University of Puerto Rico at Bayamón
Department of Computer Science

ABET Self-Study Report 2012

for the

Bachelor in Computer Science
Applied Computer Science Emphasis Area
Information Systems and Technology Emphasis Area

Contact Information

Dr. Arturo Avilés
Chancellor
University of Puerto Rico at Bayamón
170 Carr. 174, Industrial Minillas
Bayamón, PR 00959
Phone: 787-993-8850
Fax: 787-993-8900

Dr. Edna Miranda
Dean for Academic Affairs
Phone: 787-993-8860
Fax: 787-993-8912
edna.miranda1@upr.edu

Prof. Antonio Huertas
Department Chair
Phone: 787-993-8878
Fax: 787-993-8918
antonio.huertas@upr.edu

Dr. Juan Solá-Sloan
Accreditation Coordinator for Applied Computer Science
Phone: 787-993-0000 x 3310
Fax: 787-993-8918
juan.sola@upr.edu

Prof. Omar Diaz
Accreditation Coordinator for Information Sys. and Tech.
Phone: 787-993-0000 x 3310
Fax: 787-993-8918
omar.diaz4@upr.edu

Contents

List of Tables

List of Figures

Acronyms

AAC	Accreditation and Assessment Committee
ABET	Accreditation Board of Engineering and Technology
AECC	Computer Science Student Association (acronym is in Spanish)
APAD	Puerto Rico Distance Learning Association (acronym is in Spanish)
CAC	Computing Accreditation Commission
CEEB	College Entrance Examination Board
CS	Computer Science
CIW	Continuous Improvement Website
DAA	Dean of Academic Affairs
DAdA	Dean of Administrative Affairs
DSA	Dean of Student Affairs
EAB	External Advisory Board
EOs	Educational Objectives
IS	Information Systems
ISOC	Internet Society (of Puerto Rico)
PI	Performance Indicators
SIS	Student Information System
UPRB	University of Puerto Rico at Baymón
UPR	University of Puerto Rico

Background Information

1.1 Brief History of The University of Puerto Rico at Bayamón and the Computer Science Program

In 1947, the government of Puerto Rico embarked in an industrial program known as Operation Bootstrap[1]. It marked the beginning of an industrial planning based on external capital and tax exemptions. Puerto Rico entered into a period of rapid industrialization and strong economic growth. This period of prosperity lasted for several decades.

The need to provide more educational opportunities of post secondary nature was evident as an outcome of Operation Bootstrap. From 1962 to 1966, the university authorities as well as the legislature of Puerto Rico established public policy to create an integrated network of regional colleges within the UPR system. The main purpose was to address the student overpopulation in the main campuses. Also, it was envisioned that these colleges include "semi-professional" programs for students who wanted to focus in a specific technical skill, within their second year of studies. In 1970, the Administration of Regional Colleges[2] of the University of Puerto Rico was created. Its mission was to "provide opportunities for university education and academic training programs for careers of complementary and superior technical nature, according to the needs and aspirations of the communities within they are established." These colleges were subjected to the

---

[1] Operación "Manos a la Obra,"

[2] "Administración de Colegios Regionales" (ACR) in Spanish

"comprehensive development plan of the University of Puerto Rico".

The Bayamón Regional College[3] of the University of Puerto Rico was founded in 1971. The municipality of Bayamón donated a tract of land in Road 174 within Minillas Industrial Area. The college objectives were: (1) offer instruction at the university level, (2) develop two-year technical programs of occupational nature, (3) develop two year programs in liberal arts that would facilitate the transfer to bachelor degree programs on the main campuses of the UPR system[4]. Based on these objectives, the Bayamón Regional College was the first college of the UPR System which featured a wide range of technical programs. Original enrollment was 515 students in 1971-1972 and reached 1,300 in 1972-1973. As construction of more buildings advanced during the decade, it eventually reached an enrollment of around 5,000 students.

The Associate Degree in Computer Science was created in 1971. It was the first Computer Science program among the UPR regional colleges and campuses back then. Also, it was the program with the highest enrollment rate. The program was created in order to satisfy the need for computer programmers due to the establishment of several industries during the end of the '60s and '70s.

The government of Puerto Rico approved a proposal for the expansion of the Bayamón Regional College on January 30, 1979. Academic offerings were expanded to include bachelor degrees in technical areas for the 1979-80 academic year. The bachelor degrees approved in the proposal were: (a) Business Administration, (b) Electronics, (c) Secretarial Science, and (d) *Computer Science*. The main purpose of the bachelor degree was to provide depth and breath in several areas that the associate degree did not cover. The name of the institution was changed to Bayamón Technological University College[5].

In 1998, the Board of Trustees approved the conversion of the Bayamón Technological University College into an autonomous unit within the University of Puerto Rico system. The institution name changed to Bayamón University College, and to the University of Puerto Rico at Bayamón (UPRB) in the year 2000. This change was evident since the institution evolved from a two-year institution into a four-year institution[6].

In 2000, a committee of 5 professors and 1 student requested the moratorium of the Associate Degree in Computer Science, based on the low enrollment rate for this degree. The president of the University of Puerto Rico signed Certification # 29 (2003-2004)

---

[3]The Bayamón Regional College was the name of our institution from 1971 to 1979

[4]Rio Piedras and Mayagüez Campuses

[5]"Colegio Universitario Tecnológico de Bayamón" in Spanish

[6]The UPR at Bayamón became the third largest institution of the UPR system

which formally approved the moratorium alongside with three other associate degree programs.

In 2008, the Bachelor Degree in Computer Science was revised to include two new emphasis areas: (1) Applied Computer Science and (2) Information Systems and Technology. Students were to select an area of emphasis during their sophomore year. The area of emphasis in Applied Computer Science focuses on the study and comparison of programming languages, the theory of computing, and the study of the scientific method. The area of emphasis in Information Systems and Technology focuses on the development and management of information systems for commercial organizations.

In February 2012, our department chair, Prof. Antonio Huertas, requested an official change in the name of our emphasis areas. The purpose was to eradicate the confusion that could arise from the use of the name of the Information Systems and Technology emphasis area. Information Technology is an area not currently offered. Also, it was proposed that the name of the Applied Computer Science emphasis area change just to Computer Science. The issue is currently been address by the Vice-president of Academic Affairs (VPAA). It is expected that this issue will be resolved prior the visit of the evaluation team.

1.2   Options

As mentioned in Section 1.1, the program offers two emphasis areas that are indicated on the student transcript: (1) Applied Computer Science and (2) Information Systems and Technology. Students select an area of emphasis during their sophomore year.

1.3   Organizational Structure

Figure 1.1 shows an organizational chart for the UPRB. A simplified version of an organizational chart for the UPR System, is presented on figure 1.2.
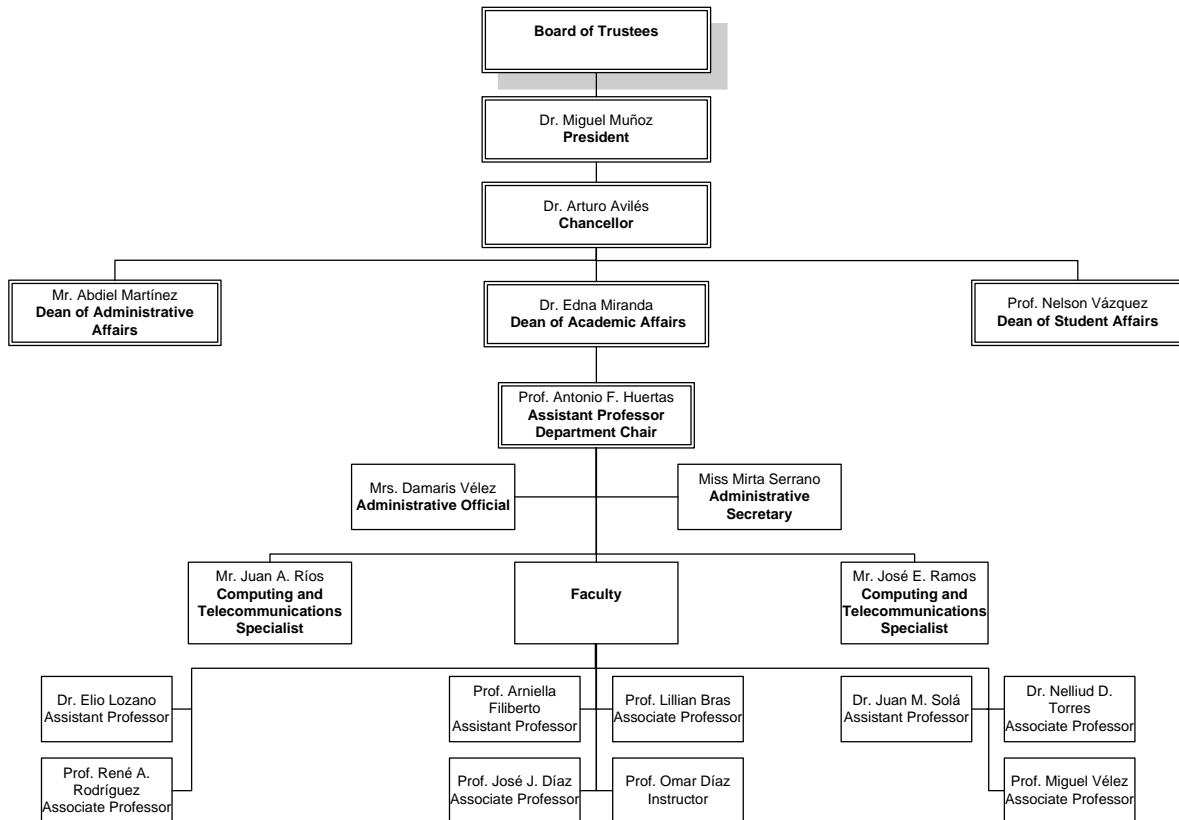
Figure 1.1: Organizational Chart of the UPRB and our Department
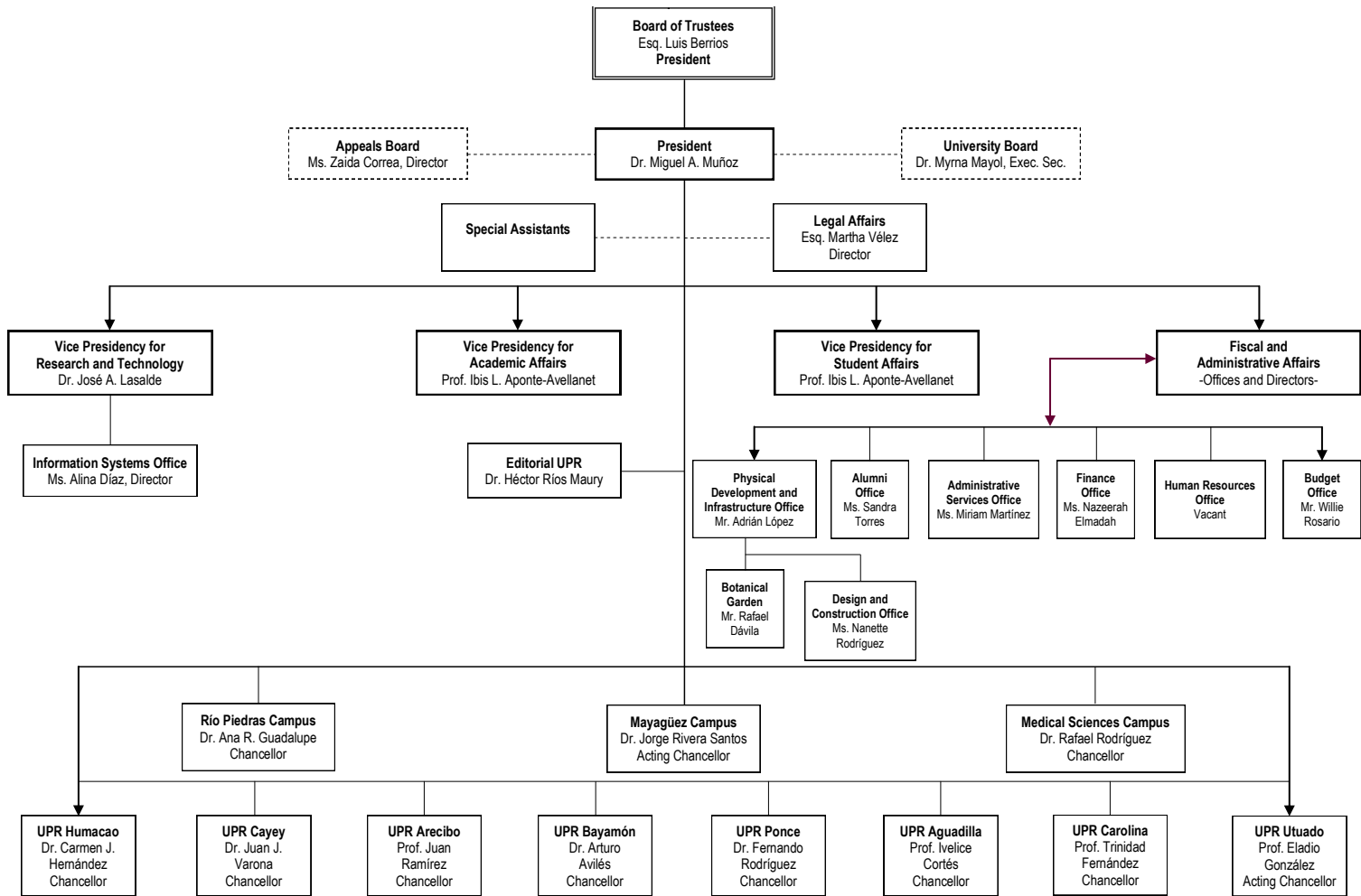
Figure 1.2: Simplified Organizational Chart of the UPR System

1.4 Services

The Computer Science Department is in the Academic Building II[7] in front of Building 100. Office hours of this Department are Monday through Friday from 7:00 a.m. to 12:00 p.m. and 1:00 p.m. to 4:30 p.m. The Department's telephone number is (787) 993-8862. You can also contact us via the main number which is (787) 993-0000, Ext 3300. The classrooms that are already in the Department are 110A, 110B, 110C, 124, 125A, 410, 801 and 806. More information about the facilities of our department and a map of the institution are available in Chapter 8.

1.5 Program Delivery Modes

Traditional lecture and laboratory courses are offered during the daytime. Evening classes are available for part time students.

1.6 Deficiencies, Weaknesses or Concerns Documented in the Final Report from the Previous Evaluation and the Actions taken to Address Them

This does not apply since this is an initial evaluation.

