only for Students in Communications, Signals & Controls Systems Area of Interest)**2nd Year - Third Quarter**

Course		Title	Credit-Hours
EE	2010	Computational Methods in Electrical & Computer Engineering	3
EE	2403	Electromechanical Energy Conversion Laboratory	1
EE	2500	Electronics I	3
EE	2501	Electronics I Laboratory	1
ENGI	2910	Engineering Mechanics, Statics & Dynamics	3
Total			11

Third Year**3rd Year - First Quarter**

Course		Title	Credit-Hours
COE	3320	Microprocessors	3
COE	3321	Microprocessors Laboratory	1
EE	3510	Electronics II	3
EE	3511	Electronics II Laboratory	1
EE	4220	Fundamentals of Software Processes, Databases & Networking	3
ENGL	1021	English Composition II	3
Total			14

3rd Year - Second Quarter

Course		Title	Credit-Hours
EE	3002	Signals & Systems	3
EE	3610	Automation Engineering	3
EE	3611	Automation Engineering Laboratory	1
EE	3702	Fundamentals of Wireless Communications and Cellular Networks	3
ETH	2020	Ethics in Engineering	3
Total			13

3rd Year - Third Quarter

Course		Title	Credit-Hours
EE	3600	Automatic Controls	3
EE ELEC		EE Communications, Signals & Controls Technical Electives	4
ENGI	2260	Engineering Economics	3
ENGL	1026	Fundamentals of Speech Communications	3
Total			13

Fourth Year**4th Year - First Quarter**

Course		Title	Credit-Hours
EE ELEC		EE Communications, Signals & Controls Technical Electives	9
ELEC		General Education Humanities Elective	3
Total			12

4th Year - Second Quarter

Course		Title	Credit-Hours
EE	4002	Capstone Design Course I	3
EE ELEC		EE Communications, Signals & Controls Technical Electives	6
ENGI	3440	Thermo-Fluids	3
		Total	12

4th Year - Third Quarter

Course		Title	Credit-Hours
EE	4022	Capstone Design Course II	3
EE ELEC		EE Communications, Signals & Controls Technical Electives	3
ELEC		General Education Social Science Elective	3
ELEC		Free Elective	3
		Total	12

PROGRAM COURSES

Computer Engineering and Computer Science Courses

(Go to the ECECS Department Courses for the Description)

CECS	2200	Computer Programming Fundamentals
CECS	2202	Computer Programming I
CECS	2203	Computer Programming I Laboratory
CECS	3216	Machine Learning
CECS	3218	Data Engineering for Machine Learning I
CECS	3234	UNIX Operating System
CECS	3302	Data Communications
CECS	4224	Deep Learning
CECS	4232	Data Engineering for Machine Learning II
CECS	4240	Real-Time Operating Systems

Computer Engineering Courses

(Go to the ECECS Department Courses for the Description)

COE	2300	Logic Circuits
COE	2301	Logic Circuits Laboratory
COE	3302	Digital System Design with VHDL
COE	3303	Digital Systems Design with VHDL Laboratory
COE	3320	Microprocessors
COE	3321	Microprocessors Laboratory
COE	4330	Computer Networks
COE	4331	Computer Networks Laboratory
COE	4340	Microcomputer Interfacing
COE	4341	Microcomputer Interfacing Laboratory

Electrical Engineering Courses

(Go to the ECECS Department Courses for the Description)

EE	1130	Freshman Design for Electrical & Computer Engineers
EE	2000	Circuit Analysis I
EE	2001	Electrical Measurements Laboratory

EE	2010	Computational Methods in Electrical & Computer Engineering
EE	2020	Circuit Analysis II
EE	2030	Electromagnetics Theory
EE	2402	Electromechanical Energy Conversion
EE	2403	Electromechanical Energy Conversion Laboratory
EE	2500	Electronics I
EE	2501	Electronics I Laboratory
EE	3002	Signals & Systems
EE	3220	Software Applications for Electrical Engineering
EE	3412	Electric Machines Control
EE	3413	Electric Machines Control Laboratory
EE	3420	Power Systems Analysis I
EE	3440	Electric System Design I
EE	3510	Electronics II
EE	3511	Electronics II Laboratory
EE	3512	Power Electronics
EE	3513	Power Electronics Laboratory
EE	3600	Automatic Controls
EE	3610	Automation Engineering
EE	3611	Automation Engineering Laboratory
EE	3702	Fundamentals of Wireless Communications & Cellular Networks
EE	3710	Random Processes
EE	4002	Capstone Design Course I
EE	4010	Electromagnetics Theory II
EE	4022	Capstone Design Course II
EE	4030	Electromagnetic Compatibility (EMC/EMI)
EE	4031	Electromagnetic Compatibility (EMC/EMI) Laboratory
EE	4220	Fundamentals of Software Processes, Databases, and Networking
EE	4400	Power Systems Analysis II
EE	4401	Power Systems Analysis Laboratory
EE	4422	Electric Power Quality
EE	4432	Power System Protection
EE	4433	Power System Protection Laboratory
EE	4438	Smart Distribution Systems Engineering
EE	4442	Lighting Fundamentals Design
EE	4444	Electric System Design II
EE	4462	Electrical Construction Project Management
EE	4464	Generation Control Systems
EE	4466	Renewable Energy Systems
EE	4602	Process Control & Instrumentation
EE	4603	Process Control & Instrumentation Laboratory
EE	4606	Digital Control Systems
EE	4612	Control System Design
EE	4620	Robotic Engineering Design
EE	4621	Robotic Engineering Design Laboratory
EE	4622	Industrial Automation
EE	4640	Avionics Systems
EE	4706	Fiber Optics System Design
EE	4720	Digital Signal Processing
EE	4724	Digital Data Transmission Systems
EE	4736	Communication Systems, Simulation & Design
EE	4742	Advanced Mobile Networks and Technologies

EE	4902	Undergraduate Research in Electrical Engineering
EE	4904	Undergraduate Research in Electrical Engineering II
EE	4911	Electrical Engineering Seminar I
EE	4912	Electrical Engineering Seminar II
EE	4990/4991	Special Topics in Electrical Engineering

Other Department Courses

(Go to the Mathematics and Sciences Department Courses for the Description)

MATH 2360 Linear Algebra

COMPUTER ENGINEERING PROGRAM

Computer Engineering is a rapidly changing field that spans a wide range of topics concerned with the design, implementation, and programming of computers and digital systems. Computer engineers develop integrated hardware and software systems and apply these to the creative solution of problems in government and business. These solutions are key enablers to global economic development and social welfare. A sample of the range of solutions created by computer engineers include: Industrial and military control systems, database management systems, health care information systems, networked systems, end-user embedded computer-controlled products, and computer-aided design tools to automate and leverage human performance in many other disciplines.

The Bachelor of Science in Computer Engineering provides both breadth and depth in the discipline by incorporating physical and mathematical sciences, core engineering subjects, fundamental computer science topics, and a wide array of specialized courses in areas of long relevance to computer engineering. It has been designed as a flexible program that is able to accommodate particular student interests through electives. Topics covered include: Algorithms and languages, digital system design, networks and communications, computer organization and architecture, microprocessor-based systems, database systems, software engineering, operating systems, and capstone design courses.

Program Mission

"To educate graduates with broad background in mathematics, science, software, and hardware capable of performing successfully as computer engineers and/or pursuing graduate studies."

Program Educational Objectives

The program educational objectives for the computer engineering graduates are:

1. Establish themselves as practicing professionals and continuously evolve to meet the needs of a changing information and industry-based society, maintaining an ethical and socially responsible perspective.
2. Develop successfully as team members, leaders, and managers or entrepreneurs in the Computer Engineering arena.
3. Provide comprehensive solutions to Computer Engineering problems that leverage technological advancements.
4. Engage in professional development through a lifetime of continuing education, research, and/or graduate studies.

Student Outcomes

By the time of graduation, students of the Computer Engineering program at PUPR are expected to have attained the following:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Career Opportunities

The demand for Computer Engineers continues to expand in parallel to the computer and informatics revolution that has characterized the turn of the century. This trend is expected to continue well into the 21st century as computers continue to impact human development in all disciplines and industries, including business, research, and entertainment. Job opportunities exist within all kinds of businesses, given their need for and reliance on computational infrastructure, as well as in organizations specifically devoted to research and development of computer technologies.

Academic Load

The minimum full-time load per trimester is twelve (12) credit-hours. To register for sixteen (16) credit-hours or above the student must obtain the approval of the Department Head and Dean. Credits will not be awarded for courses in which the student is not properly registered.

Duration

The program's curriculum format offers career-minded professionals the unique opportunity to earn a Bachelor of Science in Computer Engineering in four years, while continuing to work in their current positions. It is also suitable for full-time students who have the desire to focus their entire effort on pursuing this degree. The program may be completed in four years by enrolling in about 12 to 13 credits per trimester.

Academic Schedule

Registration for all students is held prior to the beginning of each term on designated registration days as stipulated on the Academic Calendar. Completion of registration for each term is required prior to class attendance. The academic year consists of three terms, and three summer sessions. One summer session for engineering courses, and two summer sessions for arts and sciences courses. Fall, winter, and spring classes are scheduled from 8:00 a.m. to 10:30 p.m., Monday through Thursday, and from 8:00 a.m. to 5:00 p.m. on Fridays and Saturdays. Students are required to make-up class contact hours lost because of holidays.

Developmental Studies

All students that request admission and are admitted to the Computer Engineering Program must show evidence that they have acquired the academic abilities and skills necessary to progress through this major. Those not demonstrating the complete acquisition of these abilities and skills will be required to take some of these developmental courses. Abilities and skills are demonstrated through the results of the College Entrance Examination Board Test, results in PUPR's placement test, previous university experience, other tests, or criteria. The courses are designed to help students overcome deficiencies in languages, mathematics, and science. These developmental courses are in addition to the 149 credits of the Computer Engineering Program. The courses are awarded their corresponding credits according to contact hours. The courses are the following:

Developmental Studies Component (Maximum of 30 Credit-Hours)			
Course	Title		Credit-Hours
ENGL 0100	Preparatory English		3
ENGL 0110	English Grammar		3
ESOL 0100	Beginner English as a Second Language		3
ESOL 0110	Intermediate English as a Second Language		3
ESOL 0120	Advanced English as a Second Language		3
MATH 0102	Preparatory Mathematics		3
MATH 0106	Elementary Algebra		3
MATH 0110	Intermediate Algebra		3
MATH 1330	Pre-calculus I		3
MATH 1340	Pre-calculus II		3

Laboratories

The ECECS Department provides undergraduate laboratory and research in the following topics: Electrical Measurements, Electronics, Power Electronics, Communications, Logic Circuits, Process Control & Instrumentation, Electromechanical Energy Conversion, Power System Analysis, Power System Protection, Computer Programming, Computer Interfacing, Computer Architecture, Computer Networks, Real Time Digital Signal Processing, Fundamentals of Digital Signal Processing, Automation Engineering, Robotic Engineering, and Plasma Engineering.

Student Organizations

The students enrolled in the department may become members of the following student organization:

- IEEE Student Branch- This is an organization for registered undergraduates currently enrolled in computer engineering programs. Branches are organized under the Institute of Electrical and Electronics Engineers, Inc., the world's largest professional engineering society.

Degree Offered

PUPR offers a Bachelor of Science in Computer Engineering (BSCpE) degree. In order to earn the BSCpE degree, the student must complete the following requirements:

Minimum Graduation Requirements

15	Credit-hours in Mathematics
14	Credit-hours in Basic Sciences
21	Credit-hours in Socio-Humanistic Studies and Languages
9	Credit-hours in Engineering Sciences
81	Credit-hours in Basic Computer Engineering Component
6	Credit-hours in Computer Engineering Program Electives
3	Credit-hours in Free Electives
149	Total Credit-hours

COMPUTER ENGINEERING CURRICULUM

(149 Credit-Hours)

Mathematics Component

(15 Credit-Hours)

Course	Title	Credit-Hours
MATH 1350	Calculus I	4
MATH 1360	Calculus II	4
MATH 1370	Calculus III	4
MATH 2350	Differential Equations	3

Basic Sciences Component

(14 Credit-Hours)

Course	Title	Credit-Hours
SCIE 1210	Principles of Chemistry	3
SCIE 1211	Principles of Chemistry Laboratory	1
SCIE 1430	Physics I	4
SCIE 1431	Physics I Laboratory	1
SCIE 1440	Physics II	4
SCIE 1441	Physics II Laboratory	1

Socio-Humanistic Studies and Languages Component
(21 Credit-Hours)

Course	Title	Credit-Hours
ENGL 1020	English Composition I	3
ENGL 1021	English Composition II	3
ETH 2020	Ethics in Engineering	3
ENGL 1026	Fundamentals of Speech Communications	3
WOHI 2012	World Civilization I	3
ELEC	General Education Humanities Elective	3
ELEC	General Education Social Sciences Elective	3

Engineering Sciences Component
(9 Credit-Hours)

Course	Title	Credit-Hours
ENGI 2260	Engineering Economics	3
ENGI 2270	Engineering Probability & Statistics	3
ENGI 2910	Engineering Mechanics, Statics & Dynamics	3

Computer Engineering Core Component
(81 Credit-Hours)

Course	Title	Credit-Hours
CECS 2004	Discrete Structures	3
CECS 2200	Computer Programming Fundamentals	1
CECS 2202	Computer Programming I	4
CECS 2203	Computer Programming I Laboratory	0
CECS 2222	Computer Programming II	4
CECS 2223	Computer Programming II Laboratory	0
CECS 3210	Advanced Programming	3
CECS 3212	Data Structures	3
CECS 3302	Data Communications	3
CECS 4202	Database Systems	3
CECS 4204	Software Engineering	3
CECS 4230	Operating Systems	3
COE 2300	Logic Circuits	3
COE 2301	Logic Circuits Laboratory	1
COE 3302	Digital Systems Design with VHDL	3
COE 3320	Microprocessors	3
COE 3321	Microprocessors Laboratory	1
COE 4002	Capstone Design Course I	3
COE 4022	Capstone Design Course II	3
COE 4320	Computer Architecture	4
COE 4321	Computer Architecture Laboratory	0
COE 4330	Computer Networks	3
COE 4331	Computer Networks Laboratory	1
COE 4340	Microcomputer Interfacing	4
COE 4341	Microcomputer Interfacing Laboratory	0
EE 1130	Freshman Design for Electrical & Computer Engineers	3
EE 2000	Circuit Analysis I	3
EE 2001	Electrical Measurements Laboratory	1

EE	2010	Computational Methods in Electrical & Computer Engineering	3
EE	2020	Circuit Analysis II	3
EE	2500	Electronics I	3
EE	3002	Signals & Systems	3
EE	4720	Digital Signal Processing	3

Computer Engineering Technical Electives

(Must take 6 credits in technical electives to complete graduation requirements)

Course	Title	Credit-Hours
CECS 3200	Assembly Language Programming	3
CECS 3202	Visual-Oriented Programming	3
CECS 3214	Internet Programming I	3
CECS 3216	Machine Learning	3
CECS 3218	Data Engineering for Machine Learning I	3
CECS 3220	Human-Computer Interaction	3
CECS 3234	UNIX Operating System	3
CECS 4200	Programming Languages	3
CECS 4206	Design and Analysis of Algorithms	3
CECS 4208	Computer Forensics	3
CECS 4210	Ethical Hacking	3
CECS 4214	Network Security	3
CECS 4216	Reverse Engineering	3
CECS 4218	Introduction to Game Design	3
CECS 4220	E-Commerce	3
CECS 4224	Deep Learning	3
CECS 4226	Computer Graphics	3
CECS 4228	Computational Theory	3
CECS 4232	Data Engineering for Machine Learning II	3
CECS 4236	Software Requirements Engineering	3
CECS 4240	Real-Time Operating Systems	3
CECS 4248	Software Testing and Verification	3
CECS 4911	Computer Engineering Seminar I	1
CECS 4912	Computer Engineering Seminar II	1
COE 3303	Digital Systems Design with VHDL Laboratory	1
COE 4902	Undergraduate Research in Computer Engineering	3
COE 4904	Undergraduate Research in Computer Engineering II	3
COE 4990	Special Topics in Computer Engineering	3
COOP 3010	Professional Practice	3
EE 3710	Random Processes	3
EE 4606	Digital Control Systems	3
EE 4620	Robotic Engineering Design	4
EE 4621	Robotic Engineering Design Laboratory	0
EE 4640	Avionics Systems	3
MGMT 4660	Entrepreneurship	3

Notes: A student is required to select six credit-hours of available technical electives in order to acquire additional skills that reinforce the student's knowledge in a specific area of interest. Availability of courses COE 4902, COE 4904 and COE 4990, as well as CS 4990, EE 4990, and EE 4991, for the Computer Engineering Program students will be determined by the Program Director, depending on the specific teaching or research topic.

Free Electives

(3 Credit-Hours)

Select 3 credit-hours of free electives in any area

COMPUTER ENGINEERING PROGRAM CURRICULUM SEQUENCE

(149 Credit-Hours)

First Year**1st Year - First Quarter**

Course		Title	Credit-Hours
MATH	1350	Calculus I	4
ENGL	1020	English Composition I	3
WOHI	2012	World Civilization I	3
EE	1130	Freshman Design for Electrical & Computer Engineers	3
Total			13

1st Year - Second Quarter

Course		Title	Credit-Hours
MATH	1360	Calculus II	4
CECS	2004	Discrete Structures	3
SCIE	1210	Principles of Chemistry	3
SCIE	1211	Principles of Chemistry Laboratory	1
Total			11

1st Year - Third Quarter

Course		Title	Credit-Hours
MATH	1370	Calculus III	4
SCIE	1430	Physics I	4
SCIE	1431	Physics I Laboratory	1
CECS	2200	Computer Programming Fundamentals	1
ELEC		General Education Humanities Elective	3
Total			13

Second Year**2nd Year- First Quarter**

Course		Title	Credit-Hours
SCIE	1440	Physics II	4
SCIE	1441	Physics II Laboratory	1
CECS	2202	Computer Programming I	4
CECS	2203	Computer Programming I Laboratory	0
MATH	2350	Differential Equations	3
Total			12

2nd Year- Second Quarter

Course		Title	Credit-Hours
EE	2000	Circuit Analysis I	3
ENGI	2270	Engineering Probability & Statistics	3
CECS	2222	Computer Programming II	4
CECS	2223	Computer Programming II Laboratory	0

ENGI	2910	Engineering Mechanics, Statics & Dynamics	3
			Total 13

2nd Year- Third Quarter

Course		Title	Credit-Hours
ENGL	1021	English Composition II	3
EE	2020	Circuit Analysis II	3
EE	2001	Electrical Measurements Laboratory	1
CECS	3212	Data Structures	3
ETH	2020	Ethics in Engineering	3
			Total 13

Third Year

3rd Year - First Quarter

Course		Title	Credit-Hours
CECS	3210	Advanced Programming	3
COE	2300	Logic Circuits	3
COE	2301	Logic Circuits Laboratory	1
CECS	4202	Database Systems	3
EE	2500	Electronics I	3
			Total 13

3rd Year - Second Quarter

Course		Title	Credit-Hours
CECS	3302	Data Communications	3
COE	3320	Microprocessors	3
COE	3321	Microprocessors Laboratory	1
COE	3302	Digital Systems Design with VHDL	3
ENGL	1026	Fundamentals of Speech Communications	3
			Total 13

3rd Year - Third Quarter

Course		Title	Credit-Hours
CECS	4204	Software Engineering	3
COE	4320	Computer Architecture	4
COE	4321	Computer Architecture Laboratory	0
ENGI	2260	Engineering Economics	3
EE	2010	Computational Methods in Electrical & Computer Engineering	3
			Total 13

Fourth Year

4th Year- First Quarter

Course		Title	Credit-Hours
CECS	4230	Operating Systems	3
COE	4340	Microcomputer Interfacing	4
COE	4341	Microcomputer Interfacing Laboratory	0
ELEC		General Education Social Sciences Elective	3
EE	3002	Signals & Systems	3

Total 13

4th Year- Second Quarter

Course		Title	Credit-Hours
COE	4002	Capstone Design Course I	3
EE	4720	Digital Signal Processing	3
CECS/COE ELEC		Computer Engineering Technical Elective	3
COE	4330	Computer Networks	3
COE	4331	Computer Networks Laboratory	1
Total			13

4th Year- Third Quarter

Course		Title	Credit-Hours
COE	4022	Capstone Design Course II	3
CECS/COE ELEC		Computer Engineering Technical Elective	3
ELEC		Free Elective	3
Total			9

PROGRAM COURSES

Computer Engineering and Computer Science Courses
 (Go to the ECECS Department Courses for the Description)

CECS	2004	Discrete Structures
CECS	2200	Computer Programming Fundamentals
CECS	2202	Computer Programming I
CECS	2203	Computer Programming I Laboratory
CECS	2222	Computer Programming II
CECS	2223	Computer Programming II Laboratory
CECS	3200	Assembly Language Programming
CECS	3202	Visual-Oriented Programming
CECS	3210	Advanced Programming
CECS	3212	Data Structures
CECS	3214	Internet Programming I
CECS	3216	Machine Learning
CECS	3218	Data Engineering for Machine Learning I
CECS	3220	Human-Computer Interaction
CECS	3234	UNIX Operating System
CECS	3302	Data Communications
CECS	4200	Programming Languages
CECS	4202	Database Systems
CECS	4204	Software Engineering
CECS	4206	Design and Analysis of Algorithms
CECS	4208	Computer Forensics
CECS	4210	Ethical Hacking
CECS	4214	Network Security
CECS	4216	Reverse Engineering
CECS	4218	Introduction to Game Design
CECS	4220	E-Commerce
CECS	4224	Deep Learning
CECS	4226	Computer Graphics
CECS	4228	Computational Theory

CECS	4230	Operating Systems
CECS	4232	Data Engineering for Machine Learning II
CECS	4236	Software Requirements Engineering
CECS	4240	Real-Time Operating Systems
CECS	4248	Software Testing and Verification
CECS	4911	Computer Engineering Seminar I
CECS	4912	Computer Engineering Seminar II

Computer Science Courses

(Go to the ECECS Department Courses for the Description)

Note: Courses CS 2302, CS 3010, and CS 3300, are not acceptable as valid requirements for the BSCoE degree.

Computer Engineering Courses

(Go to the ECECS Department Courses for the Description)

COE	2300	Logic Circuits
COE	2301	Logic Circuits Laboratory
COE	3302	Digital Systems Design with VHDL
COE	3303	Digital Systems Design with VHDL Laboratory
COE	3320	Microprocessors
COE	3321	Microprocessors Laboratory
COE	4002	Capstone Design Course I
COE	4022	Capstone Design Course II
COE	4320	Computer Architecture
COE	4321	Computer Architecture Laboratory
COE	4330	Computer Networks
COE	4331	Computer Networks Laboratory
COE	4340	Microcomputer Interfacing
COE	4341	Microcomputer Interfacing Laboratory
COE	4902	Undergraduate Research in Computer Engineering
COE	4904	Undergraduate Research in Computer Engineering II
COE	4990	Special Topics in Computer Engineering

Electrical Engineering Courses

(Go to the ECECS Department Courses for the Description)

EE	1130	Freshman Design for Electrical and Computer Engineers
EE	2000	Circuit Analysis I
EE	2001	Electrical Measurements Laboratory
EE	2010	Computational Methods in Electrical & Computer Engineering
EE	2020	Circuit Analysis II
EE	2500	Electronics I
EE	3002	Signals & Systems
EE	3710	Random Processes
EE	4606	Digital Control Systems
EE	4620	Robotic Engineering Design
EE	4621	Robotic Engineering Design Laboratory
EE	4640	Avionics Systems
EE	4720	Digital Signal Processing

Other Department Courses

(Go to the Business Administration Department Courses for the Description)

MGMT 4660

Entrepreneurship

COMPUTER SCIENCE PROGRAM

The field of computer science is one of the most popular academic disciplines within our information society. Computer Scientists build computer-aided design tools, manage information technology enterprises, and develop business information systems for various industries, including finance and health care, support wide-area, local, and cellular networks, and design embedded computer-controlled products.

The computer science program is a flexible curriculum that can be tailored to the students' interests and adjusted to the rapid changes in the industry. The computer science curriculum was designed to satisfy the following criteria:

1. University general education requirements.
2. A common core of computer science courses to ensure a good level of understanding of computer science.
3. A breadth requirement to provide the students with a broad knowledge of the computer science field.
4. A depth requirement to ensure that the students have substantial competence in a concentration area.
5. A senior project experience under the supervision of a faculty member.
6. Elective courses to permit further breadth/depth customization of the student's program.

Program Mission

"To prepare students with a holistic formation in mathematics, science, computation fundamentals, computers, ethical and legal aspects of computing, languages, design and analysis of algorithms, interface design, database systems and software engineering, capable of joining the workforce as computer scientists and/or pursuing graduate studies."

Program Educational Objectives

Within a few years of graduation, graduates from the Computer Science Program will be able to:

1. Participate as key team members in the creation of robust and usable solutions to complex computing problems in any domain.
2. Participate as computer science professionals in leadership positions using appropriate communication skills, contextual awareness, and ethical standards.
3. Perform as entrepreneurs, computer consultants, or providers of computing services and solutions.
4. Stay at the forefront of technological change and innovation by pursuing graduate studies, participating in professional organizations, and/or engaging in self-learning.

Student Outcomes

Graduates of the program will have the ability to:

1. analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions
2. design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline
3. communicate effectively in a variety of professional contexts
4. recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles
5. function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. apply computer science theory and software development fundamentals to produce computing-based solutions.

Career Opportunities

The bachelor's degree in Computer Science is one of the most popular programs in today's high-tech, computer oriented academic curriculums. It is ideal for undergraduates that want to obtain professional knowledge and skills that will eventually lead to a career in computer programming or a related field. The bachelor's degree in Computer Science (CS) will prepare the student with skills that are already of great demand in today's fast-paced, highly competitive work areas. Related positions are well paid because companies are in need of resources that know how to develop and/or maintain software and hardware components and computer systems. This program is an excellent choice for students who want to continue careers in application development, software engineering, appropriate analysis and design methods, and the development of hardware and software components.

Developmental Studies

All students that request admission and are admitted to the Computer Science Program must show evidence that they have acquired the academic abilities and skills necessary to progress through this major. Those not demonstrating the complete acquisition of these abilities will be required to take developmental courses. Abilities and skills are demonstrated through the results of the College Entrance Examination Board Test, results in PUPR's placement test, previous university experience, other tests, or criteria. The courses are designed to help students overcome deficiencies in languages, mathematics, and science. These developmental courses are in addition to the 122 credits of the Computer Science Program. The courses are awarded their corresponding credits according to contact hours. The courses are the following:

Developmental Studies Component (Maximum of 24 credit-hours)		
Course	Title	Credit-Hours
ESOL 0100	Beginner English as a Second Language	3
ESOL 0110	Intermediate English as a Second Language	3
ESOL 0120	Advanced English as a Second Language	3
ENGL 0100	Preparatory English	3
ENGL 0110	English Grammar	3
MATH 0102	Preparatory Mathematics	3
MATH 0106	Elementary Algebra	3
MATH 0110	Intermediate Algebra	3

Laboratories

The ECECS Department provides undergraduate laboratory and research in the following topics: Electrical Measurements, Electronics, Power Electronics, Communications, Logic Circuits, Process Control & Instrumentation, Electromechanical Energy Conversion, Power System Analysis, Power System Protection, Computer Programming, Computer Interfacing, Computer Architecture, Computer Networks, Real Time Digital Signal Processing, and Fundamentals of Digital Signal Processing.

Student Organizations

The students enrolled in the department may become members of the following professional and student organizations: ACM (Association for Computing Machinery) – is the world's first education and scientific computing society. Founded in 1947, ACM is a major force in advancing the skills of information technology professionals and students worldwide.

Degree Offered

PUPR offers a Bachelor of Science in Computer Science (BSCS) degree. In order to earn the BSCS degree, the student must complete the following requirements:

Minimum Graduation Requirements

- 14 Credit-hours in Mathematics
- 14 Credit-hours in Basic Sciences

18	Credit-hours in Socio-Humanistic Studies and Languages
3	Credit-hours in Engineering Sciences
58	Credit-hours in Computer Science Core Component
6	Credit-hours in Computer Science Program Electives
6	Credit-hours in Free Electives
3	Credit-hours in Management
122	Total Credit-hours

COMPUTER SCIENCE CURRICULUM

(122 Credit-Hours)

Mathematics Component

(14 Credit-Hours)

Course	Title	Credit-Hours
MATH 1330	Precalculus I	3
MATH 1340	Precalculus II	3
MATH 1350	Calculus I	4
MATH 1360	Calculus II	4

Basic Sciences Component

(14 Credit-Hours)

Course	Title	Credit-Hours
SCIE 1110	General Biology	3
SCIE 1111	General Biology Laboratory	1
SCIE 1430	Physics I	4
SCIE 1431	Physics I Laboratory	1
SCIE 1440	Physics II	4
SCIE 1441	Physics II Laboratory	1

Socio-Humanistic Studies and Languages Component

(18 Credit-Hours)

Course	Title	Credit-Hours
ENGL 1020	English Composition I	3
ENGL 1021	English Composition II	3
ETH 2020	Ethics in Engineering	3
ENGL 1026	Fundamentals of Speech Communications	3
WOHI 2012	World Civilization I	3
ELEC	General Education Humanities Elective	3

Engineering Sciences Component

(3 Credit-Hours)

Course	Title	Credit-Hours
ENGI 2270	Engineering Probability & Statistics	3

Management Courses

(3 Credit-Hours)

Course	Title	Credit-Hours
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MGMT 4660 Entrepreneurship 3

Computer Science Core Component

(58 Credit-Hours)

Course	Title	Credit-Hours
CECS 2004	Discrete Structures	3
CECS 2200	Computer Programming Fundamentals	1
CECS 2202	Computer Programming I	4
CECS 2203	Computer Programming I Laboratory	0
CECS 2222	Computer Programming II	4
CECS 2223	Computer Programming II Laboratory	0
CECS 3200	Assembly Language Programming	3
CECS 3210	Advanced Programming	3
CECS 3212	Data Structures	3
CECS 4200	Programming Languages	3
CECS 4202	Database Systems	3
CECS 4204	Software Engineering	3
CECS 4206	Design and Analysis of Algorithms	3
CECS 4228	Computational Theory	3
CECS 4230	Operating Systems	3
COE 4330	Computer Networks	3
COE 4331	Computer Networks Laboratory	1
CS 2302	Digital Logic for CS Majors	3
CS 3010	Numerical Analysis for CS Majors	3
CS 3300	Computer Architecture for CS Majors	3
CS 4002	Computer Science Project I	3
CS 4022	Computer Science Project II	3

Computer Science Technical Electives

(Must take 6 credits in technical electives to complete graduation requirements)

Course	Title	Credit-Hours
CECS 3202	Visual-Oriented Programming	3
CECS 3214	Internet Programming I	3
CECS 3216	Machine Learning	3
CECS 3218	Data Engineering for Machine Learning I	3
CECS 3220	Human-Computer Interaction	3
CECS 3234	UNIX Operating System	3
CECS 3302	Data Communications	3
CECS 4208	Computer Forensics	3
CECS 4210	Ethical Hacking	3
CECS 4214	Network Security	3
CECS 4216	Reverse Engineering	3
CECS 4218	Introduction to Game Design	3
CECS 4220	E-Commerce	3
CECS 4224	Deep Learning	3
CECS 4226	Computer Graphics	3
CECS 4228	Computational Theory	3
CECS 4230	Operating Systems	3
CECS 4232	Data Engineering for Machine Learning II	3

CECS	4236	Software Requirements Engineering	3
CECS	4240	Real-Time Operating Systems	3
CECS	4248	Software Testing and Verification	3
CECS	4911	Computer Engineering Seminar I	1
CECS	4912	Computer Engineering Seminar II	2
COOP	3010	Professional Practice	3
CS	4902	Undergraduate Research in Computer Science	3
CS	4904	Undergraduate Research in Computer Science II	3
CS	4990	Special Topics in Computer Science	3
MGMT	1010	Introduction to Management	3

Notes: A student is required to select six credit-hours of available technical electives in order to acquire additional skills that reinforce the student's knowledge in a specific area of interest. Availability of courses CS 4902, CS 4904 and CS 4990, as well as COE 4990 for the Computer Science Program students will be determined by the Department Chairman, depending on the specific teaching or research topic.

Free Electives

(6 Credit-Hours)

Select 6 credit-hours of free electives in any area

COMPUTER SCIENCE PROGRAM CURRICULUM SEQUENCE

(122 Credit-Hours)

First Year

1st Year - First Quarter

Course		Title	Credit-Hours
MATH	1330	Precalculus I	3
ENGL	1020	English Composition I	3
WOHI	2012	World Civilization I	3
ELEC		General Education Humanities Elective	3
CECS	2200	Computer Programming Fundamentals	1
Total			13

1st Year - Second Quarter

Course		Title	Credit-Hours
MATH	1340	Precalculus II	3
CECS	2202	Computer Programming I	4
CECS	2203	Computer Programming I Laboratory	0
SCIE	1110	General Biology	3
SCIE	1111	General Biology Laboratory	1
CECS	2004	Discrete Structures	3
Total			14

1st Year - Third Quarter

Course		Title	Credit-Hours
MATH	1350	Calculus I	4
CECS	2222	Computer Programming II	4
CECS	2223	Computer Programming II Laboratory	0
CS	2302	Digital Logic for CS Majors	3
Total			11

Summer – First Year

Course		Title	Credit-Hours
ENGL	1021	English Composition II	3
ELEC		Free Elective	3
			Total 6

Second Year**2nd Year - First Quarter**

Course		Title	Credit-Hours
MATH	1360	Calculus II	4
CECS	3200	Assembly Language Programming	3
CECS	3212	Data Structures	3
MGMT	4660	Entrepreneurship	3
			Total 13

2nd Year - Second Quarter

Course		Title	Credit-Hours
SCIE	1430	Physics I	4
SCIE	1431	Physics I Laboratory	1
CECS	3210	Advanced Programming	3
CECS	4200	Programming Languages	3
			Total 11

2nd Year - Third Quarter

Course		Title	Credit-Hours
CS	3300	Computer Architecture for CS Majors	3
CECS	4206	Design and Analysis of Algorithms	3
SCIE	1440	Physics II	4
SCIE	1441	Physics II Laboratory	1
			Total 11

Summer – Second Year

Course		Title	Credit-Hours
ENGL	1026	Fundamentals of Speech Communications	3
ELEC		Free Elective	3
			Total 6

Third Year**3rd Year - First Quarter**

Course		Title	Credit-Hours
ETH	2020	Ethics in Engineering	3
ENGI	2270	Engineering Probability and Statistics	3
CECS	4202	Database Systems	3
CECS	4204	Software Engineering	3
			Total 12

3rd Year - Second Quarter

Course		Title	Credit-Hours
CS	3010	Numerical Analysis for CS Majors	3
CS	4002	Computer Science Project I	3
CECS	4230	Operating Systems	3
CECS ELEC		CS Technical Elective	3
Total			12

3rd Year - Third Quarter

Course		Title	Credit-Hours
CS	4022	Computer Science Project II	3
CECS	4228	Computational Theory	3
COE	4330	Computer Networks	3
COE	4331	Computer Networks Laboratory	1
CECS ELEC		CS Technical Elective	3
Total			13

PROGRAM COURSES

Computer Engineering and Computer Science Courses
 (Go to the ECECS Department Courses for the Description)

CECS	2004	Discrete Structures
CECS	2200	Computer Programming Fundamentals
CECS	2202	Computer Programming I
CECS	2203	Computer Programming I Laboratory
CECS	2222	Computer Programming II
CECS	2223	Computer Programming II Laboratory
CECS	3200	Assembly Language Programming
CECS	3202	Visual-Oriented Programming
CECS	3210	Advanced Programming
CECS	3212	Data Structures
CECS	3214	Internet Programming I
CECS	3216	Machine Learning
CECS	3218	Data Engineering for Machine Learning I
CECS	3220	Human-Computer Interaction
CECS	3234	UNIX Operating System
CECS	3302	Data Communications
CECS	4200	Programming Languages
CECS	4202	Database Systems
CECS	4204	Software Engineering
CECS	4206	Design and Analysis of Algorithms
CECS	4208	Computer Forensics
CECS	4210	Ethical Hacking
CECS	4214	Network Security
CECS	4216	Reverse Engineering
CECS	4218	Introduction to Game Design
CECS	4220	E-Commerce
CECS	4224	Deep Learning
CECS	4226	Computer Graphics
CECS	4228	Computational Theory
CECS	4230	Operating Systems

CECS	4232	Data Engineering for Machine Learning II
CECS	4236	Software Requirements Engineering
CECS	4240	Real-Time Operating Systems
CECS	4248	Software Testing and Verification
CECS	4911	Computer Engineering Seminar I
CECS	4912	Computer Engineering Seminar II

Computer Science Courses

(Go to the ECECS Department Courses for the Description)

CS	2302	Digital Logic for Computer Science Majors
CS	3010	Numerical Analysis for Computer Science Majors
CS	3300	Computer Architecture for Computer Science Majors
CS	4002	Computer Science Project I
CS	4022	Computer Science Project II
CS	4902	Undergraduate Research in Computer Science
CS	4904	Undergraduate Research in Computer Science II
CS	4990	Special Topics in Computer Science

Computer Engineering Courses

(Go to the ECECS Department Courses for the Description)

COE	4330	Computer Networks
COE	4331	Computer Networks Laboratory

Other Department Courses

(Go to the Business Administration Department Courses for the Description)

MGMT	4660	Entrepreneurship
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COURSE DESCRIPTIONS – ECECS DEPARTMENT

Electrical Engineering Courses

EE 1130 – FRESHMAN DESIGN FOR ELECTRICAL & COMPUTER ENGINEERS

Three credit-hours. Two two-hour lectures per week. Prerequisite: MATH 0110 or Equivalent.