---

[7] "Académicos 2" in Spanish

Criterion 1. Students

2.1 Student Admissions

Applicants for UPRB need to fill out an admissions form and pay an application fee. Requirements include a high school diploma from a public or private high school. The school must be licensed by Puerto Rico's General Education Council or an equivalent entity. If proceeding from another state, a certified high school transcript is needed. The student has to pass the high school equivalence test given by the Department of Education if the student does not have a high school diploma. Applicants must also take the Scholastic Aptitude Test (Verbal and Mathematical) and the Scholastic Achievement Tests (Spanish, English and Mathematics) offered by the College Entrance Examination Board (CEEB). Applicants under 21 years of age must meet vaccination requirements.

The following elements are used as admissions criteria throughout the UPR System:

1. Verbal score in the Aptitude Test

2. Math score in the Aptitude Test

3. High school grade point average(GPA)

4. Special talents or abilities of the applicant

The first three elements are converted to a scale using a formula which yields the General Admissions Index (IGS in Spanish). The selection of candidates is made based on the IGS. The UPR Administrative Board certifies, on an annual basis, the General Admissions

Index and the number of applicants that will be admitted to the program according to the recommendations made by each Department. Table 2.1 includes the admission standards during the past five years, while Table 2.2 includes the data of enrollment trends for these same five years.

Academic Year	High School GPA		Composite CEEB Scores		Percentile Rank in High School		Number of New Students Enrolled
	Min	Avg.	Min	Avg.	Min	Avg.	
2006-2007	2.83	3.59	2447	2969	n/a	n/a	57
2007-2008	2.97	3.54	2185	2831	n/a	n/a	85
2008-2009	2.04	3.45	2101	2837	n/a	n/a	88
2009-2010	2.61	3.54	2217	2920	n/a	n/a	92
2010-2011	2.95	3.60	2099	2805	n/a	n/a	88

Table 2.1: Freshmen Admissions History for Last Five Years

	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011
Full-time Students	275	267	296	334	328
Part-time Students	96	99	83	77	80
Students Full Time Equivalent	324	322	341	379	370

Table 2.2: Enrollment Trends for Last Five Years

2.2 Evaluating Student Performance

This section presents the tools used by the Registrar's Office, Department Chair and the Professors for evaluating student performance.

The University of Puerto Rico at Bayamon (UPRB) has an in-house Student Information System (SIS) software. This system is used for evaluating student performance and monitoring academic progress. It contains data for all of UPRB's academic programs. The SIS includes:

- Information about required/core courses and their pre-requisites
- Course recommendations to the student based on current sequences
- Information regarding compliance with program graduation requirements.

15

The SIS keeps track of a student's progress through an academic program. Professors use the SIS to look at the official enrollment list. Also, Professors use the SIS to post student grades at the end of each academic term.

During the pre-registration period, each student receives an automated report containing suggested courses for the next semester. The student is allowed to make adjustments in his or her academic schedule within predefined parameters. Non-compliance with pre-requisites and co-requisites is avoided by software. If the student has not obtained a passing grade in a pre-requisite course, he or she is not allowed to register in the next course.

An automatic registration is generated for freshmen students on their first semester . Transfer courses for which a student has obtained credit are input manually into the student's electronic record.

Each transfer student is required to meet individually with either the department chair or any other designated person from the department's staff, if further advising is required. Also, students should meet with the department chair for solving any particular issues that might arise during the enrollment process.

Finally, if everything is Ok, the system validates the registration. If the student fails any of the current enrolled courses the system automatically drops continuation courses.

The Registrar's Office uses the SIS to generate a list of graduation candidates. The student must request graduation for further evaluation of its record. This record is finally evaluated by the program's chair. If favorable, a recommendation is made to the Registrar's Office to award the degree.

2.3 Transfer Students and Transfer Courses

There are two types of transfer categories at the UPR, each with its respective requirements: students from within the UPR system, and students from outside the UPR system.

2.3.1 Students From Within The UPR System

A transfer from one unit to another within the UPR System is possible for active and inactive students. Transfer requests are processed at each unit according to the academic

calendar. Students must meet these minimum requirements:

- If the student has less than 30 credits approved at the UPR system, then his/her academic progress must be satisfactory. He or she must also have a General Admission Index (IGS) above the minimum established by the university for the requested program.

- If the student has more than 30 credits approved at the UPR system, then his/her academic progress must be satisfactory and must meet the criteria established for the registered program. This is 2.85 GPA and either Pre-calculus passed or 6 credits in Mathematics with C grade or better.

2.3.2   Students From Outside the UPR system

Students attending or who have attended an accredited university but have not studied at the UPR system may apply for transfer to the UPRB. There are two ways to do so:

- If the student has less than 30 credits approved, then, his or her IGS must be above the minimum established for the year when the student was admitted to the university where he or she is currently studying or has studied.

- If he or she has 30 or more approved credits, he or she must meet the desired program's admission criteria and must show academic progress. This is 2.85 GPA and either Pre-calculus passed or 6 credits in Mathematics with B grade or better.

The Registrar's Office of the UPR unit where the student proceeds from must send the necessary documentation within the dates specified in the academic calendar of UPRB. The Registrar's Office sends the documents to the department chair for further evaluation. The Registrar's Office informs the final decision to the student.

Transfer requests for the spring semester are considered based on program availability. At the UPRB transfer students must also comply with residency requirements. Residency consists of completing at least the last 25% of courses required to complete the program from which graduation is desired. The UPRB reserves the right to determine which courses are accredited to students who transfer from other higher education institutions. Transfer requests have a $33.00 non-refundable fee. The request must be submitted to the UPRB Admissions Office before the deadline. Requests submitted after the deadline are considered late and have a fee of $49.50. Table 2.3 presents the number of students admitted through the transfer process for the past five years.

2.3.3 Reclasification

Reclassification is the process which allows students to switch to a different academic program within the same UPR campus. The following is required:

- If the student has less than 30 credits approved, then the student must also have a General Admission Index above the minimum established for the year in which he or she was admitted at the university. This is 2.85 GPA and either Pre-calculus passed or 6 credits in Maths with C grade or better.

- If the student has 30 or more credits approved, the student must have a satisfactory academic progress at the program where he or she was originally admitted. This is 2.85 GPA and either Pre-calculus passed or 6 credits in Maths with C grade or better.

Students must submit a reclassification request according to the dates specified in the academic calendar.

If the student is admitted to the program, the department's chair is responsible for determining which of the student's previous courses are accepted. The UPR reserves the right to accept transfer credits for courses completed with a minimum grade of C at an institution of higher education other than the UPR. The university may accept up to half of the credits corresponding to the student's major. The accepted credits appear with a P on the transcript. However, courses with a grade of P, will not be used to calculate the student's general GPA[1].

Academic Year	Transfer Students
2006-2007	11
2007-2008	9
2008-2009	9
2009-2010	15
2010-2011	15

Table 2.3: Transfer Students for the Past Five Academic Years

---

[1]Certification No. 064-1999-2000 of the Academic Senate of the University of Puerto Rico at Bayamon

2.4 Advising and Career Guidance

Counseling services are also provided by the Department Chair at the time of course selection and enrollment or through appointments throughout the year. Faculty members also offer informal guidance regarding courses and careers.

The UPRB Counseling and Orientation Department helps students by developing their academic, emotional and social skills and by promoting students integration as future professionals into society. It fosters the creation of a university environment based on prevention, lessens risk factors that negatively affect academic achievement and promotes effective psycho-environments that benefit the academic, social and mental development of students and the general academic community. This is achieved by working together with the faculty and staff of the Academic Departments and other offices. The services provided by the UPRB Counseling and Orientation Department include:

- Personal Counseling: for dealing with delicate situations related to crisis, mental health, and problems derived from circumstances that may affect academic performance.

- Career Counseling: helps students develop decision-making skills regarding future professional life and to clarify academic goals. Occupational tests are offered, as well as access to career information.

- Educational Counseling: provides information about procedures, regulations, norms and academic offerings, including help with academic and administrative probation and transfers, among others.

- Psychological Services: offers therapy, crisis intervention and interventions that address student development needs.

- Referral Services: in special situations, counselors may refer cases to professional resources outside the community.

The UPRB Counseling and Orientation Department is currently working towards achieving accreditation by the International Association of Counseling Services (IACS).

The UPRB also has a Career Development and Placement Center that helps students to develop the necessary skills and attitudes to plan and develop for their careers. The Center also serves as a liaison between students, industries, professors and the administration for the creation, dissemination and development of new job opportunities. It also supports the business community by facilitating its presence in the Institution and addressing its needs

for qualified personnel. The Center organizes activities such as the Annual Employment Fair for University students, on-campus recruitment, resume clinics, lectures and visits to companies with Faculty and students. The services offered by the Center include:

- Services to university students:
    - Education on full-time or part-time job searching.
    - Development of internship opportunities.
    - Resume writing and editing services on an individual basis and through resume clinics.
    - Preparation for job interviews.
    - Orientations on time management for working and studying.
    - Coordinate and promote new employment experiences.
- Services to companies and recruiters:
    - Pre-screening of candidates for new job opportunities.
    - Access to student resume banks created by the academic programs.
    - Promotion and publication of employment opportunities among students and faculty.
    - Group recruitment at the University.
    - Resume referrals.
    - Serve as a liaison between student organizations, companies and the Institution to develop special projects such as personnel training, scholarships, and grants.

2.5 Work in Lieu of Courses

Currently, our program does not award credit for work in lieu of courses.

2.6 Graduation Requirements

The average number of graduates during the last five years is around (40) forty. Table 2.4 present the number of graduates in the last five years.

Academic Year	Number of Graduates
2007-2008	40
2008-2009	40
2009-2010	32
2010-2011	17
2011-2012	52
Average	36.2

Table 2.4: Number of Graduates in the Last Five Years

To obtain a degree at the UPRB, students must meet the following requirements:

- Pass the required courses with minimum general and major GPAs of 2.00.

- Meet residency requirements for the institution. This means taking at the UPRB and passing the courses corresponding to the last 25% of the total courses in the program[2].

- Complete all courses required for the degree in a period of time that is less than twice the amount of time established for the academic program. If the student takes longer, he or she may be asked to repeat or take a comprehensive exam for the courses that the Director of the program determines that need to be reviewed.

- Meet all financial obligations with the institution.

- Fill out the Graduation Request Form available at the Registrar's Office at the beginning of the semester or period in which he or she should be completing all the requirements.

- Obtain a recommendation for graduation from the Director of the Department.

- Maintain good conduct during his or her university career.

The University holds commencement ceremonies on June each year. Students who meet the graduation criteria in the summer or in December may apply for a certificate of completion of the degree at the end of that academic term.

---

[2]Certification No. 022-1999-2000 of the Academic Senate of the University of Puerto Rico at Bayamon

Table 2.5 shows statistics for a sample of 25 program graduates in the last five years. Data for this table have been gathered by the Department's staff.

Numerical Id	Year of Enrollment	Graduation Year	Initial or Current Employment
1	2002	2007	Senior Programmer
2	2002	2007	Programmer Analyst
3	2002	2007	Programmer
4	2002	2008	Security Analyst
5	2002	2008	Senior Programmer
6	2006	2011	Web developer
7	2000	2008	Systems Administrator
8	2003	2008	Senior programmer
9	1997	2008	Budget Sub-Director
10	1999	2009	Programmer Analyst
11	2002	2009	School Teacher
12	2003	2009	Web developer
13	2004	2009	Programmer Analyst
14	2001	2009	Systems Administrator
15	1995	2010	Computer Operator
16	2005	2010	Consultant
17	2001	2010	Programmer
18	2005	2010	Systems Analyst
19	2006	2010	Programmer
20	2003	2010	Graduate Student - Research
21	2006	2010	Consultant & Graduate Student
22	2005	2011	Computer Operator
23	1992	2011	Technician Account manager
24	1997	2011	Senior Control Technician
25	2006	2011	Programmer

Table 2.5: A sample of graduates in the last five years

Criterion 2. Program Educational Objectives

3.1 Mission Statement

3.1.1 General Mission of the University of Puerto Rico

Art. 2. Objectives of the University of Puerto Rico. (18 L.P.R.A. sec. 601)[1]

(a) The University, as a higher education organ, because of its service duty to Puerto Rico and its due faithfulness to the ideals of an integrally democratic society, has the essential mission of reaching the following objectives, which are in coexistence with the widest freedom in teaching and scientific research:

    (1) To transmit and increase knowledge through arts and sciences, at the service of the community through the action of its professors, research students, and alumni.

    (2) To contribute to the growing and enjoyment of culture's ethical and esthetical values.

(b) In the faithful fulfillment of its mission, the University must:

---

[1] As established in Article 2 of Puerto Rico's Law #1 from January 20, 1966, also known as the Law of the University of Puerto Rico: http://www.lexjuris.com/ LEXMATE/ educacion/ lex66001.htm - *Spanish document*

(1) Conserve, enrich and disseminate Puerto Rico's cultural values and the strengthening of the unit's conscience in the common task of finding solutions to problems in a democratic fashion.

(2) Seek the student's full development and instill a sense of an individual responsibility towards the general good of the community.

(3) Develop full intellectual and spiritual richness in our people so that the intelligence and spirit of those exceptional individuals that arise at all social levels, especially the economically underprivileged, can be of service to the Puerto Rican community.

(4) Collaborate with other organizations within an action sphere appropriate for the University in the study of Puerto Rico problems.

(5) Remember that, because of its nature as a university and its identification with Puerto Rico ideals, the University of Puerto Rico shares in an essential manner with the values and interest of the whole democratic community.

(6) Cultivate love for learning as it leads to freedom and stimulate the search and discussion of knowledge in an atmosphere of respect and creative dialog.

3.1.2 Mission of the University of Puerto Rico at Bayamon (UPRB)

Facilitate meaningful, continuous and lasting learning so that students may become responsible citizens who will help transform the world in which they live, with heightened sense of the ethical and aesthetic dimensions of ideas and actions that contribute to change. To achieve this, the institution should promote the establishment of systems that support learning, investigation and collaboration with Puerto Rican society[2].

3.1.3 Vision and Mission of Computer Science Department

The vision before April 19, 2012 was:

---

[2]As published in the UPRB Catalog, page 5: http://www.uprb.edu/ es/ institucion/ catalogo/ Catalogo2008-2011-english.pdf

The Computer Science Department aims to offer the most successful program in this discipline in Puerto Rico.

The mission before April 19, 2012 was:

Provide university education in the discipline of Computer Science forming graduates capable of responding to the demands of society as professionals of excellence. We want our students to develop the academic and professional skills necessary for optimum performance within a framework of accountability with their peers and society in general.

The vision and mission of our department have changed over time. Currently we are on the process of revising the vision and mission. Chapter 5 presents the process of revising the vision and mission within the Continuous Improvement Plan. We held a meeting with our external advisory committee on April 20, 2012 to revised the vision and mission. However, we will use this revision to align our EOs and student outcomes on the next assessment cycle. The new vision and mission will be available to the evaluation team at the time of the visit.