An introduction to the engineering design philosophy, techniques, methodology, and graphical tools, with emphasis on teamwork. The course seeks to develop creativity and imagination skills in the solution of engineering problems, including critical thinking and logical presentation of an engineering analysis.

EE 2000 – CIRCUIT ANALYSIS I

Three credit-hours. Two two-hour lectures per week. Prerequisites: SCIE 1440, MATH 1360. For EE & CpE Students Only: CECS 2200. For ME Students Only: ME 2010. Corequisite: MATH 2350. For BME Students Only: BME 3010.

Elements in a circuit and electrical quantities. Techniques for the DC circuit analysis. Natural and forced response of RL, RC, and RLC circuits. Introduction to AC circuits analysis.

EE 2001 – ELECTRICAL MEASUREMENTS LABORATORY

One credit-hour. Two two-hour lectures per week. Prerequisites: SCIE 1441, ENGI 2270, EE2000.

Modern electronics measurement methods. Instrument calibration and use. Experimental verification of fundamental laws of electric circuits and magnetism. Experimental study of capacitive and inductive circuits. Use computer programs to analyze circuits. Safety consideration in the laboratory.

EE 2010 – COMPUTATIONAL METHODS IN ELECTRICAL & COMPUTER ENGINEERING

Three credit-hours. Two two-hour lectures per week. Prerequisites: CECS 2202, MATH 1360. Corequisite: SCIE 1440.

Gaussian Elimination, Linear Equations, Orthogonal Projections, Least-Squares & Eigenvalue Problems, Applied Numerical Analysis. Approximations and Errors. Numerical Solution of Linear and Nonlinear Algebraic Equations, introduction to ODE (ordinary differential equations,) Numerical solution of energy storage circuits. Curve Fitting

EE 2020 – CIRCUIT ANALYSIS II

Three credit-hours. Two two-hour lectures per week. Prerequisites: EE 2000, MATH 2350.

Sinusoidal steady state analysis. AC circuit power calculation. Three phase circuits. Coupled inductors and transformers. Laplace transform in circuit analysis. Resonance and frequency response in a circuit Transfer function and passive filters.

EE 2030 – ELECTROMAGNETICS THEORY

Three credit-hours. Two two-hour lectures per week. Prerequisites: SCIE 1440, MATH 1370. Corequisite: EE 2000.

This course exposes students to the fundamental laws of electro-static and magneto-static fields. The course also deals with the Maxwell's equations describing time-varying electric and magnetic fields with emphasis on Faraday's Law of Magnetic Induction.

EE 2402 – ELECTROMECHANICAL ENERGY CONVERSION

Three credit-hours. Two two-hour lectures per week. Prerequisites: EE 2000, EE 2030. Corequisite: EE 2020.

The study of transformers, rotating machinery basics and DC machines under steady state. Safety considerations with the electric machines.

EE 2403 – ELECTROMECHANICAL ENERGY CONVERSION LABORATORY

One credit-hour. Two two-hour lectures per week. Prerequisites: EE 2001, EE 2402.

Experimental study of electrical machines. Safety considerations with electric machines. This course is designed to give electrical engineering students a one trimester course in laboratory work on: electrical and mechanical measurements and basic operation characteristics of transformers (single and three phases) and DC machines used as motor and as generators.

EE 2500 – ELECTRONICS I

Three credit-hours. Two two-hour lectures per week. Prerequisites: EE 1130, EE 2001.

This course is the first of a three-course series in electronics. Subjects include operational amplifiers, semiconductor devices, diodes, rectification, bipolar transistors, amplification, switching, and an introduction to field-effect transistors. Design and analysis techniques are presented for each subject.

EE 2501 – ELECTRONICS I LABORATORY (Electrical Engineering Core)

One credit-hour. Two two-hour lectures per week. Prerequisites: EE1130, EE 2001. Corequisite: EE 2500.

Review of laboratory measurement equipment. Perform several design experiments according with topics on electronic theory: diodes and power supplies. Behavior of timers, Op-Amp and some design applications.

EE 3002 – SIGNALS & SYSTEMS

Three credit-hours. Two two-hour lectures per week. Prerequisites: EE 2010, EE 2020.

Continuous and discrete-time signals. Continuous-time system representation. Fourier series. Fourier transform. Z-transform. Discrete-time system representation. State-variable analysis.

EE 3220 – SOFTWARE APPLICATIONS FOR ELECTRICAL ENGINEERING

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 2202

Basic knowledge of various engineering software applications that have proven to be very intensively used in the industry and academic environments. Introduction to Microsoft Office, MATLAB, SIMULINK, MathCAD and PSpice Family Design Center.

EE 3412 – ELECTRIC MACHINES CONTROL

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 2402

The study of the following: Three phase transformers, Induction Three phase Motors, Synchronous Motors & Generators. Also, the DC motors construction and operation will be discussed. An Introduction to AC & DC drives will be presented. This includes typical applications for Variable frequency Drives, system requirements, modeling, and operation characteristics.

EE 3413 – ELECTRIC MACHINES CONTROL LABORATORY

One credit-hour. Two two-hour lectures per week. Prerequisites: EE 2403, EE 3412

Safety considerations with electric machines. This course is designed to give electrical engineering students a one-trimester course in laboratory work on: electrical measurements, operating characteristics of: Three Phase Transformers, Three Phase Induction motors, Synchronous motors, and DC motors.

EE 3420 – POWER SYSTEM ANALYSIS I

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 2402. Corequisite: EE 3412

The study of the power concepts in a process of generation, transmission, and distribution of an electric system.

EE 3440 – ELECTRIC SYSTEM DESIGN I

Three credit-hours. Two two-hour lectures per week. Prerequisites: EE 2020, EE 2402

General Design of electrical systems based in the National Electrical Code and the Puerto Rico Electric Power Authority Code.

EE 3510 – ELECTRONICS II

Three credit-hours. Two two-hour lectures per week. Prerequisites: EE 2020, EE 2500

This is the second course in a three-course series in electronics. More advanced topics of semiconductor devices are introduced. Discussion topics include differential amplifiers, multistage amplifiers, frequency response, and design and analysis of other common amplifier configurations using MOSFETs and bipolar transistors and bipolar junction transistors (BJTs).

EE 3511 – ELECTRONICS II LABORATORY

One credit-hour. Two two-hour lectures per week. Prerequisites: EE 2020, EE 2500. Corequisite: EE 3510

Review of laboratory measurement equipment. Behavior of BJT as a common-emitter, a common-base, and a common-collector amplifier. Behavior of MOSFET as a common source, a common gate, and a common drain amplifier.

EE 3512 – POWER ELECTRONICS (Communications, Signals & Controls Systems Track)

Three credit-hours. Two two-hour lectures per week. Prerequisites: EE 2020, EE 2500

Electrical rating and characteristics of power semiconductor switching devices. Phase controlled rectifiers. Fundamental switching regulators. DC choppers. Static power inverters. Load considerations. Design projects will be required.

EE 3513 – POWER ELECTRONICS LABORATORY (Communications, Signals & Controls Systems Track)

One credit-hour. Two two-hour lectures per week. Prerequisites: EE 2020, EE 2500. Corequisite: EE 3512

Experiments with Power Electronics Converters: AC-DC, DC-DC, and DC-AC. Closed-loop control of DC drives and Closed-loop control of induction motors. Use of computer programs to analyze circuits. Safety consideration in the laboratory.

EE 3600 – AUTOMATIC CONTROLS

Three credit-hours. Two two-hour lectures per week. Prerequisites: EE 3002, EE 3520

Study of linear control systems. Transfer functions. Stability criteria. Compensation techniques. Analysis of a particular system and determination of an optimal design complying with given specifications. A design project will be required.

EE 3610 – AUTOMATION ENGINEERING

Three credit-hours. Two two-hour lectures per week. Prerequisite: COE 2300. Corequisite: EE 3611

Study of the theory and practices of the technologies used for industrial automation. The PLC is used as the main micro-controller device to interface with sensors, relays, electro-pneumatics, and motors. Different problems and situations are presented to the students and they prepare and design the solution. A final project is presented at the end of the class.

EE 3611 – AUTOMATION ENGINEERING LABORATORY

One credit-hour. Two two-hour lectures per week. Prerequisite: COE 2301. Corequisite: EE 3610

Experimental exercises with sub-systems used on industrial control applications. The PLC is used as the main micro-controller. Design and programming of PLC based systems are performed.

EE 3614 - MANUFACTURING PROCESSES AUTOMATION AND REGULATIONS

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: EE 3610.

This course explores industrial automation applications of the manufacturing processes used in industries such as pharmaceutical, food and beverage; and the regulatory environments. The good manufacturing practices (GMP) regulations are covered including electronic records/signatures and validations.

EE 3702 – FUNDAMENTALS OF WIRELESS COMMUNICATIONS & CELLULAR NETWORKS

Three credit-hours. Two two-hour lectures per week. Prerequisites: ENGI 2270, EE 2030, EE 3002

Analysis and Transmission of Signals. Amplitude modulation (AM) and Angle modulation (FM, PM). Introduction to Random Processes Concepts. Introduction to Wireless Systems. Propagation Characteristic of Wireless Channels. Antennas for AM, FM and PM transceivers.

EE 3710 – RANDOM PROCESSES

Three credit-hours. Two two-hour lectures per week. Prerequisites: ENGI 2270, EE 3002

After completing this course, the students should master the theoretical principles regarding Probability and Random Processes and be familiar with some of its basic applications to electrical engineering. Topics include Probability, Random Variables, Operations in Single and Multiple Random Variables, Random Processes, Spectral Characteristics of Random Processes, Linear System with Random Inputs.

EE 4002 – CAPSTONE DESIGN COURSE I

Three credit-hours. Two two-hour meetings per week. Pre-requisite: Departmental Permit. Must have approved ENGI 2260, EE 2402, EE 3600, plus 18 credits of EE Department Electives.

First part of a two-term course on the design of projects based on open-ended requirements. Projects will be selected in accordance with the student's area of interest (i.e., Electric Power, Electronics, Communications, Automatic Controls, etc.). Students must approve both Capstone Design Courses in sequence and without interruptions. Students that approve the first course and miss the second course will be required to repeat the first course again.

EE 4010 – ELECTROMAGNETICS THEORY II

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 2030

Review of Maxwell's Equations for non-time-varying electromagnetic fields. Study of time-varying electromagnetic fields. Study of Uniform Plane Wave Propagation in lossless, lossy, bounded, and unbounded material media. Study of Transmission Lines Theory.

EE 4022 – CAPSTONE DESIGN COURSE II

Three credit-hours. Two two-hour meetings per week. Prerequisite: EE 4002

Second part of a two-term course on the design of projects based on open-ended requirements. Students must approve both Capstone Design Courses in sequence and without interruptions. Students that are approved for the first course and miss the second course will be required to repeat the first course again.

EE 4030 – ELECTROMAGNETIC COMPATIBILITY (EMC/EMI)

Three credit-hours. Two two-hour meetings per week. Prerequisites: EE 2500, EE 3002, EE 4010

Study of various aspects of Electromagnetic Compatibility including history, products requirements, as well as fundamental design principles, ramifications, and considerations. Understanding the role of Electromagnetic Compatibility in suppressing Electromagnetic Interference.

EE 4031 – ELECTROMAGNETIC COMPATIBILITY (EMC/EMI) LABORATORY

One credit-hour. Two two-hour lectures per week. Prerequisite: EE 4030

Experiments and demonstrations in Electromagnetic Compatibility.

EE 4220 – SW PROCESSES, DATABASES & NETWORKING (Electrical Engineering Core)

Three credit-hours. Two two-hour meetings per week. Prerequisite: CECS 2202

The course adopts an empirical and top-down approach to the study of the fundamental high-level concepts that are key to an operational understanding of systems that integrate information and communications technologies.

EE 4400 – POWER SYSTEM ANALYSIS II

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 3420. Corequisites: EE 3413, EE 4401

Review of impedance and admittance matrix construction and reduction. Review of transformer line and machine models suitable for short circuit and steady state analysis. Power flow analysis using the Gauss Seidel method. Case studies of power flow analysis. Short circuit analysis of three phase, single phase, and phase to phase faults. Breaker selection.

EE 4401 – POWER SYSTEM ANALYSIS LABORATORY

One credit-hour. Two two-hour lectures per week. Prerequisite: EE 3420. Corequisite: EE 4400

Experiments with electric power transmission systems, three phase generation, power lines, and synchronous motors.

EE 4422 – ELECTRIC POWER QUALITY

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 3420. Corequisite: EE 4400

Measurements and Industry Standards for Power Quality. Component modeling and network analysis under non-sinusoidal conditions. Effects of nonlinear loads. Harmonics and flicker distortion in power systems. Sags, swells, impulses, and other transient events. Improvement practices.

EE 4432 – POWER SYSTEM PROTECTION

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 4400

Introduction and general philosophies of protection for power systems. Analysis of power system during faults and abnormal conditions. Application of protective relays in electric power systems. Study of protection schemes for Transmission and Distribution lines, Substations, Transformers and Generators.

EE 4433 – POWER SYSTEM PROTECTION LABORATORY

One credit-hour. Two two-hour lectures per week. Prerequisite: EE 4432

Experimental works with protective relays and auxiliary equipment. Calibration, testing and setting of protective relays. Discussions topics include transient effects in power system networks, short circuit analysis using symmetrical components, instruments transformer PT's and CT's test, moderates protective relaying coordination studies, overcurrent relays, directional overcurrent relays, bus and transformer differential relays test and simulation. Protection and control drawing interpretation containing ANSI and IEEE guides and standard.

EE 4438 – SMART DISTRIBUTION SYSTEMS ENGINEERING

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 3420. Corequisite: EE 4400

Present a description of main systems and components for Electric Power Distribution Systems. Explain terminology to study load characteristics. Describe specification and operation of main substation components such as: Transformers, High Voltage Switching and Metering Equipment. Study main distribution system types like Aerial and Underground distribution systems. Perform analysis with techniques for Distribution Systems Voltage Regulation such as: Approximate Voltage Drop, Power Loss considerations, and Capacitors Applications. Present a description of Smart Grid Technologies including equipment used for Distribution Automation Systems. Define main systems and components for Distribution Management Systems.

EE 4442 – LIGHTING FUNDAMENTALS DESIGN

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 3420

Theory of light, sight and vision, language of lighting, light sources, luminaries data, illumination design: interior and exterior; roadway lighting.

EE 4444 – ELECTRIC SYSTEM DESIGN II

Three credit-hours. Two two-hour lectures per week. Prerequisites: EE 3420, EE 3440

General Design of electrical systems based in the National Electrical Code and the Puerto Rico Electric Power Authority Code.

EE 4452 – ALTERNATIVE GENERATION SYSTEMS (Smart Grid Power Systems Track)

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 3420

This course will help you understand the historical development of energy production, the economic impacts and environmental effects of energy production, and a description of principal fuels used for energy conversion. Also, a technical understanding of conventional energy sources will be presented such as: Steam Power Plants, Gas Cycle Plants, and Combined Cycle Plants. In addition, basic concepts, operating principles, and related technologies for renewable energy power generation such as: Solar Power, Wind Power, Biomass Power, Geothermal Energy, Hydroelectric Power, and Energy Storage System Applications. Finally, a description, planning, and comparison for investment in Distributed Generation Sources will be presented.

EE 4462 – ELECTRICAL CONSTRUCTION PROJECT MANAGEMENT

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 4444

Principles of Project Management applied to case studies of the Electrical Construction Industry, and conforming to NECA, MCAA, & SMAGNA techniques.

EE 4464 – GENERATION CONTROL SYSTEMS

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 4400

Power Plant components. Generating Plant Types. Characteristics of power generating units. Economic dispatch of thermal units and methods of solution. Unit Commitment. Automatic Generation Control. Introduction to Power System Stability.

EE 4466 – RENEWABLE ENERGY SYSTEMS (Smart Grid Power Systems Track)

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 4452

Operation and design of electrical generation systems using photovoltaic (PV) solar panels and Wind Power (WP). Considerations of a stand-alone or grid connected way throw site and energy evaluation. Analysis and design using net metering application. Component operation, system design, sizing, and installation requirements. Backup system sizing using different types of batteries. Study of solar energy irradiation and irradiance. Wind measurement using the ISA model. Power quality, safety regulations and code rules according to NEC Articles 690 (PV) and 694 (WP). Other standards (IEEE, etc.) calculations and procedures required for necessary design approval. Economic analysis and global environmental impact.

EE 4602 – PROCESS CONTROL & INSTRUMENTATION

Three credit-hours. Two two-hour lectures per week. Prerequisites: ENGI 3440, EE 3600

Study of basic components of a control system. Design of single process control systems. Study and design of cascade control systems. Study and design of ratio and feedforward control system. Study of piping and instrumentation diagram (P&ID) standards. Study of process characterization including thermal and mass transfer process. Study and analysis of fundamental PLC-based control system design. Study and analysis of final control elements.

EE 4603 – PROCESS CONTROL & INSTRUMENTATION LABORATORY

One credit-hour. Two two-hour lectures per week. Prerequisite: EE 4602

Experiments for process control and instrumentation. Transducers, transmitters, analog and digital controllers, controls valves, switches, and indicators. Experiments with a process control trainer and programmable logic controllers (PLC's).

EE 4606 – DIGITAL CONTROL SYSTEMS (Communications, Signals & Controls Systems Track)

Three credit-hours. Two two-hour lectures per week. Prerequisites: EE 3002, COE 3320

Introductory course with attention on how a DSP controller affects a closed-loop system performance. Exposure to feedback control theory principles presented by means of a digital control algorithm model, using the Z-transform. Presentation of basic mapping rules, and proper sampling period selection for a digital control algorithm, such like the PID controller. Discussion of the Harvard architecture, data conversion errors, computational performance, and hardware operational requirements for A/D and D/A signal conversion. Implementation of control strategies to satisfy standard time and frequency control performance requirements. Introduction to state-space control, thru pole-placement, LQR and state-space observer design schemes. Use of MATLAB/SIMULINK and/or microprocessor-based programming. Main interest in electromechanical control for robotic systems.

EE 4612 – CONTROL SYSTEM DESIGN

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 3600

Principles of analog and digital control. Analog and digital control using the PID controller. Design strategies with time specifications. Design strategies with frequency specifications. Special topics. Design projects will be required.

EE 4620 – ROBOTIC ENGINEERING DESIGN

Four credit-hours. Two two-hour lectures per week. Prerequisite: EE 3600 or EE 4606. Corequisite: EE 4621

Study of the technology, programming, applications, theory, and practices of robotic systems. All the basic systems of the robots are covered including manipulators, hardware components, sensors, and programming. The course covers design and applications.

EE 4621 – ROBOTIC ENGINEERING DESIGN LABORATORY

Four credit-hours. Two two-hour lectures per week. Prerequisite: EE 3600 or EE 4606. Corequisite: EE 4620

Experimental exercises with sub-systems used in robotic applications. Design and programming of PLC based systems are performed. A field trip to the industry is made as part of the laboratory.

EE 4622 – INDUSTRIAL AUTOMATION (Both Tracks Components)

Three credit-hours. Two two-hour lectures per week. Prerequisites: EE 3610, EE 3611

The purpose of this course is to discuss advanced industrial automation concepts applied to the manufacturing industry. Topics such as: System Integration, Control System Architecture, SCADA, industrial communications protocols, algorithms industry Standards and Good Manufacturing Practices, will be discussed on the course. The Allen-Bradley DCS Compaq Logic platform will be used.

EE 4640 – AVIONICS SYSTEMS

Three credit-hours. Two two-hour lectures per week. Prerequisite: Departmental Permit.

This course explains the principles and underlying theory of the core avionic systems in civil and military aircraft, comprising the pilot displays, data entry and control systems, fly by wire flight control systems, inertial sensor and air data systems, navigation systems, autopilots and flight management systems. The implementation and integration of these systems with current (2010) technology is explained together with the methods adopted to meet the very high safety and integrity requirements.

EE 4706 – FIBER OPTICS SYSTEMS DESIGN

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 3702 or EE 4400

Application of electromagnetic and optical physics theory, digital communication theory, and modulation techniques to the design of fiber optic transmission systems. A design project is required.

EE 4720 – DIGITAL SIGNAL PROCESSING

Three credit-hours. Two two-hour lectures per week. Prerequisites: ENGI 2270, EE 3002

Topics include LSI systems, the DTFT, the DFT, and the FFT. Study of linear and cyclic convolution. The Z-transform. Filter structures. Introduction to FIR and IIR digital filter design. Several DSP applications are discussed and demonstrated. MATLAB simulations and a final project are required.

EE 4724 – DIGITAL DATA TRANSMISSION SYSTEMS

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 3702

Introduction to Random Processes and review of the Sampling Theorem. Pulse amplitude modulation. Baseband digital transmission with PCM, DPCM, DM, ADM. Line coding. Intersymbol interference and equalizing. Passband binary digital transmission including ASK, FSK, PSK, and DPSK. M-ary modulation techniques. Advanced digital communication systems including spread spectrum systems and orthogonal frequency division multiplexing. Spread spectrum systems. Overview of the Behavior of digital communication systems in presence of noise (AWGN).

EE 4736 – COMMUNICATION SYSTEMS, SIMULATION & DESIGN (Communications, Signals & Controls Systems Track)

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 4724

Simulation and design of analog and digital communications systems. MATLAB, SIMULINK, the COMMUNICATION Toolbox and the Simulink DSP Block-Sets are used to verify and test the designed models. Topics include: Simulation of AM and FM links, Binary and M-ary Baseband and Passband Modulations, Time Division and Frequency Division Multiple Access. Inter Symbol Interference (ISI), Digital Equalization, Raised Cosine Shaping Filter, Spread Spectrum.

EE 4742 – ADVANCED MOBILE NETWORKS AND TECHNOLOGIES (Communications, Signals & Controls Systems Track)

Three credit-hours. Two two-hour lectures per week. Prerequisite: EE 3702

1G-5G wireless standards. Cellular traffic capacity and trunking. Large scale and small-scale radio propagation channels. Review of Propagation Models, Fading. Performance of various modulation/demodulation schemes in fading channels. Fading Mitigation. Orthogonal Frequency Division Multiplexing (OFDM). Multiple-Input Multiple-Output Systems (MIMO). Modems for Wireless Communication. Multiple-Access Techniques in Wireless Communications. Antennas for cellular communications.

EE 4902 – UNDERGRADUATE RESEARCH IN ELECTRICAL ENGINEERING

Three credit-hours. Two two-hour lectures per week. Prerequisites: Fourth-year Electrical Engineering student with 3.00 or higher GPA. Departmental Permit.

Research study in advanced topics in areas of electrical engineering like electric power systems, solid state electronics, communication systems, industrial control, robotics, digital signal processing, among others. The research can be conducted in two ways: a research paper or the implementation of a project. Each project will be evaluated observing the use of the recommended guidelines required to develop the project.

EE 4904 – UNDERGRADUATE RESEARCH IN ELECTRICAL ENGINEERING II

Three credit-hours. Two two-hour lectures per week. Prerequisites: EE 4902 and Departmental Permit.

Extension of research study in advanced topics in areas of electrical engineering like electric power systems, solid state electronics, communication systems, industrial control, robotics, digital signal processing, among others. The research can be conducted in two ways: a research paper or the implementation of a project. Each project will be evaluated observing the use of the recommended guidelines required to develop the project.

EE 4911 –ELECTRICAL ENGINEERING SEMINAR I

One credit-hour. One one and half-hour lectures per week. Prerequisite: Departmental Permit.

Topics are limited to those which are not part of content of regular courses offered by the department. Credit-hours earned can fulfill the graduation requirements in Electrical Engineering. It will also serve to stimulate further advanced studies.

EE 4912 –ELECTRICAL ENGINEERING SEMINAR II

Two credit-hours. Two one and half-hour lectures per week. Prerequisite: Departmental Permit.

Topics are limited to those which are not part of content of regular courses offered by the department. Credit-hours earned can fulfill the graduation requirements in Electrical Engineering. It will also serve to stimulate further advanced studies.

EE 4990 & EE 4991 – SPECIAL TOPICS IN ELECTRICAL ENGINEERING

Three credit-hours. Two two-hour lectures per week. Prerequisites: Departmental permit according to topics to be addressed.

Advanced topics (4th year level) in areas of current research in electrical engineering. Many include topics in advanced electric power systems, solid-state electronics, communication systems, industrial control, and robotics, among others.

Computer Engineering Courses

COE 2300 – LOGIC CIRCUITS

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 2200. Corequisite: COE 2301

This course covers a full range of topics such as number systems and codes, digital circuits, Boolean algebra, minimization of logic functions, combinational logic design and practices, introduction to combinational logic design with PLDs, sequential logic design principles and practices. A general exposure to the combinational design of an Arithmetic-Logic Unit (ALU) and the sequential design with PLDs. ROM and RAM system-level design is given. Design Projects will be required.

COE 2301 – LOGIC CIRCUITS LABORATORY

One credit-hour. Two two-hour lectures per week. Prerequisite: SCIE 1441. Corequisite: COE 2300

This laboratory provides an experimental study using the TTL digital logic circuits. Two levels of integration are used: small-scale integration (SSI) and medium-scale integration (MSI). These logic circuits are then used in such applications like: combinational logic analysis and design, multiplexing, decoding, arithmetic and comparison operations, memory devices, counting, and sequential logic analysis and design. Computer simulation will also be required.

COE 3302 – DIGITAL SYSTEMS DESIGN WITH VHDL

Three credit-hours. Two two-hour lectures per week. Prerequisite: COE 2300

Study of the modern methodology for digital system design using CAD tools and VHDL/Verilog as design Language. Design of components toward integration into a system to be used for particular purposes.

COE 3303 – DIGITAL SYSTEMS DESIGN WITH VHDL LABORATORY

One credit-hour. One four-hour or two two-hour lectures per week. Prerequisite: COE 2300, COE 2301. Corequisite: COE 3302.

Provides practical exercises in the design, simulation, and implementation of Digital Systems using semi-automated tools, and following a comprehensive design and development process. Covers fundamental computer hardware sub-systems which can be applied in follow-on Computer Architecture course and its laboratory.

COE 3320 – MICROPROCESSORS

Three credit-hours. Two two-hour lectures per week. Prerequisite: COE 2300. Corequisite: COE 3321

This course covers a full range of topics such as: numerical base, basic computer architecture and organization, microprocessor and microcontroller architecture, programmer models, microprocessor addressing modes, instruction set, and assembly language. A design project will be required.

COE 3321 – MICROPROCESSORS LABORATORY

One credit-hour. Two two-hour lectures per week. Prerequisite: COE 2301. Corequisite: COE 3320

The laboratory introduces microcontroller systems programming, including both hardware interfacing and software fundamentals.

COE 4002 – CAPSTONE DESIGN COURSE I

Three credit-hours. Two two-hour meetings per week. Prerequisites: All Computer Engineering core courses before 4th year. Senior standing. Departmental permit.

First part of a two-term course on the design of projects based on open-ended requirements. Projects will be selected in accordance with the student's area of interest (i.e., digital circuits, VLSI testing, software engineering, parallel processing, computer graphics, visualization, artificial intelligence, data base, HCI, computer Hardware, computer Software, data mining, etc.). Students must approve both Capstone Design Courses in sequence and without interruptions. Students that approve the first course and miss the second course will be required to repeat the first course again.

COE 4022 – CAPSTONE DESIGN COURSE II

Three credit-hours. Two two-hour meetings per week. Prerequisite: COE 4002

Second part of a two-term course on the design of projects based on open-ended requirements. Students must approve both Capstone Design Courses in sequence and without interruptions. Students that approve the first course and miss the second course will be required to repeat the first course again.

COE 4320 – COMPUTER ARCHITECTURE

Four credit-hours. Two two-hour lectures per week. Prerequisite: COE 3320. Corequisite: COE 4321

Instruction set architecture, functional organization, and implementation of a computer are studied from the performance point of view, to provide the students with the principles and techniques used in the design of modern computer systems.

COE 4321 – COMPUTER ARCHITECTURE LABORATORY

Zero credit-hour. Two two-hour lectures per week. Prerequisite: COE 3320. Corequisite: COE 4320

A practical experience on design, organization, performance measurement, benchmarks, and implementation of a computer system.

COE 4330 – COMPUTER NETWORKS

Three credit-hours. Two two-hour lectures per week. Corequisites: CECS 3234 or CECS 4230

Using the public Internet as the model, a top-down approach to the data transport conventions from the Application to the Link layer are analyzed, relying on the protocols published by the IETF and IEEE. The course opens with a concise history of the Internet, followed by an introduction to the organizations involved in Internet governance. The socket concept is examined along with the most important Application, Transport, Network, Link layer open protocols. Routing algorithms, IP addressing, and NAT schemes are discussed. The course closes with the discussion of protocols for multimedia networking, network security, and network management. A team design project is required.

COE 4331 – COMPUTER NETWORKS LABORATORY

One credit-hour. Two two-hour lectures per week. Corequisite: COE 4330

The laboratory exemplifies the techniques and devices that implement the solutions to communication problems discussed in class. Covers structured wiring schemes and their combination with wireless access schemes. Configures communication protocol stacks within various operating systems. Simulation and analysis of techniques that solve important communication problems. Covers various communication applications and issues of security and reliability related to different network topologies and configurations.

COE 4340 – MICROCOMPUTER INTERFACING

Four credit-hours. Two two-hour lectures per week. Prerequisite: COE 3320. Corequisite: COE 4341

Practical architectural view of microprocessor and detailed description of its interfacing elements. Laboratory assignments place emphasis on embedded system microcontrollers, their machine language and high-level language, I/O capabilities, peripheral interfacing chips for memory and devices, and counter-timers and interrupts. Interrupts and interrupt handlers are discussed in detail. Weekly interfacing problems and a design project are required.

COE 4341 – MICROCOMPUTER INTERFACING LABORATORY

Zero credit-hour. Two two-hour lectures per week. Prerequisite: COE 3320. Corequisite: COE 4340.

The laboratory emphasizes the I/O capabilities, peripheral interfacing chips for memory and devices, counter-timers and interrupts. Interrupts are discussed in detail. Weekly interfacing problems are discussed. A design project is required.

COE 4902 – UNDERGRADUATE RESEARCH IN COMPUTER ENGINEERING

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Three credit-hours. Two two-hour lectures per week. Prerequisites: Fourth-year Computer Engineering student with 3.00 or higher GPA. Departmental Permit.

Research study in advanced topics in areas of computer engineering like data communication systems, digital testing, digital signal processing, artificial intelligence, computer security, distributed systems, and parallel computation, among others. The research can be conducted in two ways: a research paper or the implementation of a project. Each project will be evaluated by observing the use of the recommended guidelines required to develop the project.

COE 4904 – UNDERGRADUATE RESEARCH IN COMPUTER ENGINEERING II

Three credit-hours. Two two-hour lectures per week. Prerequisites: COE 4902. Departmental Permit

Extension of research study in advanced topics in areas of computer engineering like data communication systems, digital testing, digital signal processing, artificial intelligence, computer security, distributed systems, and parallel computation, among others. The research can be conducted in two ways: a research paper or the implementation of a project. Each project will be evaluated by observing the use of the recommended guidelines required to develop the project.

COE 4990 – SPECIAL TOPICS IN COMPUTER ENGINEERING

Three credit-hours. Two two-hour lectures per week. Prerequisite: Departmental permit according to topics to be addressed.

Advanced topics (4th year level) in areas of current research in computer engineering. Many include topics in data communication systems, computer graphics, robotics, computer architecture, digital testing, image processing, parallel computing, software engineering, computer languages, and real-time systems, among others.

Computer Engineering and Computer Science Courses

CECS 2004 – DISCRETE STRUCTURES

Three credit-hours. Two two-hour lectures per week. Prerequisites: MATH 1330 or Equivalent. Corequisites: MATH 1340

Fundamental mathematical concepts related to computer science, including finite and infinite sets, relations, functions, and propositional logic. Introduction to other proofing techniques. Modeling and solving problems in computer science. Introduction to permutations, combination graphs, and trees with applications.

CECS 2200 – COMPUTER PROGRAMMING FUNDAMENTALS

One credit-hour. Two two-hour lectures per week. Prerequisite: MATH 0110 or Equivalent.

Introductory laboratory teaching the concept of an algorithm as a systematic solution to a problem. Students learn to represent algorithms using flowcharts and pseudocode. Fundamental constructs of structured programming languages such as variables, operators, selection, and repetition statements are then used to capture these algorithms for automated execution in a computer. Students learn to use a development environment and a high-level language such as C++.

CECS 2202 – COMPUTER PROGRAMMING I

Four credit-hours. Two two-hour lectures per week. Prerequisite: CECS 2200. Corequisite: CECS 2203

The course is a follow-up to the CECS 2200 course and continues with the development of algorithms and programming skills using C++. It emphasizes modular program design using functions, arrays, and pointers. The course introduces fundamental object-oriented concepts such as class, object, instance variables, instance methods, and constructors and destructors.

CECS 2203 – COMPUTER PROGRAMMING I LABORATORY

Zero credit-hour. Two two-hour lectures per week. Prerequisite: CECS 2200. Corequisite: CECS 2202

This course is the laboratory companion to the Computer Programming I course (CECS2202). It uses two different pedagogic strategies to assure that student carry out their lab projects successfully. The students complete a set of mini-projects in a closed laboratory

setting. Each set of mini-projects provides them with the practical skills required to tackle a major project as a take home open-lab assignment. All projects are carried out using an Integrated Development Environment for the C++ language.

CECS 2222 – COMPUTER PROGRAMMING II

Four credit-hours. Two two-hour lectures per week. Prerequisite: CECS 2202. Corequisite: CECS 2223

This course continues the development of the students' skills in algorithm programming using the object-oriented paradigm. It emphasizes dynamic memory allocation, composition, inheritance, templates, exception handling, and file processing.

CECS 2223 – COMPUTER PROGRAMMING II LABORATORY

Zero credit-hour. Two two-hour lectures per week. Prerequisite: CECS 2202. Corequisite: CECS 2222

This course is the laboratory companion to the Computer Programming II course (CECS 2222). The students complete a set of mini-projects in a closed laboratory setting. Each set of mini-projects provides them with the practical skills required to tackle a major project as a take home open-lab assignment. All projects are carried out using an Integrated Development Environment for the C++ language.

CECS 3200 – ASSEMBLY LANGUAGE PROGRAMMING

Three credit-hours. Two two-hour lectures per week. Prerequisites: CECS 2202, COE 2300 or CS 2302 for CS Majors.

This course introduces students to the fundamental principles of machine language. Basic concepts such as number or data representation (binary, hexadecimal, and others), branching and looping, memory organization, operands, instruction cycle, addressing modes, exception handling, etc. are introduced.

CECS 3202 – VISUAL-ORIENTED PROGRAMMING

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 2202

This course is an introduction to Visual Basic. Course covers the fundamentals of visual programming in Visual Basic. Topics discussed cover: variables and operators, using decision structures, loops and timers, strings, modules, procedures, arrays, and graphical user interfaces.

CECS 3210 – ADVANCED PROGRAMMING

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 2222

This course aims to advance your basic programming skills, with special attention to user interface design, problem solving, and coding style in an object-oriented event-driven language, such as C#. Topics include: objects, classes and events, GUI design, and multithreading. Optional topics are graphics and databases.

CECS 3212 – DATA STRUCTURES

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 2004, CECS 2222

The course covers fundamental data structures, the tradeoffs these imply for various sorting and searching algorithms, and their application using C++ or similar high-level language. The course emphasizes recursion, and the use of pointers, lists, stacks, queues, tables, and trees. The computational performance of searching and sorting techniques using big-O notation are also discussed. Several programs are assigned.

CECS 3214 – INTERNET PROGRAMMING I

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 2222

Covers the fundamental concepts guiding the emergence of the Internet and WWW. Focuses on technologies used at the browser's side. Includes, XHTML, advanced elements such as tables, forms and frames, use of JavaScript for DOM manipulation. Emphasizes

efficiency and scalability in the creation and maintenance of websites, including style sheets (CSS) and separation of content from presentation. An introduction to XML and related standards is included.

CECS 3216 – MACHINE LEARNING

Three credit-hours. Two two-hour lectures per week. Prerequisites: ENGI 2270, EE 2010 or CS 3010.

Algorithms and Models covered in this course include Linear Regression, Logistic Regression, Support Vector Machines, Gradient Descent, Dimensionality Reduction: Principal Component Analysis, K-means Clustering, Decision Trees, Ensemble Learning, Basic Introduction and Overview of Artificial Neural Networks and Deep Learning including Convolutional Neural Networks and Recurrent Neural Networks.

Topics include; Data Collection and Preparation, Problems with Data, Data Imputation, Data Imbalance, Supervised vs. Unsupervised Learning, Training Data, Validation Data, Test Data, Activation Functions, Parameters vs Hyperparameters, Overfitting, Underfitting, Performance Metrics, Confusion Matrix, Learning Curves, Cross Validation, The Bias-Variance Problem, Learning Rate, Transfer Learning, Local Minima vs. Global Minima, Backpropagation, The Vanishing Gradient Problem in Deep Neural Networks, Generalization Ability, Regularization Techniques, Initialization Schemes, Fast Optimizers, and Applications. A project or incremental projects including reports and/or oral presentations are required. The software used is MATLAB, Python, Tensor Flow, Keras and Scikit-Learn.

CECS 3218 – DATA ENGINEERING FOR MACHINE LEARNING I

Three credit-hours. Two two-hour lectures per week. Prerequisites: ENGI 2270, EE 2010 or CS 3010.

Review of the Machine Learning Process. Covers best practices, classes of techniques and criteria for their selection when performing Data Preparation for Machine Learning (ML). Data Cleaning and feature selection following sound statistical and modeling techniques that avoid data leakage and model distortion. Data transform algorithms most suitable to different variable types and their probability distributions, for single and multiple variables. How to transform prediction targets and integrate these into the final model. Address machine learning computational complexity issues with dimensionality-reduction algorithms.

CECS 3220 – HUMAN-COMPUTER INTERACTION

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 2222

The course explores user-centered design approaches in information system applications. Addresses the user interface and software design strategies, user experience levels, interaction styles, usability engineering and collaborative systems technology.

CECS 3234 – UNIX OPERATING SYSTEM

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 2222 or EE 4220.

Concepts of the UNIX operating system are presented. The course will also provide a deep and thorough knowledge of UNIX and its utilities. Topics include system commands, system editors, awk, sed, text formatting, and shell programming. The use of modem and terminal software and system maintenance utilities are covered as well as system call in C, lex, yacc, ar, and make.

CECS 3302 – DATA COMMUNICATIONS

Three credit-hours. Two two-hour lectures per week. Prerequisites: COE 2300 or CS 2302 for CS Majors.

This course is concerned with the exchange of data between directly connected devices. The key aspects of transmission, interfacing, link control, and error-free data transfers are examined. The physical and data link layers are discussed for a variety of LAN and WAN technologies. Design projects are required.

CECS 4200 – PROGRAMMING LANGUAGES

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 3212

The course covers general concepts and constructs of several major programming paradigms. The design issues involved in the various language constructs are discussed and how these choices lead to different languages. Imperative, declarative, logic, functional, and

object-oriented programming paradigms are illustrated in languages such as Pascal, Prolog, Lisp and C++. Methods used for describing the semantics and syntaxes of programming languages are introduced, such as: EBNF, syntax graphs, attribute grammars, operational, and denotation semantics.

CECS 4202 – DATABASE SYSTEMS

Three credit-hours. Two two-hour lectures per week. Prerequisites: CECS 2004, CECS 2222

This course is an introduction to the database concept. The course covers data models, relational database concepts, hierarchies, relational algebra and SQL, storage structures, and the role of databases and computers in application environments. Various programming assignments in SQL and a design project are required.

CECS 4204 – SOFTWARE ENGINEERING

Three credit-hours. Two two-hour lectures per week. Corequisite: CECS 4202

The course presents the different phases for the development of software: project planning, object-oriented analysis, design, coding, and testing techniques using the Unified Modeling Language (UML). In addition, some tools to support the development to complete the activities necessary to develop software. Students are required to use what is presented to develop an application (the implementation is optional.)

CECS 4206 – DESIGN AND ANALYSIS OF ALGORITHMS

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 3212

This course covers issues that arise in the analysis and design of algorithms used for solving computational problems. A number of common algorithm design paradigms and examples are presented and explained. Algorithm design issues are contemplated. Computability and computational tractability concepts are introduced. Examples of computational problems with no algorithmic solution are analyzed. The importance of time and space requirements are greatly considered as the student designs algorithms to solve computational problems.

CECS 4208 – COMPUTER FORENSICS

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 3212

The computer forensics course teaches students the basics of how a computer forensic case is carried out. The course covers the basic elements of criminology, legal theory as it applies to computer forensics, as well as the investigative process. The course teaches the necessary technical theory and practical aspects of forensic investigations. It emphasizes proper collection of evidence, proper documentation handling and information disposal procedures.

CECS 4210 – ETHICAL HACKING

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 3212

This course covers the basic skill set in the area of ethical hacking. The course explains how to analyze exploits by examining and coding them, while discussing how to protect the computing infrastructure from those same attacks. It will also examine how the process of ethical hacking is carried out in a business environment.

CECS 4214 – NETWORK SECURITY

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 3212

This course covers current network technologies and the methodologies used to secure them. The course provides a hands-on approach where the student will learn the theory as well as the implementation of network security technologies in a controlled environment. The course includes a "Capture the flag" simulation where students are expected to protect the infrastructure from real attacks on an isolated network.

CECS 4216 – REVERSE ENGINEERING

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 3212

The subject of reverse software engineering is the process of analyzing binary code to create a higher-level representation of the program being examined. This is accomplished by applying reversing techniques to obtain the assembly code from the binary executable and then obtain the C/C++ structure from the recovered assembly code. The course will study the ways in which protection mechanisms have been circumvented in the past through reverse engineering and the current methods employed to protect programs from reverse engineering. The course also emphasizes the methods by which IT personnel and programmers can protect software applications from circumvention by an attacker, thereby protecting the IT infrastructure.

CECS 4218 – INTRODUCTION TO GAME DESIGN

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 2200

This course is an introduction to the process of game design prior to game development, including the development of an idea and the production of a game design document. Topics include game elements, player motivation, game dynamics, game culture, game design team roles and game design process workflow.

CECS 4220 – E-COMMERCE

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 2222

This course will study the structure, organization, and use of the Internet. Internet technologies and their potential applications are examined including electronic commerce, database connectivity, and security. An emphasis will be placed on evaluating, organizing, and developing efficient models of electronic transactions and Web Information Systems.

CECS 4224 – DEEP LEARNING

Three credit-hours. Two two-hour lectures per week. Prerequisites: ENGI 2270, EE 2010 or CS 3010.

Machine Learning Overview, The Perceptron, Multi-Layer Neural Networks, Deep Neural Networks, Backpropagation, Transfer Learning, Convolutional Neural Networks, Recurrent Neural Networks, Attention Mechanism, Transformers, Autoencoders, Generative Adversarial Networks, Reinforcement Learning, other ANN architectures such as Boltzman Machines, Self-Organizing Maps, and others. Topics include: Data Collection and Preparation, Problems with Data, Data Imputation, Data Imbalance, Training-Test Data Split, Gradient Descent, Activation Functions, Hyperparameters Selection, Overfitting, Underfitting, Performance Metrics, Confusion Matrix, Learning Curves, Cross Validation, The Bias-Variance Problem, Learning Rate, Local Minima vs. Global Minima, The Vanishing/Exploding Gradient Problem, Generalization Ability, Regularization Techniques, Initialization Schemes, Fast Optimizers, and Deep Learning Applications. A project or incremental projects including reports and/or oral presentations are required. The software used is MATLAB, Python, Tensor Flow, Keras and Scikit-Learn.

CECS 4226 – COMPUTER GRAPHICS

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 2222

The course covers the representation and manipulation of two and three-dimensional transformations, projection, illumination and shading models. The course will focus on algorithms and techniques that have emerged in the past several years. Topics include basic modeling and rendering methods, volumes and scientific visualization techniques, visual programming languages and environments, and computer animation. Also presents computer graphics as an aid in the presentation and analysis of information.

CECS 4228 – COMPUTATIONAL THEORY

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 3212

Introduces basic concepts in computation and computability theory. The course covers formal languages, models of computation and computational complexity. Major topics include regular languages, context-free languages, decidability, reducibility, time complexity and space complexity.

CECS 4230 – OPERATING SYSTEMS

Three credit-hours. Two two-hour lectures per week. Corequisites: COE 4320 or CS 3300 for CS Majors.

Operating systems are the programs that manage the computer hardware resources, and augment or enhance their basic functionality on behalf of the application programs that use the computer. The course discusses various aspects of computer operating systems including processes, process scheduling, memory management, concurrent programming, deadlocks, and others.

CECS 4232 – DATA ENGINEERING FOR MACHINE LEARNING II

Three credit-hours. Two two-hour lectures per week. Prerequisites: CECS 3218.

Covers the processes pipeline for collecting, storing, and analyzing big-data at-scale for Machine Learning from the perspective of the Data Engineering life cycle. Presents a historical summary of the evolution of computing for big-data and machine learning. Reviews enterprise data architectural frameworks. Studies the layered models for cloud computing and hybrid clouds. Discusses and analyzes tradeoffs between the key issues of consistency, scalability, fault tolerance, and complexity. Studies ML design patterns and their adoption in major implementation frameworks. Studies the principal ML model experimentation and deployment platforms. Reviews training, validation and deployment of ML algorithms and re-training actualization. Provides practice in the utilization of some of the leading Cloud-computing platforms for ML. Covers open and standardized cloud computing management and orchestration frameworks for your application infrastructure containers, as in Docker, and Kubernetes. Discusses data governance, security, and ethical issues.

CECS 4236 – SOFTWARE REQUIREMENTS ENGINEERING

Three credit-hours. Two two-hour lectures per week. Corequisites: CECS 4202.

Explores the process of requirements, elicitation, generation, modeling, tracing, and utilization in the development of software systems under plan-based and agile software development methodologies.

CECS 4240 – REAL-TIME OPERATING SYSTEMS

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 3234 or CECS 4230.

Real-time operating systems (RTOS) are used primarily in embedded systems. In these systems, the time factor is a priority to ensure that all processes are carried out within established time frames. Examples are industrial control applications, telephone switching equipment, flight control and real-time simulations. The course introduces concepts such as task states and scheduling triggers, process and thread synchronization, and others, all emphasized on the real-time operating system. Simulator will be used to expose students to these concepts.

CECS 4248 – SOFTWARE TESTING AND VERIFICATION

Three credit-hours. Two two-hour lectures per week. Corequisites: CECS 4202.

The course presents the concepts, processes, strategies, methods, and techniques for software verification and validation. It also covers how to write a test plan and test report.

CECS 4911 – COMPUTER ENGINEERING SEMINAR I

One credit-hour. One one and half-hour lectures per week. Prerequisites: Departmental Permit.

Topics are limited to those which are not part of content of regular courses offered by the department. Credit-hours earned can fulfill the graduation requirements in Computer Engineering and Computer Science. It will also serve to stimulate further advanced studies.

CECS 4912 – COMPUTER ENGINEERING SEMINAR II

Two credit-hours. Two one and half-hour lectures per week. Prerequisites: Departmental Permit.

Topics are limited to those which are not part of content of regular courses offered by the department. Credit-hours earned can fulfill the graduation requirements in Computer Engineering and Computer Science. It will also serve to stimulate further advanced studies.

Computer Science Courses

CS 2302 – DIGITAL LOGIC FOR COMPUTER SCIENCE MAJORS

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 2200

The course covers the following topics: digital and analog systems, binary systems, digital systems, structure and behavior, design levels, combinational and sequential systems.

CS 3010 – NUMERICAL ANALYSIS FOR COMPUTER SCIENCE MAJORS

Three credit-hours. Two two-hour lectures per week. Prerequisites: CECS 2202, MATH 1360. Corequisite: SCIE 1440

This course gives students the ability to apply solutions for approximations and errors, numerical solutions of linear and non-linear algebraic equations, ODE, PDE, numerical solutions of scientific problems, curve-fitting.

CS 3300 – COMPUTER ARCHITECTURE FOR COMPUTER SCIENCE MAJORS

Three credit-hours. Two two-hour lectures per week. Prerequisite: CECS 3200

Instruction set architecture, functional organization, and implementation of a computer are studied from the performance point of view, to provide the students with the principles and techniques used in the design of modern computer systems.

CS 4002 – COMPUTER SCIENCE PROJECT I

Three credit-hours. Two two-hour meetings per week. Prerequisite: All Computer Science core courses before 3rd year. Senior standing. Departmental permit.

First part of a two-term course on projects based on open-ended requirements. Projects will be selected in accordance with the student's area of interest. Students must approve both Computer Science Project Courses in sequence and without interruptions. Students that approve the first course and miss the second course will be required to repeat the first course again.

CS 4022 – COMPUTER SCIENCE PROJECT II

Three credit-hours. Two two-hour meetings per week. Prerequisite: CS 4002

Second part of a two-term course on projects based on open-ended requirements. Projects will be selected in accordance with the student's area of interest. Students must approve both Computer Science Project Courses in sequence and without interruptions. Students that approve the first course and miss the second course will be required to repeat the first course again.

CS 4902 – UNDERGRADUATE RESEARCH IN COMPUTER SCIENCE

Three credit-hours. Two two-hour lectures per week. Prerequisite: Third-year Computer Science student with 3.00 or higher GPA. Departmental Permit.

Research study in advanced topics in areas of computer science like artificial intelligence, databases, knowledge discovery, data warehousing, computer security, distributed systems, and parallel computation, among others. The research can be conducted in two ways: a research paper or the implementation of a project. Each project will be evaluated observing the use of the recommended guidelines required to develop the project.

CS 4904 – UNDERGRADUATE RESEARCH IN COMPUTER SCIENCE II

Three credit-hours. Two two-hour lectures per week. Prerequisite: CS 4902. Departmental Permit.

Extension of research study in advanced topics in areas of computer science like artificial intelligence, databases, knowledge discovery, data warehousing, computer security, distributed systems, and parallel computation, among others. The research can be conducted in two ways: a research paper or the implementation of a project. Each project will be evaluated observing the use of the recommended guidelines required to develop the project.

CS 4990 – SPECIAL TOPICS IN COMPUTER SCIENCE

Three credit-hours. Two two-hour lectures per week. Prerequisite: Departmental permit according to topics to be addressed.

Advanced topics (3rd and 4th year level) in areas of current research in computer science. Many include topics in data mining, e-commerce, evolutionary algorithms, and data warehousing, distributed computing, computer security, human computer interaction, e-learning, knowledge.

Courses for Non-Electrical Engineering Majors**ENGI 2310 – COMPUTER PROGRAMMING & ALGORITHMS**

Three credit-hours. Two two-hour lectures per week. Prerequisite: MATH 1330 or Equivalent.

The students will learn the steps that lead to the possible solution to a problem. In addition, the course presents the tools used in the development of a program.

ENGI 2320 – PRINCIPLES OF ELECTRICAL ENGINEERING

Three credit-hours. Two two-hour lectures per week. Prerequisite: SCIE 1440

Introduction to fundamental electrical engineering concepts. Study of electrical quantities such as current, voltage, energy, and power. Study of the ideal behavior of resistors, inductors, and capacitors as well as various independent and dependent ideal energy sources. Introduction to basic techniques of electrical circuit analysis.

FACULTY

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MECHANICAL ENGINEERING DEPARTMENT

MECHANICAL ENGINEERING PROGRAM

Mechanical engineers use the fundamental principles of energy, material sciences, and mechanics in the design and production of mechanical devices and systems. Mechanical engineers are heavily involved in the generation, conversion and transmission of energy and motion. The program is suited for students with a keen interest in applied physical sciences and mathematics. It is designed to prepare our graduates to face the new challenges of the industry with success and to benefit our society.

The curriculum leading to the Bachelor of Science in Mechanical Engineering (B.S.M.E.) covers the fundamental aspects of the field, stresses on basic principles and educates students to solve engineering problems. The curriculum integrates advanced computer skills, laboratory work and design projects in a teamwork setting throughout the program. The freshman and sophomore years emphasize courses in mathematics, sciences, humanities, computer programming, computer-aided drafting and design, conventional manufacturing, engineering mechanics, material sciences, solid mechanics, and fluid mechanics. The junior and senior years are devoted to thermodynamics, heat transfer, intermediate fluid mechanics, system dynamics and controls, mechatronics, thermal and mechanical design, computer-aided design, and computer aided-manufacturing. The program concludes with comprehensive capstone design courses in which the students apply the knowledge and concepts from previous courses in solving relevant problems from the industry.

Mechanical engineering students may decide to follow a traditional mechanical engineering path or earn a concentration in aerospace engineering or robotics and industrial automation. Students following the traditional path may take elective courses in areas such as

air conditioning systems, power plant engineering, internal combustion engines, turbomachinery, manufacturing, robotics, vibrations, dynamics of machinery, biomedical engineering, plastics engineering or any of the courses that are part of the concentration in aerospace engineering or robotics and industrial automation. The traditional course sequence also includes a course in entrepreneurship to enhance the business skills and self-employment opportunities of our graduates. Students enrolled in the B.S.M.E. with a concentration in Aerospace Engineering will take courses in aerospace-related areas such as aerodynamics, flight dynamics, propulsion systems, aerospace structures, and aircraft performance and design. Likewise, students enrolled in the B.S.M.E. with a concentration in Robotics and Industrial Automation will take courses in those topics.

Program Mission

The Mechanical Engineering program at Polytechnic University of Puerto Rico is designed to develop graduates from different backgrounds who can deal with situations that involve technological and humanistic/societal issues and to cultivate their potential for leadership. The program emphasizes on developing the ability and competency of our students in utilizing scientific and engineering methods for devising useful products to satisfy the community in an economical way, while considering the impacts on society.

Program Educational Objectives

Within a few years of graduation, the PUPR Mechanical Engineering Program graduates are expected to attain the following:

1. Develop a successful professional career in mechanical engineering, science or related fields, demonstrating high competence, and social and ethical responsibility.
2. Obtain a leadership position in the industry, academy or community, promoting communication, teamwork, and the inclusion of underrepresented groups.
3. Contribute to the advancement of science and engineering through innovation, creativity, and critical thinking.
4. Continue their professional development through independent learning or by pursuing graduate studies.

Student Outcomes

Every graduating mechanical engineer from our program shall demonstrate:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Career Opportunities

Mechanical engineers have many professional options due to the breadth of their preparation. Mechanical engineers can work in design, research and development, manufacturing, service, and maintenance, as well as technical sales.

Mechanical engineers can pursue their careers with local, state, and federal agencies, as well as with private enterprises, or even organize their own businesses. Graduates from this program have found successful careers in a variety of industries such as aerospace, pharmaceuticals, electric utilities, electronics, medical devices, air conditioning, food industry, mechanical services, among others. Mechanical engineering graduates may also elect to pursue advanced degrees in engineering, or continue their education in other fields, such as law or business.

Degree Offered

The Mechanical Engineering program offers undergraduate instruction leading to the degree of Bachelor of Science in Mechanical Engineering (B.S.M.E.). To obtain the **B.S.M.E. degree**, the student must complete the following:

Minimum Graduation Requirements

15	Credit-hours in Mathematics
14	Credit-hours in Basic Science
21	Credit-hours in Socio-Humanistic Studies and Languages
19	Credit-hours in Engineering Science
66	Credit-hours in Mechanical Engineering
9	Credit-hours in Mechanical Engineering Electives
3	Credit-hours in Entrepreneurship
147	Total Credit-hours

Students pursuing the **B.S.M.E. degree with a concentration in Aerospace Engineering** take three additional credit-hours for a total of 150 credit-hours.

To obtain the **B.S.M.E. with a concentration in Aerospace Engineering**, the student must complete the following:

Minimum Graduation Requirements

15	Credit-hours in Mathematics
14	Credit-hours in Basic Science
21	Credit-hours in Socio-Humanistic Studies and Languages
19	Credit-hours in Engineering Science
62	Credit-hours in Mechanical Engineering
19	Credit-hours in Aerospace Engineering Concentration
150	Total Credit-hours

To obtain the **B.S.M.E. with a concentration in Robotics and Industrial Automation**, the student must complete the following:

Minimum Graduation Requirements

15	Credit-hours in Mathematics
14	Credit-hours in Basic Science
21	Credit-hours in Socio-Humanistic Studies and Languages
19	Credit-hours in Engineering Science
62	Credit-hours in Mechanical Engineering
19	Credit-hours in Robotics and Industrial Automation Concentration
150	Total Credit-hours

Developmental Studies

Students admitted to the Mechanical Engineering Program must show evidence that they have acquired the academic abilities necessary to progress through this major. Those not demonstrating these abilities, as reflected by the results of their College Entrance Examination Board tests, PUPR's placement test, or previous university experience, are required to take developmental courses. These courses are designed to help the student overcome deficiencies in languages, mathematics, and science. These courses are required in addition to the 147 credit hours required by the Mechanical Engineering Program.

Developmental Studies Component
(Maximum of 30 Credit-Hours)

Course	Title	Credit-Hours
ENGL 0100	Preparatory English	3
ENGL 0110	English Grammar	3
ESOL 0100	Beginner English as a Second Language	3
ESOL 0110	Intermediate English as a Second Language	3
ESOL 0120	Advanced English as a Second Language	3

MATH	0102	Preparatory Mathematics	3
MATH	0106	Elementary Algebra	3
MATH	0110	Intermediate Algebra	3
MATH	1330	Precalculus I	3
MATH	1340	Precalculus II	3

Laboratories

The facilities and laboratories of the Mechanical Engineering Department at PUPR provide students with hands on experience on several important areas such as Fluid Mechanics, Thermal Engineering, Measurements, Engineering Materials, Mechatronics, Manufacturing, Computer Aided Design and Computer Aided Manufacturing, Aerospace Engineering, Robotics and Industrial Automation, PLC's. The mechanical engineering experimental facilities are housed in the first and fourth floors of the Laboratory building, other facilities are available to develop special projects. In addition to this, chemistry, physics, electronics, and computers laboratories are also available to our students throughout the campus.

Student Organizations

The Mechanical Engineering Department encourages its students to participate actively in the following student organization:

- American Society of Mechanical Engineers (ASME)

This organization provides students with the opportunity to get acquainted with their career and participate in conferences, seminars, and field trips to broaden their professional and social activities and nurture their leadership and communications skills.

MECHANICAL ENGINEERING CURRICULUM

Mathematics Component (15 Credit-Hours)

Course	Title	Credit-Hours
MATH 1350	Calculus I	4
MATH 1360	Calculus II	4
MATH 1370	Calculus III	4
MATH 2350	Differential Equations	3

Science Component (15 Credit-Hours)

Course	Title	Credit-Hours
SCIE 1210	Principles of Chemistry	3
SCIE 1211	Principles of Chemistry Laboratory	1
SCIE 1430	Physics I	4
SCIE 1431	Physics Laboratory	1
SCIE 1440	Physics II	4
SCIE 1441	Physics II Laboratory	1

Socio-Humanistic Studies and Languages Component (21 Credit-Hours)

Course	Title	Credit-Hours
ENGL 1020	English Composition I	3
ENGL 1021	English Composition II	3
ETH 2020	Ethics in Engineering	3
ENGL 1026	Fundamentals of Speech Communications	3

WOHI 2012	World Civilization I	3
ELEC	General Education Humanities Elective	3
ELEC	General Education Social Sciences Elective	3

Engineering Sciences Component
(19 Credit-Hours)

Course	Title	Credit-Hours
ENGI 2270	Engineering Probability and Statistics	3
ENGI 2110	Engineering Mechanics, Statics	3
ENGI 2410	Engineering Mechanics, Dynamics	3
EE 2000	Circuit Analysis I	3
ENGI 2420	Fluid Mechanics	3
ENGI 2260	Engineering Economics	3
ENGI 2421	Fluid Mechanics Laboratory	1

Mechanical Engineering Component (Does Not Apply for Concentration in Aerospace Engineering)
(66 Credit-Hours)

Course	Title	Credit-Hours
ME 1210	Computer Aided Drafting and Design	3
ME 1211	Conventional Manufacturing Lab	1
ME 2010	Computer Programming for ME	3
ME 2020	Applied Numerical Analysis	3
ME 2210	Engineering Materials	3
ME 2211	Engineering Materials Laboratory	1
ME 2220	Mechanism Design	3
ME 2230	Solid Mechanics I	3
ME 3011	Engineering Measurements Laboratory	1
ME 3030	System Dynamics and Controls	3
ME 3040	Mechatronics	3
ME 3110	Thermodynamics I	3
ME 3120	Thermodynamics II	3
ME 3140	Intermediate Fluid Mechanics	3
ME 3150	Heat Transfer I	3
ME 3160	Heat Transfer II	3
ME 3230	Solid Mechanics II	3
ME 3240	Design of Machine Elements I	3
ME 3250	Design of Machine Elements II	3
ME 3260	Manufacturing Engineering	3
ME 4011	Mechatronics Laboratory	1
ME 4110	Design of Thermal Systems	3
ME 4111	Thermal Engineering Laboratory	1
ME 4251	Modeling & Product Realization Laboratory	1
ME 4992	Mechanical Engineering Capstone Design I	3
ME 4994	Mechanical Engineering Capstone Design II	3

Elective Courses Component (Does Not Apply for Concentration in Aerospace Engineering or Robotics and Industrial Automation)
(9 Credit-Hours)

Course	Title	Credit-Hours
ME ELEC	Mechanical Engineering Electives	9

Business Component (Does Not Apply for Concentration in Aerospace Engineering or Robotics and Industrial Automation)
(3 Credit-Hours)

Course	Title	Credit-Hours
MGMT 4660	Entrepreneurship	3

Total Minimum Program Credit-Hours: 147

Mechanical Engineering Component (Concentration in Aerospace Engineering or Robotics and Industrial Automation)
(62 Credit-Hours)

Course	Title	Credit-Hours
ME 1210	Computer Aided Drafting and Design	3
ME 1211	Conventional Manufacturing Lab	1
ME 2010	Computer Programming for ME	3
ME 2020	Applied Numerical Analysis	3
ME 2210	Engineering Materials	3
ME 2211	Engineering Materials Laboratory	1
ME 2220	Mechanism Design	3
ME 2230	Solid Mechanics I	3
ME 3011	Engineering Measurements Laboratory	1
ME 3030	System Dynamics and Controls	3
ME 3040	Mechatronics	3
ME 3110	Thermodynamics I	3
ME 3120	Thermodynamics II	3
ME 3140	Intermediate Fluid Mechanics	3
ME 3150	Heat Transfer I	3
ME 3160	Heat Transfer II	3
ME 3230	Solid Mechanics II	3
ME 3240	Design of Machine Elements I	3
ME 3250	Design of Machine Elements II	3
ME 3260	Manufacturing Engineering	3
ME 4011	Mechatronics Laboratory	1
ME 4251	Modeling & Product Realization Laboratory	1
ME 4992	Mechanical Engineering Capstone Design I	3
ME 4994	Mechanical Engineering Capstone Design II	3

Aerospace Engineering Concentration Component
(19 Credit-Hours)

Course	Title	Credit-Hours
ME 2330	Introduction to Aerospace Engineering	3
ME 3330	Aerodynamics	3
ME 3340	Flight Dynamics	3
ME 3350	Aircraft Propulsion	3
ME 3356	Aerial Robot Dynamics	3
ME 3365	Rocket Propulsion	3
ME 4306	Autonomous Flight Control	3
ME 4319	Gas Turbine Performance and Design	3
ME 4330	Aerospace Structures	3
ME 4340	Aircraft Performance and Design	3
ME 4351	Aerospace Engineering Laboratory	1

Total Minimum Program Credit-Hours (Concentration in Aerospace Engineering): 150**Robotics and Industrial Automation Concentration Component**
(19 Credit-Hours)

Course	Title	Credit-Hours
ME 2032	Measurements and Programming	3
ME 2033	Measurements and Programming Laboratory	1
ME 3080	Introduction to Robotics	3
ME 3082	Automated Systems and Robotics I	3
ME 3083	Automated Systems and Robotics I Laboratory	1
ME 4042	Automated Systems and Robotics II	3
ME 4043	Automated Systems and Robotics Laboratory II	1
ME 4044	Industrial Automation with PLC Programming	3
ME 4045	Industrial Automation with PLC Programming Laboratory	1

Total Minimum Program Credit-Hours (Concentration in Robotics and Industrial Automation): 150**Mechanical Engineering Elective Courses**

Course	Title	Credit-Hours
ME 2032	Measurements and Programming	3
ME 2330	Introduction to Aerospace Engineering	3
ME 3080	Introduction to Robotics	3
ME 3082	Automated Systems and Robotics I	3
ME 3330	Aerodynamics	3
ME 3340	Flight Dynamics	3
ME 3350	Aircraft Propulsion	3
ME 3940	Biomaterials	3
ME 3960	Introduction to Plastics Engineering	3
ME 3962	Plastics Processing	3
ME 4042	Automated Systems and Robotics II	3
ME 4044	Industrial Automation with PLC Programming	3
ME 4330	Aerospace Structures	3
ME 4340	Aircraft Performance and Design	3
ME 4940	Bio-fluid Mechanics	3
ME 4942	Bio-solid Mechanics	3
ME 5910	Air Conditioning Systems Design	3
ME 5916	Internal Combustion Engines	3
ME 5918	Power Plant Engineering	3
ME 5922	Turbomachinery	3
ME 5950	Mechanical Vibration	3
ME 5952	Introduction to Dynamics of Machinery	3
ME 5954	Introduction to Finite Element Method	3
ME 5956	Introduction to Design for Manufacturing	3
ME 5958	Robotics	3
ME 5970	Mechanical Engineering Practice	3
ME 5980	Undergraduate Research	3
ME 5990	Special Topics in Mechanical Engineering	3

MECHANICAL ENGINEERING CURRICULUM SEQUENCE**First Year****First Quarter**

Course	Title	Credit-Hours
MATH 1350	Calculus I	4
ME 1210	Computer Aided Drafting & Design	3
ENGL 1020	English Composition I	3
WOHI 2012	World Civilization I	3
		13

1st Year – Second Quarter

Course	Title	Credit-Hours
MATH 1360	Calculus II	4
SCIE 1430	Physics I	4
SCIE 1431	Physics I Laboratory	1
ME 1211	Conventional Manufacturing Laboratory	1
ELEC	General Education Humanities Elective	3
		13

1st Year – Third Quarter

Course	Title	Credit-Hours
MATH 1370	Calculus III	4
SCIE 1210	Principles of Chemistry	3
SCIE 1211	Principles of Chemistry Laboratory	1
SCIE 1440	Physics II	4
SCIE 1441	Physics II Laboratory	1
		13

Second Year**First Quarter**

Course	Title	Credit-Hours
ENGI 2110	Engineering Mechanics, Statistics	3
ENGI 2270	Engineering Probability & Statistics	3
ME 2010	Computer Programming for ME	3
MATH 2350	Differential Equations	3
		12

Students with concentration in Aerospace Engineering add:

ME 2330	Introduction to Aerospace Engineering	3
		15

Students with concentration in Robotics and Industrial Automation add:

ME 2032	Measurements and Programming	3
		15

2nd Year – Second Quarter

Course	Title	Credit-Hours
ENGI 2410	Engineering Mechanics, Dynamics	3
ME 2020	Applied Numerical Analysis	3

ME 2210	Engineering Materials	3
EE 2000	Circuits Analysis I	3
		12

Students with concentration in Robotics and Industrial Automation add:

ME 2033	Measurements and Programming Laboratory	1
		13

2nd Year – Third Quarter

Course	Title	Credit-Hours
ENGI 2260	Engineering Economics	3
ENGI 2420	Fluids Mechanics	3
ME 2211	Engineering Materials Laboratory	1
ME 2220	Mechanism Design	3
ME 2230	Solids Mechanics I	3
		13

Third Year**First Quarter**

Course	Title	Credit-Hours
ME 3030	System Dynamics & Controls	3
ME 3110	Thermodynamics I	3
ME 3140	Intermediate Fluid Mechanics	3
ME 3230	Solids Mechanics II	3
ENGI 2421	Fluid Mechanics Laboratory	1
		13

3rd Year – Second Quarter

Course	Title	Credit-Hours
ME 3011	Engineering Measurements Laboratory	1
ME 3120	Thermodynamics II	3
ME 3150	Heat Transfer I	3
ME 3240	Design of Machine Elements I	3
ETH 2020	Ethics in Engineering	3
		13

Students with concentration in Robotics and Industrial Automation add:

ME 3080	Introduction to Robotics	3
		16

3rd Year – Third Quarter

Course	Title	Credit-Hours
ME 3040	Mechatronics	3
ME 3160	Heat Transfer II	3
ME 3250	Design of Machine Elements II	3
ME 3260	Manufacturing Engineering	3
		12

Students with concentration in Robotics and Industrial Automation add:

ME 3082	Automated Systems and Robotics I	3
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15

Fourth Year**First Quarter**

Course	Title	Credit-Hours
ENGL 1021	English Composition II	3
MGMT 4660	Entrepreneurship	3
ME 4011	Mechatronics Laboratory	1
ME 4110	Design of Thermal Systems	3
ME ELEC	Mechanical Engineering Elective	3
		13

Students with concentration in Aerospace Engineering register:

ENGL 1021	English Composition II	3
ME 3350	Aircraft Propulsion	3
ME 4330	Aerospace Structures	3
ME 3330	Aerodynamics	3
ME 4011	Mechatronics Laboratory	1
		13

Students with concentration in Robotics and Industrial Automation register:

ENGL 1021	English Composition II	3
ME 4011	Mechatronics Laboratory	1
ME 3083	Automatic Systems and Robotics I Laboratory	1
ME 4042	Automatic Systems and Robotics II	3
ME 4044	Industrial Automation with PLC Programming	3
		11

4th Year – Second Quarter

Course	Title	Credit-Hours
ME 4111	Thermal Engineering Laboratory	1
ME 4251	Modeling & Product Realization Laboratory	1
ME 4992	ME Capstone Design I	3
ELEC	General Education Social Sciences Elective	3
ME ELEC	Mechanical Engineering Elective	3
		11

Students with concentration in Aerospace Engineering register:

ME 4251	Modeling & Product Realization Laboratory	1
ME 3340	Flight Dynamics	3
ME 4992	ME Capstone Design I	3
ELEC	Socio-Humanistic Studies or Language Elective	3
		10

Students with concentration in Robotics and Industrial Automation register:

ME 4045	Industrial Automation with PLC Programming Laboratory	1
ME 4251	Modeling & Product Realization Laboratory	1
ME 4992	ME Capstone Design I	3
ELEC	General Education Social Sciences Elective	3
		8

4th Year – Third Quarter

Course	Title	Credit-Hours
ME 4994	ME Capstone Design II	3
ENGL 1026	Fundamentals of Speech Communications	3
ME ELEC	Mechanical Engineering Elective	3
		9
Students with concentration in Aerospace Engineering register:		
ME 4340	Aircraft Performance and Design	3
ME 4994	ME Capstone Design II	3
ME 4351	Aerospace Engineering Laboratory	1
ENGL 1026	Fundamentals of Speech Communications	3
		10
Students with concentration in Robotics and Industrial Automation register:		
ME 4043	Automatic Systems and Robotics II Laboratory	1
ME 4994	ME Capstone Design II	3
ENGL 1026	Fundamentals of Speech Communications	3
		Total 7

COURSE DESCRIPTIONS

ENGI 2410 – ENGINEERING MECHANICS, DYNAMICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENGI 2110.

This course covers the study of kinematics and kinetics of particles and rigid bodies in the idealization of mechanical systems. The course emphasizes the application of Newton's laws, work and energy, and impulse and momentum methods in the dynamic analysis of such systems.

ENGI 2420 – FLUID MECHANICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENGI 2410 or ENGI 2910.

This course covers the study and application of the fundamental principles of fluid mechanics. The course focuses on the static, kinematic and dynamic analysis of fluids in engineering systems. Application of momentum, energy, and continuity principles to the analysis of incompressible flow applications. The course concludes with an analysis of viscous flows in pipes and open channels applications.

ENGI 2421 – FLUID MECHANICS LABORATORY

One credit-hour. One four-hour laboratory period per week. Prerequisite: ENGI 2270 (or CEE 2110), ENGI 2420.