3.2   Program Educational Objectives

Our Educational Objectives are common for the Computer Science and Information System emphasis areas. This have been accomplish by mapping the appropriate student outcomes to the common EOs. The EOs are the following.

After completing the program, our graduates will:

1. Have the professional competences that will add value to their careers in Computer Science and/or Information Systems

2. Apply mathematical tools, problem solving skills, and essential knowledge in the process of computational solution development in the practice of Computer Science, Information Systems and/or related application areas.

3. Demonstrate a sense of societal, human, and ethical responsibility in their professional endeavors.

4. Engage in professional development or post-graduate education amid future technological changes as well as to the needs of society.

5. Communicate effectively in English and Spanish.

6. Perform efficiently in team environments either as members or leaders.

3.3 Consistency of the Program Educational Objectives

The Mission of the Institution is accomplished through the fulfillment of the Educational Objectives (EO). Program graduates achieve them as a result of experiencing a meaningful, continuous and lasting learning process through the formative years at the university, always in accordance with the institutional mission. EOs are integral in nature, as they contemplate how graduates will perform at a broader level[3]. EOs enable the graduate to collaborate, not only with the Puerto Rican society, but also at a global scale by appreciating current social, environmental and ethical issues. Consequently, the graduate becomes a responsible citizen.

3.4 Program Constituencies

The Computer Science Department has identified the following as the constituents of our program:

- Department Faculty - They teach the courses and are in direct contact with the students, often providing informal academic and professional counseling, and serving as mentors and role models.

- Students - they are currently enrolled in the program and they are the essence of the program. They also benefit as a group from the improvements to the program, not only through courses, but also through other activities which prepare them for their careers.

- Program alumni - They have experienced the transition from students to professionals at first hand. They have recently experienced seeking that first job opportunity. Once employed, they have been through particular on-the-job training, promotions,

---

[3]As a professional that can communicate with others and is well aware of its surrounding environment

downsizing, and other real-life experiences. As such, they tend to have a clear perspective of how the program has prepared them to face current daily challenges. They also know where there is room for improvement.

- UPRB Administration - They participate in the daily decision-making process and long-term challenges that can directly or indirectly affect the program. They have a clear perspective of the strengths and weaknesses of the program.

- Staff members - They play an important supporting role in the daily activities of the department. Staff members aid the enrolled students with tasks such as the enrollment process, handing out program literature, and assisting them with computer issues. On occasion, they listen to students concerns and can provide feedback to the faculty regarding day-to-day issues.

- Employers - They have direct contact with program graduates and can provide information as far as their needs in new employee knowledge, skills and attitudes. They are direct beneficiaries of the program and can contribute clear and precise input regarding trends in the market.

- Representatives of other related industry sectors - Even though they do not necessarily employ recent program graduates, they are an integral part of a larger picture that shows where the local and global market trends are heading. They provide a broader perspective as far as to the direction in which the program should evolve.

Other program constituents include prospective high-school students and the parents of present and future students, among others. The Department considers these to be indirect constituent and keeps them informed of improvements to the programs through the Department's web page which is open to the general public, and activities such as the Department's open-house.

A list with the names of our current program constituents that are part of the External Advisory Board can be found in Table 3.1.

3.4.1 Program Advisement

The Department's External Advisory Board was established in March of 2010. Its mission is to steer, recommend and assess our programs from an outside point of view. The composition of the EAB is well balanced, as it includes a broad demographic spectrum representing various professional, executive, administrative, and academic backgrounds.

Name	Company/Organization	Type
Sandra Fonseca Lind	ISACA PR	EAB
Judith Diaz	Placement Office	UPRB
Angel Pérez	Rock Solid Technologies	EAB
Eduardo Diaz	Internet Society of PR	EAB
Francisco Torres	Optivon	EAB
Joel Vázquez	E-nabler Tech.	EAB & Alumni
José Alfonso Vélez	New Port Sales	Alumni
José Raúl Rodriguez	Digital Tree	EAB & Alumni
Marcel Rivera	UPRB	Student
Mario P Vecchi	APEX Technologies	EAB
Rafael Oquendo	Rock Solid Technologies	EAB & Alumni
Ramón Meléndez	Evertech	EAB
Víctor Santos	UPRB	Student
Antonio Huertas	UPRB	Department's Chair
Juan M. Solá-Sloan	UPRB	Assistant Professor
Nelliud Torres	UPRB	Associate Professor
Filiberto Arniella	UPRB	Associate Professor
Jose J. Díaz	UPRB	Associate Professor
Miguel Vélez	UPRB	Aux. Dean of Academic Affairs
Omar Díaz	UPRB	Instructor
Damaris Vélez	UPRB	Adm. Official
Mirta Serrano	UPRB	Adm. Secretary

Table 3.1: Name of Program Constituents that are part of the EAB

The Department's External Advisory Board has been active and meeting regularly[4]. Its first tasks included the discussion, modification and approval of the Program Educational Objectives. It was also involved in drafting the Department's vision and mission. Suggestions were also made regarding particular skills that should be developed in the students, as well as the CS Department's branding. Some of these recommendations have been already incorporated in our program. Some others will be incorporated on the next assessment cycle. The EAB has provided input regarding trends that the programs could incorporate through the curricula or extracurricular activities (i.e., a mobile devices, self-learning, problem-solving). Evidence of the Advisory Board's active involvement in shaping and improving the programs will be available in the exhibit room for ABET's Evaluation Team, including the agendas, attendee lists, minutes and memorandums of the meetings held. Arrangements are also being made for the Board members to be available for interviews by the visiting team.

---

[4]at least once a year

3.5 Process for Revision of the Program Educational Objectives

The current program educational objectives were initially drafted by the Department Assesment and Accreditation Committee (AAC) as a compromise between ABET's and the UPR's definition for program objectives. Once drafted, they were presented to the External Advisory Board (EAB) and to the Department's Faculty for further discussion, evaluation and approval. Suggestions gathered under this process were incorporated into a final draft.

The AAC evaluate together the data gathered to draw conclusions as to the levels of achievement of each EO and outcomes. Based on this analysis, the committees prepare recommendations. If the recommendations entail modifying the EOs and/or outcomes, then, the AAC drafts the changes. Later on, the AAC presents the changes to the EAB and the Faculty for further evaluation, discussion, and approval. The changes are then made and submitted to the Dean of Academic Affairs for final approval, if necessary.

A request for the revision of the EOs can also originate from the EAB or the Faculty, in which case the same procedure described above would apply.

Chapter 4

Criterion 3. Student Outcomes

4.1   Student Outcomes

After completing the Computer Science program the graduates will posses:

1. An ability to apply knowledge of computing and mathematics appropriate to the discipline.

2. An ability to analyze a problem, identify and define the computing requirements appropriate to its solution.

3. An ability to design, implement, and evaluate a computer-based system, process, component or program to meet desired needs.

4. An ability to function effectively on teams to accomplish a common goal.

5. An understanding of professional, ethical, legal, security and social issues and responsibilities.

6. An ability to communicate effectively with a range of audiences.

7. An ability to analyze the local and global impact of computing on individuals, organizations, and society.

8. Recognition of the need for and an ability to engage in continuing professional development.

9. An ability to use current techniques, skills, and tools necessary for computing practices.

4.1.1 Student Outcomes of the CS Emphasis Area

10. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices

11. An ability to apply design and development principles in the construction of software systems of varying complexity

4.1.2 Student Outcomes of the Information Systems Emphasis Area

The outcomes presented in this section are expected for all students enrolled in the Information Systems and Technology emphasis area.

12. An understanding of processes that support the delivery and management of information systems within a specific application environment.

4.2 Relationship of Student Outcomes to Program Educational Objectives

This section presents different mappings between the Student Outcomes, the Educational Objectives, and the Courses. Table 4.1 and 4.2 present the relationship between the EO and the Student Outcomes for both emphasis areas.

#		Our graduates will have the professional competences that will add value to their careers in Computer Science and/or Information Systems	Our graduates will apply mathematical tools, problem solving skills, and essential knowledge in the process of computational solution development in the practice of Computer Science, Information Systems and/or related application areas.	Our graduates will demonstrate a sense of societal, human, and ethical responsibility in their professional endeavors.	Our graduates will engage in professional development or post-graduate education amid future technological changes as well as to the needs of society	Our graduates will communicate effectively in English and Spanish.	Our graduates will perform efficiently in team environments either as members or leaders.
1	An ability to apply knowledge of computing and mathematics appropriate to the discipline.	x	x				
2	An ability to analyze a problem, identify and define the computing requirements appropriate to its solution.	x	x				
3	An ability to design, implement, and evaluate a computer-based system, process, component or program to meet desired needs.	x	x				
4	An ability to function effectively on teams to accomplish a common goal.	x					x
5	An understanding of professional, ethical, legal, security and social issues and responsibilities.			x			
6	An ability to communicate effectively with a range of audiences.					x	
7	An ability to analyze the local and global impact of computing on individuals, organizations, and society.			x			
8	Recognition of the need for and an ability to engage in continuing professional development.				x		
9	An ability to use current techniques, skills, and tools necessary for computing practices.	x	x		x		
10	An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices	x	x				
11	An ability to apply design and development principles in the construction of software systems of varying complexity		x				

Figure 4.1: Educational Objectives vs. Student Outcomes Mapping for CS

	Our graduates will have the professional competences that will add value to their careers in Computer Science and/or Information Systems	Our graduates will apply mathematical tools, problem solving skills, and essential knowledge in the process of computational solution development in the practice of Computer Science, Information Systems and/or related application areas.	Our graduates will demonstrate a sense of societal, human, and ethical responsibility in their professional endeavors.	Our graduates will engage in professional development or post-graduate education amid future technological changes as well as to the needs of society	Our graduates will communicate effectively in English and Spanish.	Our graduates will perform efficiently in team environments either as members or leaders.
1 An ability to apply knowledge of computing and mathematics appropriate to the discipline.	x	x				
2 An ability to analyze a problem, identify and define the computing requirements appropriate to its solution.	x	x				
3 An ability to design, implement, and evaluate a computer-based system, process, component or program to meet desired needs.	x	x				
4 An ability to function effectively on teams to accomplish a common goal.	x					x
5 An understanding of professional, ethical, legal, security and social issues and responsibilities.			x			
6 An ability to communicate effectively with a range of audiences.					x	
7 An ability to analyze the local and global impact of computing on individuals, organizations, and society.			x			
8 Recognition of the need for and an ability to engage in continuing professional development.				x		
9 An ability to use current techniques, skills, and tools necessary for computing practices.	x	x		x		
12 An understanding of processess that support the delivery and management of information systems within a specific application environment		x				

Figure 4.2: Educational Objectives vs. Student Outcomes Mapping for IS

4.3 Enabled Student Characteristics

Table 4.1 presents the mapping between courses and student outcomes. The second column marks with an **x** the courses that are part of the program's core[1]. Courses marked with (is) are specific to the Information Systems emphasis area. Courses marked with (cs) are specific to the Computer Science emphasis area.

	Core	1	2	3	4	5	6	7	8	9	10	11	12
COTI 3101	x	✓	✓	✓	✓		✓	✓		✓			
COTI 3102	x	✓	✓	✓	✓						✓	✓	
COTI 3205	x	✓	✓	✓							✓		
SICI 3015	x		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SICI 4009	x	✓	✓	✓	✓				✓	✓	✓		
SICI 4019	x	✓	✓	✓	✓		✓		✓	✓			
SICI 4028	x	✓	✓								✓		
SICI 4029	x	✓	✓	✓	✓			✓	✓	✓	✓		
SICI 4030	x	✓	✓	✓		✓							
SICI 4036	x	✓	✓	✓			✓			✓	✓	✓	
SICI 4037	x	✓		✓	✓		✓	✓	✓	✓	✓	✓	
SICI 4038	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SICI 4210	x		✓	✓						✓			
COTI 4250	cs	✓	✓	✓							✓		
SICI 3039	cs	✓	✓	✓			✓	✓		✓	✓		
COTI 4150	is	✓	✓	✓	✓		✓		✓	✓	✓	✓	
COTI 4430	is		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 4.1: Student Outcomes vs. Courses

Table 4.1 give us an overview of in which courses the outcomes are covered. In order to facilitate the measurement of the student outcomes, the AAC subdivided each one into performance indicators as explained in Chapter 5.

---

[1]These courses are common for all the students in our program

4.4 Process for the Establishment and Revision of the Student Outcomes

The AAC adopted the student outcomes for the CS and IS programs drafted by ABET in the document named Criteria for Accrediting Computing Programs, Effective for Evaluation During the 2010-2011 Accreditation Cycle. We choose this alternative since the aligment of the ABET student outcomes with our EOs was straightforward. The student outcomes were aligned with the EOs and with the Institutional Educational Objectives[2]. Section 4.1 presents the Student Outcomes and the way they were classified for emphasis areas. Section 4.2 presents the mapping between the Educational Objectives and the Student Outcomes as well as the mapping within the courses. The Student Outcomes were divided into thirty five (35) performance indicators, in order to measure them. These are presented in Chapter 5 as part of the Continuous Improvement Program.

---

[2]Educational Goals

Chapter 5

Criterion 4. Continuous Improvement Process

5.1 Phases of the Continuous Improvement Plan

Figure 5.1 presents the Continuous Improvement Process. The process consists of seven phases:

1. Educational Objectives and Student Outcomes Assessment

2. Course alignment and Revision of vision and mission. Surveys delivered and administered.

3. Pre/Post-Test administration and Data recollection from courses.

4. Data gathering from surveys, extra curricular activities and courses

5. Preliminary Assessment of Student Outcomes.

6. Focus groups (if needed)

7. Final analysis and recommendations.
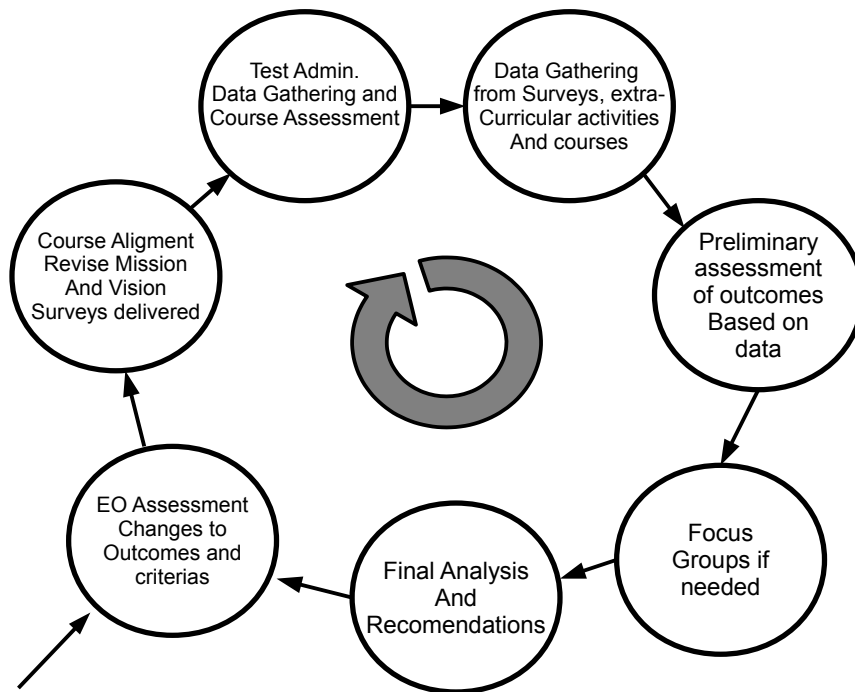
Figure 5.1: Continuous Improvement Plan Map

5.1.1 Educational Objectives and Student Outcomes Assessment

This phase focuses in assessing the EOs, Student Outcomes and Performance Indicators (PI). Informally, this is also known as the initial phase. The Educational Objectives are assessed based on the findings from discussions on focus groups and formal and informal meetings of the program constituents. The EAB is key on this phase. They suggest changes to the program EOs. The student outcomes are revised and re-aligned based on their input.