Laboratory experiences to illustrate the fluid mechanics concepts learned in ENGI 2420. Analysis of results and statistical evaluation data from experiments in gravimetric flow, hydrostatic thrust, stability of floating bodies, flow through orifices, discharge over weirs, impact of a jet and friction on pipes and accessories. The laboratory emphasizes teamwork and communication skills through the submission of oral and written reports.

ME 1210 – COMPUTER AIDED DRAFTING AND DESIGN

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course presents an introduction to the principles of graphics communication in mechanical engineering. The course covers key engineering visualization techniques such as sketching, solid modeling, assemblies, dimensioning, tolerance definition and drafting using standard practices and state-of-the-art computer applications. The course emphasizes orthographic projections and multi-view

drawings for engineering design and fabrication. At the end of the course, the students will work on a team-based design of a prototype device to be fabricated in ME 1211.

ME 1211 – CONVENTIONAL MANUFACTURING LABORATORY

One credit-hour. One four-hour laboratory period per week. Prerequisite: ME 1210.

This course presents an introduction to the practices and techniques in conventional processes for the manufacturing of engineering components. The course focuses on techniques for the use of band saws, milling machines, lathes, and welding machines. The end of the course integrates the fabrication (under the guidance of the instructor) of the prototype device already designed in ME 1210.

ME 2010 – COMPUTER PROGRAMMING FOR MECHANICAL ENGINEERING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MATH 1350.

This course will introduce the students to the development of algorithms and computer programs using MATLAB. The course will cover basic program construction techniques such as top-down designs, flowcharting, pseudo coding, editing, and debugging. Students will apply the learned techniques to the solution of engineering problems.

ME 2020 – APPLIED NUMERICAL ANALYSIS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 2010.

This course will introduce the students to the application of numerical methods and techniques to the solution of engineering and mathematical problems. The course addresses relevant topics in numerical analysis such as: root finding techniques, solution of linear algebraic equations, determination of eigenvalues and eigenvectors, curve fitting, as well as the application of numerical techniques for the differentiation, integration, and solution of ordinary differential equations. The course emphasizes the use of MATLAB programming.

ME 2210 – ENGINEERING MATERIALS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: SCIE 1210, SCIE 1211. Corequisite: ENGI 2110.

This course introduces mechanical engineering students to the structures and properties of engineering materials such as metals, ceramics, glasses, polymers, and composites. The course covers important topics such as atomic bonding, crystalline and non-crystalline structures, mechanical behavior, phase transformations and thermal processing techniques. The course emphasizes the selection and application of engineering materials to the design of engineering applications.

ME 2211 – ENGINEERING MATERIALS LABORATORY

One credit-hour. One four-hour laboratory period per week. Prerequisite: ENGI 2270, ME 2210.

Laboratory experiences to support the concepts learned in ME 2210. Characterization and statistical analysis of mechanical properties of metals using tension, hardness, micro-hardness, metallography, phase transformation and heat treatment techniques. The laboratory emphasizes teamwork and communication skills through the submission of oral and written reports.

ME 2220 – MECHANISM DESIGN

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENGI 2410, ME 1211, ME 2020.

This course introduces students to the application of fundamental concepts of kinematics and kinetics to the analysis and design of mechanisms in mechanical systems. The course focuses on the design of linkages, cams and gears using analytical, graphical, and computer-aided techniques.

ME 2230 – SOLID MECHANICS I

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENGI 2110, ME 2020, ME 2210.

This course introduces mechanical engineering students to the concepts of stress, strain, and deformation of structural components in mechanical systems. The course covers the analysis of structural members under axial, torsion and bending loading conditions.

ME 3011 – ENGINEERING MEASUREMENTS LABORATORY

One credit-hour. One four-hour laboratory period per week. Prerequisites: EE 2000.

Laboratory practices to introduce students to experimental techniques in mechanical engineering applications. The laboratory has an emphasis in the statistical analysis of experimental results. The practices cover the selection and calibration of instrumentation, data acquisition techniques, and measurement error analysis. The laboratory emphasizes teamwork and communication skills through the submission of oral and written reports.

ME 3030 – SYSTEM DYNAMICS AND CONTROLS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENGI 2420, EE 2000.

This course covers the modeling, analysis, and control of dynamic systems. An emphasis is placed in mathematical modeling to determine the transient and steady-state response of mechanical, electrical, thermal, and fluid systems. The course also covers the analysis and design of linear feedback control systems in the time and frequency domains.

ME 3040 – MECHATRONICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ME 3030, ME 3011.

This course introduces mechanical engineering students to the automation and digital control of industrial applications using electrical, electronic, hydraulic, and pneumatic control devices and systems. Topics in this course include design of control circuits and analysis of the response of several mechanical systems to external conditions.

ME 3110 – THERMODYNAMICS I

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENGI 2420.

This course introduces mechanical engineering students to the fundamental concepts of thermodynamics. The course focuses on thermodynamic properties, energy and mass conservation, entropy and second law analysis as well as introduction to the study of ideal gas mixtures.

ME 3120 – THERMODYNAMICS II

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ME 3110, ME 2020.

This course continues the study of the fundamental concepts and applications of thermodynamics. The course focuses on the application of thermodynamic principles to the analysis and design of vapor-powered, gas-powered, refrigeration and heat pump systems, refrigeration systems. The course concludes with key concepts in reacting mixtures and combustion principles.

ME 3140 – INTERMEDIATE FLUID MECHANICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ENGI 2420, ME 2020. Corequisite: ENGI 2421.

This course is a continuation of ENGI 2420 to address specific applications for mechanical engineers. The course presents a comprehensive view to the differential analysis of fluid flow, the study of flow over immersed bodies and the boundary layer theory and the analysis of compressible fluid flow. The course concludes with the treatment of fluid mechanics to turbomachinery applications.

ME 3150 – HEAT TRANSFER I

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ME 3110, ME 3140.

This course presents an introduction of fundamental concepts of heat transfer. The course focuses on unidirectional and multidirectional steady-state conduction, transient conduction, and introduction to radiation heat transfer.

ME 3160 – HEAT TRANSFER II

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3150, ENGI 2421.

This course is a continuation of ME 3150 to cover basic concepts in heat convection transfer. This course provides an emphasis on external forced convection, internal forced convection, natural convection, and convection with change of phase. The course concludes with the analysis and design of heat exchangers and an introduction to the principles of mass transfer.

ME 3230 – SOLID MECHANICS II

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 2230.

This course continues the development of stress-strain analysis techniques for structural members in mechanical systems. The course emphasizes the application of stress and strain transformation techniques to structural members under combined loadings and thin-walled pressure vessels. The course also introduces students to theories of failure for static load conditions and the design of machinery components. The course concludes with the analysis of indeterminate beams, the buckling stability of columns and an introduction of energy methods.

ME 3240 – DESIGN OF MACHINE ELEMENTS I

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3230.

This course covers the design of mechanical components subjected to static and fatigue loads. The students are exposed to the design of machines using non-permanent joints (e.g., fasteners, screws, etc.), permanent joints (e.g., welding, brazing, bonding, etc.), mechanical springs, rolling and journal bearing design.

ME 3250 – DESIGN OF MACHINE ELEMENTS II

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 2220, ME 3240.

This course continues the development of machine design techniques from ME 3240. Design of key mechanical components such as gears, shafts, couplings, brakes, clutches, and flexible mechanical elements (e.g., belts, chains, etc.) subject to static and fatigue loads.

ME 3260 – MANUFACTURING ENGINEERING

Three credit-hours. Two two-hour lecture periods per Week. Prerequisite: ME 3230.

This course presents mechanical engineering students with a survey of manufacturing processes including casting, forming, machining, welding, brazing, adhesive bonding, mechanical fastening, as well as forming and shaping plastics and composite materials. The course also covers important topics in quality assurance, testing, and inspection of manufactured products.

ME 4011- MECHATRONICS LABORATORY

One credit-hour. One four-hour laboratory period per week. Prerequisite: ME 3040.

Laboratory experiences in automation using electrical, electronic, hydraulic, and pneumatic control systems. The laboratory practices include the selection and implementation of sensors and actuators (i.e., mechanical, pneumatics and hydraulics), along to electronic data acquisition systems and Programmable Logic Controllers. The laboratory emphasizes teamwork and communication skills through the submission of oral and written reports. situations.

ME 4110 – DESIGN OF THERMAL SYSTEMS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ME 3120, ME 3160, ENGI 2260.

This course provides senior-level students with an integrated approach to analyze, simulate, and design energy systems such as heat exchangers and pumps. The course also incorporates system economics and design optimization techniques in the design of such systems.

ME 4111 – THERMAL ENGINEERING LABORATORY

One credit-hour. One four-hour laboratory period per week. Prerequisite: ME 4110.

Laboratory experiences to illustrate senior-level students the practical aspects of fluid and thermal systems such as heat exchangers, steam generators, cooling towers, refrigeration and air conditioning systems, wind tunnel, compressible fluid flow, and turbomachinery. The laboratory emphasizes teamwork and communication skills through the submission of oral and written reports.

ME 4251 – MODELING AND PRODUCT REALIZATION LABORATORY

One credit-hour. One four-hour laboratory period per week. Prerequisite: ME 3260, ME 2220.

This course presents senior-level students an opportunity to integrate computer-aided design (CAD), computer-aided engineering (CAE) and computer-aided manufacturing (CAM) applications in the design and development of engineering products. The course emphasizes the modeling and simulation of mechanical systems to predict the mechanical behavior and optimize the design as well as the use of modern manufacturing equipment such as rapid prototyping, numerical controlled programming, foam cutters and 3D scanners in the fabrication of a prototype.

ME 4992 – MECHANICAL ENGINEERING CAPSTONE DESIGN I

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ME 3160, ME 3250, ME 3040. Corequisites: ME 4110, ENGI 2260. Concentration in Aerospace Engineering: ME 3040, ME 3250, ME 4935, ME 5930, ME 4930, ME 3160. Corequisite: ENGI 2260. Concentration in Robotics and Industrial Automation: Prerequisites: ME 2020, ME 2033, ME 3030. Corequisite: ENGI 2260. General requisite: Department Head consent.

Comprehensive course to emphasize the key knowledge and concepts through the Mechanical Engineering program. Teams work in open-ended, multi-disciplinary design projects focused on solving industrially relevant problems. The course implements a system engineering approach and emphasizes the generation and selection of ideas as well as the application of analysis and design tools developed in previous courses. The course ME 4992 covers the development of the project from problem definition to its final design. The course stresses teamwork, project management and communication skills through several technical presentations through the progress of the project.

ME 4994 – MECHANICAL ENGINEERING CAPSTONE DESIGN II

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 4992.

This course is an extension of ME 4992. The course ME 4994 covers the development of the project from its final design to the construction and validation of a prototype. The course stresses teamwork, project management and communication skills through several technical presentations through the progress of the project and the submission of a final comprehensive report.

Robotics and Industrial Automation Courses**ME 2032 - MEASUREMENTS AND PROGRAMMING**

Three credit-hours. Two two-hours lecture periods per week. Prerequisites: SCIE 1440, SCIE 1441. Corequisite: ME 2010.

This course presents an introduction to the fundamental background in the theory of engineering measurements and the concepts of standards and calibration. Error sources in engineering measurements are introduced and classified. Also, the statistical nature of physical variables and uncertainty are introduced. MATLAB, LabVIEW, and Python will be used as the integrated development environment (IDE) with emphasis in data acquisition of digital and analog DC signals, transducers, and signal conditioning.

ME 2033 - MEASUREMENTS AND PROGRAMMING LABORATORY

One credit-hour. One four-hour lecture periods per week. Prerequisite: ME 2032. Corequisite: EE 2000.

The laboratory experiences will introduce measurements and sensors using MATLAB, and LabVIEW as the integrated development environment (IDE). The virtual instruments (VI's) are introduced: numeric, Boolean controls, indicators, nodes, terminals, and wiring. Also, the structures, "For" and "While" loops are introduced, shift registers and feedback nodes. "Case" structures, arrays, graph

charts and wiring IO's. Data Acquisition of digital and analog DC signals, transducers, and signal conditioning are emphasized and the measuring-transducing-conditioning temperatures measurements.

ME 3080 - INTRODUCTION TO ROBOTICS

Three credit-hours. Two two-hours lecture periods per week. Prerequisites: ME 2033, ME 3030, ME 2220. Corequisite: None.

This course presents an introduction to the concepts of robotics and movement, how robots perceive their environment, and how they adjust their movements to avoid obstacles and navigate difficult complex tasks. The student is exposed to real world examples of how robotics has been applied in distinct situations and to learn how to program a robot to perform a variety of movements and grasping objects. The MATLAB software is used to simulate dynamical systems and the tuning parameters for a PID controller system. Additionally, for a nonlinear system application, a 6 degree-of-freedom manipulator arm is used.

ME 3082 - AUTOMATED SYSTEMS AND ROBOTICS I

Three credit-hours. Two two-hours lecture periods per week. Prerequisite: ME 3080. Corequisite: None.

This course presents an introduction of components, circuits, instruments, and control techniques used in automated systems and robotics. This course is designed as first of two courses, and it emphasizes the concepts of electrical motors, sensors, industrial controls, variable-speed drives, servomechanisms, solid-state electronics, and instrumentations and process controllers.

ME 3083 - AUTOMATED SYSTEMS AND ROBOTICS I LABORATORY

One credit-hour. One four-hour lecture periods per week. Prerequisite: ME 2082. Corequisite: ME 3040.

Introduction to Robotics Programming with emphasis on writing programs: Point-to-Point and Tasks Programs. Control of the Robot Using a Human Machine Interface, HMI: The Teach Pendant to account for a change in object positioning and delays. Modifying the speed associated with a recorded programmed point. Design flow charts and creation of programs where many devices are used to simulate a transfer and assembly process: Gravity Feeders, Conveyors, Belt Conveyor, Pneumatic Feeders, and Rotary Carousels.

ME 4042 - AUTOMATED SYSTEMS AND ROBOTICS II

Three credit-hours. Two two-hours lecture periods per week. Prerequisite: ME 3082. Corequisite: ME 3083.

This is a second course of automated systems and robotics with emphasis on computer-integrated manufacturing techniques both hardware and software. Concepts about robot control through vision sensors as well as vision tasks are discussed. Also, robots utilizing vision systems to recognize objects through edge detection and extraction: shape and size, position, and orientation. Robot programming through computer control and software structure is emphasized.

ME 4043 - AUTOMATED SYSTEMS AND ROBOTICS II LABORATORY

One credit-hour. One four-hour lecture periods per week. Prerequisite: ME 4042. Corequisite: None.

Laboratory experiments are aimed at industrial application of automated systems and robotics components and devices. Creating programs that simulate the automated painting of a surface with a spray gun, modify the spraying speed, keep a constant angle between the nozzle of the spray gun, and the surface being painted. The experiences considered with the robot can stay at the home position until parts are placed in the feeder and move a certain distance along the conveyor belt. Both hardware and software are involved with controls and industrial processes laboratories.

ME 4044 - INDUSTRIAL AUTOMATION WITH PLC PROGRAMMING

Three credit-hours. Two two-hours lecture periods per week. Prerequisites: ME 3040, ME 4011. Corequisite: None.

This course presents an introduction to programming industrial controllers, called programmable logic controllers, PLCs, with emphasis on the design of programs for industrial automation. This course introduces the design process to develop the tasks involved in industrial automation, breaking the program into manageable subtasks, and the code for the automatic parts and handling the sequential parts of the problem. With this skill, the student can write the appropriate code defined as Ladder code or Statement Logic code to control or read data from the real world.

ME 4045 - INDUSTRIAL AUTOMATION WITH PLC PROGRAMMING LABORATORY

One credit-hour. One four-hour lecture periods per week. Prerequisites: ME 4044, ME 4011. Corequisite: None.

Laboratory experiences illustrating communication protocols to interface with a computer, DF1 protocol and DH-485 network, PLC Programming, Machine control, File Organization, Address Mapping, and program development templates. Configuration of the hardware for ladder logic instructions with relays, counting and timing instructions and logic instructions to perform basic mathematical functions (addition, subtraction, multiplication, division, double division, and square root) for the program flow and execution in industrial application of level process, hydraulics, pneumatics, electro-mechanical, and bottling process. Configuration of the hardware in the lab to work with your laptop or tablet.

Mechanical Engineering Aerospace Engineering Courses**ME 2330 – INTRODUCTION TO AEROSPACE ENGINEERING**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENGI 2410.

Introduction to the fundamental concepts of aerodynamics and how they are applied to the design of aircraft. The concepts of lift, drag, propulsion, performance, stability, and control are discussed through the reference of real-life examples.

ME 3330 – AERODYNAMICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 2330, ME 3140.

This course introduces the aerodynamics of bodies and the principles of airfoil design. The course covers concepts in incompressible airfoil and wing theory as well as topics in gas dynamics that include shock and expansion waves applied to supersonic airfoils, inlet design, and the transonic flight regime.

ME 3340 – FLIGHT DYNAMICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3030, ME 3140.

This course is designed to provide aerospace engineering undergraduate students the fundamental concepts of modeling of aerodynamics in enough detail so they can study static and dynamic stability, and simulation of aircraft dynamics. Also, the concept of handling qualities will be introduced. The students will also be introduced to MATLAB software package for the analysis of dynamic systems.

ME 3350 – AIRCRAFT PROPULSION

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3120, ME 3140.

This course covers the study of how concepts of thermodynamics, fluid mechanics, aerodynamics, and compressible flow theory are applied to the analysis and design of aircraft jet engines. The course includes the transition duct aerodynamics, the compressor stall/surge characteristics; the inclusion of propulsion system integration shows propulsion as one element of a larger system (namely, aircraft) and the necessity of trade-off in overall system design.

ME 3356 – AERIAL ROBOT DYNAMICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3030, ME 3330.

This course covers aircraft gas turbine engines, from their basic principles to more advanced treatments in engine components. The course includes first compressible flow, thermodynamics, and combustion relevant to aircraft and space vehicle propulsion. Analysis and design of gas turbine components, including turbines, inlets, combustion chambers, and nozzles. The inclusion of propulsion system integration shows propulsion as one element of a larger system (namely the aircraft) and the need for trade-offs in the overall system design.

ME 3365 – ROCKET PROPULSION

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3330, ME 3120, ME 3140

This course describes different rocket propulsion systems and the main engineering definitions and principles required to analyze rocket propulsion. The course is focused on the analysis of fluid through nozzles and the thermodynamics relations involved in the process. The study of chemical combustion rocket engines and the basic principles of electric thrusters will be considered.

ME 4306 – AUTONOMOUS FLIGHT CONTROL

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3040, ME 3330.

This course provides a comprehensive foundation in the autonomous control of unmanned aerial vehicles (UAV). A simple dynamic model is used in the design of attitude and position control algorithms by applying classical and modern control methods. These control methods are then used for the design of flight planning. A programming platform will be used to implement control and simulation models.

ME 4319 – GAS TURBINE PERFORMANCE AND DESIGN

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3350.

This course covers aircraft gas turbine engines, from their basic principles to more advanced treatments in engine components. The course includes first compressible flow, thermodynamics, and combustion relevant to aircraft and space vehicle propulsion. Analysis and design of gas turbine components, including turbines, inlets, combustion chambers, and nozzles. The inclusion of propulsion system integration shows propulsion as one element of a larger system (namely the aircraft) and the need for trade-offs in the overall system design.

ME 4330 – AEROSPACE STRUCTURES

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3240.

This course introduces the students to the analysis and design of aerospace structural components. The course covers the development of design criteria, the determination of structural loads, and the selection of materials in aerospace applications. The course emphasizes the analysis and design of thin-walled structures as key structural elements in aerospace applications.

ME 4340 – AIRCRAFT PERFORMANCE AND DESIGN

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3030, ME 3330.

An introduction to the performance and design of Aircraft. Performance during steady and accelerated flights, from point performance to mission analysis of propeller-driven and jet-propelled aircraft is discussed, with emphasis on implications on conceptual design. Airplane aerodynamics, propulsion, weights, and vehicle synthesis and optimization methodologies are presented and applied to the conceptual design of an aircraft.

ME 4351 – AEROSPACE ENGINEERING LABORATORY

One credit-hour. Two two-hour laboratory period per week. Prerequisites: ME 4011, ME 3350, ME 4330.

Experimental analysis of airfoils, non-aerodynamic shapes, propellers, turbines, flight dynamics simulations, aerospace structures, vibrations, and instrumentation systems are performed. All results are compared to theoretical predictions. The laboratory emphasizes teamwork and communication skills through the submission of oral and written reports.

Other Mechanical Engineering Elective Courses

ME 3940 – BIOMATERIALS

Three credit-hours. Two two-hour lecture periods per Week. Prerequisite: ME 2210.

Introduction to the terminology, definitions, and concepts that are required to select, manipulate, evaluate, and use materials in

biomedical applications. This course covers structure-property relationships, biocompatibility criteria, and physiological/clinical performance.

ME 3960 – INTRODUCTION TO PLASTICS ENGINEERING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3220.

This course covers the fundamentals of plastic materials, historic review, classification, definitions, and terminology. Furthermore, the course covers chemical, physical and mechanical properties, processing techniques and recycling of plastic materials.

ME 3962 – PLASTICS PROCESSING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3960.

This course is centered on the processing of plastics materials. Preliminary concepts such as: crystallization, glassy state, visco-elasticity, polymeric and composites compounds are covered. The course also covers processing techniques like casting, compression molding, injection, calendaring, extrusion, thermoforming, bending, machining, welding, gluing, and surface coating are compared establishing their applications.

ME 4940 – BIO-FLUID MECHANICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENGI 2420.

Introduction to the study of blood flow in the cardiovascular system and gas flow in the pulmonary system. Emphasis on modeling and the potential of flow studies for clinical research application.

ME 4942 – BIO-SOLID MECHANICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 2230.

The mechanics of living tissue, e.g., arteries, skin, heart muscle, ligament, tendon, cartilage, and bone. Constitutive equations and some simple mechanical models. Mechanics of cells and applications.

ME 5910 – AIR CONDITIONING SYSTEMS DESIGN

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ME 3120, ME 3160

Application of the principles of thermodynamics to the analysis and design of air conditioning systems. Principles for the control of moist air properties to meet comfort and industrial requirements. Heat transmission in building structures. Calculation of heating and cooling loads. Component performance, distribution, selection, and controls.

ME 5916 – INTERNAL COMBUSTION ENGINES

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ME3120, ME 3160.

The principles of thermodynamics, compressible fluid flow, and combustion processes as applied to the study of spark ignition and compression-ignition engines. Operating power cycles, engine performance, heat losses, efficiencies, and air pollution are included.

ME 5918 – POWER PLANT ENGINEERING

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ME 3120, ME 3160.

This course presents a study of the thermal and economic aspects of power plants. The course covers fuel and combustion processes as well as power cycles (e.g., Rankine cycles and Brayton cycles) in power plants. The course focuses on the design and operation of power plant components such as boilers, condensers, cooling towers, feed-water heaters. The course also introduces the students to non-conventional power plants using renewable energy sources.

ME 5922 – TURBOMACHINERY

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ME 3120, ME 3160.

Dimensional analysis, energy transfer in rotating passages. Flow through passages and over blades and vanes. Centrifugal pumps, fans, and compressors. Axial flow pumps, fans, and compressors. Steam and gas turbines. Hydraulic turbines. Wind turbines.

ME 5950 – MECHANICAL VIBRATION

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3030.

This course presents an introduction to free and forced vibration of single degree and multiple degree of freedom systems. The course covers modeling and analysis techniques for mechanical systems to determine natural frequencies, mode shapes and forced response under harmonic and transient loads. The course also introduces the practical design aspects of vibration control devices.

ME 5952 – INTRODUCTION TO DYNAMICS OF MACHINERY

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3030.

This course presents an introduction to the analysis and design of rotating machinery. The course combines the theory and application of dynamics, vibrations, fluid mechanics, and tribology to the design of such systems.

ME 5954 – INTRODUCTION TO FINITE ELEMENT METHOD

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 3150.

Introduction to the fundamental aspects of the finite element method (FEM) and its applications. Review of matrix algebra and an introduction to FEM formulations. Analysis of truss, beam, and frame structures. One- and two-dimensional elements.

ME 5956 – INTRODUCTION TO DESIGN FOR MANUFACTURING

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ME 3230, ME 3260.

Design for Manufacturing and Assembly (DFM/A) is an approach to product design that systematically includes consideration of manufacturability and assembly in the design. DFM/A includes organizational changes, design principles, and guidelines. The scope of DFM/A is expanded also to other areas as marketability, testability, serviceability, maintainability.

ME 5958 – ROBOTICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ME 3040, ME 4011.

Introduction to robotic manipulators. Layout design of robot arms. Kinematics and Dynamics Analyzes. Analytical methods and algorithms for computer implementation. Motion description of manipulators in terms of trajectories in space. Control of robotic manipulators using digital computers. Robot programming.

ME 5970 – MECHANICAL ENGINEERING PRACTICE

Three credit-hours. Time schedule by arrangement. Prerequisites: ME 3110, ME 3230, approval by the Director of the Mechanical Engineering Department.

A course organized in collaboration with industry or government agencies to provide the student with practical experience in mechanical engineering. The project must be pre-approved by the Director of the Mechanical Engineering Department. The project execution is jointly supervised by a designated faculty member from the Mechanical Engineering Department and a qualified representative from the cooperating organization. A minimum of 200 hours of field experience is required.

ME 5980 – MECHANICAL ENGINEERING UNDERGRADUATE RESEARCH

Three credit-hours. Time schedule by arrangement. Prerequisite: Instructor and Head of the Department Consent. Individual research project under the supervision of a faculty member.

ME 5990 – SPECIAL TOPICS IN MECHANICAL ENGINEERING

Three credit-hours. Time schedule by arrangement. Prerequisite: Instructor and Head of the Department Consent.

Arranged by individual faculty with special expertise, these courses survey fundamentals in areas that are not covered by the regular mechanical engineering course offerings. Specific course descriptions are disseminated by the Mechanical Engineering Office well in advance of the offering.

Specials Topics

ME 4703 – FLUID DYNAMICS AND THERMODYNAMICS OF GAS TURBINE COMBUSTION

Three credit-hours. Two two-hour lecture periods per week.

This course will examine, through the laws of fluid mechanics and thermodynamics, the means by which energy transfer is achieved in the chief types of turbomachines, together with differing behavior of individual types in operation. Methods of analyzing the flow processes differ depending upon the geometrical configuration of the machine, whether the fluid can be regarded as incompressible or not, and whether the machine absorbs or produces work. As far as possible, a unified treatment is adopted so that machines having similar configurations and functions are considered together.

ME 4704 – GAS TURBINE COMBUSTION

Three credit-hours. Two two-hour lecture periods per week.

The mechanism of heat release in combustion chamber of a gas turbine engine, thermochemistry principles, along with chemical kinetics, will be covered in class. In addition, the course will cover the characteristic length scales of the problem involved in flame stability and length, to understand how this problem is ultimately tied to the combustion chamber geometry and sizing. In a combustion chamber of an air-breathing engine, liquid fuel and air are brought together with an ignition source to start off the chemical reaction. This course will also teach students in mechanical engineering fundamentals in which the need for cooling methodology, gas-turbine heat transfer, combustion fundamentals and efficiency, and design of components for combustion component systems will be discussed. In addition, the student will learn about topics regarding the design of liners for combustion chamber cooling, effects of different types of fuels on both individual component and overall turbine engine efficiency.

ME 4705 – GAS TURBINE GAS TRANSFER

Three credit-hours. Two two-hour lecture periods per week.

This course will teach an undergraduate, mechanical engineering student fundamental in which the need for turbine cooling, gas turbine heat-transfer problems, and cooling methodology will be discussed. In addition, the student will learn about turbine heat transfer, in which turbine rotor and stator heat-transfer issues, including end-wall and blade tip region under engine conditions, as well as under simulated engine conditions are discussed, but turbine film cooling, including turbine rotor and stator blade film cooling are discussed. Furthermore, this course will include information regarding turbine internal cooling, including impingement cooling, rib-turbulated cooling, pin-fin cooling, and compound and new cooling techniques. Finally, the student will be familiarized with experimental measurement techniques, such as flow and thermal field techniques, optical techniques, liquid-crystal thermography, and heat-transfer and mass-transfer techniques.

ME 4706 – ROTOR DYNAMICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENGI 2420.

This course extends the study of blade vibrations to rotor dynamics, which is the study of vibrations related to the rotor's structural dynamics, including concerns for the bearings. Most of the attention is focused on hydrodynamic bearings, rotor dynamic stability problems, combined with methods for calculating damped critical speeds. Adequate rotor dynamic models for high-performance turbomachinery must account for the structure, the bearings, and all the remaining forces, and these models (component and system) computationally adequate for the analysis of rotors.

ME 4707 – DESIGN OF TURBOMACHINES

Three credit-hours. Two two-hour lecture periods per week.

This course will provide both design and application engineers with an understanding of the mechanical aspects of turbomachinery design. Techniques by which a design can be optimized are emphasized, and the complete process for analytical validation of new designs and developing new components for existing machines is described from the beginning to the final detailed design.

ME 4801 – INTRODUCTION TO UNMANNED AIR VEHICLE SYSTEMS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ME students: ME 3011, ME 3030/ CE, EE students: EE2001, EE3002.

A comprehensive fundamentals course that relates Unmanned Aerial Vehicles (UAVs) to Operators, Weather Conditions, Airspace Regulations, Communication Systems, Components, and Recent Technologies for successful missions and flight. Emphasis is placed on Integration of Systems that support UAV usage in military, governmental, and civil settings. The student will benefit from gaining knowledge for developing and fielding prototype UAVs, managing complex UAS programs, and/or be able to pursue and engage in his or her own UAV services with an entrepreneurial spirit.

ME 4802 – SMALL UNMANNED AIR VEHICLE (sUAV) DESIGN LAB

One credit-hour. Two two-hour laboratory period per week. Prerequisite: ME 4801.

Experiments and training that provide students with the knowledge to build and fly their own UAV. Topics covered include Definitions and Types, Small UAV Sensors, Small UAV Design, Small UAV Propulsion, Small UAV Energy Systems, Small UAV Regulation, and Small UAV Operations. Course material will help students make the best decision possible in purchasing small UAVs. The content will also provide students to be effective as a pilot, sensor operator, maintenance technician, mission commanders, observers, supervisor, purchasing agent, decision makers, and more.

ME 4810 – EMBEDDED CONTROL

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 4011.

This course provides a comprehensive overview of embedded control systems. Concepts are implemented with the use of the ARDUINO microcontroller and its Integrated Development Environment (IDE). Special focus is given on the processes of analyzing, designing, and implementing embedded control systems, from both theoretical and practical perspectives. The theory is introduced in a series of lectures, and practical illustrations of the theory are given in a series of mandatory workshops, during which students design an embedded real-time control system. Complementary selected topics vary each trimester.

ME 4850 – AUTONOMOUS UNMANNED SYSTEMS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ME 4011.

This course provides a comprehensive background in autonomous control of unmanned systems. It describes the different levels of control in autonomous systems and, drawing from multiple examples, defines generic control architecture. Basic control theory with PID, fuzzy logic, and artificial neural networks are applied to the design of a simple robotic controller. Elements of the autonomous system are reviewed such as those related to sensing: feature extraction, detection, recognition, and identification. Also, an introduction to mechanisms for reasoning, planning, and optimization in decision making are described. Basic coordination schemes are discussed such as group decision making, task allocation, scheduling, and formation control. A sample system for swarm control is developed.

ME 5953 – INTRODUCTION TO DYNAMICS OF MACHINERY

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ME 2220; ME 3030.

This course presents an introduction to the analysis and design of rotating machinery. The course combines the theory and application of dynamics, vibrations, fluid mechanics, and tribology to the design of such systems.

Courses for Non-Mechanical Engineering Students

ENGI 2430 – ENGINEERING THERMODYNAMICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENGI 2420.

This presents an introduction to fundamental concepts in thermodynamics and heat transfer for non-mechanical engineering students. The course discusses thermodynamic properties, principles of conservation of mass and energy, entropy and second law of thermodynamics as well as vapor and gas power cycles. The course concludes with an introduction to heat transfer concepts in steady conduction and unsteady heat conduction as well as natural and forced convection heat transfer.

ENGI 3440 – THERMOFLUIDS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENGI 2410.

An introduction to thermodynamics and fluid mechanics. Study the concepts of energy and the laws governing the transfers and transformations of energy. Emphasis on thermodynamic properties and the first and second law analysis of systems and control volumes. Integration of these concepts into the analysis of basic power cycles is introduced. Study of the fundamentals of fluid mechanics. Application of momentum, energy, and continuity principles to the analysis of incompressible flow applications. The course concludes with the analysis of viscous flows in pipes.

FACULTY

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GENERAL ENGINEERING COURSES**COURSE DESCRIPTIONS****ENGI 2260 – ENGINEERING ECONOMICS**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: Math 1350

Introduction to economic evaluation of investments for engineering projects. Life cycle costing. Replacement analysis. Evaluation of public projects. Depreciation and Income tax determination.

ENGI 2270 – ENGINEERING PROBABILITY AND STATISTICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: Math 1350

This course introduces the students to the basic concepts of probability and statistics and its application to the solution of engineering problems. Principles of probability theory, discrete and continuous random variables, probability distributions, hypothesis testing, correlation and simple linear regression concepts will be essential to identify, formulate and solve engineering problems.

FACULTY

PONS FONTANA, CARLOS A. – Associate Professor; Assistant to the Department Head in Student Affairs; Ph.D., Carlos Albizu University, San Juan, 2004; MEM, Polytechnic University of Puerto Rico, 1994; BSIE, Polytechnic University of Puerto Rico, 1986; MS Psych, Centro de Estudios Postgraduados, 1975; BA Psych, University of Puerto Rico, 1972. E-mail: cpons@pupr.edu

GENERAL SCIENCE COURSES**COURSE DESCRIPTIONS****SCIE 1110 – GENERAL BIOLOGY**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None. Corequisite: SCIE 1111

Introduction to biological concepts as a vital tool for understanding our world and for meeting many of the personal and global challenges that student confronts today. It includes topics such as: heredity and evolution; the study of living beings with a particular emphasis on human biology; eco-systems and their characteristics.

SCIE 1111 – GENERAL BIOLOGY LABORATORY

One credit-hour. One three-hour laboratory periods per week. Prerequisite: None. Corequisite: SCIE 1110

This laboratory course complements the biological concepts being studied in class. Laboratory exercises involving the basic principles of biology, in particular, to how they relate everyday life, health and the environment.

SCHOOL OF BUSINESS ADMINISTRATION

The School of Business Administration seeks to provide theoretical and practical knowledge to those students who aim to receive a Bachelor in Business Administration (BBA) or a Bachelor of Science in Organizational Management (BSOM). The School is dedicated to advancing business knowledge and the practical application of business principles in a global technological environment. The faculty has created a business curriculum which emphasizes the link between business management and technology. The curriculum is also designed to provide an interdisciplinary approach to business decision making, blending broad-based knowledge of the business functions with an emphasis in a particular discipline. Students are exposed to the areas of accounting, economics, finance, organizational management, and statistics, and their application in a corporate, service, manufacturing, or entrepreneurial environment.

Career Opportunities

Business administration graduates are highly regarded and sought by the manufacturing, production, and construction industries, as well as the government and service sector of our economy. They serve as a liaison between the technological resources of the industry and the human resources that make it work. The ability to do so is acquired through the various techniques of analysis and synthesis presented throughout the curriculum.

Mission

The School of Business Administration at Polytechnic University of Puerto Rico is dedicated to providing students with a well-rounded, technology-oriented business education that will empower them to become tomorrow's socially responsible business leaders.

Educational Objectives of the Business Administration Programs

The main objectives of the academic programs offered at the School of Business Administration are to:

1. Provide a multi-disciplinary approach to business decision-making.
2. Enhance the student's awareness and skills in technology, quantitative reasoning, knowledge of business fundamentals and their understanding of its application in a global business environment.
3. Improve the student's leadership abilities, teamwork, and communication skills. Contribute to achieving personal, professional, and academic goals while being aware of ethical and social responsibilities in the decision-making process.

Student Outcomes

The Business Administration program is designed to develop a broad knowledge of the business disciplines, awareness, and skills in the use of technology for business decision-making, a sense of social responsibility, as well as effective communication and team-work skills.

Graduates from the Business Administration Program shall be able to:

1. Demonstrate the ability to gather and analyze information for research and creative problem-solving.
2. Employ effective communication skills in a variety of business situations and daily work environments.
3. Acquire the ability to utilize leadership skills, to influence and support others in the performance of their tasks.
4. Demonstrate the ability to work effectively as a team member and team leader.
5. Develop the ability to manage technological change and understand its role in the global business environment.
6. Demonstrate ability for self-evaluation, behavior modification, and evidence comprehension of business ethics and social responsibility.
7. Develop the ability to integrate and apply knowledge of the various business disciplines, in conjunction with the selected specialization, to improve the decision-making process.
8. Acquire the ability to conceptualize, plan, develop and apply the necessary skills to engage in an entrepreneurial endeavor.

Degree Offered

The School of Business Administration offers the following degrees:

1. Bachelor in Business Administration (BBA)

- Accounting
- Entrepreneurship
- General Management
- Marketing

Accounting - Minimum Graduation Requirements

- 24 Credit-Hours in General Education Component
- 15 Credit-Hours in Mathematics/Science Component
- 47 Credit-Hours in General Business Administration Component
- 33 Credit-Hours in Accounting Component
- 3 Credit-Hours in Free Electives

Total Credits Hours – 122

Entrepreneurship - Minimum Graduation Requirements

- 24 Credit-Hours in General Education Component
- 15 Credit-Hours in Mathematics/Science Component
- 47 Credit-Hours in General Business Administration Component
- 33 Credit-Hours in Entrepreneurship Component
- 3 Credit-Hours in Free Electives

Total Credits Hours – 122

General Management - Minimum Graduation Requirements

- 24 Credit-Hours in General Education Component
- 15 Credit-Hours in Mathematics/Science Component
- 47 Credit-Hours in General Business Administration Component
- 33 Credit-Hours in General Management Component
- 3 Credit-Hours in Free Electives

Total Credits Hours – 122

Marketing - Minimum Graduation Requirements

- 24 Credit-Hours in General Education Component
- 15 Credit-Hours in Mathematics/Science Component
- 47 Credit-Hours in General Business Administration Component
- 33 Credit-Hours in Marketing Component
- 3 Credit-Hours in Free Electives

Total Credits Hours – 122

2. Bachelor of Science in Organizational Management (BSOM) – Minimum Graduation Requirements

- 30 Credit-Hours in General Education
- 9 Credit-Hours in Business Foundation
- 30 Credit-Hours in Business Foundation Electives
- 27 Credit-Hours in BSOM Core Courses

24 Credit-Hours BSOM Academic Track & Electives

Total Credits Hours – 120**3. Bachelor of Science in Construction Management - Minimum Graduation Requirements**

15 Credit-Hours in General Education Humanities

21 Credit-Hours in General Education Math & Science

22 Credit-Hours in Business

60 Credit-Hours in Construction Management

3 Credit-Hours in Free Electives

121 Total Credit-Hours**Student Organizations**

Students have the opportunity to get involved in academic, professional, and cultural activities such as conferences, seminars, visits to plants and factories. They can also participate in other students' associations and fraternities organized and/or recognized by Polytechnic University of Puerto Rico.

Developmental Studies

All students who request admission and are admitted to the Business Administration Program must show evidence that they have acquired the academic abilities and skills necessary to progress through this program. Those who do not have these abilities and skills as reflected by the results of their high school grades, previous university experience or other evidence, will be required to take additional courses to gain knowledge. Thus, there may be variations on how to fulfill the minimum graduation requirements stated above. The component of these courses, if required, is in addition to the credit-hours of the Business Administration Program. The courses are awarded their corresponding credit-hours according to the contact hours. Some of the courses are the following:

Developmental Studies Component
(18 Credits-Hours)

Course	Title	Credit-Hours
ESOL 0100	Beginner English as a Second Language	3
ESOL 0110	Intermediate English as a Second Language	3
ESOL 0120	Advanced English as a second Language	3
ENGL 0100	Preparatory English	3
ENGL 0110	English Grammar	3
MATH 0102	Preparatory Mathematics	3
MATH 0106	Elementary Algebra	3
MATH 0110	Intermediate Algebra	3
Total		18

BUSINESS ADMINISTRATION CURRICULUM

General Education Component
(24 Credit-Hours)

Course	Title	Credit-Hours
ENGL 1020	English Composition I	3
ENGL 1026	Fundamentals of Speech Comm	3
PHIL 3000	Business Ethics	3
PSYC 1010	Introduction to Psychology	3
****	General Education Component	3
****	General Education Component	3
	Socio-Humanistic Elective	3
	Socio-Humanistic Elective	3

Total 24

General Education Math & Science
(15 Credit-Hours)

Course	Title	Credit-Hours
COMP 1020	Computer Programming Fundamentals	3
MATH 1310	Applied Mathematics for Business I	3
MATH 1320	Applied Mathematics for Business II	3
STAT 2010	Probabilities and Statistics	3
STAT 2020	Statistics & Hypothesis Testing	3
Total		15

General Business Administration Component
(47 credit-hours)

Course	Title	Credit-Hours
ACCO 2010	Accounting Principles I	4
ACCO 2020	Accounting Principles II	4
COMP 2010	Business Application Programs	3
ECON 3010	Microeconomics	3
ECON 3020	Macroeconomics	3
ENTR 1010	Principles of Entrepreneurship	3
FINA 2010	Finance	3
MARK 1010	Marketing	3
MGMT 1010	Introduction to Management	3
MGMT 2010	Organizational Management Theory	3
MGMT 2020	Business Law	3
ENTR 4010	International Business	3
MGMT 2030	Leadership in Organizations	3
MGMT 3000	Business Simulation	3
MGMT 3010	Introduction to Communication	3
Total		47

Free Elective Component
(Three credit-hours)

Course	Title	Credit-Hours
	***Free Elective Course	3
Total		3

MAJORS IN BUSINESS ADMINISTRATION

BBA – Accounting
(33 Credit-Hours)

Course	Title	Credit-Hours
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ACCO 3310	Cost Accounting	4
ACCO 3330	Intermediate Accounting I	4
ACCO 3340	Intermediate Accounting II	4
ACCO 3360	Federal Income Taxes	3
ACCO 4320	Auditing	3
ACCO 4370	Accounting Project	3
	*** Directed Dept. Elective in Accounting	3
	*** Directed Dept. Elective in Accounting	3
	*** Directed Dept. Elective in Accounting	3
	*** Directed Dept. Elective	3
Total Departmental Electives: 12cr		

Total 33**Entrepreneurship Component**

(33 Credit-Hours)

Course	Title	Credit-Hours
ENTR 3010	Business Creativity and Innovation	3
ENTR 3020	Electronic Business	3
ENTR 3030	Design Thinking	3
ENTR 4020	Entrepreneurial Finance	3
MGMT 4620	Strategic Management	3
ENTR 4070	Entrepreneurial Project	3
	*** Directed Dept. Elective in Entrepreneurship	3
	*** Directed Dept. Elective in Entrepreneurship	3
	*** Directed Dept. Elective in Entrepreneurship	3
	*** Directed Dept. Electives	3
	*** Directed Dept. Electives	3
Total Departmental Electives: 15cr		

Total 33**General Management Component**

(33 Credit-Hours)

Course	Title	Credit-Hours
MGMT 3610	Human Resources Management	3
MGMT 3620	Organizational Behavior	3
MGMT 4610	Total Quality Management	3
MGMT 4620	Strategic Management	3
MGMT 4630	Organizational Development	3
MGMT 4670	General Management Project	3
	*** Directed Dept. Elective in Management	3
	*** Directed Dept. Elective in Management	3
	*** Directed Dept. Elective in Management	3
	*** Directed Dept. Electives	3
	*** Directed Dept. Electives	3
Total Departmental Electives: 15cr		

Total 33**BBA – Marketing**

(33 Credit-Hours)

Course	Title	Credit-Hours
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MARK 3410	Sales and Retail Management	3
MARK 3430	Product Management	3
MARK 3450	Advertising	3
MARK 3460	Public Relations	3
MARK 4410	Marketing Research	3
MARK 4470	Marketing Project	3
	*** Directed Dept. Elective in Marketing	3
	*** Directed Dept. Elective in Marketing	3
	*** Directed Dept. Elective in Marketing	3
	*** Directed Dept. Electives	3
	*** Directed Dept. Electives	3
	Total Departmental Electives: 15cr	
		Total 33

BACHELOR OF SCIENCE IN CONSTRUCTION MANAGEMENT CURRICULUM**General Education Humanities Courses**

(15 Credit-Hours)

Course	Title	Credit-Hours
ENGL 1020	English Composition I	3
PSYC 1010	Introduction to Psychology	3
ENGL 1026	Fundamentals of Speech Comm	3
**** ****	General Education Elective	3
**** ****	General Education Elective	3

General Education Math and Science Courses

(21 Credit-Hours)

Course	Title	Credit-Hours
MATH 0110	Intermediate Algebra	3
MATH 1330	Precalculus I	3
MATH 1340	Precalculus II	3
SCIE 2410	General Physics I	3
COMP 2020	Computer Programming for Business	3
CEE 2110	Engineering Geology	3
STAT 2010	Probability and Statistics	3
		Total 21

Business Courses

(22 Credit-Hours)

Course	Title	Credit-Hours
MGMT 1010	Introduction to Management	3
PHIL 3000	Business Ethics	3
ACCO 2010	Accounting Principles I	4
MGMT 2020	Business Law	3
COMP 2010	Business Application Programs	3
FINA 2010	Finance	3
ECON 3010	Microeconomics	3

Total 22**Construction Management Courses**

(60 Credit-Hours)

Course	Title	Credit-Hours
MGMT 3210 3	Construction Management	
MGMT 3230	Construction Materials & Methods	3
COMT 1010	Construction Graphics	3
COMT 2010	Construction Safety and Health	3
MGMT 3220	Construction Contracts & Legal Documents	3
COMT 2020	Construction Blueprints and Specifications	3
COMT 2030	Structural Concepts	3
MGMT 3240	Construction Estimates & Costs	3
COMT 3010	Steel Structures	3
COMT 3020	Soil Mechanics for Construction	3
COMT 3030	Building Codes and Standards	3
COMT 3040	Reinforced Concrete Structures	3
COMT 3050	Mechanical Systems	3
MGMT 4210	Project Planning and Control	3
COMT 3060	Construction Site Work & Equipment	3
COMT 3070	Electrical Systems	3
COMT 3080	Temporary Structures	3
COMT 4010	Timber Structures	3
COMT 4020	Roofing Systems	3
COMT 4100	Construction Management Capstone	3

Total 60**Free Elective Component**

(3 Credit-Hours)

Course	Title	Credit-Hours
Free Elective	Free Elective	3
		Total 3

General Education Component Electives

(Choose 2 of the Following General Education Humanities Electives)

Course	Title	Credit-Hours
SOHU 2010	Socio-Humanistic Studies I	3
SOHU 3060	Selected Topics in Socio-Humanistic Studies	3
ENGL 2010	Analysis of World Literature	3
HIST 3050	History and Art Appreciation	3
SPAN 0120	Elementary Spanish I	3
SPAN 0130	Elementary Spanish II	3

Concentration and Departmental Electives

ACCO 3110	Managerial Accounting	3
ACCO 3320	Computer Applications in Accounting	3
ACCO 3360	Federal Income Tax	3
ACCO 4320	Auditing	3
ACCO 4330	Accounting Governmental & Not-for-Profit Organizations	3
COMP 3010	Database Management	3
ENTR 4020	Entrepreneurial Finance	3
FINA 3710	Intermediate Managerial Finance	3
FINA 3730	Money and Banking	3
FINA 3740	Capital Markets	3
FINA 3750	Risk and Insurance Coverage	3
FINA 4710	Investments	3
FINA 4720	International Finance	3
ISYS 3510	Management Information Systems	3
ISYS 3540	Computer and Information Technology	3
ISYS 3550	Data Communication and Networks I	3
ISYS 3560	Programming Language for Business Administration	3
ISYS 4510	System Analysis & Design	3
ISYS 4520	Computer Security & Audit	3
ISYS 4530	Local Area Network Systems	3
MARK 3420	Consumer Behavior	3
MARK 3440	Service Marketing	3
MGMT 3120	Operations & Production Management	3
MGMT 3130	Material & Purchasing Management	3
MGMT 3140	Inventory, Material & Capacity Requirement, Plan.	3
MGMT 4110	Statistical Quality Control	3
MGMT 4120	Advanced Operations and Productions Management	3
MGMT 3250	Construction Equipment	3
MGMT 4650	Adm. Wages and Salary	3
MGMT 4660	Entrepreneurship	3

COURSE DESCRIPTIONS

Accounting Courses

ACCO 2010 – ACCOUNTING PRINCIPLES I

Four credit-hours and a half hour lecture periods twice per week. Prerequisites: None

Study basic accounting principles and concepts. Complete accounting cycle using different procedures for preparation, adjustments, and of financial statements. Use of general and special journals, general and subsidiary ledgers. Worksheets, inventory pricing systems and methods control of assets, liabilities, and equity accounts.

ACCO 2020 – ACCOUNTING PRINCIPLES II

Four credit-hours. Two and a half hour lecture periods twice per week. Prerequisite: ACCO 2010.

Study the accounting principles and procedures in partnership and corporations. Review of the organizational characteristics in areas such as administration, liquidation, legal aspects, and distribution of capital in these types of businesses. Analyze the earnings per

share concept and procedures for financing through bonds and stocks in great detail. Also, include the financial statements' analysis for corporations, partnerships, and sole proprietorship.

ACCO 3310 – COST ACCOUNTING

Four credit-hours. Two and a half hour lecture periods twice per week. Prerequisite: ACCO 2020.

Study the basic cost accounting concepts, methods and procedures used in the determination of the unit cost of a product. It includes the procedures for the three main elements of the cost of a product (raw materials, direct labor, and manufacturing overhead) by the two cost accumulation methods (job order and process cost) and by standards cost. Special emphasis is placed on the discussion of managerial analysis and control of productions costs.

ACCO 3320 – COMPUTER APPLICATIONS IN ACCOUNTING

Three credit-hours. Two-hour lecture periods twice per week. Prerequisites: COMP 2010, ACCO 2020.

Study accounting computer software like Peachtree Excel, among others with extensive use in today's business. This course simulates accounting scenarios to show how accounting concepts apply to real-world situations. Following step-by-step directions, the students pass through full accounting cycle. Complete bookkeeping work, create a chart of accounts, payment register, checks, invoices, inventory, and prepare necessary adjusting entries for the presentation and analysis of financial statements and tax returns. Visit web sites of Peachtree Corp., IRS and others related to the area.

ACCO 3330, 3340–INTERMEDIATE ACCOUNTING I-II Eight credit-hours

Two and a half hour lecture periods twice per week. Prerequisites: ACCO 2020, ACCO 3330.

This is a two-term course with the purpose of covering financial accounting in depth. It examines topics such as the development of the conceptual framework and the evolution of the profession's regulatory bodies and its pronouncements. Also, includes a review of the complete cycle plus the analysis of its components and related topics. Use of time value of money techniques (Present Value of \$1 of an Ordinary Annuity or an Annuity Due) to account for amortization of bonds, mortgages, interest on loans and other financial instruments.

ACCO 3360 – FEDERAL INCOME TAX

Three credit-hours. Two-hour lecture periods twice per week. Prerequisite: ACCO 2020.

It is the study of the concepts and procedures used to prepare the federal income tax return for individuals, partnerships and corporations according to the United States Internal Revenue Code. Special attention is given to the computation of adjusted gross income and the exemptions and deductions to determine net taxable income including the preparation of schedules visiting the IRS website on the Internet. This course will prepare the students about taxes for the CPA exam.

ACCO 4310 – ADVANCED ACCOUNTING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ACCO 3340

Analyze special problems in the Accounting field. Discuss in depth how to account for business combinations, the home office and branch relationship and consolidated financial statements preparation through worksheet adjustment.

ACCO 4320 – AUDITING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ACCO 3330

A study of the AICPA Professional Standards and their applications in the examination of financial statements, the standard short-form opinion, internal control systems, auditing programs, and the rules of professional and ethical responsibilities and legal liabilities of an independent auditor. Special attention is given to the role of the auditor in the survival of an economic entity. Also, study the contemporary development of the auditing field. Review the requirements to become a CPA. Also, students will be illustrated with real-life situations and visit websites on the Internet.

ACCO 4330–ACCOUNTING FOR GOVERNMENT AND NOT-FOR-PROFIT ORGANIZATIONS

Three credit-hours. Two-hour lecture periods twice per week. Prerequisite: ACCO 3340.

The study of basic accounting concepts for governmental and non-profit entities, including hospitals, universities, churches, among others. Contrast the marked differences between for-profit (business) accounting and governmental and non-profit accounting. These organizations serve entirely different purposes in society than do business entities. State the need to report on management's accountability to citizen (taxpayers, donors) who largely finance its operations, creditors, oversight bodies, and others for how resources had been used in providing services.

ACCO 3110–MANAGERIAL ACCOUNTING

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisites: ACCO 2010, FINA 2010.

Focuses on the compilation, use, and analysis of financial accounting tools for management decision process, the role of the accounting manager in the enterprise, and the interpretation of financial systems; the use of costs as a tool for planning and controlling the activities of manufacturing and distributing merchandise as well as directing service enterprises. Emphasis on quantitative aspects of budgets, cost per unit, break-even point, and decision process techniques.

Computer Courses**CEC 3000 – OBJECT ORIENTED PROGRAMMING (C/C++) I**

Three credit hours. Two two-hour lecture periods per week. Prerequisite: MATH 0110

Introduces students to computers; Algorithm development, UNIX, and C++ are discussed in detail. The introduction covers top-down analysis, problem analysis, flow charts, and pseudocode. Structured programming and development and debugging are also emphasized. C++ coverage includes variables, data types, operators, and functions.

CEC 3070 – VISUAL BASIC PROGRAMMING

Three credit hours. Two two-hour lecture periods per week. Prerequisite: CEC 3000

This course introduces the student to Visual Basic. Course covers the fundamentals of visual programming in Visual Basic. Topics discussed cover: variables and operators, using decision structures, loops and timers, strings, modules, procedures, and arrays.

COMP 1010–INTRODUCTION TO COMPUTERS AND BASIC LANGUAGE

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: None.

Introduction to the computers used. A brief historical overview. Study the Operating Systems (DOS). Introduction, repetition, decision and other programming structure using OBASIC language.

COMP 1020 – COMPUTER PROGRAMMING FUNDAMENTALS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None.

This course introduces the fundamental concepts of computer programming thinking, problem-solving processes, and technics when using algorithms. Activities include analyzing, developing, understanding, and generating computer programming algorithms. Emphasize is given to computer software associated with functional programming languages such as MS Excel®.

COMP 2010–BUSINESS APPLICATIONS PROGRAMS

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: None.

Learn the use of the currently most popular business software packages at present. They are Microsoft Office 2010, Publisher 2010, etc., special emphasis on Excel spreadsheet.

COMP 3010 – DATABASE MANAGEMENT

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: COMP 2010.

Study of the principles of database systems. Survey of the techniques and methodologies used in database management, Software design analysis and programming in the database environment. Introduce internet environment. Interface business application program with the Internet.

Construction Management Courses**COMT 1010 - CONSTRUCTION GRAPHICS**

Three Credit Hours – Two-hour lecture period twice pre week. Prerequisites MGMT 3210

Introduction to graphic communications used in construction, including schematics, and civil, architectural, and structural drawings. It also includes creating and editing plans, symbols, terminology, and layout. Basic drawing using 2D & 3D modeling software to visualize and build plans and models is covered.

COMT 2010–CONSTRUCTION SAFETY AND HEALTH

Three Credit Hours – Two-hour lecture periods per week. Prerequisite: None

This course provides an overview of the applicability of the regulations and standards related to health and safety set forth by OSHA and other regulatory agencies. Students will learn how to design a safety plan for a project by recognizing, evaluating, and preventing the most common safety hazards in the construction industry, apprehending that productivity tends to increase in safe and healthy environments.

COMT 2020 - CONSTRUCTION BLUEPRINTS AND SPECIFICATIONS

Three Credit Hours – Two-hour lecture period twice pre week. Prerequisites COMT 1010

In this course, students develop blueprint reading skills focused on residential and commercial construction. Basic concepts of blueprint reading, such as views, scales, lines, and symbols, as well as plan views, elevations, sections, and details, are studied. Also, students develop skills to read architectural and engineering plans and more technical content such as specifications, footings, walls, roof finishes, and structural, mechanical, and electrical drawings.

COMT 2030–STRUCTURAL CONCEPTS

Three Credit Hours – Two-hour lecture periods per week. Prerequisite: SCIE 2410

Essential topics of statics and mechanics of materials. The analysis of particles and rigid bodies, simple trusses, statically determinate beams, and columns. Location of centroid and calculation of composite areas. Determination of stresses in axially loaded bars and columns.

COMT 3010 - STEEL STRUCTURES

Three Credit Hours – Two-hour lecture period twice pre week. Prerequisites COMT 2030 and MGMT 3220

Calculation of gravity loads and lateral loads. Approximate analysis of building frames. Analysis and identification of possible failure modes of structural elements of steel structures, including tension members, columns, beams, beam-columns, joists, and joist girders. Identification of different types of structural elements in steel structures.

COMT 3020–SOIL MECHANICS FOR CONSTRUCTION

Three Credit Hours – Two-hour lecture periods per week. Prerequisite: CEE 2110

This course provides an overview of the soil mechanics for construction focused on general contractors, construction managers, supervisors, and any construction professional. The course discusses topics like the formation of natural soil deposits, engineering

properties of soil, soil exploration, water in the soil, subsurface stresses in soils, consolidation, and settlement, shear strength and foundations, among other topics that a Construction project manager must know before to work in a construction site.

COMT 3030 - BUILDING CODES AND STANDARDS

Three Credit Hours – Two-hour lecture period twice pre week. Prerequisites: None

Introduction to the International Building Code with an additional overview of Building Department procedures, code development process, and general Florida laws and regulations relating to building inspection. Review of inspector certifications available through model code organizations.

COMT 3040–REINFORCED CONCRETE STRUCTURES

Three Credit Hours – Two-hour lecture periods per week. Prerequisite: COMT 3010, COMT 3020

Analysis and identification of possible modes of failure of structural elements of reinforced concrete structures, including beams, slabs, columns, walls, footings, and retaining walls. Preliminary design of reinforced concrete buildings. Identification of different types of structural elements in steel structures.

COMT 3050 - MECHANICAL SYSTEMS

Three Credit Hours – Two-hour lecture period twice pre week. Prerequisites: COMT 2020

This course provides an overview of these systems aimed at general contractors, construction managers, supervisors, and those desiring to enter the construction industry. The course discusses several mechanical systems for residential and commercial buildings, such as plumbing, sanitary drainage, air heating systems, ventilation, air conditioning, and refrigeration systems, among others. In addition, the course cover materials, accessories, equipment selection, energy efficiency, building checklist, troubleshooting and services, test procedures, and automation control systems recommend in construction codes in buildings.

COMT 3060 - CONSTRUCTION SITE WORK AND EQUIPMENT

Three Credit Hours – Two-hour lecture period twice pre week. Prerequisites: MGMT 3240

This course provides an overview of the construction site work and equipment that is used in construction projects. This course is focused on general contractors, construction managers, supervisors, and any construction professional. The course discusses topics like construction environment, equipment economics, planning for earthwork construction, compaction, and stabilization equipment, and other construction equipment such as dozers, graders, rippers, scrapers, excavators, truck and hauling, and drilling. Other topics that the course indicates are asphalt mix production and equipment, concrete and equipment, cranes, and planning for building construction. All these are elements that a construction project manager must know before working on a construction site.

COMT 3070 – ELECTRICAL SYSTEMS

Three Credit Hours – Two-hour lecture period twice pre week. Prerequisites: COMT 2020

This course covers basic electrical concepts related to building electrical systems, including basic circuits, electrical codes, electrical plans and connections, cables, switches and receptacles, transformers, and commercial circuits.

COMT 3080 - TEMPORARY STRUCTURES

Three Credit Hours – Two-hour lecture period twice pre week. Prerequisites: COMT 2030

This course provides an overview of temporary structures in construction. It is focused on general contractors, construction managers, supervisors, and any construction professional. The course discusses topics like professional and business practices, standards, codes, and regulations about temporary structures, construction site safety, roadway decking, scaffolding, concrete formwork, temporary structures in repair and restoration, cranes, and protection of the site, adjacent area, and utilities.

COMT 4010–TIMBER STRUCTURES

Three Credit Hours – Two-hour lecture periods per week. Prerequisite: COMT 2030

Study of timber as a structural material. Understanding timber mechanical properties (strength and stiffness), durability, and construction processes. The student will learn about the typical structural systems for timber structures. Introduction to the applicable design requirements for timber structures. Overview of the basic concepts used in the design and verification of timber structures (rules, tools, and codes). Details and joint design. Stability and bracing systems. Basic strength and serviceability (deflection, vibration) state requirements.

COMT 4020 - ROOFING SYSTEMS

Three Credit Hours – Two-hour lecture period twice pre week. Prerequisites: COMT 3030

This course will familiarize students with the most common types of roof and roof systems accessible in the US. In addition, the student will become familiar with roofing safety requirements, codes, construction documents, and rigging practices. Special topics such as new technologies and materials, heat transfer and wind resistance, and inspection and maintenance will also be covered. This course provides an overview of these systems aimed at contractors, construction managers, supervisors, architects, engineers, and those desiring to enter the construction industry.

COMT 4100 – CONSTRUCTION MANAGEMENT CAPSTONE

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: Academic Department Authorization.

Study the stages of a construction project from the development and planning, to estimating cost, construction, project control and final stage. Students must apply real world construction projects to different techniques and models learned. The work performed by the students will be supervised by instructors from the Business Administration Program. A written paper is required.

Entrepreneurship Courses

ENTR 1010–PRINCIPLES OF ENTREPRENEURSHIP

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: None

Provides an introduction and general description of business principles. Students will acquire a solid foundation in entrepreneurship, and a better understanding of the role entrepreneurs play in the global economy. The course is designed to expose students to the knowledge, techniques and skills, competencies and resources required to be entrepreneurs. In addition, it emphasizes the skills to be developed by a person with an interest in establishing and managing a business.

ENTR 3010 – BUSINESS CREATIVITY AND INNOVATION

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: ENTR 1010

Study of the principles of database systems. Survey of the techniques and methodologies used in database management, Software design analysis, and programming in the database environment. Introduces students to the Internet environment. Interface business application programs with the Internet.

ENTR 3020 – ELECTRONIC BUSINESS

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: ENTR 1010

Study of the principles of electronic business (e-business), electronic commerce (e-commerce), electronic marketing (e-marketing), and electronic entrepreneurship (e-entrepreneurship) terminologies and concepts for developing small and medium enterprises. In addition, it covers how business needs to adapt and innovate in a constantly changing technology. Students develop administrative and operational plans aimed at new business or improving an existing one considering emerging technologies and opening markets.

ENTR 3030 - DESIGN THINKING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: ENTR 1010

In this course, the student will learn how to leverage fundamental design-thinking principles and tools to address business challenges and build products, strategies, teams, and environments for ideal performance. Students will walk away with an innovation toolkit of structures for identifying business opportunities and generating possible solutions for an organization's initiatives.

ENTR 4010 – INTERNATIONAL BUSINESS

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: ENTR 1010

Study the principles of international business (as a system) and the theories behind it. It examines the international business environment, legal/political configurations, sociocultural aspects, technological mechanisms, and logistics required to export, import, manufacture and sell products and services to other countries that support trade and investment. It provides students with opportunities and required information to establish alliances and business outside Puerto Rico's territory. It will also review various government agencies and private entities that promote trade with other countries. This course may require travel outside of Puerto Rico.

ENTR 4020–ENTREPRENEURIAL FINANCE

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: FINA 2010

Focuses on financial analysis and reveal students how to determine the entrepreneurship financing needs that business ventures faces in all stages of their life cycles. It examines the different financial alternatives available according to the economic position of enterprises. The topic of entrepreneurial finance analysis involves any issues including business financial position, working capital needs, permanent financing, cash flow position and financial institutions terms and conditions, in addition to the implications of financial decision-making.

ENTR 4070–ENTREPRENEURIAL PROJECT

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: Department Head Authorization

The project course is oriented to integrate the knowledge and skills that student obtains through the Entrepreneurship major. Students must demonstrate knowledge of the necessary elements to establish a business through one of two alternatives: a preparation of a complete business plan or an internship where skills and knowledge acquired in the Entrepreneurship Program become evident. A project report and an oral presentation are intended outcomes of the class.

Finance Courses

FINA 2010 – FINANCE

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Discuss the basic principles of finance administration. The course includes the measurement of risk-profit, analysis of financial statements, planning, and control of budget and the cost of financing.

FINA 3710–INTERMEDIATE MANAGERIAL FINANCE

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisites: FINA 2010, ECON 3010

Study the budget and capital structure models, dividends policy and administration of current assets. Use mathematical models such as linear programming trees used in the decision-making progress of optimal financial variables.

FINA 3730 – MONEY AND BANKING

Three credits-hours. Two-hour lecture periods, twice per week. Prerequisite: FINA 2010, ECON 3020.

Discuss the money and banking systems of the United States. Discuss the basic concepts of financial banking and non-banking institutions. Different classifications of financial markets and the basic theories of determining interest rates are analyzed. Emphasis

is placed on the importance of the financial and monetary sector of the economy. The Central Bank System of the United States of America, the Federal Reserve, and its monetary policy are explained.

FINA 3740—CAPITAL MARKETS MANAGEMENT

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: FINA 3710.

Discussion of the characteristics of liquid investments and configuration of the financial markets with which they deal. Also, the functions of brokerage companies and investment banking are studied. The financial press will be analyzed and interpreted. Examine the use and language of financial markets, their structure to understand investment and financial processes. After the review of market analysis and assessment dynamics, particular attention will be given to financial models and strategies, essential in the decision-making process.

FINA 3750—RISKS AND INSURANCE COVERAGE

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisites: FINA 2010, ECON 3020, STAT 2010.

Course directed at understanding what is risk or hedge, and which risks are insurable for the companies and individuals. Other aspects the course considers are cost quantification, the efficiency of life insurance, public responsibility, contingencies debt and miscellaneous.

FINA 4710—INVESTMENTS

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisites: FINA 3740. STAT 2010.

A study of the theoretical aspect and its application in liquid investment and their markets. Debt values are analyzed, along with profit sharing and hybrids. The nature of the market of share options reading and interpretation of the financial press and the negotiation with a registered broker are studies.

FINA 4720—INTERNATIONAL FINANCE

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisites: FINA 2010, ECON 3020.

A course designed to offer a collection of topics about the complexity of investing and financing with international funds. It discusses the phases and techniques in reducing risks in money exchange, the decision of capital structure, direct or indirect investment in international securities as part of capital budgets and other relevant complexities.

Information System Courses

ISYS 3510 – MANAGEMENT INFORMATION SYSTEMS

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisites: MGMT 1010, COMP 1010.

This course is an introduction to the concepts of management information systems. Emphasize the management design. (Service and manufacturing environment will be of special interest). Analyze the organization regarding its structure and information requirements. Identify major subsystems of the organization such as requirement planning, production function, personnel function marketing, finance, and other applications.

ISYS 3540 – COMPUTERS AND INFORMATION TECHNOLOGY

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: COMP 2010

This course provides students with a conceptual framework on the fundamentals and technologies in the areas of computer architecture, operating systems, software translators, compilers and telecommunications and Networks serve as facilitator courses allowing systems to communicate effectively and efficiently with members of the information system area.

ISYS 3550 – DATA COMMUNICATIONS AND NETWORKS I

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: COMP 3010.

Study the topics in teleprocessing. Analyze data transmission, channels, computer equipment's configurations, procedures, and security of teleprocessing systems, teleconferencing, electronic mail, electronic fund transfer, integration of teleprocessing and automation into MIS, Internet. Electronic Commerce & EDS Concepts.

ISYS 3560—PROGRAMMING FOR BUSINESS ADMINISTRATION

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: COMP 1010.

The course concentrates on the fundamentals of new programming language and/or other new programming languages developed for the new information. Technology infrastructure. Course contents emphasize program construction, algorithm development, coding, debugging, and documentation of command line interface-based applications. The assignments and labs of the course will be done in the Java Language and Windows environments to demonstrate language development.

ISYS 4510 – SYSTEMS ANALYSIS AND DESIGN

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: ISYS 3510.

Introduce the student to basic system analysis tools and the procedure for conducting a system analysis. Topics relate to conducting a system requirement, the initial analysis, logical design, and the general systems proposal. Students gain practical experience through projects and/or case studies.

ISYS 4520 – COMPUTER SECURITY AND AUDIT

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: ISYS 3510.

Introduce the EDP auditing with emphasis on an audit of deficiency, effectiveness, control, and security. Other topics include audit techniques and their effect on information system development. Cover and examination of security measures as they apply to protecting information over communication lines and various preventive techniques.

ISYS 4530 – LOCAL AREA NETWORK SYSTEMS

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: ISYS 3550.

Evaluation of computer Local Area Network technology. The use of data, text, voice, and image technology in the application of data processing, word processing and telecommunications networks and the impact of automation in the office environment. Students will learn how to install, run, maintain, and manage Local Area Network Systems.

Management Courses

ECON 3010 – MICROECONOMICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Study of the theories and basic principles of marketing operations in capitalist, socialist, and liberal societies, emphasizing concepts of microeconomics.

ECON 3020 – MACROECONOMICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

A study of basic economic concepts. Topics include the modern national income formation theory, economics fluctuations, money, banking monetary, and fiscal policy, economic stabilization theory and policy, the public sector, economic growth and development, and comparative economics systems.

MGMT 1010 – Introduction to Management

Three credit-hours. Two-hour lecture periods, twice per week.

Study the dynamic and new workplace, the implications for management, focusing on the competitive environment and aspects of information technology and decision making. It also describes the historical foundations of management, its global dimensions, ethical and social responsibility, strategic management and entrepreneurship, organizational and work process design, human resources management and the new role of leadership of the establishment of innovative technologies.

MGMT 2010 – ORGANIZATIONAL MANAGEMENT THEORY

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: MGMT 1010.

Study the functions of organizations, and how they affect and are affected by the environment in which they operate. This course will provide the students with the necessary skills to understand how organizational structure, culture, and internal processes must be transformed to achieve organizational goals effectively and efficiently.

MGMT 2020 – BUSINESS LAW I

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MGMT 1010

This course covers basic principles of law and their application to business problems. Topics include a discussion of legal rights and social forces; the legal relationships of government, business, and society; law of contracts; personal property, bailments, sales of goods, torts, and business crimes.

MGMT 2030 – LEADERSHIP IN ORGANIZATIONS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MGMT 2010

This course examines the skills for understanding and leading individuals and groups in attaining both personal and organizational objectives are developed. The basic concepts of motivation, control changed, team building, and developing effective relationships in diverse work environments are examined. Proactive leadership devices such as organizational development, decision-making, and influence techniques are presented.

MGMT 3000 – BUSINESS SIMULATION

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MARK 1010, FINA 2010

The objective of this course is to integrate the particular areas of business administration by requiring the student to analyze and make strategic and operational decisions in the environment of a computer-processed management simulation.

MGMT 3010 – Introduction to Communication

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisites: PSYC 1010

This course introduces students to the fundamentals of human communication in a business context. They will explore the principal communications needs that organizations face and learn how to communicate business messages effectively to different stakeholders and in different situations.

MGMT 3130 – MATERIALS AND PURCHASING MANAGEMENT

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisites: MGMT 3120, STAT 2020

A study of the purchasing and materials functions in manufacturing, service, and public organizations. Topics include source selection, make-buy analysis, and inventory control, warehousing. The course emphasizes innovative models of intervention theories and method, business transformation, corporate evolution, and organizational culture change, geared to develop a new philosophy of business.

MGMT 3140–INVENTORY AND MATERIAL REQUIREMENT PLANNING/CAPACITY REQUIREMENT PLANNING

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisites: MGMT 3120, COMP 2010.

Fundamentals of inventory management, capacity planning, and materials requirement planning. Introduction to supply change management. Topics include inventory management, aggregate planning, master scheduling capacity planning and material requirement planning.

MGMT 3210 – CONSTRUCTION MANAGEMENT

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: MGMT 1010.

This course discusses the concepts of Construction Management with emphasis in the enterprise contractor's organization structure including the operation and administration of a construction company, trade of services, cost control, and the project organization. It also addresses the basic concepts of the economy used in the construction industry and its impact in the construction projects organization.

MGMT 3220 – CONSTRUCTION CONTRACTS AND LEGAL DOCUMENTS

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: MGMT 2020.

Study of construction contracts and legal documents, specifically: definitions, interpretation and utilization of drawings specifications, agreements, bidding forms, general conditions, bonds, subcontracts, and related documents. Cover the impact of the legal systems or corporate strategy, managerial decisions, and planning processes. Consumer, contract, commercial and secured financing laws. Also, discuss employer liability to PROSHO/OSHA, regulation aspects of the construction industry.

MGMT 3230 – CONSTRUCTION MATERIALS AND METHODS

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisites: MGMT 3210

Introduction to the materials and methods of building construction and to construction drawings. Discuss the foundation, structural framing, floor, roof and wall systems, mechanical, electrical and communication installations. Field trip.