5.1.1.1 Current Educational Objectives

The initial EOs were drafted by the AAC as a compromise between ABET's and the UPR's definition for Program Objectives. Once drafted, they were presented to the EAB and to

the Department's Faculty for discussion, evaluation and approval. Suggestions gathered under this process were incorporated into a final draft. The AAC evaluate the data gathered to draw conclusions as to the levels of achievement of each EOs and outcomes. Based on this analysis, the committee prepares recommendations. If the recommendations entail modifying the EOs and/or outcomes, the AAC drafts the changes. Later on, the AAC presents the changes to the EAB and the faculty for further evaluation, discussion, and approval. The changes are then made and submitted to the Dean of Academic Affairs for final approval, if necessary.

A request for the revision of the Program Educational Objectives can also originate from the EAB or the Faculty, in which case the same procedure described above would apply.

5.1.1.2 Current Student Outcomes

As this initial phase, the AAC adopted the student outcomes for the CS and IS programs drafted by ABET in the document named Criteria for Accrediting Computing Programs, Effective for Evaluation During the 2010-2011 Accreditation Cycle. These outcomes were aligned with the EOs and the Institutional Educational Objectives.

The level of achievement of the programs EOs is measured through surveys to alumni and their employers. These surveys will be available to the evaluation team later on. An analysis document for facilitating the analysis of the data, containing graphs for each EO, will also be available. The data from these surveys is evaluated by the Department's Accreditation and Assessment Committee after completing the assessment cycle.

5.1.2 Course alignment and Revision of Vision and Mission

The revised student outcomes could result in a revision or realignment of performance indicators. These indicators need to be aligned with the courses offered by the program. This happens during this phase. Actions that could be taken include: (a) identify which courses are already aligned to the revised or new PIs, (b) make adjustments to the courses, (c) revised the program to include them[1].

As a byproduct of the first phase, a revision of the Department's vision and mission is performed. This phase will pave the way for future changes. The program constituents

---

[1]if needed

revised them and their input is gathered. Surveys to alumni and employers are revised and installed on our Continuous Improvement Website (CIW). Changes to the vision and mission are envisioned for the next cycle[2]. Data obtained by the surveys and the input of the program constituents is further revised during the preliminary and final analysis and recommendations phase.

5.1.3   Test Administration and Data Collection from Courses

A pre/post-test[3] is administered to have an overview of the achievement level of the student outcomes. The first task of this phase is to revise and validate the test. This pre/post-Test measures basic knowledge that the student must have at the time of graduation. Some performance indicators that reflect cognitive learning are measured. This test is a requirement of the *capstone course*, SICI 4038 Research Workshop, that all student must pass. Also the test is administered, when needed, to the freshmen students while taking the course COTI 3101 to have a measurement of their achievement.

In order to guarantee that the student outcomes are met, we need to identify in which courses the PIs are measured. Data is gathered by the professors of the department during the academic year. This data is gather from, but not limited to: quizzes, tests, homeworks, projects and rubrics. This information is compiled during this phase.

5.1.4   Data Gathering Phase

On this phase, the data gathering from courses finalizes. Also, data is obtained from surveys and extra curricular activities. An evaluation of the data obtained is performed and if it is sufficient, the next phase. However, if the AAC concludes that the data gathered is insufficient or missing, corrective measures are taken to obtain them.

5.1.5   Preliminary Assessment/Analysis

The preliminary analysis of outcomes is performed during this phase. A preliminary assessment is made from the data gathered from courses, surveys, pre/post test results, meetings with the EAB and program constituents. Also the extra-curricular activities

---

[2]No changes are made on the current cycle

[3]Exit exam

are considered. The vision and mission is re-written based on the assessment of the data gathered with the EAB meetings. The AAC determines if focus groups, informal or formal meetings with the constituents are needed to further assess the student outcomes.

5.1.6   Assessment via Focus Groups

This phase is a result of the previous phase. If the AAC determines that further analysis of the data obtained is needed for a special issue, focus groups are created. These groups could be composed of a subset of the program constituents. For example: faculty only, alumni only, faculty and students, faculty and the EAB etc. Input from these focus group is used for the final analysis.

5.1.7   Final Analysis and Recommendations

This is the final phase of the cycle. The AAC prepares a document recommending changes to the program. This document is presented to the program constituents. Changes to the program are made accordingly. An analysis of the the continuous improvement plan is made for further refinement[4]. Finally, the next cycle is prepared.

5.2   Surveys Rationale

Alumni and employer surveys were developed to assess alumni achievement of the EOs. Respondents are allowed to select the level of achievement from four choices. These are (a) high, (b) intermediate, (c) low, or (d) does not apply.

5.2.1   Alumni Survey

The alumni survey also includes questions for collecting data pertaining to the alumnus activities after graduation, including:

- How much time it took to complete the degree.
- Overall opinion of the education provided by the program

---

[4]only if needed

- Whether the alumni is pursuing graduate studies or continuing education[5].

- Salary range

- Current position.

- Whether the alumni works on the island, on the states or outside USA and the territories.

- Continuing education activities

- Professional certifications and associations.

- Whether the alumni is interested in participating in focus groups or interviews pertaining to program assessment

These answers are used for establishing tendencies as to what is the current competence the program graduates should have after obtaining the degree. One of the most important aspects we are considering is the feedback obtained when they are asked what technologies should be applied to enrich the curriculum. Also an alumni profile can be created which helps to fine tune the EOs and outcomes.

In addition to the employer and alumni surveys, focus groups and formal and informal interviews are included as a strategy to provide a deeper understanding of issues that might arise from the two surveys. For example, if a particular EO is identified as being weak, the AAC can design a focus group from among the respondents to identify the causes of the weakness and establish possible improvements to the program to strengthen them.

5.2.2   Employer Survey

In order to administer this survey, we must complete some tasks a priori. First, the industries, government agencies, academic institutions, and organizations who have been employing our graduates lately are identified in collaboration with the placement office[6] of the UPRB. Then, unique keys are generated by the survey system and are sent to each employer's contact via email, including a link to our Continuous Improvement Website (CIW). The employer's contact accesses the survey with this key and answers the survey.

---

[5]ie. Certification
[6]Oficina de Empleos

The data gathered is used to assess the level of achievement of the EOs. The employer survey also includes questions for collecting the following additional data:

- Type of organization.

- Number of program graduates hired.

- Number of new hires that the company expects for the next five years.

- Skills or knowledge that graduates should have.

- Invitation to participate in focus groups, interviews or as part of the External Advisory Committee.

The AAC tabulates the results and separates the data according to areas of study within the survey, after receiving the completed employer and alumni surveys. Data pertaining to the EOs is converted into plots. These graphs are then distributed among the faculty for evaluation.

5.3 Measuring the Student Outcomes with Performance Indicators

Specific and easily measurable performance indicators were developed for each outcome. This simplifies and enriches the assessment process. The performance indicators present which specific areas are being met within an outcome. Each indicator includes an action verb that describes the type of learning that is been measured. A list of these action verbs was provided by Dr. Gloria Rogers. This list is grouped by three types of learning (cognitive, affective and psychomotor). It was decided that direct assessment methods for each type of learning would be used as follows:

- Cognitive learning: measured through a locally developed test and through the courses.

- Affective learning: measured through behavioral observation and scored rubric

- Psychomotor learning: None of the performance indicators drafted covered Psychomotor learning[7].

---

[7]The nature of our program does not covered this aspect

The following list presents the student outcomes with the corresponding performance indicators. Notice that the outcomes are indicated with a number and performance indicators with a letter (i.e., 1a, 2b, etc.). The corresponding performance indicators are listed right underneath each outcome.

5.3.1 Performance Indicators for the Program's Core

1. An ability to apply knowledge of computing and mathematics appropriate to the discipline.

   (a) Select the appropriate algorithm for a specific situation (Cog-Knowledge).

   (b) Analyze the asymptotic running time of simple algorithms using big-O notation (Cog-Analysis)

   (c) Apply mathematical concepts in the solution of a given problem (Cog-Application)

2. An ability to analyze a problem, identify and define the computing requirements appropriate to its solution.

   (a) Analyze a problem (Cog-Analysis)

   (b) Identify and define the computational requirements needed in a real situation (Cog-Synthesis).

   (c) Choose the appropriate software and/or hardware tools to meet the desired goals (Cog-Evaluation).

3. An ability to design, implement, and evaluate a computer-based system, process, component or program to meet desired needs.

   (a) Design a solution for a given problem using the structured approach (Cog-Synthesis).

   (b) Design a solution for a given problem using the object-oriented approach(Cog-Synthesis).

   (c) Implement an algorithm design using the appropriate programming language (Cog-Application).

   (d) Implement abstract solutions using pseudo code, flowchart or natural language (Cog-Application).

(e) Perform both unit and systems testing (Cog-Analysis).

4. An ability to function effectively on teams to accomplish a common goal.

   (a) Evaluate a given problem within a team environment (Cog-Evaluation).

   (b) Perform the tasks assigned when working on a team (Affective-Responding).

   (c) Assists teammates when needed (Affective-Responding).

   (d) Complete duties assigned within a team environment (Affective-Valuing).

5. An understanding of professional, ethical, legal, security and social issues and responsibilities.

   (a) Evaluate the ethical implications of an issue in the computing discipline (Cog-Evaluation).

   (b) Evaluate the social impact of a given computing technology (Cog-Evaluation).

   (c) Recognize the responsibilities inherent to the profession of computing (Cog-Knowledge).

6. An ability to communicate effectively with a range of audiences.

   (a) Present different topics both orally and in writing (Affective-Responding).

   (b) Explain technical concepts using the correct terminology (Affective-Valuing).

   (c) Display knowledge of technical report writing skills (Cog-Knowledge)

7. An ability to analyze the local and global impact of computing on individuals, organizations, and society.

   (a) Identify the contribution of computing and other related professionals to society (Cog-Knowledge).

   (b) Understand computational or technological advances and their impact to the profession (Cog-Comprehension).

8. Recognition of the need for and an ability to engage in continuing professional development.

   (a) Recognize options of continuing studies after degree completion (Cog-Knowledge).

   (b) Use diverse information resources when performing assigned duties (Cog-Application).

9. An ability to use current techniques, skills, and tools necessary for computing practices.

   (a) Use hardware and software tools currently available (Cog-Application).

   (b) Recognize emerging technologies and their implication to the practice of the profession (Cog-Knowledge).

5.3.2 Performance Indicators for the CS Emphasis Area

10. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices

    (a) Solve problems using the principles from discrete and continuous mathematics (Cog-Application).

    (b) Perform basic algorithmic analysis using big-O notation (Cog-Analysis)

    (c) Determine the most appropriate data structure needed to solve a given problem (Cog-Evaluation).

    (d) Demonstrates basic knowledge of scientific computing using numerical analysis (Cog-Comprehension).

    (e) Appraise whether a given problem has a computational solution (Cog-Evaluation).

    (f) Determine the most appropriate programming paradigm needed to solve a problem (Cog-Evaluation).

11. An ability to apply design and development principles in the construction of software systems of varying complexity.

    (a) Evaluate the feasibility of a proposed software system (Cog-Evaluation).

    (b) Perform object oriented and structure analysis and design of software systems (Cog-Application).

    (c) Analyze and evaluate alternatives for acquiring or developing a software system (Cog-Evaluation).

    (d) Construct a complete software system (Cog-Synthesis).

5.3.3 Performance Indicators for the IS Emphasis Area

12. An understanding of processes that support the delivery and management of information systems within a specific application environment.

    (a) Display basic knowledge of accounting and management principles (Cog-Comprehension).

    (b) Analyze the information flow in an organization (Cog-Analysis).

    (c) Understand the process operations within an organization (Cog-Comprehension).

    (d) An ability to discern between a transactional, management information and decision support systems (Cog-Evaluation).

    (e) Recommends viable solutions using computer systems as main solution (Cog-Evaluation).

    (f) Construct an Information System (Cog-Synthesis).

Chapter 6

Criterion 5. Curriculum

The Computer Science program at UPRB focuses on the study of how to solve problems through the development of computer programs (software) and how to use the equipment required to run these programs (the hardware). Graduates of our Bachelor Degree in Computer Science possess the theoretical and practical knowledge in developing computer systems using state of the art technology.

Students at CS department are both from the former curriculum (1981-2008) and the new curriculum (since August 2008). The former curriculum was an hybrid one, combining elements from both CS and IS. Students on the hybrid curriculum need not to choose an area of emphasis. In contrast, students on the current curriculum must choose an emphasis area when finalizing their sophomore year. These areas are: (1) Applied Computer Science or (2) Information Systems and Technologies [1]. The area of Applied Computer Science emphasizes on theory of computing and the design and comparison of programming languages. The Information Systems and Technology emphasizes on the development and management of technologically complex information systems for commercial organizations.

A graduate from the Bachelor Degree in Computer Science of the UPRB posses a robust mathematical and analytical background, and the skills and knowledge that enables the individual to perform as a responsible professional. Also, a Computer Science graduate have a solid foundation in developing modern computer programs.

---

[1]These names are going to change to Computer Science and Information Systems in the near future. A request was made to the UPR authorities on February 2012

6.1   The Current Curriculum

When the ABET evaluation team visits the program in October or November 2012, students from both the former curriculum and the revised program will be taking courses concurrently. Since there are still students that joined the program prior to the 2008 revision, they are entitled to complete their degree with the former programs requirements This constitutes approximately 19% of our current students[2]. Once there are no more students officially enrolled in the former program, the courses that were not included in the program will not be offered.