MGMT 3240 – CONSTRUCTION ESTIMATES AND COSTS

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisites: MGMT 3210

The course presents the necessary concepts to prepare a construction cost estimate. It exposes the student to different elements of direct and indirect costs that are considered conceptual or detailed cost estimates.

MGMT 3250–CONSTRUCTION EQUIPMENT

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: MGMT 3210.

Study the selection and acquisition of construction equipment, application if financial decision making on construction selection; application of engineering fundamentals and economic of performance characteristics and production equipment specification.

MGMT 3610–HUMAN RESOURCES MANAGEMENT

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: MGMT 1010.

A framework for the study, understanding and application of human resources management in an organization. It includes topics such as: Human resources, equal employment opportunity and global human resources management, planning, job analysis, design, recruitment, selection, performance evaluation compensation, employee benefits and services, orientation and training; career planning and development, maintaining labor relations and employee's safety and health.

MGMT 3620 – ORGANIZATIONAL BEHAVIOR

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MGMT 2010

This course focuses on the importance of understanding behavior in organizational settings and applying scientific methods to the resolution of managerial problems and the improvement of the organization.

MGMT 4110–STATISTICAL QUALITY CONTROL

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisites: MGMT 3120, STAT 2020.

Study the theory and application of statistical control techniques to industrial and service processes; specifically, the theory of the control chart method, including sensitivity measurement and the design of process control systems. Acceptance sampling, including both variables and attributes, is surveyed. Operating characteristics curves and various criteria are also included; Statistical and mathematical concepts are explored.

MGMT 4120–ADVANCED OPERATIONS & PRODUCTION MANAGEMENT

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisites: MGMT 3120, STAT 2020.

Analyze the production systems; include quantitative methods for capacity planning and production scheduling. Use the quantitative and computer programs for the solution of Operation Management problems. Computer models as Linear Programming, Waiting Lines, and Transportation Models will be studied.

MGMT 4210 – PROJECT PLANNING AND CONTROL (PERT)

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MGMT 3210

Study the Network planning techniques for project management and resource allocation. Emphasis on PERT, CPM, heuristic models for multi-project, and scheduling. The use of computer software for project planning will be covered. Management techniques of construction are discussed in relation to alternative means of project execution. Organizational structures, management systems and controls are examined from the point of view of owners, constructors, and managers.

ACCO 4370–ACCOUNTING PROJECT

Three credit-hours. By Arrangement. Prerequisite: Department Head Authorization.

This course is an application of all concepts learned through accounting specialization courses. The student will work the accounting cycle in the real business environment, use their creativity submitting ideas to improve weak points and flaws identified in the accounting system worked. Also, the student can demonstrate the ability to work effectively as a team member implementing his/her leadership skills. The work performance by the students will also, be supervised by an instructor from the Accounting Program. A written report and a group presentation are the instruments used to assess the student learning in the class.

MGMT 4610 – TOTAL QUALITY MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MGMT 1010

The course presents the different elements in the total quality control management function. It focuses upon the foundations of quality control and their industrial applications. Statistical principles will be used as a basic tool in decision making related to the variables that need to be controlled.

MGMT 4620 – STRATEGIC MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MGMT 2010

This course studies contemporary models geared toward development of strategies, planning, and control of organizations. It focuses on strategic management and business policy as well as the decision-making process to develop competitive organizations.

MGMT 4630 – ORGANIZATIONAL DEVELOPMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MGMT 4620

The course studies organizational change, processes, decision making styles, organizational effectiveness, efficiency, and productivity. It emphasizes the use of innovative models of intervention theories, corporate evolution, and organizational cultural change. The course focuses on the development of a new philosophy of doing business.

MGMT 4650–WAGES AND SALARIES ADMINISTRATION

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: MGMT 1010.

The course is based on the scientific principles and the theories that tend to explain the human behavior in the working world. The course intends that the student know how a compensation system is developed according to the needs of the organization and the employees. Also emphasizes the concept of job evaluation and its remuneration as an independent variable from the employee.

MGMT 4660 – ENTREPRENEURSHIP

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course teaches the process of establishing and managing a business enterprise. The student will learn to identify and develop the necessary skills to become an entrepreneur as well as laws, and social and economic factor related to business establishment. Also, the student will analyze the conflicts and problems faced by an entrepreneur in his/her way to success.

MGMT 4670 – GENERAL MANAGEMENT PROJECT

Three credit-hour. By Arrangement. Prerequisite: Department Head Authorization

This course is designed to provide the student with practical and real-life experiences in the field. A written report reflecting the course experiences will be prepared by the student.

PHIL 3000 – BUSINESS ETHICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MGMT 1010

Study of the philosophical and legal aspects of ethics and their application to the professional responsibility in the field of Business Administration.

Marketing Courses**MARK 1010 – MARKETING**

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: None.

This course offers an overview of the important marketing topics while keeping the focus on practical fundamentals, background, strategies, and practices. Students will learn how to apply these principles in their careers. It covers the standard introductory marketing topics: market segmentation, environment, and decision making and planning the 4 P's advertising, not-for-profit and service marketing, market research, multicultural and global issues, retailing and wholesaling.

MARK 3410 – SALES AND RETAIL MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MARK 1010

This course presents problems in hiring and supervising salespeople. It focuses on prospective evaluation methods of salespeople, budget, and control of sales. Study of incentive plans to stimulate sales. Study of sales and retail functions for a business. Considerations of problems that may arise in sales and retail for small and large organizations, operation control, design of facilities and new strategies developed in the retail business.

MARK 3420–CONSUMER BEHAVIOR

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: MARK 1010.

Study consumer motivation, decision-making process in the selection of goods and services. Analyze the prevailing theories of consumer behavior. Study the methods used to examine this behavior that will help in marketing decision making aimed at consumers.

MARK 3430 – PRODUCT MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MARK 1010

This course focuses on the study of techniques and practices used in creating, developing, and implementing new products in the market. The product life cycle and marketing strategies that can be used in each stage are analyzed. Case study of real products and projections of future products.

MARK 3440 – SERVICE MARKETING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MARK 1010

Study the service sector of the economy. Development of marketing strategies to improve productivity and effectiveness of the services, publicity, and media promotion for the service industry. Strategic development plans for service industry.

MARK 3450 – ADVERTISING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MARK 1010

This course teaches existing techniques and skills used in advertising. It focuses in the more effective way to develop an advertising plan to reach the objectives. It shows how advertising is applied to products, service, manufacturers or retail business and profit and non-profit organizations. It analyzes the advertising media and new techniques on the Internet.

MARK 3460 – PUBLIC RELATIONS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MARK 1010

This course studies public affairs as a professional activity for business promotion in terms of the different groups that can influence a business. It focuses on the techniques and skills for the evaluation of advertising outcomes, public image, and relations with communication media. How to maintain a good image before the consumers and how to conceptualize the business and its products in terms of quality and service.

MARK 4410 – MARKETING RESEARCH

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: COMP 2010, MARK 1010, STAT 2020

Study the research activity in the marketing field, data collection analysis and methods. Emphasize marketing quantitative techniques, computer's role in marketing research, control, and evaluation of the marketing function.

MARK 4470 – MARKETING PROJECT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: Academic Department Authorization.

The Marketing Project course is oriented to integrating the knowledge and skills that students obtain in marketing area. The student will be using his presentation, research, creative and organization skills. The marketing project must be assigned by the professor in two principal aspects: First, make a research project creating a marketing plan for a professor theme. Second, the student can work in a company in the marketing area (not sales). A written paper is required.

Quantitative Courses

STAT 2010 – PROBABILITY AND STATISTICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MATH 1320, COMP 2010

Introduction to the fundamentals of descriptive and inferential statistics; procedures for the collection organization and analysis of data; frequency distributions, graphing techniques, measures of central tendency, measures of dispersion, standard deviation, and probability distributions.

STAT 2020–STATISTICS AND HYPOTHESIS TESTING

Three credit-hours. Two-hour lecture periods, twice per week. Prerequisite: STAT 2010.

A continuation of Probability & Statistics course. This course offers the fundamentals of statistical inference. It includes a review of sampling distributions and the principles of hypothesis testing for one, two or more populations regarding the mean-variance and proportion. Goodness fit testing, forecasting methods, ANOVA – One way, among other statistical methods.

**BACHELOR OF SCIENCE IN ORGANIZATIONAL MANAGEMENT
(BSOM) ORGANIZATIONAL MANAGEMENT CURRICULUM**

**General Education Humanities
(Maximum of 12 Credit-Hours)**

Course	Title	Credit-Hours
ENC 1101	English Composition I	3
ENC 1102	English Composition II	3
SPC 1026	Fundamentals of Speech Com	3
WOH 2012	World Civilization I	3
Total		12

**General Education Humanities Electives
(Choose one of the following courses)**

Course	Title	Credit-Hours
ARH 1000	Art Appreciation	3
HUE 1999	Selected Topics in Humanities	3
HUM 1020	Humanities	3
LIT 2411	Literature and Culture Issues	3
MUL 1010	Music Appreciation	3
SPN 1120	Elementary Spanish I	3
SPN 1121	Elementary Spanish II	3
Total		3

**General Education Math & Science
(Maximum of 3 Credit-Hours)**

Course	Title	Credit-Hours
MAC 1105	College Algebra	3
Total		3

**General Education Science Electives
(Choose two of the following courses)**

Course	Title	Credit-Hours
CGS 1100	Computer Science	3
MSE 1999	Selected Topics in Math or Sciences	3
PSC 1121	Physical Science	3
Total		6

**General Education Social Science Electives
(Choose two of the following courses)**

Course	Title	Credit-Hours
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PSY 2012	Introduction to Psychology	3
SSE 1999	Selected Topics in the Social Sciences	3
SYG 2000	Introduction to Sociology	3
Total		6

Foundation Electives
(Choose two of the following Courses)

Course	Title	Credit-Hours
ACC 2001	Principles of Accounting I	3
ECO 2013	Principles of Macroeconomics	3
ECO 2023	Principles of Microeconomics	3
MAR 1011	Principles of Marketing	3
MGT 2021	Principles of Management	3
Total		6

Core Courses
(30 Credit-Hours)

Course	Title	Credit-Hours
FIN 2000	Principles of Finance	3
ISY 3510	Management Information Systems	3
MGT 3120	Critical Thinking for Managers	3
MGT 3210	Managing Diversity in the Workplace	3
MGT 3220	Leadership in Organizations	3
MGT 3620	Organizational Behavior	3
MGT 3640	Organizational Communications	3
MGT 3650	Business Law and Ethics	3
MGT 4620	Strategic Management	3
MGT 4630	International Business	3
Total		30

Organizational Management
(18 Credit-Hours)

Course	Title	Credit-Hours
MGT 3610	Human Resources Management	3
MGT 4020	Project Management	3
MGT 4030	Financial Management	3
MGT 4130	Managing Change	3
MGT 4230	Marketing Management	3
MGT 4410	Quality Assurance	3
Total		18

Technical Electives
(6 Credit-Hours)

Course	Title	Credit-Hours
Business Elective 1	See Course Descriptions for selection of possible courses or select a course from another track	3
Business Elective 2	See Course Descriptions for selection of possible courses or select a course from another track	3
Total		6

Free Electives
(30 Credit-Hours)

Course	Title	Credit-Hours
G ELEC 1	See Course Descriptions for selection of possible courses	3
G ELEC 2	See Course Descriptions for selection of possible courses	3
G ELEC 3	See Course Descriptions for selection of possible courses	3
G ELEC 4	See Course Descriptions for selection of possible courses	3
G ELEC 5	See Course Descriptions for selection of possible courses	3
G ELEC 6	See Course Descriptions for selection of possible courses	3
G ELEC 7	See Course Descriptions for selection of possible courses	3
G ELEC 8	See Course Descriptions for selection of possible courses	3
G ELEC 9	See Course Descriptions for selection of possible courses	3
Total		30

COURSE DESCRIPTIONS

Accounting Courses

ACC 2001 – PRINCIPLES OF ACCOUNTING I

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: None

An introduction to the basic principles of financial accounting with emphasis on basic accounting procedures. Analysis of income statement procedures, computerized accounting applications and the accounting cycle are highlighted. Other topics include inventories, receivables, and cash.

Computer Courses

CGS 1100 – COMPUTER SCIENCE

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: None

An introduction to computer fundamentals including information processing, operation, and usage of an operating system. Applications in word processing, electronic spreadsheets, and electronic filing systems are presented.

Finance Courses

FIN 2000 – PRINCIPLES OF FINANCE

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course is an introductory course reviewing the creation allocation and utilization of money, and the effect of monetary policy upon individuals, business, national and international economics.

Information System Courses

ISY 3510 – MANAGEMENT INFORMATION SYSTEMS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Introduction to the concepts of management information systems. Emphasis on system design. Analyze the organization in terms of its structure and information requirements. Identify major subsystems of the organization. Such as requirements planning, manufacturing, human resources, etc.

General Management Courses

ECO 2013 - PRINCIPLES OF MACROECONOMICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

A study of basic economic concepts. Topics include the modern national income formation theory, economics fluctuations, money, banking monetary, and fiscal policy, economic stabilization theory and policy, the public sector, economic growth and development, and comparative economics systems.

ECO 2023 - PRINCIPLES OF MICROECONOMICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Study of the theories and basic principles of marketing operations in capitalist, socialist, and liberal societies, emphasizing concepts of microeconomics.

MGT 2021 – PRINCIPLES OF MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course analyzes the major functions of management including planning, staffing, directing, and controlling. Emphasis is placed on learning how to manage organizations. Topics include goal setting, strategic planning, decision making, and organizational structure.

MGT 3120 - CRITICAL THINKING FOR MANAGERS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Principles, procedures, and practices of good communication and their relationship to management supervision are discussed. Oral and written communication skills as well as critical thinking skills and time management planning are emphasized.

MGT 3210 - MANAGING DIVERSITY IN THE WORKPLACE

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

The course gives recognition to cultural diversity and strategies associated with workplace management. Concepts, delivery strategies, and values associated with cultural diversity are examined.

MGT 3220 - LEADERSHIP IN ORGANIZATIONS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course examines the skills for understanding and leading individuals and groups in attaining both personal and organizations objectives are developed. The basic concepts of motivation, control changed, team building, and developing effective relationships in diverse work environments are examined. Proactive leadership devices such as organizational development, decision-making, and influence techniques are presented.

MGT 3610 – HUMAN RESOURCES MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

A framework for the study, understanding, and application of human resources management in an organization. It includes topics such as EEO, and global human resource management. Job analysis, recruitment, performance evaluation, compensation, employee benefits and safety are also included.

MGT 3620 – ORGANIZATIONAL BEHAVIOR

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course focuses on the importance of understanding behavior in organizational settings and applying scientific methods to the resolution of managerial problems and the improvement of the organization.

MGT 3640 - ORGANIZATIONAL COMMUNICATIONS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: None

The role of communication in the effective management of formal organizations is studied. Contemporary communication theory as well as a set of strategies and methods helpful in analyzing an organization's ability is examined.

MGT 3650 - BUSINESS LAW AND ETHICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Current topics in the area of law, regulatory controls, and ethical issues and their effect on decision making are examined. Attention is given to developing critical thinking skills to make humane and informed choices in resolving managerial dilemmas which pose ethical or legal problems.

MGT 4020 - PROJECT MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

The course examines the formal and informal functions of organizations and diagnose an agency or organization based on a systems model. Student will analyze and solve problems using systematic approaches associated with project management

MGT 4030 - FINANCIAL MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ACC 2011 (BBA), FIN 2000 (BSOM)

Utilization of accounting and financial data as a managerial decision tool is discussed. Students will explore methods of measuring the financial strength and stability of organizations through financial statements, ratios, and current market data.

MGT 4130 - MANAGING CHANGE

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course examines concepts and strategies for managing change in the business environment. Processes, procedures, and skills for managing change are also discussed

MGT 4230 - MARKETING MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Management of the marketing function of firms. Fundamental procedures for decision-making in areas such as promotion, product research, channel selection, and pricing.

MGT 4410 - QUALITY ASSURANCE

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

The modern management principles of the quality movement are presented. The history of total quality management, process management, and implementation of quality assurance programs in organizations are examined.

MGT 4620 - STRATEGIC MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course studies contemporary models geared toward development of strategies, planning, and control of organizations. It focuses on strategic management and business policy as well as the decision-making process to develop competitive organizations.

MGT 4630 - INTERNATIONAL BUSINESS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course examines the aspects and activities of international business and offers insight into the importance of world trade among multinational organizations. The diversity among international markets is also examined.

Marketing Courses

MAR 1011 – PRINCIPLES OF MARKETING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course deals with the distribution of goods from producer to consumer and covers such topics as market research and analysis, buying and selling, product design, pricing, promotion, transportation, competition, and the responsibilities of the marketing manager.

FACULTY

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COMBINED BACHELOR'S AND MASTER'S DEGREE PROGRAM

Polytechnic University of Puerto Rico has designed the combined bachelor's-master's degree program. The objective is to provide talented PUPR undergraduate students the opportunity to complete the combined bachelor's-master's degree in a reduced time-period. Students enrolled in 5-year bachelor's degrees may request admission to this program after completing 105 undergraduate credit-hours (excluding developmental courses.) Those enrolled in 4-year bachelor's degrees may request admission to this program after completing 72 undergraduate credit-hours (excluding developmental courses.)

Admission

Conditions for admission to the combined program will be the following:

1. GPA of 3.00 or higher. When the student has a GPA of 2.50 to 2.99 his/her application may be evaluated and conditionally admitted to the combined program
2. Comply with the minimum undergraduate number of credit-hours for the combined Bachelor's – Master's Program.
3. Be recommended by the corresponding department head and graduate program director/coordinator.

Procedure

1. The student must complete and submit the application form.
2. The department chairperson and graduate program director/coordinator recommend the candidate for admission.
3. The application is evaluated to verify that the student indeed qualifies for the program
4. The dean verifies the recommendations and gives its approval/denial of the student's application.
5. The final decision is notified of the student.

General Comments

Whenever any of the courses are passed with a grade of "C" or lower, the student is disqualified to continue in the combined program. In the event that the application is denied, the student may appeal the decision in writing to a committee composed of the

undergraduate department head, graduate program director/coordinator, dean of the Graduate School and the vice-president for Academic Affairs. The decision of the committee is final.

GRADUATE SCHOOL

GRADUATE SCHOOL

The Graduate School at Polytechnic University - Orlando Campus provides a solid foundation in business concepts and technological perspective to those students who aim to receive a master's degree. The graduate programs contribute to the intellectual and professional formation of students through the development of critical and analytical thinking skills, enabling students to relate to the reality of the entrepreneurial world and the convergence of technology and management.

Graduate School Mission Statement

The mission of the Graduate School (GS) is to promote and encourage excellence in graduate education for the students. To accomplish this mission, the GS values integrity, collaboration, efficiency, innovation, and inclusiveness in all that it does. These values are central to the GS's role in encouraging a creative environment for scholarship and research, teaching and learning. The GS develops new concepts and best practices for graduate education and supports other schools within the Institution in their graduate initiatives and emerging programs. It aims to guarantee that all graduate students regardless of ethnicity, gender, or other individual characteristics are afforded the opportunity to achieve their full potential as professionals.

The Graduate Dean, in collaboration with academic and administrative units of the University, exercises overall review and supervision of graduate programs conducted in the several colleges and provides guidance in the development of new programs as well as the maintenance of standards for existing programs. Each college of the University has developed its graduate programs in accordance with the Council of Graduate Schools national professional standards and the standards of their respective fields.

ADMISSIONS

Admissions

For admission to graduate studies, a student must have obtained a bachelor's degree prior to enrollment. Degree-seeking applicants may sometimes be admitted conditionally. Admission and/or continued enrollment depends on the satisfactory fulfillment of these conditions.

PUPR admits qualified students without regard to gender, sexual orientation, age, race, color, religion, national or ethnic origin, marital status, veteran status or disability.

Active Status

Active Status requires the student to be registered as a Part-Time or Full-Time student. Students can lose this status due to poor academic performance, failure to register for two terms or failure to complete their degree within established time limits.

For application forms and programs information, write to:

Polytechnic University of PR, Orlando Campus
550 N Econlockhatchee Trail
Orlando, FL 32825

Prospective applicants should indicate their preferred academic area when they inquire about admission. Candidates may apply for admission in any academic term.

Applicants who are denied admission may request reconsideration by a committee. The Reconsideration committee is composed by the Academic Director, Campus Director, and a Graduate School faculty member. The procedures and criteria for reconsideration are established by the Committee considering the applicant's job experience and professional licensing. Individual programs may have additional requirements.

Applicants are encouraged to consult the catalog's section that describes the graduate program of interest.

An active undergraduate student can only register in graduate courses if he/she has been admitted to the Combined Bachelor's & Master's Degree Program. (Refer to **Combined Bachelor's and Master's Degree Program** section of this Catalog).

Upon proper completion of all admission requirements the applicant will, if admitted, be eligible to register after all fees are paid.

Graduate Student Classification

Full-Time Degree-Seeking Status – The student who intends to complete a graduate degree on a full-time basis must enroll on a minimum of 6 credit-hours per term. To register for more than six credit-hours the student must seek the approval of the Graduate Program Director/Coordinator or the Dean of Graduate School.

Part-time Degree-Seeking Status – The student who intends to complete a graduate degree on part-time basis.

Transfer of Credit Hours

A maximum of 12 credit-hours of graduate-level course work may be transferred from another institution to apply towards a master's degree. Acceptance of transfer credit-hours toward program requirements is at the discretion of the program. The student must file a formal petition at the Academic Director's office accompanied with descriptive material such as transcripts, catalog descriptions and listings of textbooks used, among others.

Transfer of credit-hours will be favorably considered if courses were completed with a B or higher grade. Also, the courses must be equivalent to those offered in the curriculum of the chosen Graduate Program and they must have been completed within the last five years. No expired courses will be transferred unless there is a waiver in writing by the Academic or Campus Director.

Internal Transfer Students - Students transferred between Polytechnic University Campuses

Any student requesting transfer from one campus to another should:

- Complete an Authorization for Internal Transfer form and present it to the transferring campus. Transcript is not required since student's file will be transferred.
- If the student has an inactive status (two consecutive trimester) he or she should apply for readmission and internal transfer.
- The student must complete a minimum of 12 credits of the master's degree in the Orlando Campus to consider for graduation.

Prerequisite for a Graduate Program Taken Outside PUPR

Students may take undergraduate prerequisite courses required as part of the graduate program curriculum at institutions different than PUPR as long as:

- The institution is adequately licensed,
- Course content is equivalent to the course required at PUPR,
- And a minimum grade of "C" is obtained in the course.

International Students

All instruction and written work at Polytechnic University - Orlando and Miami campuses is in English. Students whose primary language is not English must provide proof of English proficiency. The standard measure of this ability is the TOEFL (Test of English as a Foreign Language). The applicant should provide a minimum score of 79 (internet-based test), 213 (computer-based test), or 550 (paper test) to enter the regular program courses. If TOEFL or an equivalent test is not provided or does not comply with the minimum score, an English proficiency test will be given by the Admission Office to assess his/her abilities and prepare a development plan.

Polytechnic University of Puerto Rico (San Juan, Miami, and Orlando campuses) is authorized by the Immigration and Naturalization Services (INS) to issue a Certificate of Eligibility for Nonimmigrant Student Status (Form I-20) for qualified international students who are not citizens of the United States of America or permanent residents.

Following admission acceptance, the applicant must submit all documentation required by the INS and established in the Applicant's Checklist. Afterward, the Admissions Office issues and delivers the Form I-20 to admitted students. The admitted students then deliver the completed Form I-20 to the Bureau of Immigration and Citizenship Services (BICS) of their country of origin in the petition of a Student Visa Number. Subsequent to the BICS authorization of a Student Visa Number, admitted students return this Form I-20 to the Admissions Office. Applicants are classified as international students only after receipt of all required documentation and paid registration fees for the first academic term of full-time enrollment.

CHECKLIST

Non-Resident Applicants/Students Visa

To process the I-20, all applicants must demonstrate financial capacity to complete the required educational program.

- Submit a sworn statement by the person that will cover the applicant's educational costs and living expenses, indicating the annual amount assigned for this purpose.

Transfer Applicants

- Submit an official transcript of the applicant's home country and certified by one of the following agencies: **Educational Credential Evaluators, Inc., World Education Services, Academic Credentials Evaluation, Josef Silny, Inc.**

Transfer Student with Form I-20

- An application for admission.
- Payment of sixty dollars (\$60.00) non-refundable application fee.
- An official transcript from each institution of higher education previously attended. The transcript should be sent directly from the institution of origin to the Admissions Office. Translations should be made and validated by a representative of the Department of State of the country of origin or its consulate in Puerto Rico.
- Evidence of the ability to defray all expenses while studying in Puerto Rico. A completed Affidavit of Financial Support form for each sponsor and notarized supporting bank statements showing financial support for the first year of study and complete the form I-134.

NON-DEGREE SEEKING ADMISSION

A non-degree student status is a candidate who would like to take graduate course work for professional development, personal enrichment, or familiarize with the curriculum of a graduate program. Visiting Students, those students that visit PUPR for a term and then transfer the course credit-hours to their degree-granting institution, could also apply as a non-degree student. Students who are required some pre-requisites courses for a graduate program could take these courses as a non-degree student before being granted full admission to the Graduate School.

A maximum of 12 credit-hours may be completed in the student's graduate program before program admission. Non-degree seeking student must have permission and the signature of the Graduate Program Director or Coordinator and Graduate School Dean to register for graduate courses. Permission to attend PUPR as a non-degree student does not guarantee admission at the undergraduate or graduate level, nor does it guarantee admission into a continuous education program. The number of credit-hours taken as a non-degree student will be limited to 12 credit-hours of graduate course work. If the non-degree student decides to apply for a graduate program (change his/her status as a degree-seeking student) and admission is granted, full credit could be given for courses completed with a grade of at least "B", while having the non-degree student status.

Application Requirements

To apply for admission as a non-degree student, the candidate will be required to provide proof of undergraduate degree by means of an official academic transcript. A one-time non-refundable application fee will be required for the non-degree applicants, and the fee will cover all terms attended as a non-degree student. If later the non-degree student decides to apply for a graduate program, the corresponding non-refundable graduate admission application fee will be waived.

Registration Requirements

A non-degree student must receive permission from both, the Graduate Program Director/Coordinator and the Graduate School Dean before registering.

Upon completion or registration of the 12 credit-hours the student may contact the Office of Graduate Affairs for advice on admission into a graduate program.

Restrictions

The following restrictions apply to the non-degree student status:

- A student who is already admitted to PUPR may not register for a non-degree status.
- Financial aid is not available for non-degree students.
- All students, degree, and non-degree alike, must meet the requirements as stated in the current PUPR Graduate Catalog. Failure to meet these requirements will subject students to probation or dismissal.

READMISSION POLICY AND PROCEDURES

Students who have been inactive at Polytechnic University of Puerto Rico for two or more regular terms, or who have been suspended academically and wish to be readmitted, must apply for readmission.

Regular students who have discontinued their studies for one year or more will be readmitted under the procedures in effect. The applicable curriculum will be the one outlined in the Catalog in effect at the time of readmission.

The student will receive and submit the readmission application form the Registrar's office and will submit it to the same office. Readmission applications must be submitted at least a month prior to the next registration period. If the student does not register during the period requested, the application will remain active for one (1) additional term.

A student whose readmission application has been denied may appeal to the Readmissions Committee through the Academic Director's office. The student will receive instructions regarding the procedure to follow in order to request reconsideration by the committee.

An applicant who is delinquent with the Finance Office may be readmitted conditioned to the full payment of all financial and other debts due to Polytechnic University of Puerto Rico prior to registration.

Validation of courses from other institutions taken before the five-year period prior to readmission may be canceled. A readmitted student may be asked to take such, or other equivalent courses, by his/her Academic Director.

All courses having more than five calendar years of approval at PUPR or elsewhere are considered to be expired. Nevertheless, during the readmission process the Academic Director will pass judgment of every expired course and determine which ones shall be taken and which others are waived in writing, if any.

Additional Criteria

Upon acceptance at the university, all students are required to provide a copy of a current driver's license or photo identification for placement in the files for official records.

In considering an application, the Director of Admissions of Polytechnic University-Orlando campus will take into account the scholastic record to determine qualification for admission. The University reserves the right to request further information from any applicant.

Applicants who do not meet the minimum GPA required can request, in writing, reconsideration by the Admissions Committee. The final determination is at the discretion of the Admission Committee.

INTERNAL GRADUATE SCHOOL TRANSFER OF CREDIT-HOURS FROM MEM PROGRAM TO MBA PROGRAM

Graduate students requesting transfer credits from our institution from MEM program to the MBA program, or vice versa, will be awarded with only 18 credits of the core courses.

GRADUATE SCHOOL TRANSFER OF CREDIT-HOURS

A maximum of 12 credit-hours of graduate-level course work may be transferred from another institution to apply towards a master's degree. Acceptance of transfer credit-hours toward program requirements is at the discretion of the program. The student must file a formal petition at the Graduate Affairs Office accompanied with descriptive material such as transcripts, catalog descriptions and listing of textbooks used, among others.

Transfer of credit-hours will be favorably considered if courses were completed with a B or higher grade. Also, the courses must be equivalent to those offered in the curriculum of the chosen Graduate Program and they must have been completed within the last five years. No expired courses will be transferred unless there is a waiver in writing by the Dean of the Graduate School.

Prerequisite for a graduate program taken outside PUPR

Students may take undergraduate prerequisite courses required as part of the graduate program curriculum at institutions different than PUPR, as long as: 1. The institution is adequately licensed, 2. Course content is equivalent to the course required at PUPR, and 3. A minimum grade of "C" is obtained in the course.

MULTIPLE MASTER'S DEGREES

Completion of an Additional Degree

Students that would like to complete an additional graduate degree (i.e., Graduate School alumni) must: 1. Complete the admission procedure for the desired additional graduate program, and 2. know that only common core courses will be counted towards the additional desired graduate program degree.

Completion of an Additional Emphasis Area

Students could complete an additional emphasis area in the same graduate program where they are enrolled by completing the number of credit-hours required in the new desired emphasis area. Courses already approved in the emphasis area will not be considered towards the required number of credit-hours of the new emphasis area.

FINANCIAL INFORMATION AND SERVICES

TUITION AND FEES SCHEDULE FOR GRADUATE PROGRAM

The following schedule of tuition and fees applies to all graduate students at Polytechnic University of Puerto Rico Orlando Campus. The academic year consists of three consecutive academic periods called terms from August to July of the following year.

Tuition per Credit-Hour

Tot Codes	Description	Fiscal Year 2025-2026
TGR	Tuition - Graduate	\$405.00

General Fees

General Fees (Per Trimester – 12 weeks)* (Summer Term – 6 weeks)*

Tot Codes	Description	
GGF	Graduate General Fee	\$420.00
GGF	Graduate General Fee Summer	\$210.00

Other Fees

Tot Codes	Description	
ACE	Academic Evaluation Fee	\$15.00
ADF	Application for Admission – International Students	\$60.00
ADG	Application for Graduate Admission	\$50.00
IDC	ID Campus Card	\$15.00
CER	Certification Fee	\$10.00
CMP	Change of Academic Concentrations or Programs	\$20.00
RRC	Copy of Registration Report	\$8.00
DPC	Deferred Payment Charge	\$85.00
ADC	Drop Fee/Partial and Total Withdrawal (Per Course)	\$20.00
DDI	Duplicate Diploma	\$80.00
DID	Duplicate ID Card	\$15.00
GRA	Graduation Fee	\$360.00
GRA	Graduation with Late Fee	\$390.00
IFC	Interest Finance Charge (Monthly)	2.5%
LRE	Late Registration Fee	\$90.00
REA	Readmission	\$30.00
RCF	Return Check Processing	\$65.00
PCOL	Collection Fee – Refer to Collection Agency	\$ 75.00
TRA	Transcript Fee	\$14.00

Tuition and fees are subject to change without notice. Other service charges not included.

General Fees don't have specific allocation. This charge covers expenses for Students Activities, Library and Technology fees, among others. * *Graduation candidates will pay the graduation fee in effect at the moment of the graduation ceremony.

* TUITION AND FEES SCHEDULE ARE SUBJECT TO CHANGE WITHOUT PREVIOUS NOTICE. OTHER SERVICES CHARGES NOT INCLUDED

Reservation of Rights: The University makes every effort to anticipate local and national developments and adapt as appropriate to continue delivering educational services for students. There may be situations where, for the health, safety and/or wellbeing of our community and as determined by the University in its discretion, we will be required to make changes to methods and timing of instruction, delivery of and access to services and course content, etc., including possibly implementing a full or partial campus closure, temporary suspension of classes and services, and/or switching from on-campus learning and delivery of services to distance or remote learning and delivery of services. By signing up for classes or otherwise enrolling in or attending classes offered by the University, you understand and agree that such changes may take place to the extent the University determines such changes are necessary for the health, safety, or wellbeing of members of the University community or due to other circumstances outside the University's control. You further understand and agree that the University does not in any way guarantee in-person, on-campus education or services or any other particular format of education or services. Finally, you understand and agree that you are responsible for all tuition and fees, regardless of the format in which education and services are provided, and that no refunds or credits for tuition, fees, or other charges will be provided in the event of such changes, including any changes from on-campus education and/or services to remote services and/or remote learning. Any decision by the University to provide a refund or credit, in whole or in part, of any fee or other charge in the event of a campus closure, suspension, or other change to the delivery format of education and/or services shall be in the University's discretion and shall not create an expectancy that any individual is entitled to such refund or credit or that it will be provided in any other instance.

REFUND POLICIES

The Bursar's Office is responsible for complying with the refund policy established by the Institution. These policies take into consideration institutional and current federal regulations. The student must request a drop/withdrawal in accordance with the Academic Calendar for the refund to be applied. The policies will be applied as follows for any withdrawal (partial or total) requested by student:

INSTITUTIONAL REFUND

For any withdrawal (partial or total) requested by a student

Regular Term – 12 Weeks (Fall, Winter, and Spring)

Period of Term	Percentage of Refund
During Regular Registration Process	100%
During first and second week of classes in each term*	100%
Census Date calculated on the last day of week 2**	
During the third week of classes through the withdraw deadline of each term (W grade will be assigned)	0.00%

* Drop Charges will apply. **Census date is the cutoff date for aid calculation.

Summer Term – 6 Weeks (June and July)

Period of Term	Percentage of Refund
During regular registration process	100%
During first week of classes in each term*	100%
During next 3 days of classes*	
Census Date calculated on the last day of week 1**	
During the second week of classes through the withdraw deadline of each term (W grade will be assigned)	0.00%

* Drop Charges will apply **Census date is the cutoff date for aid calculation.

PAYMENT OF TUITION AND FEES

Tuition and fees are payable in full during the registration period, and prior to the first day of classes. Students may opt to defer payment for thirty (30) days at a cost of \$65.00 (deferred payment fee), after paying 50% of total cost. The deferred payment will allow the student a grace period after the first day of classes to pay the remaining balance without paying late charges. The registration process is not completed until all fees have been paid or proper arrangement for deferred payments has been made.

In case the student cannot fully satisfy his debt prior to registration, the university's collection policy is as follow:

- a. Tuition and fees due from previous terms of study must be paid in full, prior to the student registering for the new term.
- b. Any balance remaining after 30 days will be subject to a 2% monthly surcharge.
- c. Balances remaining unpaid after 180 days will be subject to an additional collection fee.

Students who request loans or veteran benefits must either consult the Director of Financial Aid or the Institution's Veterans Representative in the Registrar Office before their registration can be completed.

Payment of fees can be made either in money order, personal check, a bank manager's check, a certified check, Automatic Teller (ATM), Visa, Master Card or American Express. Failure to pay any University fees when due may result in administrative withdrawal or withholding copies of student's academic records or other documents by the appropriate university officials. Students with pending balances on their accounts are not permitted to enroll in subsequent terms.

FINANCIAL DELINQUENCY

Students failing to pay their debt to PUPR on or before the day payment is due may be excluded from graduation. The university may also withhold grades, the issuance of transcripts, degrees, diplomas, and the granting of certificates of good standing to any student whose account is in arrears. Inactive students with debts will have the opportunity to pay the pending balances. Their payment plan agreement with Polytechnic University of Puerto Rico is held in association with the United Credit Bureau Service. If the students fail to comply with the payment plan, they are referred to a collection agency. Students referred to an agency for collection will be charged an additional fee.

FINANCIAL AID OFFICE

The Financial Aid Office provides information to students and their families regarding the available financial aid programs as well as the application process and eligibility requirements. Its mission is to provide accurate and clear consumer information to help students explore the different financial aid resources that can help them obtain the necessary funding to reach their academic goals.

Polytechnic University – Orlando Campus participates in the following financial aid programs from federal, and private sources available to Graduate Students:

- Federal Direct Loan Program for Students
- Federal PLUS Direct Loan Program for Graduate Students
- Private Student Loans
- Private Scholarships

The availability of programs will depend on the total funds allotted to the institution each academic year.

Student Consumer Information

The University conforms to the Student Consumer Information Requirements established by the United States Department of Education and hereby serves notice that the Director of Student Financial Aid and office staff are the persons designated under those requirements to assist the students or prospective student in obtaining information regarding student financial assistance.

General Eligibility Requirements

To be eligible to receive financial aid from most federal, state and institutional programs, the student must:

- Be enrolled as a regular student

- Be working towards a degree in an eligible program
- Be a U.S. citizen or eligible non-citizen with valid Social Security Number
- Have a high school diploma or its equivalent
- Meet the Standards of Satisfactory Academic Progress
- Demonstrate financial need (except for some loans programs)
- Certify that the federal student aid will only be used for educational purposes. The student must also not be in default or owe money on a federal grant.

In addition to the above basic eligibility requirements, the student could be required to meet additional requirements such as minimum enrollment credits, minimum GPA, state residency status among others, depending on the financial aid program. For the eligibility requirements of a specific program, contact the Financial Aid Office.

Application Process

To determine student's eligibility for federal aid, the student must complete the Free Application for Federal Student Aid (FAFSA). Some financial aid programs, such as state grants, student loans, and federal work-study require an additional application.

The student must reapply for financial aid every year after October 1. New students should apply for financial aid at least two months before the first day of classes for the period in which they will enroll. Regular students must submit their application before the end of December.

Follow these steps to complete your FAFSA:

1. Obtain an FSA ID for yourself at www.studentaid.gov. If you already have an FSA ID, you will use it to renew your FAFSA every year.
2. Collect the following information:
 - Your social security number. If you are married, you will also be required to provide your spouse's legal name, social security numbers, date of birth, and email address.
 - Your driver's license number (if applicable).
 - Prior-prior Income tax returns, W-2 forms, and other records of income earned for yourself and your spouse (if married).
 - Evidence of untaxed income received during the prior year such as Child Support, veteran's non educational benefits, among others.
 - Information about savings, investments as well as business and farm assets for yourself and your spouse, if applicable.
 - **PUPR's School Code: 014255**
3. Complete the FAFSA at www.studentaid.gov. FAFSA is free! You should not pay for completing this application. If you need assistance to complete the FAFSA, contact the Financial Aid Office.
4. After the FAFSA application is processed by the Department of Education, the Financial Aid Office will receive a report with the student and parent information. If your application is selected for verification, the Financial Aid Officer will request the student to provide documents to confirm the information submitted in your FAFSA. No financial aid disbursement will be processed until the verification process is completed.
5. If your financial aid file is completed; the Financial Aid Office will proceed to the awarding of the aid programs you are eligible for. You will receive electronic communication with instructions on how to accept your student aid awarding.

Transfer Students

Financial aid awards cannot be transferred automatically from one post-secondary institution to another. The student must correct the FAFSA application to include **Polytechnic University's Code: 014255**. After the Financial Aid Office receives your FAFSA results, we can determine your eligibility for the available financial aid programs.

Transfer students with previous student loans can defer paying loan payments if enrolled at least half-time. The deferment will not be automatically granted with enrollment. To defer a student loan, the student must complete an In-School deferment form and submit it to the Registrar's Office. The deferment forms are available at the loan servicers websites.

Awarding Process

The student's eligibility for financial aid programs will be determined after the FAFSA application is received, and the verification process is completed, if selected. The student's Expected Family Contribution (EFC), and the cost of attendance (COA), will be considered when preparing the award package. The student will not be considered for a Student Loan or the Federal Work-Study program unless a proper program application has been completed. For supplemental aid programs, priority will be given to students with economic need, in order of application processing date.

The student will receive an Award Letter listing the student aid programs awarded for the academic year. Initial student aid awards are offered based on full-time enrollment. Awards may then be adjusted, if applicable, to actual enrollment after the add/drop period for each trimester. Other sources of assistance such as merit awards and private and institutional scholarships will be taken into consideration when preparing the student's award package.

****Students repeating a course may not be eligible for financial aid for that specific course.**

Financial Aid Disbursements

Financial aid funds are credited to the student's institution account to cover tuition costs and fees. The student's enrollment status and eligibility for the financial aid program will be verified every trimester before disbursing any money. If there is an excess after funds are paid, a check will be issued to refund the student. If the financial aid is not sufficient to cover all charges, the student is responsible for paying the outstanding balance.

The following are some of the reasons why the student's aid disbursement may be delayed or cancelled:

- Application submitted after deadline
- Not providing all required documentation before deadline
- Not completing the Entrance Counseling and/or Master Promissory Note for Direct Loan borrowers
- Not keeping the minimum academic workload
- Not making Satisfactory Academic Progress towards the program degree
- Being in default on a student loan or owing an overpayment to any Title IV financial aid program

Student Aid Cancellation and Refusals

Students may refuse to accept any financial aid awarding. For this purpose, the student may notify the Financial Aid office in writing to refuse an awarded aid prior to its disbursement. If the student aid has already been disbursed, the student is required to notify in writing within fourteen days of the credit.

Students who do not officially withdraw (unofficial total withdrawal) and received a WU grade in all enrolled courses will only earn 50% of the federal funds received. The student would be responsible for any pending balances due to the return of Title IV funds.

Return of Financial Aid

Students who drop or withdraw might have to repay a portion or the total amount of financial aid received. Students that enroll but do not attend class will also be required to repay any received financial aid.

If an over award occurs, the student's award package will be reduced which may result in a repayment. To avoid over awards, students must notify the Financial Aid Office of any potential awards such as private scholarships, vocational rehabilitation benefits, etc., that were not included in the Award Letter.

****Refer to the Federal Financial Aid Return Policy for more information on the calculation procedure and for an example of the calculation.**

STANDARD OF SATISFACTORY ACADEMIC PROGRESS FOR STUDENTS WITH FINANCIAL AID

The Standard of Satisfactory Academic Progress of the Financial Aid Office establishes the evaluation criteria to determine the student's academic progress, which is one of the eligibility requirements to participate in student financial aid from Federal, State, Institutional and Private Programs.

The minimum federal components to measure satisfactory academic progress require three specific measures: qualitative, quantitative, and maximum timeframe to receive Federal aid. These three components provide a measure of the reasonable progress the student should have to complete the academic career successfully.

Evaluation Criteria

A. Qualitative Measure

One of the elements of the Standards of Satisfactory Academic Progress is the qualitative measure. This component consists of the grade point average and the total accumulated credits at the end of the academic year. The Polytechnic University- Orlando Campus, adopts the retention rate (qualitative measure) according to the following chart:

Total Earned credits * (1+2)	Minimum Required Grade Point Average (GPA)
0 -9	2.00
10 – 18	2.50
19 or more	3.00

*Total Earned Credits includes transferred credits and completed credit hours at PUPR.

Credits transferred from other colleges are not taken into consideration to calculate the grade point average, but they are considered to calculate the student's level or year.

B. Quantitative Measure

The second element of the Standards of Satisfactory Academic Progress is the quantitative measure. This component compares the number of credits attempted by students in the Institution, versus the number of approved credits. The student must approve at least 66% of all the credits attempted at PUPR. This measure will be cumulative.

C. Maximum time to receive payments from federal financial aid.

All students must complete the graduation requirements within a maximum equivalent to 1.5 times (150%) of the program degree credits. Developmental courses will not be considered in the evaluation of the maximum time, but all courses attempted at our Institution will be included.

Students who have completed the maximum time do not qualify for financial aid.

Example:

Student in Master of Business Administration - Accounting

The MBA-ACCO Program requires 39 credits to complete the curriculum.

Maximum time (39 crds. x 150%) = 58 attempted credits.

The credits hours will be used to determine the maximum time.

- The maximum time must be 150% of the credit-hours required to complete the program degree.
- All attempted credits, even those in which the student did not receive financial aid, counts towards the established maximum.
- This policy includes and measures students who are enrolled half-time.
- All courses attempted in the institution, except for the developmental courses will also be included for the maximum time.

Probation Status

A student who does not comply with the Standards of Satisfactory Academic Progress for the first time is put on probation status. While on probation, the student does not qualify for any Federal, State, or Institutional aid programs. Students on probation are able to appeal the probation status, and if approved, could be eligible to receive Federal, State, and Institutional aid.

Procedure for Appealing a Probation Status

1. How can the student appeal a probation status? The student must complete the Appeal Form and carefully follow the instructions.
2. The student must submit the Appeal Form and supporting documentation before the deadline to the Financial Aid Office.
3. Once submitted, continue to step #4. If denied, the student will not be eligible for Federal, State and/or Institutional aid programs until complying with the Standard of Satisfactory Academic Progress regulation.
4. Plan to improve academic progress:
 - Once the appeal is approved, the student will be referred to meet with the Academic Dean to establish an academic plan for the next term. The academic plan will be established at the beginning of each trimester.
 - Sign the academic plan agreement with the Academic Dean.
 - Submit the established academic plan to the Financial Aid Office to reactivate your financial aids.
5. The academic plan will be evaluated every trimester by the Financial Aid Office to see if the student is complying with it. Student compliance with the academic plan assures the continuity of his/her eligibility to receive Federal, State and/or institutional aids, as long as the student meets other requirements. Not meeting any of the terms outlined in the academic plan will make the student lose all Federal, State and/or institutional aids until he/she complies with the Standard of Satisfactory Academic Progress.

Suspension Status

A student that does not overcome the probation status, falls in a suspension status. A student in a suspension status does not qualify for Federal, State nor Institutional aid. Students in suspension status cannot appeal to the Satisfactory Academic Progress Committee. A student in a suspension status may be eligible to receive Federal, State, and Institutional aid funds when the student complies with the Satisfactory Academic Progress Standard.

DEFINITIONS

Attempted Credits – Enrolled credits at PUPR in which the student has obtained grades of I (with grades), A, B, C, D, F or W, WU, S, NS, P, NP, WN, including all course repetitions.

Academic Progress – Is the measure which shows whether a student is complying with the three criteria of the Satisfactory Academic Progress Standard (Qualitative, Quantitative, and Timeframe).

Academic Term – Typical academic term during which regular courses are offered, and which consists of 12 weeks, beginning on the first day of school and ending on the last day of final examinations. In summer, the academic term is reduced to 6 weeks, doubling the weekly contact hours.

Academic Year – Consists of three academic terms that begin in August and end in May. The summer term is optional.

Courses with W Grade – Course from which the student officially and voluntarily withdraws. These courses will be considered in the calculation of the quantitative measure.

Earned Credits - Credits of courses attempted at PUPR which obtained grades of A, B, C, D or Pass.

Expired Credits – Courses approved seven or more years ago in this, or other institution will expire at the date of applying for readmission except for those validated by the Department Director and the Faculty Dean. The student must repeat all courses declared outdated or must take other equivalent courses of the existing curriculum, with the approval of the Department Director and the Faculty Dean. These courses are considered for the calculation of quantitative measures.

Financial Aid Probation – Classification given to a student who at the end of any academic year, does not comply with the Standards of Satisfactory Academic Progress. This student will not qualify for Federal, State, or Institutional aid while in this status. The student can appeal this decision and could qualify for aid if the appeal is approved. Once approved, the student must comply with all requirements of every academic plan, which must be prepared every term.

Grade Point Average (GPA) – The measure of academic merit achieved by the student. It is calculated by dividing the total number of accumulated honor points by the number of credits in which the student has received final grades, including F's and WU's, which have not been removed.

No Satisfactory Academic Progress (NPAS – Suspension) – Classification that is given to the student who at the end of his Financial Aid Probation period does not overcome the academic deficiencies or has not completed the Academic Plan as agreed. The student does not qualify for any Federal, State, or Institutional aid.

Provisional Grades (Incompletes) – If the Professor gives an incomplete in a course, the student must complete the requirements of the course within the established date in the next academic term. The Professor will remove the incomplete within the established date. If the incomplete is not removed, it will become the provisional grade until the professor changes the grade. Provisional grades are considered in the calculation of the qualitative and the quantitative measures of the Satisfactory Academic Progress Standard.

Repeated Courses – Courses that the student has been enrolled in two or more times. For the purpose of determining the Grade Point Average, only the highest grade will be used. Repeated courses will be considered in the quantitative measure of the Satisfactory Academic Progress Standard.

Transferred Credits – Credits taken at other institutions of higher education recognized by accrediting agencies, that were approved with A, B or C, and which are accepted by the Department Director or by the authorized Dean, in compliance with the standards of PUPR.

STUDENT'S RIGHTS AND RESPONSIBILITIES

The student has the right to receive the following information from the Financial Aid Office:

- Available financial aid programs.
- Application process, deadlines, and eligibility requirements.
- Awarding and disbursement procedures.
- What financial aid must be repaid, the terms and schedules for repayment.
- The terms and conditions of any employment that is part of the financial aid award.
- What is the criterion of maintaining Satisfactory Academic Progress and how to reestablish eligibility?
- Institution's refund policy for the students that withdraw from school.

It will be the students' responsibility to:

- Comply with deadlines.
- Provide all required documents in a timely manner.
- Provide the Financial Aid Office with information on changes in a family's household, income, or enrollment status.
- Inform the Financial Aid Office of any outside scholarships, tuition assistance, VA benefits or any other benefits that the student will be receiving during the academic year.
- Use any financial aid received from Federal, State or Institutional funds, for expenses related to their education.
- Notify any change in name, social security, citizenship status, address, phone number or email address.
- Understand and comply with the policies regarding refunds, repayments, and satisfactory academic progress.
- Complete the Exit Counseling for Federal Student Loan program before departure from college or if registering as less than half time student in any term.

PRIVACY NOTICE

The Financial Aid Office ensures the confidentiality of students' records. For this reason, confidential information will not be released by email or phone to students. In addition, no information will be released to any third party, unless legally required to do so, without written authorization from the student. This includes parents, spouses, siblings, or friends.

ACADEMIC INFORMATION AND SERVICES

The student should be thoroughly familiar with: (1) this section of the Catalog, (2) the section containing the academic requirements for the degree he/she plans to earn, (3) the offerings of his/her major program of study, and (4) any changes published after the publication of this Catalog. A degree will be awarded only to a student who has satisfied all the academic and administrative requirements of Polytechnic University of Puerto Rico.

Program Curriculum Sequence Continuity

Polytechnic University of Puerto Rico provides students with the program curriculum sequence aligned with the academic time length and course prerequisites. The student is responsible for following the curriculum sequence to accomplish the graduation requirements within the corresponding schedule.

If the student is not able to follow the curriculum sequence, he/she must coordinate and develop the most effective program sequence with his/her mentor to comply with the graduation timeframe. The department is in charge of providing courses based on the program curriculum sequence. If the course has low enrollment, the department will develop course alternatives for students that comply with the program curriculum sequence.

Academic Program Continuity

Polytechnic University of Puerto Rico will reserve the right to close or postpone an academic program based on low student enrollment. To ensure that the student is not affected by this decision, the institution will provide the necessary course alternatives to allow program completion.

Graduate Academic Schedule

Registration for all students is held prior to the beginning of each term on designated days as specified in the Academic Calendar. Completion of registration for each term is a prerequisite of class attendance. The academic year consists of three terms, and three summer sessions. Fall, winter, and spring classes are scheduled from Monday through Thursday from 6:00 pm to 10:30 pm; Saturday from 9:00 am to 1:00 pm or through online courses. Online courses may have on-campus requirements. Depending upon the term, students may be required to make-up class contact hours lost due to days observed as holidays.

Changes in Class Schedule

During the first week of classes a student may add, or drop from, courses by completing an Add/Drop Form at the Registrar's Office.

Add Policy: A student may add a course during the official Add/Drop period; a class which has been dropped will not appear in his/her permanent record. Some academic programs may require approval of the Program Director/Coordinator before any course change is made. For withdrawal after the Add/Drop period, consult the Withdrawal Policy.

Academic Load

The regular or normal load per term is six (6) credit-hours. Additional credit-hours require the approval of the Academic Director. Credit-hours will not be awarded for courses in which the student is not properly registered.

Definition of Credit-Hour

A credit -hour for Federal programs, including the Federal student financial assistance program, is defined as follows: (34 CFR 600.2 of financial regulations) - An amount of work presented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalent that reasonably approximates not less than:

1. One hour of classroom or direct faculty instruction and minimum of two hours of out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of time; or
2. At least an equivalent amount of work as required in paragraph (1) of this definition for other academic activities as established by the institution, including laboratory work, internship, practice, studio work, and other academic work leading to the award of credit-hours.

Credit Hours at PUPR System

One credit-hour corresponds to 15 contact hours per term for a lecture course, and thirty (30) to forty-five (45) contact hours per term for a laboratory or practicum course. Additionally, it includes a minimum of 2.5 hours of out-of-class student work each week for the twelve-week term.

Other Definitions Related to Credit-Hours:

- **Attempted Credit-Hours** – all credit-hours in which the student enrolls at the graduate level at Polytechnic University of Puerto Rico, for which a grade of I, A, B, C, D, F, W, WU, WN, NS, S, NP, or P is given, including all the number of times the student has enrolled in the same course.
- **Transfer Credit-Hours** – graduate credit-hours approved with a grade of “A”, “B” or its equivalent at an accredited institution of higher learning and are accepted by the Graduate School in accordance with the prevailing norms at PUPR. Transfer credit-hours will not be taken into consideration in qualitative evaluation. These credit-hours will be considered to determine the level or year of study of the student at the graduate level. A maximum of six (6) credits will be accepted in transfer from other accredited institutions of higher learning.
- **Approved Credit-Hours** – credit-hours attempted at PUPR by students admitted to the Graduate School and approved with a grade of “A”, “B”, “C”, “S” or “P”.
- **Grade Point Average (GPA)** – measure used to evaluate the academic performance of the graduate student. This measure is computed by dividing the total number of credit-hours accumulated by the total number of credit-hours in which the student has received final grades, including “F” that have not been removed. Courses in which grades of “S”, “NS”, “P” or “NP” will not be included for computing the measure.
- **Repetition of Courses** - practice under which the graduate student is allowed to repeat only a course in which he or she obtained a grade of “C”, “D”, “F”, “NS”, or “NP”. In accordance with this practice, only the highest grade will be considered to determine the Grade Point Average.

WITHDRAWALS

The process for partial and total withdrawals is the same; both must be completed online through the student portal on or before the deadline stipulated in the Academic Calendar.

Polytechnic University of Puerto Rico does not encourage withdrawals from courses. However, if a student considers withdrawing from a course or all courses, consultation with a professor, counselor or mentor is recommended to discuss possible options rather than withdrawal.

The W is a grade, and it will stay permanently on the academic transcript.

Students cannot withdraw from any course identified with “NR.” (See: Class Attendance section for NR explanation). Remember that withdrawing from a course does not exempt the student from paying the cost of it.

Veteran students must present evidence of activation or mobilization orders to the Veterans Coordinator at the Registrar’s Office.

Abandoning a Course

Whenever a student leaves the course and does not request an official withdrawal will receive a “WU” grade to allow the institution to differentiate between a student who failed to complete its academic responsibility and a student who failed as a result of course abandonment.

GRADING SYSTEM: GRADES WITH HONOR POINTS

Polytechnic University of Puerto Rico utilizes an alphanumeric grading system. (Honor points are the equivalences assigned arbitrarily to a letter grade) The grades that must appear on the midterm and final reports are as follows:

A	Excellent (4 honor points per credit-hour)
B	Good (3 honor points per credit-hour)
C	Satisfactory (2 honor points per credit-hour)
D	Deficient (1 honor point per credit-hour)
F	Failure (0 honor point per credit-hour)
WU	Student abandoned course without authorization (0 honor point per credit-hour)
I (with Grade)	Incomplete with a grade (Points will be equivalent to the grade that accompanies the Incomplete)

GRADE POINT AVERAGE OR INDEX

Grade Point Average is the measure of academic achievement. It is computed as follows:

- The total number of credit-hours corresponding to all courses taken, counted once, and having a grade of A, B, C, D, F or WU, is obtained (**T**).
- The credit-hours of each course is multiplied by 4, 3, 2, 1 or 0, according to grades A, B, C, D, F or WU, respectively.
- These products are added (**S**) and identified as honor points.
- **S** is divided by **T** to obtain the Grade Point Average (GPA).

In computing the Grade Point Average, the highest grade obtained in a repeated course will be used whenever it is higher than the original grade. If the grade obtained in the repeated course is lower than the original grade, the original grade will prevail.

SYMBOLS

T	Transferred
AU	Audit (class audited only)
R	Repeated course
W	(Withdrawals) Indicates that the student, after obtaining proper authorization from PUPR's Officers, receives permission to withdraw from a course without penalty.
WM	Military Withdrawal
WN	Unofficial withdrawal of a student who takes a (P/NP, or S/NS) course that does not carry a grade
P	Pass, only for specified courses
NP	Not passed, only for specified courses
E	Expired course, (course no longer offered)
S	Satisfactory, only for specified courses
NS	Not satisfactory, only for specified courses
CE	Course Exemption

Face-to-Face Class Attendance

The fact that classes are scheduled is evidence that attendance is important. Students should maintain regular attendance if they are to attain maximum success in the pursuit of their studies. Students who have not attended any classes during the first two (2) weeks of the academic term are automatically disqualified from charging tuition fees to federal funds and are responsible for their payment.

This course will be identified with an “NR” (No Record/Show). The instructor via email the names of all such students to the Registrar’s Office. ([Policy of Class Attendance](#))

It is recognized that the record of class attendance may vary according to the student, the instructor, or the course. On occasions, it may be necessary for the student to be absent from scheduled classes or laboratories for health or other reasons. In this case, the student is responsible for contacting the instructor and for all work completed or assigned.

Online Class Attendance

Student attendance in online courses is defined as active participation in the course as described in each course syllabus. The faculty members must certify that students are actively attending an online course, or a hybrid course according to the procedures established by the Center for Distance Education. Students will be required to complete at least one (1) of the following activities during the first two (2) weeks of the academic term for each online or hybrid course.

1. Submit an assignment online;
2. take an online assessment;
3. participate in an online discussion about academic matters;
4. complete an online interactive tutorial or computer-assisted instruction that is trackable; or
5. initiate contact with the faculty member to ask a question about the academic subject studied in the course.

Students who fail to complete any of these activities during the first two (2) weeks of the academic term are automatically disqualified from receiving federal funds for tuition and fees and are responsible for their payment. This course will be identified with an “NR” (No Record/Show). The instructor will submit via email the names of all such students to the Registrar’s Office.

On occasions the student may not be able to access the online/hybrid course due to health or other reasons. In this case, the student is responsible for contacting the instructor, providing documentation that supports the need for late submission of a graded activity. As a component of course attendance, students are expected to check their course email regularly (preferably daily), course announcements, and discussion forums. The student is responsible for checking updates related to the course. Log on at least three (3) times a week – it is recommended to complete weekly assignments, assessments, discussions, or other weekly deliverables as directed by the instructor and outlined in the course syllabus.

STUDENTS WITH VETERANS’ BENEFITS

Students with veteran’s benefits should provide the Certificate of Eligibility and the DD-214 form. If the student needs assistance to complete this document, he/she must contact the Veterans Coordinator in the Registrar’s office.

Students eligible for Veterans benefits are required to make their financial arrangements in line with the policies of the University for all students.

MILITARY TRAINING

Polytechnic University students may request consideration of credit award for documented military training. The Academic Director has the responsibility of working with the student to evaluate the request and to determine if the credit option is appropriate.

For Post 9/11 GI Bill® (Ch 33) students and VA Vocational Rehabilitation and Employment (Ch 31) students, our tuition policy complies with 38 USC 3679(e) which means Post 9/11 and Vocational Rehabilitation and Employment students will not be charged or otherwise penalized due to a delay in VA tuition and fee payments. For eligibility consideration, a Post 9/11 GI Bill® student must submit a VA Certificate of Eligibility (COE) and a Vocational Rehabilitation Student must provide a VAF 28-1905 form. Also, should provide the DD-214 form. If the student needs assistance to complete this document, he/she must contact the Veterans Coordinator in the Registrar’s office. For more information, refer to the following link: <https://www.govinfo.gov/content/pkg/PLAW-115publ407/pdf/PLAW-115publ407.pdf>

GI Bill® is a registered trademark of the U.S. Department of Veterans Affairs (VA). More information about education benefits offered by VA is available at the official U.S. government website at www.benefits.va.gov/gibill. Students eligible for Veterans benefits are required to make their financial arrangements in line with the policies of the University for all students.

NORMS AND PROCEDURES FOR THE EVALUATION OF STUDENTS ACADEMIC PROGRESS AT THE GRADUATE LEVEL

Purpose

This section includes the norms and procedures of student academic progress at the graduate level. The purpose of these norms and procedures is to define the parameters to be used in the retention, probation, suspension, and academic dismissal of students. They establish the mechanisms to be followed in the evaluation of student academic progress. These norms and procedures apply to every student admitted or readmitted to pursue graduate studies.

Norms and Procedures

The PUPR - Orlando Campus requires that all graduate students demonstrate academic progress through the number of approved credit-hours and grade point average.

A. Definitions

1. **Attempted Credit-Hours** - all credit-hours in which the student enrolls at the graduate level at the Polytechnic University-Orlando Campus, for which a grade of I, A, B, C, D, F, W, WU, WN, S, NS, NP, or P is given, including all the number of times the student has enrolled in the same course.
2. **Transfer Credit-Hours** - graduate credit-hours approved with a grade of "A", "B" or its equivalent at an accredited institution of higher learning and are accepted by the Graduate School in accordance with the prevailing norms at the PUPR-Orlando Campus. Transfer credit-hours will not be taken into consideration in qualitative evaluation. These credit-hours will be considered to determine the level or year of study of the student at the graduate level. A maximum of six (6) credits will be accepted in transfer from other accredited institutions of higher learning after official admission.
3. **Approved Credit-Hours** – credit-hours attempted at the PUPR – Orlando Campus by students admitted to the Graduate School and approved with a grade of "A", "B", "C", "S" or "P".
4. **Grade Point Average**- measure used to evaluate the academic performance of the graduate student. This measure is computed by dividing the total number of credit-hours accumulated by the total number of credit-hours in which the student has received final grades, including "F's" that have not been removed.
5. **Repetition of Courses** - practice under which the graduate student is allowed to repeat only a course in which he (she) obtained a grade of "C", "D", "F", "NS", or "NP". In accordance with this practice, only the highest grade will be considered to determine the general average.
6. **Probation** - temporary condition of the graduate student at the PUPR- Orlando Campus because of academic reasons, in which both the quantitative and qualitative elements are taken into consideration.
7. **Suspension for Academic Deficiency** - dismissal of the graduate student at PUPR-Orlando Campus for academic reasons, in which the qualitative elements, as well as the time on probation, are considered.
8. **Academic Year and Term** - Academic year consists of three consecutive academic periods called terms from August 1 to July 31 of the following year. The Summer academic period is optional and the grades will be added to the previous academic period of study.

B. Norms of Academic Progress to be followed by the Registrar's Office for the evaluation of students.

1. Retention Index

The institution adopts the required index as presented in Table A below, in accordance with the number of credits completed and transferred credits. (The student must have a general grade point average of 3.00 or more, both concentration courses and grade point average, for the granting of the degree.)

Table A- Retention Index

Total Credit-Hours Accumulated at PUPR*	Minimum Grade Point Average
0 -9	2.00
10 – 18	2.50
19 or more	3.00

*Total Accumulated = Transferred + Passed Credit Hours

2. Probation and Suspension

- 2.1 All students whose academic progress does not comply with paragraph B.1, will enter a period of probation (P1) which shall not exceed one academic year.
- 2.2 If the student does not surpass the probation (P1) and fails to comply with the qualitative element, the student will be suspended (S1) for a term of one year. At the end of the period of suspension, the student should request readmission if he/she wants to continue his/her studies. When readmitted, the student will enter a probation (P2) status for one academic year. If probation fails (P2), and does not comply with the general average, the student will be expelled from the Institution without the right to appeal.

3. Incomplete Grade

If the professor gives an incomplete in a course, the student must complete the requirements thereof within the date indicated in the next academic term. The professor should remove the incomplete within the date set in the academic calendar. If the incomplete is not removed at the established date, it becomes the final grade linked to the incomplete grade. These incomplete grades are considered in the calculation of the qualitative measure.

C. Procedure

The academic progress of all eligible students not receiving financial aid will be measured in the following way:

1. The qualitative part shall be verified once a year during the summer period. The retention rate refers to the general average that the student must accumulate in comparison with the total number of credits accumulated according to Table A (qualitative part). The general average will be calculated using only the credits approved at PUPR. In this calculation, all courses in which the student is enrolled and that belong to his/her degree at the Graduate School until the last period of study will be considered. The condition of the student shall be determined using the following procedure:
 - a. When the cumulative index is less than the established in Table A, probation (P1) shall be granted for a period of one academic year. The Registrar's Office will notify such probation (P1) to the student in a certified letter. At the same time, it shall notify the academic Department for the corresponding follow-up.
 - b. At the end of the period of probation (P1), the student must achieve an academic index equal to or greater than that provided in Table A.
 - b.1 During the period of probation (P1) the student will be responsible for preparing its own program of study with the advice and help of his/her Director/Coordinator or academic Director, repeating, firstly, all courses taken which have rating "C", "D", "F" or "WU".
 - b.2 If the student requests a total withdrawal or leaves the University during his or her probation period (P1), it will be placed on probation when he or she returns, in the event that he or she returns.
 - a. If after completing one year of probation (P1) the student does not comply with the conditions laid down in paragraph 2 and does not surpass the academic deficiencies, will be suspended (S1) for one academic year. The Office of the Registrar will notify the suspension in a certified letter. At the end of the period of suspension, if the student wants to continue studying, he or she shall request readmission. When readmitted, the student will be on probation (P2) for one academic year. If it fails probation (P2), the student will be expelled from the institution, without the right to appeal.

- b. Any student who is suspended for academic deficiency will need to remain separated academically from PUPR for one academic year before qualifying for readmission, and courses taken at another institution will not be transferred.

D. Right to Appeal

Every student has the right to appeal the probation or suspension issued by the Registrar's Office. The student may send an online request for reconsideration to the Academic Achievement Committee, within ten (10) labor days after notification of the decision. The student must go to www.pupr.edu, to complete the Appeal for Probation Form and supporting documentation, if needed, and carefully follow the instructions.

The request for reconsideration should state clearly the decision referred to, give a brief statement of facts, and state and justify the basis for the requested change or restitution. Once the Academic Achievement Committee makes the decision, it will be final.

APPLICATION FOR GRADUATION

An official academic evaluation is required prior to applying for graduation. The graduation application must be completed, and a graduation fee paid no later than the date specified in the academic calendar. Academic and Graduation applications are obtained at the Registrar's Office. The graduation application should be returned to this Office after clearance by Library, Financial Aid and Finance Offices confirming non-existence of debts and payment of the non-refundable graduation fee. Any alleged error in the analysis of an academic record should be reported to the attention of the Academic Director within a week after it has been received by the student.

Graduation Requirements

Polytechnic University of Puerto Rico reserves the right to make changes in the different curricula and degree requirements at its discretion. As a rule, a student is entitled to graduate under the curriculum requirements in force at the time of admission to the institution. However, students who fail to fulfill the graduation requirements within the regular period assigned to their corresponding curricula, and students who re-enroll after a period of one year or more of absence are governed by the existing curricular requirements at the time of graduation.

To receive a graduation diploma from Polytechnic University of Puerto Rico, candidates must meet the following conditions or requirements:

1. Apply for graduation after passing 80% of the program credit-hours required by filling in an application form at the Registrar's Office on the day specified in the academic calendar.
2. Pay the graduation fee and satisfy all other financial obligations to the University not later than the date specified in the academic calendar.
3. Students must have been recommended for the degree by the Dean of the Graduate School, the President of PUPR and the Board of Trustees.
4. Students completing graduation requirements in any academic term are invited to participate in the summer commencement ceremony.
5. Students should have taken the final credit-hours for the degree at PUPR with the understanding that these credit-hours correspond to the total credit-hours of the last year of the program as specified and described in the Catalog.
6. The student must attain a minimum cumulative grade point average of 3.00.
7. In general, the acceptable grades in an academic record to enable graduation include A, B, or C. However, a student is only allowed two courses with grade C to be eligible for graduation.
8. When a student receives a grade of D, F, NS or NP in a course, the student must enroll in the same course and obtain an acceptable grade.
9. If a student has three courses with grade C, the student must enroll in one of these course and obtain a minimum grade of B.
10. From the term of first registration, graduate students have five years to complete their degree. The time limit for completing a graduate degree can be extended from the term of first registration up to seven years via: a formal petition issued by the graduate student to the Graduate School Dean and the corresponding approval by the Dean. *Note: Time limit extensions are subjected to verification of caducity of certain courses.*

11. The student must satisfy all credit-hours specified for the degree within a period equivalent to five years. After the expiration of said period, all expired courses must be repeated, unless otherwise authorized by the Graduate School Dean.
12. PUPR celebrates Commencement Ceremony once every academic year during the Summer term, at which time all degrees and certificates are awarded.

CURRICULAR CHANGES

When the curriculum of any one program is revised, the Registrar will automatically initiate the transfer process of every student, enrolled in said program to the revised curriculum. The student will be moved horizontally and will be required to take all the necessary courses of a level higher than that at which he/she actually is until he/she completes the number of credit-hours specified in the old curriculum. Under no circumstances will the student be asked to go and take any new courses of lower codification added to the revised curriculum. By the same token, the Department Director and the Registrar will do everything within their power to help the student transfer smoothly without the penalty of taking an excessive number of new courses. When the curriculum of a graduate program is revised, this curriculum will apply to (1) new students admitted to the program and (2) inactive students who have been out of the Institution for at least one academic year. Active students who would like to adopt the curriculum change in his or her program must complete the specific form at the Academic Department.

TRANSFER OF CREDITS TO OTHER EDUCATIONAL INSTITUTIONS

Most colleges and universities accept transfer credits from regionally accredited universities, subject to limitations on elapsed time and the number of credits. Although the University is regionally accredited, it remains the responsibility of the student to confirm the transferability of Polytechnic University credits to another college or university program.

CERTIFICATIONS AND TRANSCRIPTS

Whenever a student files an application with the Registrar's Office for a program of study certification, transcripts or any other official statement, the same will usually be issued by the Registrar within two weeks after the filling of the request. However, when a request is made at the beginning or the end of the term, a longer period for issuance may be required.

To transfer credit-hours to other colleges and universities and to supply information to certifying agencies and prospective employers, official transcripts are issued in a confidential manner. These are mailed directly to the addresses designated by the student and are never given to the student or any other individual. Students may also obtain an official copy of the transcript of credits marked as Student Copy. Any alleged errors in the transcript should be reported to the Registrar within ten (10) days of receiving it. A transcript and certification fee is charged for each transcript. All services are denied to debtor students.

DIPLOMAS

Diplomas must be claimed by graduates at the Registrar's office no earlier than three (3) months following the graduation ceremony.

CHANGE OF ADDRESS

A student may submit a change of address at any time at the Registrar's Office. If a change of address is not indicated, the University will not be responsible for correspondence it sends which is not received by the student. Any notice, official or otherwise, mailed to a student's address as it appears in the records shall be deemed enough notice in case of any claim.

CHANGE OF GRADUATE PROGRAM

A student that would like to change from his/her current graduate program to a new program must:

- Complete the Change of Graduate Program form and pay the required fees,
- be in good academic standing,
- have approved at least 3 credit-hours and
- comply with the specific graduate program requirements.

CHANGE OF EMPHASIS AREA

Students must complete the Change of Emphasis Area form available at the Registrar's Office.

STANDARDIZED EXAMINATIONS

The University will accept a maximum of 30 credit hours of standardized testing credit. All such credit will be listed on the student's transcript and will not be removed once it has been recorded. Students may receive credit after successfully completing any of the following standard examinations: College Level Examination Program (CLEP) and/or Defense Activity for Non-Traditional Educational Support (DANTES).

GRADUATE PROGRAMS

SCHOOL OF BUSINESS ADMINISTRATION

The School of Business Administration is dedicated to advancing business knowledge and the practical application of business principles in a global technological environment. The academic programs aim to raise awareness about the social responsibility of management within the global economic system and the importance of effective communication. The programs encourage creative leadership, and flexibility to adapt to a rapidly changing business environment. Polytechnic University - Orlando Campus offers a Master of Business Administration degree.

Educational Objectives of the School of Business Administration

- Demonstrate the professional practice skills and in-depth knowledge needed to be successful in their professional practice while fostering professional growth, leadership, and career advancement within the field of study;
- Being aware of the complexity and advances in science and technology that will enable contributions towards the body of knowledge within the related fields;
- Contribute to achieve team goals while being aware of ethical, professional, and social responsibilities in the decision-making process.