Figure 6.1 and 6.2 presents the pre-requisite structure plus the recommended schedule of our program for both emphasis areas. Notice, that the CS core courses are displayed in light blue, general education courses in orange, Math and Sciences in green, and elective courses in white.

As required by *ABET Self-Study Questionnaire:Template for a Self-Study Report 2012-2013 Review Cycle*, Tables 6.1, 6.2, and 6.3 describes the plan of study for students in this program and its emphasis areas. These tables include information on course offerings in the form of a recommended schedule by year and term. Also, they present the average section enrollments for all courses in the program over the two years immediately preceding the visit.

---

[2]This number should be lower at the time of the visit since some of the students of the former curriculum will graduate in May 2012
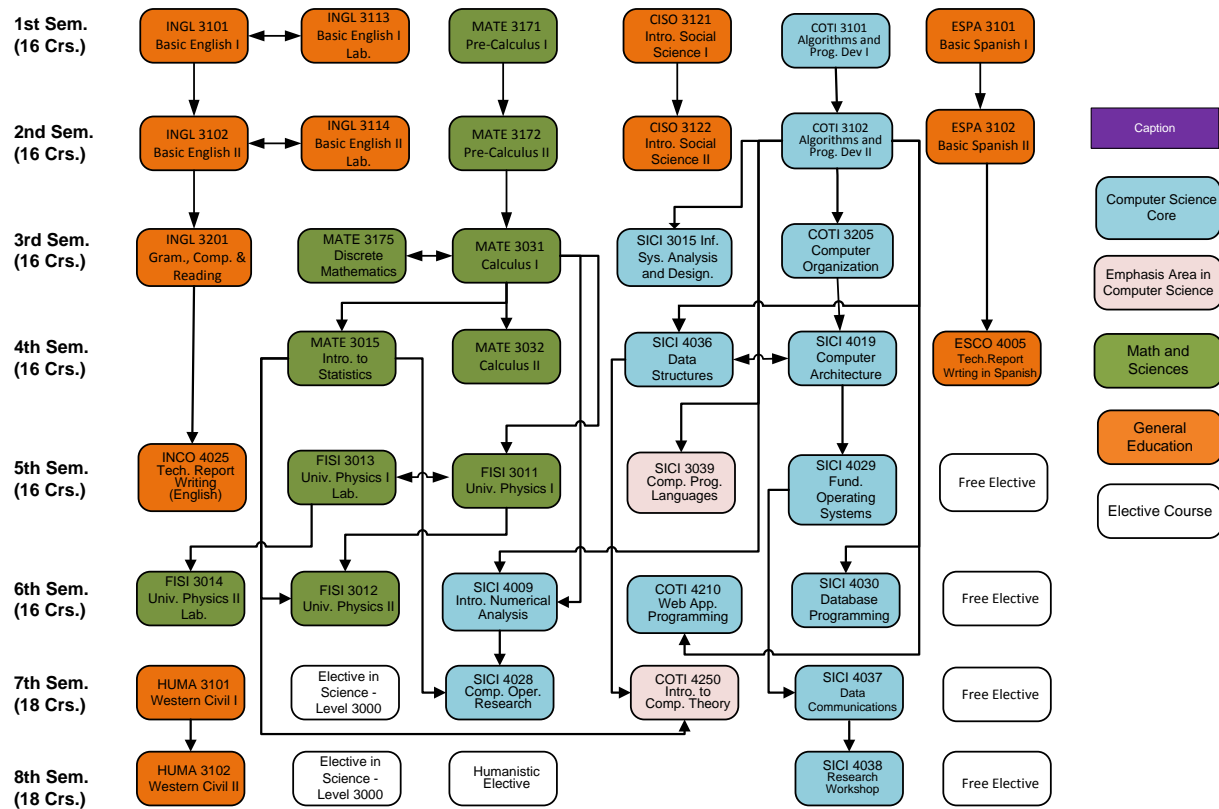
Figure 6.1: Pre-Requisite Structure for CS
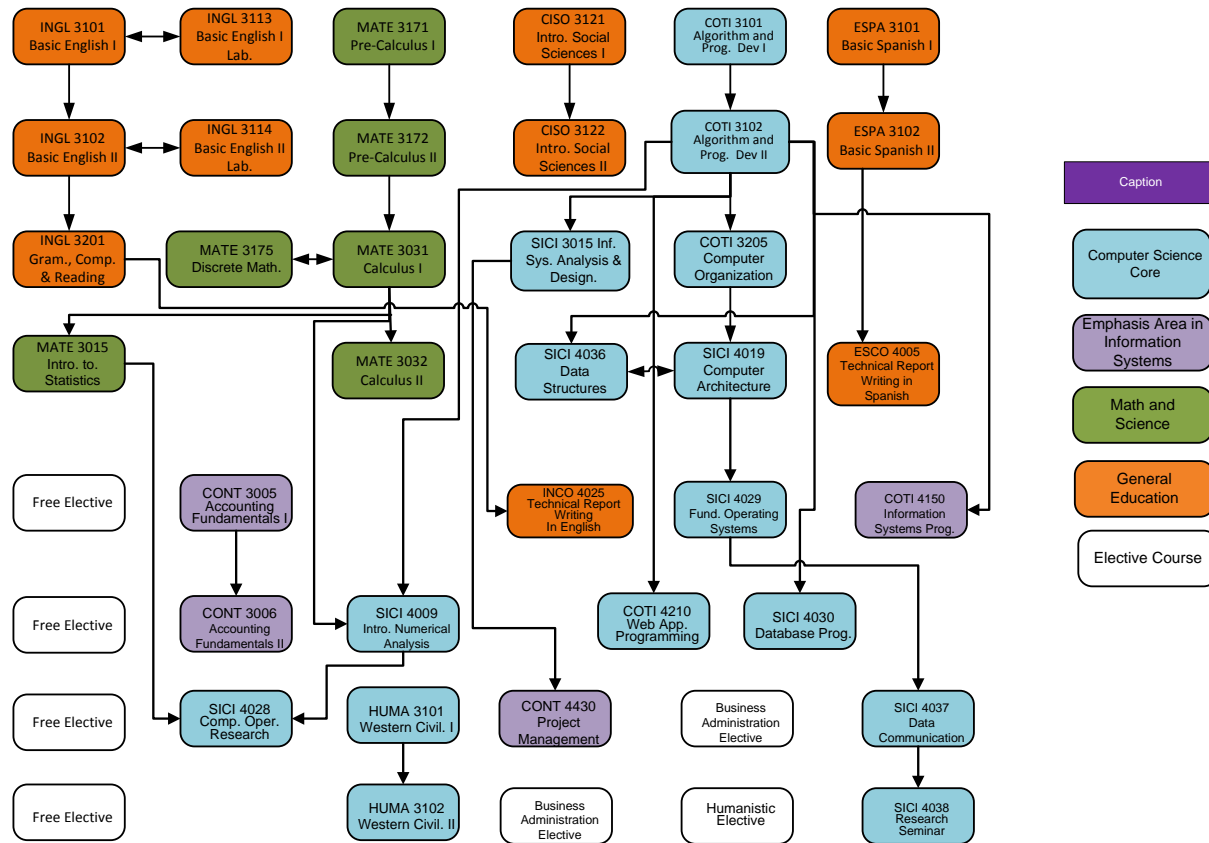
Figure 6.2: Pre-Requisite Structure for IS

Year Term	Code	Course Name	Req. Elec. Sel.	Math Sci.	Comp. Topics	Fund. Adv.	Gen. Ed.	Other	Last 2 Terms Offered	Avg. Enroll.
First Year (first Semester)										
1/1	COTI 3101	Algorithms & Program Dev. I	R		4	F			2011-2012- II	19
1/1	MATE 3171	Pre-calculus I	R	3					N/A	N/A
1/1	INGL 3101	Basic English I	R				3		N/A	N/A
1/1	INGL 3113	Basic English Lab. I	R				0		N/A	N/A
1/1	ESPA 3101	Basic Spanish I	R				3		N/A	N/A
1/1	CISO 3121	Intro. to Social Sciences I	R				3		N/A	N/A
(Second Semester)										
1/2	COTI 3102	Algorithms & Program Dev. II	R		4	F			2011-2012- II	15
1/2	MATE 3172	Pre-Calculus II	R	3					N/A	N/A
1/2	INGL 3102	Basic English II	R				3		N/A	N/A
1/2	INGL 3114	Basic English Lab. II	R				0		N/A	N/A
1/2	ESPA 3102	Basic Spanish II	R				3		N/A	N/A
1/2	CISO 3122	Intro. to Social Science II	R				3		N/A	N/A
Second Year (First Semester)										
2/1	COTI 3205	Computer Organization	R		3	F			2011-2012- II	19
2/1	SICI 3015	Inf. Sys. Analysis & Design	R		3	F			2011-2012-II	15
2/1	MATE 3031	Calculus I	R	4					N/A	N/A
2/1	MATE 3175	Discrete Mathematics	R	3					N/A	N/A
2/1	INGL 3201	English Gram. Comp. & Reading	R				3		N/A	N/A
(Second Semester)										
2/2	SICI 4019	Computer Architecture	R		3	F			2011-2012-II	19
2/2	SICI 4036	Data Structure	R		3	F			2011-2012-II	15
2/2	MATE 3032	Calculus II	R	4					N/A	N/A
2/2	MATE 3015	Intro. to Statistics	R	3					N/A	N/A
2/2	ESCO 4005	Tech. Report Writing (in Spanish)	R				3		N/A	N/A

Table 6.1: Computer Science Core Curriculum Table (First-Second Year)

6.2   Alignment with Program Educational Objectives

The curriculum is aligned with the EOs via the student outcomes and performance indicators. We use the notion that PIs $\rightarrow$ SOs $\rightarrow$ EOs if they are all mapped. The performance indicators are mapped to the courses via the syllabus (see Appendix B). Tables 6.4, 6.5, 6.6 and 6.7 present a mapping between the performance indicators and the courses. Evidence must be supplied by the professor in charge of each course that covers the performance indicators. This evidence can be an exam, quiz, homework, project, monograph, term paper, oral presentation rubrics or any formal way that the faculty in charge of the course can provide. This evidence will be available during the team visit.

Year Term	Code	Course Name	Req. Elec. Sel.	Math Sci.	Comp. Topics	Fund. Adv.	Gen. Ed.	Other	Last 2 Terms Offered	Avg. Enroll.
Third Year (first Semester)										
3/1	SICI 4029	Fund. Operating Systems	R		3	A			2011-2012-II	15
3/1	INCO 4025	Tech. Rep. Writing (in English)	R				3		N/A	N/A
3/1	SICI 3039	Comp. Programming Languages	R		3	A			2011-2012-II	15
3/1	FISI 3011	Univ. Physics I	R	3					N/A	N/A
3/1	FISI 3013	Univ. Physics I Lab.	R	1					N/A	N/A
3/1	xxxx xxxx	Free Elective	E					3		
(Second Semester)										
3/2	SICI 4009	Intro. to Numerical Analysis	R		3	A			2011-2012-II	21
3/2	SICI 4030	Database Programming	R		3	A			2011-2012-II	15
3/2	COTI 4210	Web. App. Programming	R		3	A			2011-2012-II	20
3/2	FISI 3012	Univ. Physics II	R	3					N/A	N/A
3/2	FISI 3014	Univ. Physics II Lab.	R	1					N/A	N/A
3/2	xxxx xxxx	Free Elective	E					3		
Fourth Year (First Semester)										
4/1	SICI 4037	Data Communications	R		3	A			2011-2012-II	14
4/1	SICI 4028	Comp. Oper. Research	R		3	A			2011-2012-II	26
4/1	HUMA 3101	Western Civil. I	R				3		N/A	N/A
4/1	COTI 4250	Intro. to Comp. Theory	R		3	A			2011-I	9
4/1	xxxx 3xxx	Science Elective - Level 3000	SE	3					N/A	N/A
4/1	xxxx xxxx	Free Elective	E					3	N/A	N/A
(Second Semester)										
4/2	SICI 4038	Research Workshop	R		4	A			2011-2012-II	13
4/2	HUMA 3102	Western Civilization II	R				3		N/A	N/A
4/2	xxxx 3xxx	Science Elective - Level 3000	SE	3					N/A	N/A
4/2	xxxx xxxx	Humanistic Elective	SE				3		N/A	N/A
4/2	xxxx xxxx	Free Elective	E					3	N/A	N/A
		Overall Total including Core	130	31	51		36	12		
		Percent of Total		24%	39 %		28%	9%		

Table 6.2: Computer Science Emphasis Area Curriculum Table (Third-Fourth Year)

Year Term	Code	Course Name	Req. Elec. Sel.	Math Sci.	Comp. Topics	Fund. Adv.	Gen. Ed.	Other	Last 2 Terms Offered	Avg. Enroll.
Third Year (first Semester)										
3/1	SICI 4029	Fund. Operating Systems	R		3	A			2011-2012-II	15
3/1	INCO 4025	Tech. Rep. Writing (in English)	R				3		N/A	N/A
3/1	COTI 4150	Information Systems Prog.	R		3	A			2010 2011 I	17
3/1	CONT 3005	Accounting Fundamentals I	R					4	N/A	N/A
3/1	xxxx xxxx	Free Elective	E					3		
(Second Semester)										
3/2	SICI 4009	Intro. to Numerical Analysis	R		3	A			2011-2012-II	21
3/2	SICI 4030	Database Programming	R		3	A			2011-2012-II	15
3/2	COTI 4210	Web. App. Programming	R		3	A			2011-2012-II	20
3/2	CONT 3006	Accounting Fundamentals II	R					4	N/A	N/A
3/2	xxxx xxxx	Free Elective	E					3		
Fourth Year (First Semester)										
4/1	SICI 4037	Data Communications	R		3	A			2011-2012-II	14
4/1	SICI 4028	Comp. Oper. Research	R		3	A			2011-2012-II	26
4/1	HUMA 3101	Western Civil. I	R				3		N/A	N/A
4/1	COTI 4430	Project Management	R		3	A			2010 2011-I	14
4/1	xxxx xxxx	Elective in Business Adm.	SE					3	N/A	N/A
4/1	xxxx xxxx	Free Elective	E					3		
(Second Semester)										
4/2	SICI 4038	Research Workshop	R		4	A			2011-2012-II	13
4/2	HUMA 3102	Western Civilization II	R				3		N/A	N/A
4/2	xxxx xxxx	Humanistic Elective	SE				3		N/A	N/A
4/2	xxxx xxxx	Elective in Business Adm.	SE					3	N/A	N/A
4/2	xxxx xxxx	Free Elective	E					3	N/A	N/A
		Overall Total including Core	130	20	48		36	23		
		Percent of Total		15%	37 %		28%	18%		

Table 6.3: Information Systems Emphasis Area Curriculum Table (Third-Fourth Year)

6.3 Capstone Course : SICI 4038 Research Workshop

> *A capstone course is an opportunity for students to show that they have achieved the outcomes established by their educational institution and major department. The course should be designed to assess cognitive, affective and psychomotor learning and to do so in a student-centered and student-directed manner which requires the command, analysis and synthesis of knowledge and skills[3].*

SICI 4038 Research Workshop, is a requisite for all the students in the CS department. This applies for both, the former and the revised program. In this course, students must implement a complete system by themselves in a real environment. This could be either in a professional environment or within a research project under the advice of a professor. The student must pass through all the stages in the software development life cycle, from identifying the problem to its computerized implementation. The Computer Sciences faculty selects the problem either by a suggestion from the student or by a suggestion from another faculty member. The student must present their conclusions in a final technical report. Table 4.1 presents the outcomes of all courses. Notice that all outcomes are strengthen by this course.

---

[3]Robert C. Moore, *Capstone Courses*. http:// users.etown.edu/ m/ moorerc/ capstone.html

	Type	1a	1b	1c	2a	2b	2c	3a	3b	3c	3b	3d	3e
COTI 3101	x	✓		✓	✓		✓	✓	✓	✓		✓	✓
COTI 3102	x	✓			✓		✓	✓	✓				✓
COTI 3205	x			✓	✓			✓		✓		✓	
COTI 4150	is	✓		✓	✓			✓		✓		✓	✓
COTI 4430	is				✓	✓	✓	✓	✓	✓	✓	✓	
COTI 4250	cs	✓	✓	✓	✓							✓	
SICI 3015	x				✓	✓	✓	✓	✓		✓	✓	
SICI 3039	cs	✓		✓	✓	✓	✓	✓	✓	✓	✓		
SICI 4009	x			✓	✓	✓	✓	✓		✓	✓	✓	
SICI 4019	x			✓	✓	✓		✓		✓		✓	
SICI 4028	x	✓			✓								
SICI 4029	x	✓			✓					✓	✓		
SICI 4030	x	✓			✓	✓		✓		✓		✓	✓
SICI 4036	x	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓
SICI 4037	x			✓		✓	✓			✓			
SICI 4038	x		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SICI 4048	el						✓	✓		✓			✓
SICI 4997	el			✓				✓		✓		✓	
SICI 3027	el			✓			✓	✓		✓	✓	✓	
SICI 4210	x						✓	✓	✓	✓	✓	✓	✓
Totals		9	3	12	15	9	11	16	8	16	9	13	8

Table 6.4: Performance Indicators vs. Courses (1a-3e)

	Type	4a	4b	4c	4d	5a	5b	5c	6a	6b	6c	7a	7b
COTI 3101	x			✓						✓		✓	
COTI 3102	x			✓	✓								
COTI 3205	x												
COTI 4150	is				✓					✓			
COTI 4430	is	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
COTI 4250	cs												
SICI 3015	x	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
SICI 3039	cs									✓			✓
SICI 4009	x	✓	✓	✓	✓								
SICI 4019	x	✓	✓	✓	✓				✓	✓	✓		
SICI 4028	x												
SICI 4029	x				✓								✓
SICI 4030	x					✓	✓	✓					
SICI 4036	x									✓			
SICI 4037	x	✓	✓	✓	✓				✓	✓		✓	✓
SICI 4038	x	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	
SICI 4048	el	✓	✓	✓	✓						✓	✓	
SICI 4997	el	✓	✓	✓	✓		✓	✓	✓	✓		✓	
SICI 3027	el												
SICI 4210	x												
Totals		8	8	10	11	3	5	5	5	10	5	7	4

Table 6.5: Performance Indicators vs. Courses (4a-7b)

	Type	8a	8b	9a	9b	10a	10b	10c	10d	10e	10f	11a	11b	11c	11d
COTI 3101	x				✓										
COTI 3102	x							✓			✓		✓		
COTI 3205	x					✓									
COTI 4150	is		✓	✓	✓			✓			✓		✓		
COTI 4430	is	✓	✓	✓	✓						✓	✓	✓	✓	✓
COTI 4250	cs						✓			✓					
SICI 3015	x	✓		✓							✓	✓	✓	✓	✓
SICI 3039	cs			✓	✓						✓				
SICI 4009	x	✓		✓		✓			✓	✓					
SICI 4019	x		✓	✓	✓										
SICI 4028	x					✓				✓					
SICI 4029	x	✓		✓					✓						
SICI 4030	x														
SICI 4036	x			✓	✓	✓	✓	✓			✓		✓		
SICI 4037	x		✓		✓	✓									✓
SICI 4038	x	✓	✓	✓	✓		✓					✓		✓	✓
SICI 4048	el		✓												
SICI 4997	el		✓		✓										
SICI 3027	el			✓	✓										
SICI 4210	x			✓	✓										✓
Totals		5	7	11	11	5	3	3	2	3	6	3	5	3	4

Table 6.6: Performance Indicators vs. Courses (8a-11d)

	Type	12a	12b	12c	12d	12e	12f
COTI 3101	x						
COTI 3102	x						
COTI 3205	x						
COTI 4150	is						
COTI 4430	is	✓	✓	✓	✓	✓	✓
COTI 4250	cs						
SICI 3015	x		✓	✓	✓	✓	✓
SICI 3039	cs						
SICI 4009	x						
SICI 4019	x						
SICI 4028	x						
SICI 4029	x						
SICI 4030	x						
SICI 4036	x						
SICI 4037	x						
SICI 4038	x	✓	✓	✓	✓	✓	✓
SICI 4048	el						
SICI 4997	el						
SICI 3027	el						
SICI 4210	x						
		2	3	3	3	3	3

Table 6.7: Performance Indicators vs. Courses (12a-12f)

Chapter 7

Criterion 6. Faculty

There are ten (10) full-time faculty members in the program, five (5) tenured Associate Professors, two (2) tenured Assistant Professors, one (1) tenured Instructor and two (2) tenure-track Assistant Professor. Currently, the program also has four (4) Adjunct Professors. All faculty members have a strong academic background and expertise. Among the full-time professors, three professors have earned a doctoral degree, while seven others hold a master degree. Currently, there are three professors who are pursuing a doctorate degree. Faculty Qualifications are presented in Table 7.1.

The diversity of the program's topics is well addressed through the variety of educational backgrounds and expertise areas of the faculty. The faculty members are alumni of the University of California at Berkeley, Fairleigh Dickinson University, Nova Southeastern University, Interamerican University of Puerto Rico, Turabo Univeristy of Puerto Rico, University of Puerto Rico at Mayagüez, and the University of Puerto Rico at Río Piedras. Faculty expertise is oriented to Computer Science and Information Systems. The degrees obtained by the faculty range from the following topics: Computer Science, Information Systems, Operational Research, Applied Mathematics, Educational Computing, Open Systems, Computer Information Science and Engineering and Computer Engineering. Faculty members are also members of a variety of professional associations, including ACM, IEEE, and ISACA. Most faculty members have both academic and professional experience, either through private practice or services to other institutional units.

Faculty Name	Highest Degree	Type	Acad. Appoint.	Years in Govnt. Indus. Practice	Years in this Institution	Prof. Certs	Level of Activity		
							Prof. Orgs.	Prof. Dev.	Consult. Summer Work
Filiberto Arniella	M.S./A.B.D.	T	AST	10	27	-	L	L	L
Lillian Bras	M.S.	T	ASC	6	27	-	L	L	L
José Díaz	M.S.	T	ASC	10	21	-	L	L	L
Omar Díaz	M.A.	TT	I	26	9	ACM	L	H	L
Antonio Huertas	M.S.	T	AST	2	15	-	L	L	L
Elio Lozano	Ph.D.	TT	AST	12	3	-	H	H	H
Jaime Miranda	M.S.	NTT	A	1	15	-	H	H	H
Rafael Nieves	D.B.A.	NTT	A	10	5	$\alpha\beta\Sigma$	H	H	H
Carlos Olivares	Ph.D.	NTT	A	-	1	-	M	M	L
Gerardo Ortega	M.S.	NTT	A	-	1	ISACA	H	H	L
Carlos Rodriguez	M.S.	NTT	A	4	4	-	H	H	M
José Rodriguez	M.S.	NTT	A	8	3	-	L	L	L
René Rodríguez	M.S./M.S.	T	ASC	12	17	-	M	M	M
Edgardo Román	M.S.	NTT	A	5	5	-	L	L	L
Madeline Ross	M.A.	NTT	A	-	1	APAD	H	H	L
Juan M. Solá	Ph.D.	TT	AST	18	7	ACM	L	L	L
Nelliud Torres	D.B.A.	T	ASC	-	17	-	L	H	L
José Valles	Ph.D.	NTT	A	9	4	-	L	H	L
Miguel Vélez	M.S.	T	AST	-	14	ISOC	H	H	H

Table 7.1: Faculty Qualifications

7.1   Faculty Workload

Faculty members have a workload of twelve credit hours per semester, with at least half of it for teaching. Full-time professors can select up to 3 different subjects to teach and 21 credits as their maximum academic load. Professors are expected to teach the program's courses, to actively participate in committees as well as to conduct research[1]. They are also expected to actively engage in student advising, and to be active members of various department, college or institutional committees.

7.2   Faculty Size

The faculty size is adequate as evidenced by the fact that all of the course sections are covered every semester. Faculty members willingly choose additional courses beyond the full load of twelve credits. The faculty in conjunction with the Department's student association (AECC, its Spanish acronym)[2] organizes activities every semester. One of the

---

[1]For those who posses doctoral degrees
[2]Computer Science Student Association in English

most important activities is the Computer Programming Inter-University Contest which has been held in the UPRB for twelve (12) years. Computer Science and related program undergraduate students from universities islandwide compete. More information could be found at *http://www.uprb.edu/ profesor/ ntorres/ competencias.htm* Also, the AECC offers seminars and mentoring in computer programming to freshmen and sophomores.

Table 7.3 presents the faculty classified by their expertise. Notice that out of the 18 faculty, 10 emphasizes in CS and 8 in IS.

7.3 Service Courses and Adjunct Professors

Our department offers courses that serve other academic departments. These courses are:

- SICI 4066 *Computer Applications in Education* for Pre-School Teaching and Phys. Ed. Department.

- SICI 3028 *Software Applications* for the Materials Management Department.

- SICI 3017 *Introduction to Electronic Data Processing* for the Department of Biology.

- SICI 4008 *Principles of Electronic Data Processing in Business* for the Department of Business Administration.

These courses introduce students to the use of computers and their software tools oriented specifically to their respective academic programs. The courses cover: Computer Literacy, Word Processing, Electronic Spreadsheet, Presentation Tools, and Databases.

The Computer Science department hires adjunct professors to cover must of the service courses. Eight (8) of the fourteen (14) service courses have been given by adjunct professors, in the past two terms. This represents a 57% of these courses. Also, of the eleven (11) courses taught by the adjunct professors, eight (8) have been a service course (see Table 7.2).

Student advising is formally done by the Department Chair and the Administrative Officer during the pre-registration and registration period. However, Students usually seek advice during the office hours of the professors.

7.4 Professional Development

The Faculty is encouraged to attend seminars, workshops and conferences to seek professional development. Some of our professors have participated in nationwide workshops during the last five years. Also, the Faculty attends seminars within campus. The UPRB holds an annual "Faculty Development Day"[3], which includes a series of concurrent sessions/workshops with local and guest speakers. The topics range from the use of software tools, research projects, research on student learning, assessment and teaching methods. The Department Faculty also offers workshops, seminars, and conferences which are relevant to the academic community. All these activities are considered when applying for promotion in rank and for tenure. Evidence regarding professional development activities will be provided by request to the evaluation team at the time of the visit.

7.5 Authority and Responsibility of Faculty

The Department's Faculty, as a group, works in committees. The committees currently existing in the Department are:

- Assessment and Accreditation Committee (AAC): Established in 2009 to lead the Department's accreditation efforts. This committee has been involved in assessment and accreditation processes. Its activities include the analysis of the ABET criteria with respect to the programs as they were in 2009, suggesting improvements to the program, preparing an initial draft of the program's educational objectives and outcomes, designing the assessment processes, and finally preparing the self-study report. It is responsible for designing accreditation-related corrective actions, including the implementation of changes. This committee is in charge of the Continuous Improvement Process.

- External Advisory Board (EAB): Established in 2010 to comply with ABET criteria, this committee has been active in drafting and approving the program educational objectives, overseeing the curricular revisions, including suggesting courses and course topics; suggesting actions for ensuring the achievement of the educational objectives; and serving as a compass by providing the general directions in which the program should move.

---

[3] "Jornada Docente" in Spanish

- Curricular Committee : This committee oversees course effectiveness in leading to the achievement of the student outcomes and the program educational objectives. It evaluates input from the AAC, the Office of the Dean for Academic Affairs, the Vice-Presidency for Academic Affairs, the Department's Faculty, the UPRB Academic Senate, among other academic entities. The Committee proposes changes to the program, from adding topics to specific courses, the creation of new courses to address changes in the program outcomes or educational objectives, to major and minor curricular revisions with these recommendations and assessment data. It also oversees the program's compliance with new certifications or guidelines.

- Personnel Committee: Aids the Department Chair in overseeing the general aspects related to the Department's personnel. This includes Faculty members in the tenure-granting or rank promotions processes, evaluation of potential new Faculty members, the periodic evaluation of the Faculty members through peer-evaluations and student evaluations, and the awards and recognitions to Faculty members, among others. This committee has representation at the campus level in the Institutional Personnel Committee.

- Research and Development Committee: Promotes and supports the Faculty's involvement in research and development activities. Has representation at the campus level.

- Laboratory Committee : Aids the Department Chair in matters pertaining the availability, maintenance and update of software and hardware tools needed by the courses and the student community.

- Student Affairs Committee : This committee serves as a liason between our student and faculty. The committee provide ways to notify the students of interships, workshops, conferences, seminars, summer Research Experience for Undergraduates (REU), computer programming contests, and programming challenges.

Regarding the definition, revision and implementation of the EOs, the Faculty, through the work and interactions of its committees, has been directly involved in the general bearing of the program. These have been achieved through the following activities; revision of course topics, materials, textbooks, and reference materials, interactions with individual students or student groups, the acquisition and maintenance of the equipment and facilities, and developing curricular revisions.