Degrees Offered

The School of Business Administration offers graduate instruction leading to the following degrees.

Master of Business Administration (MBA) with the following six emphasis areas:

- Accounting
- General Management
- International Enterprises Management
- Computer Information Systems
- Healthcare Management
- Project Management

MASTER OF BUSINESS ADMINISTRATION (MBA)

The Master of Business Administration (MBA) degree is one of the most sought-after degrees in the world because of its value to people in business and administration. The MBA degree has been designed to provide the student with a personalized education that fits his/her background, experience, and goals, and that challenges to reach fullest potential. It provides students from diverse academic backgrounds with a solid foundation in business concepts and a broad management perspective for today's global business environment. Emphasis is placed on teaching students to fully utilize today's rapidly advancing technology to attain the organization's goals and objectives more quickly and effectively.

Program Description

The MBA program consists of 39 credit-hours. Students will complete 18 credit-hours within the Core in Management courses, 12 within the Core in Business Administration courses, and 9 credit-hours within an Emphasis Area (Accounting, Computer Information Systems (CIS), Healthcare Management, General Management, International Enterprises Management, or Project Management).

Program Philosophy and Objectives

Organizations today demand multitalented knowledgeable professionals who can contribute and succeed in a team/project management environment. The MBA Program has been carefully crafted to train professionals through the study of management theory and practical problem solving. It focuses on developing versatility through critical thinking, intellectual flexibility, analytical and applied research skills, creativity, and high standards for professional integrity and ethics. Globalization issues of management are instilled into many of the Program courses. Teamwork is an essential component of organizational dynamics, and it is stressed through team projects that encourage face-to-face meetings as well as synchronous and asynchronous online meetings.

To implement our Philosophy and vision, the MBA Program has established the following goals:

- To help students transform themselves into knowledgeable managers that understand business dynamics at all levels.
- To present the interrelatedness of the functional areas of business and be able to integrate them in the performance of business decisions and in solving complex business issues.
- To dispense relevant curriculum that combines academic theory with practical problem-solving skills.
- To provide the fundamental concepts and principles that underlie the operation of business enterprises as well as offer a comprehensive set of more specialized courses to allow students to tailor their education to their specific needs and career goals.
- To develop students with the ability and insight to apply cross-functional approaches.

General Admission Requirements and Procedures

All students who have graduated from an undergraduate program at a higher education institution applying for admission to Polytechnic University - Orlando Campus must:

- Complete an application for admission.
- Submit an official academic transcript from the college or university that conferred the bachelor's degree. Transcript(s) should be sent directly from the institution(s) to Polytechnic University.
- Pay fifty dollars (\$50.00) non-refundable application fee. The application fee will not be applicable towards the students' registration charges. Fee is valid for two consecutive quarters.

Admission Requirements

The MBA program is subject to the general admission requirements of the Polytechnic University - Orlando Campus. The admission requirements specific to the MBA program are as follows:

- Have an undergraduate degree from an accredited college or university.
- Have obtained a minimum undergraduate GPA of 2.50/4.00.

Applicants who do not meet the minimum GPA required can request, in writing, reconsideration by the Admissions Committee. Final determination is at the discretion of the Admissions Committee.

Student must provide a copy of a current driver's license or photo identification for placement in the files for official records upon acceptance to a degree program at the university.

Minimum Graduation Requirements

The MBA degree requires a minimum of 39 credit hours of graduate coursework with a minimum grade point average of 3.0 on a 4.0 system. No thesis or comprehensive exams are required.

General Prerequisites

The MBA curriculum is designed for students from diverse academic backgrounds. In a broad philosophical sense, the MBA program is not geared exclusively for undergraduate business students; rather, students with a wide range of undergraduate experiences such

as engineering, science, liberal arts as well as business administration are encouraged to apply. The student will work with a wide breadth of business disciplines with the objective of maximizing the organization's effectiveness and financial performance as required by its major stakeholders. MBA students pursuing the Computer Information Systems emphasis area must have both a database management and a programming language course.

Students must provide a copy of a current driver's license or photo identification for placement in the files for official records upon acceptance to a degree program at a university.

Career Opportunities

Because of their ability to analyze problems, address unstructured business challenges, and generate alternatives for a given situation, MBA graduates are among the most sought by companies throughout the world. There are many opportunities in the private sector as well as in the public or not-for-profit sectors, which offer extensive employment opportunities. Success will depend ultimately on self-awareness, research, and preparation. The Master of Business Administration degree has been so popularized over the last decades that many employers now consider it a prerequisite for entry into several career fields, and a must for growth consideration. It is a requisite in many companies for certain positions, just as the bachelor's degree was a few decades ago.

Student Organizations

Students have the opportunity to get involved in academic, professional, and cultural activities such as conferences, seminars, and visits to plants and factories. They can also participate in other students' associations and fraternities organized and/or recognized by Polytechnic University of Puerto Rico.

MASTER OF BUSINESS ADMINISTRATION (MBA) EMPHASIS AREAS

Accounting - Minimum Graduation Requirements

- 18 Credit-Hours in Management Core Courses
- 12 Credit-Hours in MBA Core Courses
- 9 MBA Emphasis Area
- 39 Total Credit-Hours**

Computer Information Systems - Minimum Graduation Requirements

- 18 Credit-Hours in Management Core Courses
- 12 Credit-Hours in MBA Core Courses
- 9 MBA Emphasis Area
- 39 Total Credit-Hours**

General Management - Minimum Graduation Requirements

- 18 Credit-Hours in Management Core Courses
- 12 Credit-Hours in MBA Core Courses
- 9 MBA Emphasis Area
- 39 Total Credit-Hours**

Healthcare Management - Minimum Graduation Requirements

- 18 Credit-Hours in Management Core Courses
- 12 Credit-Hours in MBA Core Courses
- 9 MBA Emphasis Area
- 39 Total Credit-Hours**

International Enterprises Management - Minimum Graduation Requirements

- 18 Credit-Hours in Management Core Courses
- 12 Credit-Hours in MBA Core Courses
- 9 MBA Emphasis Area
- 39 Total Credit-Hours**

Project Management - Minimum Graduation Requirements

- 18 Credit-Hours in Management Core Courses
- 12 Credit-Hours in MBA Core Courses
- 9 MBA Emphasis Area
- 39 Total Credit-Hours**

MASTER OF BUSINESS ADMINISTRATION CURRICULUM

Management Core Courses (18 Credit-Hours)

Course	Title	Credit-Hours
MGM 5500	Managerial Accounting	3
MGM 5700	Probabilities and Statistical Methods	3
MGM 6070	Human Resources Management	3
MGM 6560	Management of Information Systems	3
MGM 6620	Managerial Finance	3
MGM 6690	Decision Making Techniques	3
Total		18

MBA Core Courses (12 Credit-Hours)

Course	Title	Credit-Hours
MBA 5600	Managerial Economics	3
MBA 5700	Managerial Marketing	3
MBA 6830	Operations Management	3
MBA 6900	Strategic Management	3
Total		12

MASTER OF BUSINESS ADMINISTRATION **Emphasis Areas**

Accounting (9 Credit-Hours)

Course	Title	Credit-Hours
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ACC 6500	Accounting Information Systems	3
ACC 6600	Advanced Auditing	3
ACC 6800	Advanced Financial Accounting	3
Total		9

Computer Information Systems
(9 Credit-Hours)

Course	Title	Credit-Hours
CIS 6605	Data Base Management Systems	3
CIS 6615	Software Engineering for Business	3
CIS 6705	Data Communication and Computer Networks	3
Total		9

General Management
(9 Credit-Hours)

Any three courses from any MBA emphasis areas

Course	Title	Credit-Hours
MBA ____	MBA Emphasis Course	3
MBA ____	MBA Emphasis Course	3
MBA ____	MBA Emphasis Course	3
Total		9

Healthcare Management
(9 Credit-Hours)

Course	Title	Credit-Hours
HCM 6500	Healthcare Management I	3
HCM 6600	Healthcare Management II	3
HCM 6800	Healthcare Ethics	3
Total		9

International Enterprises Management
(9 Credit-Hours)

Course	Title	Credit-Hours
MIE 7010	International Business Operations	3
MIE 7020	International Business Strategies	3
MIE 7110	International Finances	3
Total		9

Project Management
(9 Credit-Hours)

Course	Title	Credit-Hours
PJM 6500	Project Management: Initiation, Implementation, and Termination	3
PJM 6600	Project Risk Management	3
PJM 6800	Project Procurement and Solicitation	3

Total 9

COURSE DESCRIPTIONS

Management Core Courses

MGM 5500 - MANAGERIAL ACCOUNTING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This is a graduate course where the accounting principles and techniques for making decisions are taught. The role of decision criteria based on General Accepted Accounting Principles and others is explained in detail. Therefore, this course provides the essential information that the manager or businessman needs to have control of the firm in order to obtain his objectives effectively and efficiently.

MGM 5700 – PROBABILITY AND STATISTICAL METHODS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This is a graduate course in relevant business statistics emphasizing applications specific to engineering disciplines. In this course various probability and statistical methods to sample, measure of dispersion and skewness, probability distributions are studied. Also testing hypothesis and making decisions, analysis of variance, chi-square analysis and linear regression and correlation are examined. Advanced topics such as nonlinear regression, multivariable analysis, time series analysis and exploratory data analysis are introduced. Case studies of quality control and engineering decisions are assigned and discussed.

MGM 6070 – HUMAN RESOURCES MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Psychology concepts and corresponding methodology to manage human resources in scientific and technical enterprises. Techniques for hiring, benefits, incentives, promotion, retention, development, replacement of personnel, and creativity, among others are discussed emphasizing the human dimension. Techniques to solve complaints, insubordination, and violations of regulations are introduced.

MGM 6560 – MANAGEMENT OF INFORMATION SYSTEMS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Information systems that provide support for management in areas such as finance, manufacturing, cost estimation, and marketing. Introduction to analysis of data flow diagrams, databases, and data communication are introduced.

MGM 6620 – MANAGERIAL FINANCES

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MGM 5500

Financial concepts encountered in engineering. Situations are introduced based on the fact that they are an integral part of planning, organizing, directing, and controlling activities. The financial cycle budgeting, accounting, controlling, and auditing is discussed.

MGM 6690 – DECISION MAKING TECHNIQUES

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MGM 5700

This is a graduate course where the scientific management methods for making decisions and solving administrative problems are taught. The role of decision criteria and subjective factors, Bayesian analysis, advanced decision-making methods, linear programming, and analysis of alternatives are discussed. Also, the value of reliable and representative information, utilization of statistical

information, strategic analysis and projections, forecasting, PERT, CPM and other management techniques to solve problems are introduced.

Accounting Courses

ACC 6500 – ACCOUNTING INFORMATION SYSTEMS

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ACCO 3330, ACCO 3340, MGM 6560

An introduction to accounting information systems (AIS) and the relationship of AIS to Management Information Systems. Includes analysis of hardware and software, system design and the systems development life cycle (SDLC) approach, database management systems (DBMS), internal control, flowcharting, data flow diagrams and their application to the accounting cycles (revenue, expenditure, conversion). Microsoft Access will be used to develop a basic system.

ACC 6600 – ADVANCED AUDITING

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ACCO 3330/3340, ACCO 4320

A study of modern auditing techniques. Includes tools and techniques of risk assessment, the audit risk model and the audit plan. The implications and auditing of information systems and technology, GAAS and PCAOB standards, ethics and the Sarbanes-Oxley requirements.

ACC 6800 – ADVANCED FINANCIAL ACCOUNTING

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: ACCO 3330/3340

A study of theory and techniques preparing consolidated financial statements, partnerships, foreign subsidiary accounting and non-profit accounting.

Computer Information Systems Courses

CIS 6605 – DATA BASE MANAGEMENT SYSTEMS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course presents methodologies and principles of database design. The focus is on database architectures, logical modeling, the relational model, and database design process and techniques. Topics covered include the entity relationship model, the relational model, relational operators, integrity constraints, the SQL language, and data normalization. Also included are topics in distributed databases, object-oriented databases, and security issues.

CIS 6615 – SOFTWARE ENGINEERING FOR BUSINESS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Basic concepts of software requirements generation and analysis, software design, structured design methodologies, data flow design, and programming of an engineering system and testing.

CIS 6705 – DATA COMMUNICATION AND COMPUTER NETWORKS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Recent advances and new applications in the expanding field of computer networks and distributed systems are examined. The technical fundamentals, architecture, and design of computer networks and distributed systems are described. Strategies, tools, and techniques for network planning, implementation, management, maintenance, and security are delineated. Topics include ISDN, and ATM, the OSI model, transmission media, network operating systems, topologies, configuration protocols, and performance characteristics. Trends in standardization, internetworking, downsizing, and the development of local-networks (LANs), wide-area networks (WANs), metropolitan-area networks (MANs), and enterprise-wide networks are explored.

General Management Courses

Students select any three courses from MBA emphasis areas.

Healthcare Management Courses**HCM 6500 – HEALTHCARE MANAGEMENT I**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course provides an overview of the history, structure, and current perspectives of the US healthcare system. The course examines topics such as: cost, financing, access to healthcare, information management systems, public health, and systems for delivery of healthcare are covered.

HCM 6600 – HEALTHCARE MANAGEMENT II

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course offers a global perspective on how the United States and other countries address issues of health and health care. The course reviews organizational principles, practices, and the management of health service organizations.

HCM 6800 – HEALTHCARE ETHICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course discusses ethical issues in the healthcare field. Cases and a variety of topics related to the healthcare field are discussed.

International Enterprises Management Courses**MIE 7010 – INTERNATIONAL BUSINESS OPERATIONS**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course examines the basics of international business operations. The course begins discussing the global environment and reasons for an organization to become global, including the two main ways about how international business takes place. Then, the characteristics of multinational companies will be explained, followed by global competitiveness and affairs. Among the material that will be covered are Michael Porter's diamond theory of international competitiveness, the latest work in the theory of multinational enterprises, global markets, and new research on organizational learning within corporations.

MIE 7020 – INTERNATIONAL BUSINESS STRATEGIES

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course examines international business strategies using an integrative approach, specially set around the questions of "how functional strategies are integrated?" It begins discussing functional international strategies and explaining actual actions by global companies in different global settings. Then, an integrative approach for global strategy will be taken. Among the materials that will be covered are foreign exchange rate management (currency swapping), "absolute" and "comparative" advantages in developing multinational strategies, and strategies for doing business in the "triad" markets.

MIE 7110 – INTERNATIONAL FINANCES

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Financial concepts encountered in engineering situations are presented based on the fact that they are an integral part of planning, organizing, directing, and controlling, and auditing is discussed. The general goal is to provide the necessary knowledge to the student about different financial concepts that a manager of scientific and technological activities uses in order to prepare budgets, secure funding, analyze financial alternatives and control expenses.

MBA Core Courses

MBA 5600 – MANAGERIAL ECONOMICS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Most relevant points regarding supply and demand, analysis of consumer behavior, analysis of production cost, main structures of the marketplace, linear programming, the economic systems, and development of economic concepts and macro- economics.

MBA 5700 – MANAGERIAL MARKETING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

The study of the strategic process of creating time and place utilities. It deals with how to identify customer's needs, change those needs to wants, and sustain the desire of the particular product (service or good). How this process can be applied to profit and non-profit organizations.

MBA 5800 – LEADERSHIP

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course is organized around the concept that leadership involves influencing others in a non- coercive manner where capital reigns, competitive advantage occurs when an organization utilizes the knowledge and experience of all its members. "Command and control" leadership styles are limited to specific emergency circumstances. Instead, leaders should direct their efforts toward shared goals, collaborative methods and leverage the leadership potential of all members of the entire organization. The course integrates current research on leadership and real-world business events. The design offers an experiential, practical, and theoretical approach to understanding the qualities, characteristics, styles, and behaviors of successful leaders. The course also provides participants to focus on their own leadership abilities and to explore strategies for building teamwork, motivation, creativity, effective communication, conflict resolution, strategic leadership, and innovative leadership practices that enhance innovation and organizational performance.

MBA 6830 – OPERATIONS MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None.

This is a graduate course in manufacturing techniques. In this course the student will acquire deep knowledge of the tools, techniques and types of manufacturing processes and management of the production planning, schedule, and operation. Topics such as Production and Inventory Control, just-in-time, total quality control, statistical process control, waste analysis, work measurement and world class Manufacturing will be discussed. Also cover manufacturing systems such as factory layout, machine center, robotics, sensing, manufacturing cells and automated factories will be included.

MBA 6900 – STRATEGIC MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: 27 credits approved.

The corporate world is becoming a very different place. Mergers and acquisitions have transformed the landscape. International boundaries are fading in importance as businesses take on a more global perspective, and the technology of the "Information Age" is narrowing the time it takes to communicate and make decisions. Business Policy or Strategic Management takes a panoramic view of this changing corporate terrain. This course unifies the various departments, majors, and sub discipline found in a business school. The material of this course will be explained in the context of cases which have been class tested and revised based on the feedback from those classes. The firms range in size and maturity from large, established multinational to small, entrepreneurial ventures, and cover a broad range of issues and address questions raised. The students are expected to have a general knowledge of the basic business functions; finance, marketing, operations management, accounting, quantitative methods, and human resources.

Project Management Courses

PJM 6500 – PROJECT MANAGEMENT: INITIATION, IMPLEMENTATION, AND TERMINATION

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course introduces project management fundamentals and principles from the perspective of a manager, who must organize, plan, implement and control non-routine activities to achieve schedule, budget, and performance objectives. Topics include project selection, organization and charters, planning, conflict and negotiation, budgeting, cost estimation, scheduling, monitoring, controlling, auditing, and termination.

PJM 6600 – PROJECT RISK MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course addresses the important elements of risk management. The coursework also explores the risk management processes outlined in the Project Management Body of Knowledge (PMBOK) Guide. Topics include risk management planning, risk identification, risk analysis, development of appropriate responses, and risk monitoring and control.

PJM 6800 – PROJECT PROCUREMENT AND SOLICITATION

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course presents the major processes through which goods and services are acquired in the project management environment. Topics include planning, solicitation, source selection, contract administration, and contract closeout.

MASTER IN ENGINEERING MANAGEMENT

The Master in Engineering Management (MEM) program prepares engineers and other degrees associated with the engineering field for managing complex technological organizations in service and manufacturing industries. The program of study is multi and intra disciplinary, merging the latest development in management and technology theory and practices. The program design aims at developing the knowledge, abilities, and judgment to become a successful manager and entrepreneur using best practices, techniques and paradigms of project management, supply chain operations and system thinking. Therefore, it provides a well-balanced education among management and business thinking, engineering judgment, and technological operations.

Program Philosophy and Objectives

The combination of management concepts and technical skills presented in the MEM Program allows graduates from this program to acquire the managerial skills necessary to advance in today's technologically driven organizations, in either the service or manufacturing sector. Emphasizing the continuity of management and engineering related efforts from planning through development, operations and controlling, and stressing the application of management and system theory and techniques to increase the efficiency and effectiveness of the organization, is one key issue facing many organizations. Based on these realities the Program stresses the importance of using practices of project and program management, management information systems, organizational behavior, and system operations. It is amply confirmed that the MEM Program is well designed to develop future industry leaders by combining a core management curriculum with a master's level education. The goals of the Program are:

- To help students understand the management dimension, and advantages in technological driven organizations.
- To gain experience using management methods of a quantitative nature to design and efficiently operate today's technically involved business systems.
- To demonstrate an understanding of management and organizational theory and the principles of organized labor as they apply to the efficient and effective operation of the organization.
- To develop skills and competencies related to a broad range of management functions, allowing the student to work in fields of management, in organizations of varying size, requiring strategic planning, technical knowledge, development skills, and general operational knowledge of management.

General Admission Requirements and Procedures

Admission Requirements

The MEM program is subject to the general admission requirements of the PUPR Orlando Campus. The admission requirements specific to the MEM program are as follows:

- Complete an application for admission. All applicants must have obtained a minimum undergraduate GPA of 2.50/4.00
- Possess an undergraduate degree in Engineering, Architecture or Business from an accredited college or university.
- Submit an official transcript from the college or university that conferred the bachelor's degree. Transcript(s) should be sent directly from the institution(s) to Polytechnic University.
- Pay fifty dollars (\$60.00) nonrefundable application fee. The application fee will not be applicable towards the student's registration charges. Fee is valid for two consecutive quarters.

Graduation Requirements

The MEM degree requires a minimum of 39 credit-hours of graduate course work with a minimum grade point average of 3.00. No thesis is required.

Degree Offered

The program offers graduate instruction leading to the Master of Engineering Management Degree. The emphasis areas are:

- **Construction Management**

Provides managerial knowledge essential in the utilization of different and available information systems in managing construction projects from their initial design, cost estimates, labor organization, contracts, and construction management. Real situations are emphasized. The contractor is visualized as a manager who has to administer each phase of the project.

- **Environmental Management**

Provides managerial knowledge that will enable engineers to administer and take charge of, and control projects and processes to minimize environmental pollution. Federal and state laws that regulate the handling, disposal, treatment of contaminants and environmental protection will be stressed. Awareness will be created in the student about environmental problems in Puerto Rico and engineering methods and processes required to minimize and decrease environmental pollution.

- **Manufacturing Management**

Provides managerial knowledge required to administer the design, implementation, operation, maintenance, and quality control in the complex technical processes of manufacturing. A substantial number of courses in this specialization are geared toward quality control and modern productivity techniques.

- **Project Management**

Provides the managerial knowledge critical for any engineer to carry out planning, organization, and improving processes to reach successful results in a project. Nowadays, Project Management is essential for professionals in multiple disciplines like healthcare, construction, manufacturing, and services. The professionals in this discipline develop excellent communication, time management, problem-solving, and leadership skills. In addition, they learn technical aptitudes related to engineering. The project management courses discuss and cover the project phases of initiation, implementation, and termination. Students will also have the opportunity to learn about risk management, procurement, and solicitation.

- **General Engineering Management** - (The student selects any of the three emphasis courses from the abovementioned areas.)

Career Opportunities

The complete experience is stimulating and offers outstanding career opportunities. The graduates from this program will be adequately qualified to perform effectively as managers of technological or scientific enterprises. The Program has been particularly structured to fit the needs of engineers in Puerto Rico and USA. Also, through its areas of emphasis, it provides an opportunity to hold leadership positions in managing business firms in Manufacturing, Public and Service Enterprises, Construction and Environmental Management.

MASTER IN ENGINEERING MANAGEMENT (MEM) EMPHASIS AREAS

Construction Management - Minimum Graduation Requirements

- 18 Credit-Hours in Management Core Courses
- 12 Credit-Hours in MEM Core Courses
- 9 Credit-Hours MEM Emphasis Area
- 39 Total Credit-Hours**

Environmental Management - Minimum Graduation Requirements

- 18 Credit-Hours in Management Core Courses
- 12 Credit-Hours in MEM Core Courses
- 9 Credit-Hours MEM Emphasis Area
- 39 Total Credit-Hours**

Manufacturing Management - Minimum Graduation Requirements

- 18 Credit-Hours in Management Core Courses
- 12 Credit-Hours in MEM Core Courses
- 9 Credit-Hours MEM Emphasis Area

39 Total Credit-Hours**Project Management - Minimum Graduation Requirements**

18 Credit-Hours in Management Core Courses

12 Credit-Hours in MEM Core Courses

9 Credit-Hours MEM Emphasis Area

39 Total Credit-Hours**General Engineering Management - Minimum Graduation Requirements**

18 Credit-Hours in Management Core Courses

12 Credit-Hours in MEM Core Courses

9 Credit-Hours MEM Emphasis Area

39 Total Credit-Hours**MASTER IN ENGINEERING MANAGEMENT CURRICULUM****Management Core Courses**

(18 Credit-Hours)

Course	Title	Credit-Hours
MGM 5500	Managerial Accounting	3
MGM 5700	Probabilities and Statistical Methods	3
MGM 6070	Human Resources Management	3
MGM 6560	Management of Information Systems	3
MGM 6620	Managerial Finance	3
MGM 6690	Decision Making Techniques	3
Total		18

MEM Core Courses

(12 Credit-Hours)

Course	Title	Credit-Hours
MEM 5600	Engineering Economics Analysis	3
MEM 6110	Engineering Management I	3
MEM 6120	Engineering Management II	3
MEM 6200	Engineering Management Project	3
Total		12

MASTER IN ENGINEERING MANAGEMENT**EMPHASIS AREAS****Construction Management**

(9 Credit-Hours)

Course	Title	Credit-Hours
MEM 6170	Cost Estimation and Contracting	3
MEM 6410	Construction Management	3
MEM 6820	Business and Construction Law	3
Total		9

Environmental Management

(9 Credit-Hours)

Course	Title	Credit-Hours
MEM 6910	Air Quality	3
MEM 6915	Water Quality	3
MEM 6940	Introduction to Pollution Control of Earth Systems	3
Total		9

General Engineering Management

(9 Credit-Hours)

Any three courses from any MEM emphasis areas

Course	Title	Credit-Hours
MEM _____	MEM Emphasis Course	3
MEM _____	MEM Emphasis Course	3
MEM _____	MEM Emphasis Course	3
Total		9

Manufacturing Management

(9 Credit-Hours)

Course	Title	Credit-Hours
MEM 6420	Maintenance Management	3
MEM 6610	Productivity Management	3
MBA 6830	Operation Management	3
Total		9

Project Management

Course	Title	Credit-Hours
PJM 6500	Project Management: Initiation, Implementation & Termination	3
PJM 6600	Project Risk Management	3
PJM 6800	Project Procurement and Solicitation	3
Total		9

COURSE DESCRIPTIONS**Management Core Courses****MGM 5500 - MANAGERIAL ACCOUNTING**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This is a graduate course where the accounting principles and techniques for making decisions are taught. The role of decision criteria based on General Accepted Accounting Principles and others is explained in detail. Therefore, this course provides the essential information that the manager or businessman needs to have control of the firm in order to obtain his objectives effectively and efficiently.

MGM 5700 - PROBABILITY AND STATISTICAL METHODS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This is a graduate course in relevant business statistics emphasizing applications specific to engineering disciplines. In this course various probability and statistical methods to sample, measure of dispersion and skewness, probability distributions are studied. Also testing hypothesis and making decisions, analysis of variance, chi-square analysis and linear regression and correlation are examined. Advanced topics such as nonlinear regression, multivariable analysis, time series analysis and exploratory data analysis are introduced. Case studies of quality control and engineering decisions are assigned and discussed.

MGM 6070 - HUMAN RESOURCES MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Psychology concepts and corresponding methodology to manage human resources in scientific and technical enterprises. Techniques for hiring, benefits, incentives, promotion, retention, development, replacement of personnel, and creativity, among others are discussed emphasizing the human dimension. Techniques to solve complaints, insubordination, and violations of regulations are introduced.

MGM 6560 - MANAGEMENT OF INFORMATION SYSTEMS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Information systems that provide support for management in areas such as finance, manufacturing, cost estimation, and marketing. Introduction to analysis of data flow diagrams, databases, and data communication are introduced.

MGM 6620 - MANAGERIAL FINANCES

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MGM 5500

Financial concepts encountered in engineering. Situations are introduced based on the fact that they are an integral part of planning, organizing, directing, and controlling activities. The financial cycle budgeting, accounting, controlling, and auditing is discussed.

MGM 6690 - DECISION MAKING TECHNIQUES

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MGM 5700

This is a graduate course where the scientific management methods for making decisions and solving administrative problems are taught. The role of decision criteria and subjective factors, Bayesian analysis, advanced decision-making methods, linear programming, and analysis of alternatives are discussed. Also, the value of reliable and representative information, utilization of statistical information, strategic analysis and projections, forecasting, PERT, CPM and other management techniques to solve problems are introduced.

General Engineering Management Courses

Student selects any three courses from MEM emphasis areas.

Construction Management Courses

MEM 6170 - COST ESTIMATION AND CONTRACTING

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course takes the engineer to cover in depth the fundamental principles that govern public enterprises such as government departments, public instrumentalities, state, and municipal government, etc. Probability and decision theory in cost- effectiveness studies, profit and risk analysis are also covered.

MEM 6410 – CONSTRUCTION MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

The management of construction is at one time an art and a science. Both have to deal with planning, scheduling, controlling, and following different activities of great diversity such as cost estimating, scheduling, contracting, insuring, accounting, labor relations, etc. At times, the manager must use highly quantitative methods while at other times the intuitive or empirical approach is all what is available. Therefore, construction and maintenance managers must be masters of a wide range of qualitative and quantitative subjects. Consequently, he must possess a very high level of competency in a large number of areas. This course is designed to help students gain a perspective regarding the construction industry and some cross-sectional understanding of the things to be mastered if they wish to be successful as construction managers.

MEM 6710 – PROFESSIONAL ETHICS AND PUBLIC POLICY

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course permits the engineer to imbue in the law and codes professional ethics that govern public enterprises such as government departments, public instrumentalities, state and municipal governments and professional ethics.

MEM 6820 – BUSINESS AND CONSTRUCTION LAW

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Concepts of business and construction law in general are covered. This course is designed to provide students with the professional skills of understanding the clauses and applications of commercial law emphasizing construction litigation.

Environmental Management Courses

MEM 6910 – AIR QUALITY

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course will be covering several topics regarding the air quality and pollution control. Some of the topics that will be studied in this course are as follows: Indoor Air, The Atmosphere, Ozone Depleting Substances (Montreal Protocol), Aldrin Inhalation Toxicity Weight (TRI), Banned or Severely Restricted Pesticides (USEPA), Explanation of Criteria, Air Pollutant: Rank States, Particulate Size 10 microns Pollution Locator: Criteria Air Pollutants, Lead, Particulate Size 2.5 Microns, Respiratory Toxicity Health Effects, Greenhouse Gases, (Intergovernmental Panel of Climate Change), EPA'S National Ambient Air Quality Standards, The Standard Review and Re-evaluation Process, Introduction to Air-Pollution Control, Air Pollution Effect, and Environmental Preservation.

MEM 6915 – WATER QUALITY

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course exposes the student to different methods of water purification for commercial and industrial use, wastewater treatment and disposal, and topics associated with water quality.

MEM 6940 – INTRODUCTION TO POLLUTION CONTROL OF EARTH SYSTEMS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

The course presents the concept of the earth as an integrated system, where human activity, based on the use of natural resources for material development, generates impacts on the environment, interfering with ecology, and creating scenarios that present challenges related to human health and a balanced environmental.

Manufacturing Management Courses

MEM 6420 – MAINTENANCE MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course is designed to help students gain a perspective regarding the maintenance of buildings and industries and some cross-sectional understanding of managers. New administrative and management tools and methodology specific to maintenance activities are covered. Students will learn how to manage the resources: money, machines, materials, and personnel that are basic to realize effective maintenance.

MEM 6610 – PRODUCTIVITY MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course moves the engineer through the different approaches to Total Quality Management. Total Quality Management is a system to effectively achieve institutional goals with the active participation of all the employees, clients, and suppliers. Through the course traditional management for productivity techniques, TQM, Crosby, Juran and Deming philosophies are discussed. The concepts of quality cycles, changes in institutional culture, zero defects, corrective action, productivity measurements, error cause removal, Pareto Principle, etc., are discussed.

MBA 6830 – OPERATIONS MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None.

This is a graduate course in manufacturing techniques. In this course, the student will acquire deep knowledge of the tools, techniques and types of manufacturing processes and management of the production planning, schedule, and operation. Topics such as Production and Inventory Control, just-in-time, total quality control, statistical process control, waste analysis, work measurement and world class Manufacturing will be discussed. Also cover manufacturing systems such as factory layout, machine center, robotics, sensing, manufacturing cells and automated factories will be included.

MEM Core Courses

MEM 5600 – ENGINEERING ECONOMIC ANALYSIS

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This is a graduate course in engineering analysis emphasizing the planning and control of engineering economics including manufacturing costs. In this course project cost evaluation including interest rates and continuous compounding, present worth and capitalized cost, is discussed. Methodology to determine rate-of-return for various alternatives, benefit/cost ratio evaluation, replacement analysis and others are described. The preparation of cash-flow diagrams and introduction to cost estimation are studied. Determination of break-even values, sensitivity analysis and decision trees and introduction to value engineering techniques is included.

MEM 6110 – ENGINEERING MANAGEMENT I

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

In depth discussion of the elements of modern management and business practices is conducted. This course is designed to provide student without specialized business training to understand the principles used by professionally trained managers to guide the typical industrial and business enterprise.

MEM 6120 – ENGINEERING MANAGEMENT II

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MEM 6110

This course enables students to deepen the understanding of fundamental concepts and principles of general management emphasizing their application in technological and scientific organizations in industry and government. For the purpose of the study of management, one needs to perceive all major functions in some coherent framework. Such a framework is provided by breaking down the totality of the management process into its four major components: planning, organizing, leading and controlling. In this course, the student will explore the concepts that provide the foundations for these four managerial functions.

MEM 6200 – ENGINEERING MANAGEMENT PROJECT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MEM 6120

This is a project course that provides the opportunity to apply concepts and methods previously studied to the solution of problems in engineering management. Students will work individually on problems proposed by the student and approved by the professor.

Project Management Courses

PJM 6500 – PROJECT MANAGEMENT: INITIATION, IMPLEMENTATION, AND TERMINATION

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course introduces project management fundamentals and principles from the perspective of a manager, who must organize, plan, implement and control non-routine activities to achieve schedule, budget, and performance objectives. Topics include project selection, organization and charters, planning, conflict and negotiation, budgeting, cost estimation, scheduling, monitoring, controlling, auditing, and termination.

PJM 6600 – PROJECT RISK MANAGEMENT

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course addresses the important elements of risk management. The coursework also explores the risk management processes outlined in the Project Management Body of Knowledge (PMBOK) Guide. Topics include risk management planning, risk identification, risk analysis, development of appropriate responses, and risk monitoring and control.

PJM 6800 – PROJECT PROCUREMENT AND SOLICITATION

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This course presents the major processes through which goods and services are acquired in the project management environment. Topics include planning, solicitation, source selection, contract administration, and contract closeout.

GRADUATE SCHOOL FACULTY

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DECLARATIONS AND CERTIFICATIONS

NON-DISCRIMINATION CLAUSE

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

FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA)

STUDENTS' RIGHTS TO KNOW UNDER THE FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA)

Students' Annual Notice

Each year, Polytechnic University of Puerto Rico informs students about the Family Educational Rights and Privacy Act enacted in 1974 (FERPA.) This Law, with which the University will totally comply, was designed to protect the privacy of student's academic records, to establish the student's rights to inspect and review their educational records, and to provide guides in cases where incorrect or misleading information must be corrected through formal or informal hearings. Students will also have the right to file complaints concerning alleged failure by the University in complying with the Law.

Our institutional policy explains in detail the procedure which Polytechnic University of Puerto Rico will follow to comply with the provisions of the Law. This policy can be found in the Institutional Catalog at www.pupr.edu.

Questions related to this Law will be referred to the Vice Presidency for Enrollment Management and Student Services. The student who files a complaint and who considers that the decision granted has been unfair or does not conform to the dispositions within the Law, may request in writing the mediation of the Vice Presidency of Enrollment Management and Student Services. As an additional resource, the student who considers that his/her rights have been violated can file a complaint with the Family Educational Rights and Privacy Act Office, Department of Education, Office 4074, Switzer Building, Washington, D.C. 20201. This complaint must be related to alleged deficiencies incurred by Polytechnic University of Puerto Rico in complying with FERPA.

PUBLIC NOTICE DESIGNATING WHAT IS DIRECTORY INFORMATION

Through these means, Polytechnic University of Puerto Rico designates the following categories of information about students as public information or Directory Information. This information may be divulged by Polytechnic University of Puerto Rico for any particular purpose, and at its discretion.

Category I	Name, address, telephone number, attendance date, courses.
Category II	Institutions previously attended, specialized fields, awards, honors (including Dean's List,) and degrees obtained, including dates.
Category III	Present and past participation in sports and officially recognized activities, physical appearance (height, weight) of athletes, place, and date of birth.

If you wish to request that no Directory Information be divulged, please contact the Registrar's Office at registro@pupr.edu. Polytechnic University of Puerto Rico understands that if a student does not make this request to prevent information from being divulged, the information can be made public.

RESERVATION OF THE RIGHT TO MODIFY THE CATALOG

The provisions of the various sections of this Catalog are to be considered directive in character and not as an irrevocable contract between the student and the University. The University reserves the right to make any changes that are deemed necessary or desirable.

APPROVAL OF THE CATALOG

I certify that this Catalog has been approved for distribution for the academic years 2023 - 2024.

A handwritten signature in blue ink, appearing to read "Ernesto Vazquez", with a stylized flourish at the end.

Ernesto Vazquez Martínez, BSIE, MBA
President
Polytechnic University of Puerto Rico