Faculty Member	PT or FT	Classes Taught Last Two-Terms	Program Activity Dist.			% of Time Devoted to the Program
			Teaching	Research or Scholarship	Other	
Filiberto Arniella	FT	COTI 3205, SICI 3028 SICI 4008, SICI 4019 SICI 4028, SICI 4038	90.25%		9.75% Assessment	100%
Lillian Bras	FT	COTI 3101, COTI 3102 SICI 4038	100%			100%
José Díaz	FT	COTI 3101, COTI 3102 SICI 3017, SICI 3028 SICI 4008, SICI 4029	100%			100%
Omar Díaz	FT	COTI 4150, COTI 4430 COTI 3015, SICI 4008 SICI 4038, SICI 4038	90%		10% Acred. Assessment	100%
Antonio Huertas	FT	COTI 3101, COTI 3205 SICI 3039, SICI 4036	50%		50% Chairman Admin.Board	100%
Elio Lozano	FT	COTI 3101, COTI 4210 COTI 4250, SICI 1008 SICI 3038, SICI 4029	82%	18%		100%
Jaime Miranda	PT	SICI 4028	100%			25 %
Rafael Nieves	PT	SICI 3028, SICI 4008	100%			50 %
Carlos Olivares	PT	SICI 3015	100%			25 %
Gerardo Ortega	PT	SICI 4008	100%			33 %
Carlos Rodríguez	PT	SICI 4066	100%			25 %
José Rodríguez	PT	SICI 4036	100%			25 %
René Rodríguez	FT	MATE 3171, SICI 3017 SICI 3038, SICI 4008 SICI 4009	75%		25 % UPRB Senate Admin Board	100 %
Edgardo Román	PT	SICI 4019	100%			25 %
Madeline Ross	PT	SICI 4066	100%			25 %
Juan M. Solá	FT	COTI 4150, SICI 3017 SICI 4036, SICI 4037 SICI 4048, SICI 4997	70%	18%	12 % Acred.	100 %
Nelliud Torres	FT	COTI 3101, SICI 3017 SICI 4030, SICI 4038 SICI 4066	100%			100%
José Valles	PT	SICI 3105, SICI 4008	100%			50 %
Miguel Vélez	FT	COTI 4210, SICI 4008 SICI 4066	12%		88% Assistant Acad. Dean	100 %

Table 7.2: Faculty Workload Summary

Faculty Member	PT FT	Computer Science	Information Systems
Filiberto Arniella	FT	✓	
Lillian Bras	FT	✓	
José Díaz	FT	✓	
Omar Díaz	FT		✓
Antonio Huertas	FT		✓
Elio Lozano	FT	✓	
Jaime Miranda	PT	✓	
Rafael Nieves	PT		✓
Gerardo Ortega	PT		✓
Carlos Rodríguez	PT		✓
José Rodríguez	PT	✓	
René Rodríguez	FT	✓	
Edgardo Román	PT	✓	
Madeline Ross	PT		✓
Juan M. Solá	FT	✓	
Nelliud Torres	FT		✓
José Valles	PT		✓
Miguel Vélez	FT	✓	

Table 7.3: Faculty Classified by Their Expertise

Criterion 7. Facilities

8.1 Offices, Classrooms and Laboratories

8.1.1 Department Office

The Department Office is located besides building 100, on Academic Building # 2 (see A2 on Figure 8.1). The Department Chair, the administrative assistant and the secretary all have their office spaces located at the Department's Main Office. The equipment at these offices consists of three desktop computers, four printers, a photocopier and a fax machine.

8.1.2 Faculty Offices

Each Faculty member has an office space where they are required to hold at least six weekly office hours. Offices vary in size. Some of these offices accommodate a single professor while others accommodate two. These offices have computers with access to the UPRB domain. The offices are located also in Academic Building # 2.
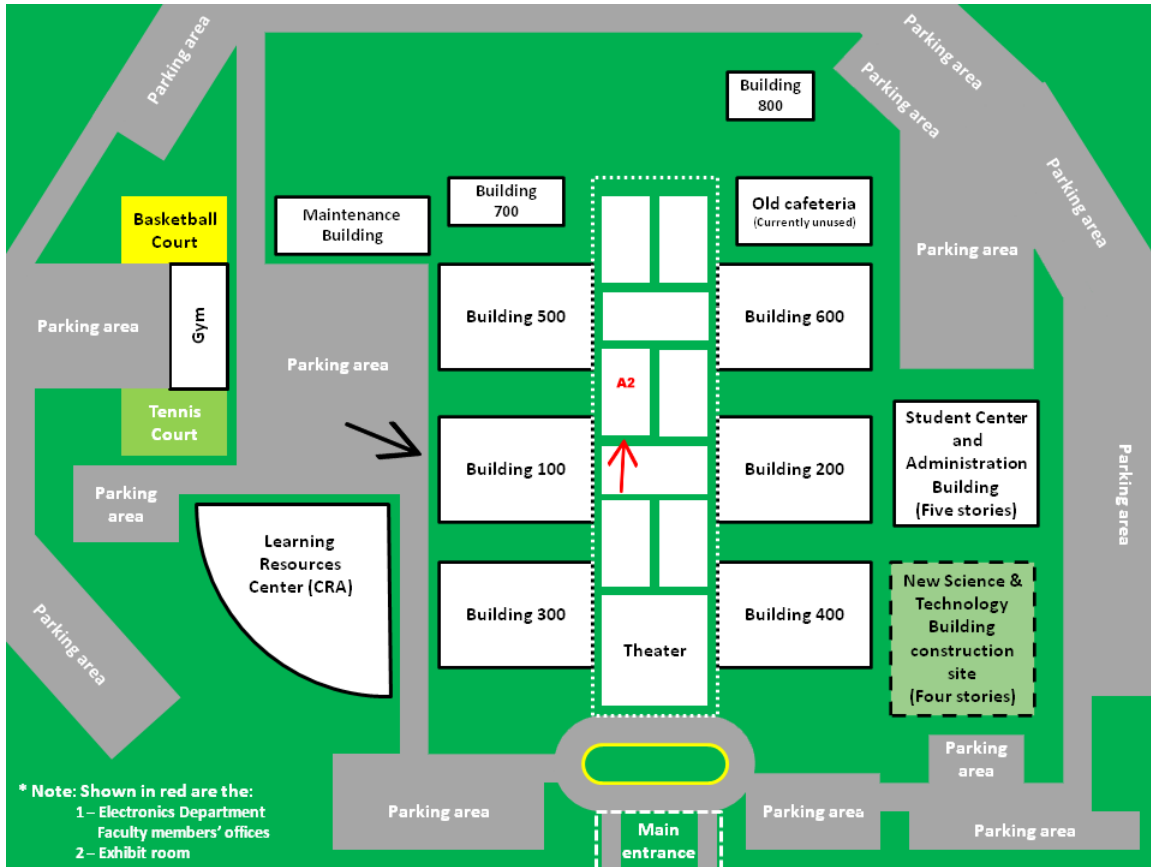
Figure 8.1: UPRB Map

8.1.3 Classrooms and Laboratories

The computer labs are equipped with the latest software available, similar to those to which program graduates are expected to find in their professional work environment. The UPRB domain links all of the Department's computers. This domain provides access to the software needed for programming, project management, as well as for writing reports and creating tables and presentations. Also, it provides Internet access for registered users.

The Department has six computer laboratories. All of them are located in building 100. This building is shared with the Electronics Department and the UPRB's Information Systems Office. Figure 8.1 shows a partial map of the UPRB. Notice that building 100

67

can be identified right in the middle of the map.

Three out of six computer labs are used exclusively for courses. All of them are equipped with a digital projector, a smart board and an orthodox white board. These rooms are 125-A, 124, and 110-A. Laboratories 110-B, 110-C, and 110-D are exclusively for the students of our department. No classes are taught in those laboratories. Labs 125-A, 124, 110-A and 110-B each have between 21 to 22 computers each equipped with the following software:

1. Windows 7

2. Office 2010

3. Visual Studio 2010

4. Eclipse and Netbeans IDE

5. Java JDK

Also, our institution is part of the Microsoft Academic Alliance. This enables the college community to download academic versions of some Microsoft software via the MSDN Alliance Website. Students are able to download software from this library to use them on courses[1].

Laboratory 110-C is known as the "servers and research" lab. This multi-purpose lab has been used for projects in several courses, for undergraduate research projects under the advise of Dr. Elio Lozano, and for the use of the AECC.

Laboratory 110-D is been re-designed. Equipment has been identified and will be ordered during the next academic year as soon as funds are available. We hope that this lab will be ready by the time of the visit.

Tables 8.1 and 8.2 present a brief description of the computers and servers that the department has on their respective rooms and offices.

Our tools are not limited to proprietary software. Open Source software tools and applications are available to our students. Dr. Juan M. Solá-Sloan and Mr. Juan Rios have root access to our SUSE Linux server. This server is currently used for the course SICI 4048 UNIX Operating System. Also, this server has been used for the course COTI 4210 Web Application Programming. Any student of the department may request access to this server via Dr. Solá-Sloan or via Mr. Juan Rios. This server is access remotely via a terminal emulator software or via VNC.

---

[1]For example: Visio and Microsoft Project are used by our students in some of the courses

Lab	Quantity	Type	Computer Model	Usage
110-A	21	Desktop	Dell Optiplex 790	Classroom Computer
110-B	20	Desktop	Dell Optiplex SX 280	Laboratory Computer Only for students of our department
110-C	8	Servers	Dell Pow.Edge SC 1420 Xeon	Laboratory Computer Only for students of our department
124	21	Tower	Dell Optiplex 745	Classroom Computer
125-A	23	Desktop	Dell Optiplex 780 core 2	Classroom Computer
Professor's Office	10	Desktop	Optiplex 745 core 2	Professors Computer

Table 8.1: Department Computers and their Respective Use

Room/Office	Computer Model	Operating System	Usage
P-120	Dell Pow.Edge SC 1420 Xeon	Windows Server 2003 Oracle Database Java JDK	File & Print Server
P-120	Dell Pow. Edge SC 1420	Linux Open Suse	SICI 4048 Unix OS

Table 8.2: Department Computer Servers and their Respective Use

Not all of our courses are taught in a computer lab. Our department share classrooms with the Engineering and Math departments. These rooms are 801 and 806 at the 800 building and 401 at the 400 building (see Figure 8.1). Room 401 is equipped with more than 25 writing desks, and one PC, digital projector and white board for the professor. Rooms 801 and 806 have orthodox white board and writing desks classrooms.

8.2 Computing Resources

The Department has a local Ethernet network which is connected to the UPRB network. Users connect at 100 Mbit/s or 1Gbit/s to the switches. The UPRB network connects to the UPR network through a broadband link.

In addition, the college community can access the Internet anytime through wireless LAN[2] access points. These access points are available throughout the campus. Students must login into the UPRB's network in order to use the wireless infrastructure.

The UPRB Information Systems Office (OSI, in Spanish) maintains and operates the

---

[2]Wi-fi

UPRB network. The Computer Science Department has two technicians who are also responsible for the maintenance and operation of Department's network.

Students, Faculty and Staff members are assigned individual UPR system-wide e-mail accounts. These accounts can be access anywhere. Also, UPRB network accounts allow them to access most computers throughout the UPRB campus.

8.3 Guidance

Since our courses are taught in computer laboratories, the professor of each course provides the appropriate guidance regarding the use of the tools, equipment, computing resources and laboratories. Moreover, students are required to complete lab excercises during the class in which they most demonstrate knowledge of how to use these tools.

8.4 Maintenance and Upgrading of Facilities

Students are required to pay a technology fee at the moment of registration. Yearly, the Chairman of the Department of Computer Science submits a request to the Office of the DAA detailing the needs for the department. The DAA provides funding to the department for the acquisition, upgrade and maintenance of equipment based on money raised from the technology fee and the needs identified by the Chairman. Information that presents the software and hardware that has been acquired for the past five years will be available at the time for the evaluation team.

8.5 Library Services

Through the use of the UPRB network, students and Faculty members can access the Center for Learning Resources and its information databases. Faculty and students are able to access digital libraries of scholar level (i.e. ACM and IEEE Digital Library). This provides the opportunity to browse over two million documents including research articles, standards, transactions and conference proceedings.

8.6   The New Science and Technology Building

The New Science and Technology Building Facilities was scheduled for beginning construction during the second half of 2010. However, this construction have been delayed. The 55,600 square feet structure will be the new home for the academic and research laboratories of the Electronics, Engineering, Computer Science, and Biology Departments. Information about the status of this new building and the space that will be granted to the department is available upon request.

Chapter 9

Criterion 8. Institutional Support

9.1 Leadership

9.1.1 Department Chair

The Department Chair serves as a hub between the Department Faculty, committees, administrative and technical staff, students, campus Administration, the support and service offices, and other academic and non-academic entities within the campus. At the Department level, the Chair leads the efforts towards the achievement of the program EOs and the enforcement of any policies and regulations affecting them. The Department Chair also designs and implements mechanisms to ensure the quality, consistency and effectiveness of the EOs.

9.1.2 The Dean of Academic Affairs

The Office of the Dean for Academic Affairs (DAA) acts as a hub between:

- The academic programs
- The degree-granting departments
- The service departments

- The Office of the Dean for Student Affairs (DSA)

- The Office of the Dean for Administrative Affairs (DAdA)

- Underlying dependencies

- The Chancellors Office

- The UPR Vice-Presidency for Academic Affairs.

The DAA is the administrative official responsible:

- For matters associated to the academic departments and programs

- Formulating guidelines to ensure academic excellence

- The optimal performance of curricular processes.

The Dean also coordinates:

- The efforts to maintain an assessment culture of student learning.

- The *accreditation of academic programs and services*

- The Center for Learning Resources (*Library*).

The key goals of the DAA office are to promote, monitor and coordinate academic activities, the teaching-learning processes, and to stimulate and support academic research. The Office of the DAA, through its activities, policies and actions, helps campus-wide students to meet the EOs of each of the programs. These activities, policies and actions were outlined by the UPRB Administrative Board through *Certification 16-2008-2009*, and established in the UPRB Institutional Strategic Plan. Some of these include:

- Ensure that each semester's academic course offerings allow students to complete their respective programs on time.

- Increase student participation in academic and research activities in and out of the University.

- Provide and promote among the alumni continuing education options.

- Encourage and support the continuous and systematic review of the academic offerings in order to adapt to the development trends of each discipline, and the social and cultural demands, as well as the needs of the various employers in terms of knowledge, skills and attitudes.

- Encourage and support continuous improvement through the systematic assessment of the quality and effectiveness of academic programs and services, including professional and specialized accreditation at the program level, and the units' accreditation at the institutional level.

- Aim the available financial resources towards the achievement of each program's educational objectives.

- Lead and promote the professional development of the academic community, including the Faculty, staff, administration officials, and alumni through professional development programs.

- Stimulate the integration of the Faculty's outside professional experience within the courses and extracurricular activities.

- Encourage departments to establish agreements with other departments, industry, universities, and other external entities, thus promoting an integral development of the students.

- Encourage departments to integrate experiences of community service and social responsibility as part of their development.

9.1.3   The Chancelor

The Chancellor is the highest academic and administrative authority on campus. His office serves as the hub connecting the campus to the rest of the University community, including other campuses, the UPR Central Administration, the Municipal Government, District Senators and Representatives in PR's Government, and the external community in general. In the exercise of his or her corresponding duties, the Chancellor guides and supervises the academic staff in teaching, research, administrative and technical duties. This falls under the provisions of the University Law and the General Rules. This person presides the Academic Senate, the Administrative Board, and the campus's Faculty meetings, and represents the UPRB in official ceremonies, functions, and academic events. The Chancellor appoints the three deans, who are then ratified by the Board of Trustees, after a process of consultation with the faculty. Each Department Head is also appointed by the Chancellor, with the recommendation of the Dean for Academic Affairs and in consultation with the corresponding academic departments' Faculty. The appointment or hiring of the rest of the university support staff is also overseen by the highest ranking official. Based on the recommendations and evaluation of the unit's budgetary requests, the

Chancellor submits the UPRB budget request to the Administrative Board for approval. The budget request is then submitted to the UPR President and the University Board for consideration. The budget is eventually approved by the Board of Trustees.

In addition, the following offices are directly under to the Chancellor's Office:

- Budget Office

- Legal Counsel Office

- Office of Information Technology and Telecommunications

- Student's Ombudsman

The Chancellor's Office, through the following tasks, helps the students meet each program's educational objectives. These activities are included in the UPRB Institutional Strategic Plan, approved by the Administrative Board through *Certification 16 - 2008-2009*.

- Encourage student participation in committees working on issues concerning the university community.

- Stimulate technology transfer, commercialization of intellectual property and research of impact for Puerto Rico's socio-economic development.

- Create mechanisms to facilitate access to electronic information needed for research.

- Set the internal audit mechanisms for the UPRB meeting the highest quality in the administration and provision of university services.

- Making informed decisions on the administrative structure, the re-engineering of business processes and the redistribution of fiscal resources.

- Providing effective access to the network infrastructure and the technological equipment for students and professors, and hosting training sessions to strengthen their computer skills.

- Fostering the participation of professors and students in activities outside the institution and vice versa.

- Create conditions for students to participate in exchanges, volunteering, internships and other experiences including training in academic centers and other institutions.

- Encouraging sponsoring agreements with organizations or entities to subsidize student participation in exchange programs.

- Promote the active participation of professors and students in forums, debates and conferences.

- Promoting through a detailed work schedule and the allocation of resources, the maintenance, preventive care, conservation and improvement of structures, physical facilities, and the surrounding environment.

- Manage the construction of quality spaces for the most suitable environment for learning, research, creation, recreation and sport. In particular, provide professors and researchers with the appropriate individual office spaces.

- Support the ongoing efforts to continue working on the Physical Development and Programmatic Framework.

- Carry out activities and special events at both the academic and cultural levels, improving the relationship between the institution and its graduates.

9.2   Program Budget Process and Financial Support

The UPR System's operational budget is provided by the Government of Puerto Rico as an annuity established by Law, which constitutes 9.6% of the revenues collected by Puerto Rico's General Fund. The UPR Board of Trustees oversees the distribution of this assigned budget.

On a yearly basis, the Deans of Academic Affairs from each of the system's eleven campuses request each of their department's the budgetary needs for the next academic year. Each department chair submits the budget needed with recommendations from its Faculty members and administrative personnel. Each Dean harmonizes the various departmental budget needs and presents them as a whole to the Chancellor. Then, the Chancellor submits this request to the Office of the President of the UPR System. This includes the recommendations from the unit's Administrative Board. The President in turn submits the budget for the UPR System[1] to the UPR Board of Trustees, with the University Board's recommendations.

The UPRB's support for the Department's programs is evidenced by the fact that, even under financial hardship, the assigned budget for the past five years has enabled the CS Department to retain its faculty members and administrative personnel. In addition, the

---

[1]as a whole consolidated budget

University has assigned additional funds to fully cover the required academic load with approximately four part-time professors per semester.

The primary source of financial support for the UPR is the government of Puerto Rico. The second financial source is the enrollment costs, paid by each of the students. Some additional funding is available through proposals submitted by Faculty and staff members, and/or students to a University-wide review committee and a Campus-wide review committee. These proposals can include requests for funding equipment, software, and technological classroom improvements. Table 9.1 lists projects that have been approved and funded in recent years.

A technology fee is part of the enrollment cost of each student. This technology fee is used to acquire, maintain and upgrade the technology infrastructure, facilities and equipment used.

Project Title	PI	2011-2012	2010-2011	2009-2010
Web Server Benchmark Tools for Webstone 2.5 and httperf	Dr. Juan M. Solá-Sloan	$ 9,777.00	$ 8,577.00	
Data Adquisition Using the USB Port	Dr. Elio Lozano Prof. Ismael Sanchez (Electronics Department)			$ 13,000.00
UPRB Intelligent Buildings	Dr. Elio Lozano Prof. Ismael Sanchez (Electronics Department)		$ 13,000.00	
Machine Vision System Libraries to improve Computer Science Curriculum	Dr. Elio Lozano	$ 9,320.00		

Table 9.1: Faculty Funded Research Projects

9.3 Staffing

The Department's support personnel consist of one full-time administrative officer, one full-time secretary, and two Computer & Telecommunications Equipment Specialists. The following is a brief description of the tasks performed by each of them:

- Administrative Officer: Supervises the department administrative work and helps students with their registration process.

- Department Secretary: Processes departmental purchasing requests, maintains all files, schedules meetings, prepares mailings, provides assistance to students in the enrollment process, arranges faculty travel, and processes reimbursements.

- Computer and Telecommunications Equipment Specialists: Assist with technical support on software and equipment. The specialist is responsible for the maintenance and reliability of the laboratories and the equipment, as well as the inventory list. They also distribute some equipment and laboratory materials and components to the students.

In addition, the institutional services available at the UPRB include:

- Admissions Office

- Athletic Activities Department

- Career Development and Placement Center

- Counseling and Orientation Department

- Disabled Student Services

- Division of Continuing Education and Professional Studies

- Financial Aid Office

- Health Services Office

- Information Systems Office

- Learning Resources Center (formerly called the UPRB Library)

- Office for Institutional Research and Planning (OPEI)

- Students Ombudsperson

- Quality of Life Program

- Registrar's Office

- Special Programs Office

- Student Council

- Student Organizations Office

- Social and Cultural Activities Office

- University Student Child Care Program (ACUDEN)

Additional information on these services is available in the UPRB Catalog, which can be downloaded in English at *http://www.uprb.edu/ es/ institucion/ Catalogo2008 - 2011 - english.pdf.* The support personnel and institutional services necessary to achieve the Program Educational Objectives and Program Outcomes are considered adequate and sufficient.

The UPRB obtains funds from diverse sources. The greatest financial contribution to the UPRB comes from state government's general funds. The global recession has had an impact on the Island's economy since 2006. As a result, PR's Government Appropriations have steadily declined and currently reflect a reduction of approximately 14% in tax revenues, which aggravates the Government's deficit. Consequently, the UPR's budget has confronted a proportional decline for the current and upcoming fiscal years.

The UPRB Administration has assigned additional discretionary funding based on priorities and department's necessities, in an effort to alleviate this situation. In addition, the UPRB has created internal mechanisms to improve the administration of financial resources and meeting the established precautionary measures. These mechanisms include an intramural practicum plan, external funds from projects and research, and a planned growth of the non-traditional student population through the UPRB's Extended University Division. These measures are expected to alleviate the institutional economy in the future.

All of the needs from the Computer Science Department's Faculty and its administrative personnel have been covered despite the present situation.

9.4   Support of Faculty Professional Development

The UPRB provides adequate professional development through:

1. Leaves of absence: The UPRB provides a program for Faculty development through the support of obtaining doctoral or post-doctoral degrees.

2. Sabbatical leaves: The UPRB provides a program for doctoral-level Faculty members to conduct research experiments with the intent of further developing the Faculty in general.

3. Individual: Release time is provided to Faculty members as encouragement to attend

professional and academic seminars and meetings outside of the Institution. The UPRB can also provide financial support for attending these meetings depending on the availability of funds and the institutional needs.

4. Institutional Seminars: The UPRB holds an annual activity for the Campus Faculty which includes seminars in diverse topics, aimed at professional development. These are presented by different speakers, including guests.

9.5 Faculty Hiring and Retention

The UPR recognizes that the faculty members are central to the Institution's teaching and learning process. The UPR faculty members are qualified professionals by virtue of their education, training,experience and skills. Until June 2006, the minimum education requirement for a tenure track position as a faculty member was a master's degree[2]. In June 2006, the Board of Trustees of the UPR approved Certification 145 2005-2006 which requires a doctoral degree as the minimum academic qualification to be recruited in a tenure-track position. Therefore, any candidate for a tenure-track position as a professor or researcher must have a doctoral degree or equivalent in the teaching or research discipline[3] according to the policies and procedures established by the President of the UPR. In addition, the Academic Senate has approved internal policies and procedures for the recruitment of new faculty members.

The Department Chair regularly schedule meetings with the Department's Personnel Committee members who make suggestions about the human resources needs of the program. Together, the director and committee identify desirable characteristics and skills of personnel. The hiring and assignment process is adjusted according to the trend of the program. Whenever there is a change in the program trend, a faculty opening occurs. Then, the faculty member hired must conform to those needs. When a vacancy occurs, the Department looks into the pool of candidates that qualifies to fill the vacancy. The Personnel Committee invites the qualified candidates to come to an interview. The one who best matches the vacancy requirements at the time of hiring is selected. The faculty is hired and assigned according to the program needs. All faculty appointments are made among the candidates who respond to the public announcement/ call to a position. This announcement is made once the Dean's Office of Academic Affairs authorizes the department to appoint someone to a tenure-track position. In accordance with Article 46 of the

---

[2]UPR General Bylaws, Article 42; Section 42.1

[3]except of those disciplines with a proven difficulty in recruitment

UPR Regulations, the criteria for the selection of personnel are:

1. the quality of the academic record and university where studies were made

2. mastery of the subject to be taught and capacity to integrate it in related areas

3. teaching experience and the application of knowledge in a particular area

4. publications and presentations made

5. identification with the University Law's philosophy and objectives

6. the capacity for scientific research or creative work.

A candidate for any faculty position must submit his or her academic credentials, a curriculum vitae and a letter of intention to the Department Director. The Department Personnel Committee members perform the peer evaluation of the candidate taking into consideration the recruitment plan, the strategic plan, the academic and professional qualifications of the candidate and the results of the personal interview. When confronted with the decision of filling a position, the Program takes into account some influential or crucial criteria (for example: teaching or other related experience of the candidate, professional certifications, service projects or research).

The main criterion for recruitment in the UPR is the academic preparation. However, the Department Personnel Committee considers professional experience and certifications.

The academic departments, as well as the UPRB, recognize the importance of the faculty's professional development in order to reach the goals and promote excellence in student learning. Faculty is maintained updated on technical aspects in their teaching area through participation in workshops, lectures, seminars, and congresses, among others. To maintain updated in the practice of their discipline, professors also have the opportunity to offer consultant services, work in industry, and offer workshops and lectures in business and industry. There are professors who are in charge of coordinating internships, which allows them to be in contact with industry. By having professors specialized in different areas, students are exposed to different facets of knowledge thereby providing them with a broader academic preparation. Our faculty has liaisons and contacts with the public and private sector, and some faculty are members of professional organizations in their field.

The faculty promotion process has three evaluation phases. The first stage is conducted by the Department Personnel Committee; the second one is performed by the Institutional Faculty Committee; and the last step is made by the Administrative Board. The

evaluations and the original recommendations concerning promotions are made by the Department Personnel Committee, who presents its reports through the corresponding channels.

The recommendations of the departmental committee are sent to the Dean's Office of Academic Affairs via the department chairperson. The reports should include the foundations and conclusions upon which they are based, as well as the list of recommended candidates in order of priority. The Institutional Personnel Committee evaluates each of the candidate's files and recommends promotions to the academic dean. The dean presents the promotions proposed to the chancellor with the recommendations made by the dean's office, the Institutional Personnel Committee, and the department chairperson. When the petitions for promotions are presented to the chancellor, copies are also sent to the Administrative Board. Each academic year, the Administrative Board establishes the date for the ratification of the evaluation reports of the faculty for possible promotions. The Administrative Board, as proposed by the chancellor, evaluates the cases for the possible promotions of faculty and either approves or denies the promotion. As established by Certification No. 32-2002-2003, the Administrative Board (appendix F-10)agreed that promotions be given in descending order of points with one promotion for each rank beginning with full professor until the available funds are depleted. Faculty may be promoted to Auxiliary Professor, Associate Professor or Full Professor. The specific guides and procedures for faculty's application for promotion are described in the process handbook Instruction Guide on the Summary of Points for Promotions of the UPRB Faculty revised in November 2007.

Appendix A

Professors Curriculum Vitae

This appendix presentes an update of the professors Curriculum Vitae.

Part I

Full-Time Professors

Filiberto Arniella

Personal Information

Filiberto Arniella
farniella@hotmail.com
filiberto.arniella@upr.edu
http://www.uprb.edu/profesor/farniella

Academics

A.B.D. Operational Research,
University of Pensylvannia, 1974.

M.A. Mathematics,
University of California at Berkeley, 1971.

B.A. Mathematics,
Universidad de Puerto Rico, Recinto Río Piedras, 1969.

Teaching Experience

Associate Professor University of Puerto Rico at Bayamón,
Computer Science Department. since 1985.

Assistant Professor Inter-american University.
Mathematics and Computer Science. 1984 - 1985.

Professional Association

Member of Statistics Society of Puerto Rico.

Achievements

Math Department Medal UPR, Río Piedras, 1969.

June 26, 2012

Lillian Bras

Personal Information

Lillian Bras-Cummings
lillian.bras@upr.edu

Academics

M.A. Mathematics,
Universidad de Puerto Rico, Recinto Río Piedras, 1970.

B.S. Mathematics,
Universidad de Puerto Rico, Recinto Río Piedras, 1985.

Teaching Experience

Associate Professor University of Puerto Rico at Bayamón,
Computer Science Department, since 1985.

Instructor Sacred Heart University,
Computer Science Department, 1981-1985

Teacher Cupeyville School
Math Teacher, 1977-1980.

Industrial Experience

Project Supervisor "Centro de Acceso a la Información", Sacred Heart University, 1984-1985.

June 26, 2012

Jose J. Díaz

Personal Information

José J. Díaz-Caballero
jose.diaz39@upr.edu
http://www.facebook.com/josejuandiaz

Academics

M.S. Computer Science,
Fairleigh Dickinson University, New Jersey, 1983

B.S. Chemistry Engineering,
Universidad de Puerto Rico, Recinto Mayagüez, 1981

Teaching Experience

Associate Professor University of Puerto Rico at Bayamón,
Computer Science Department, since 1991.

Industrial Experience

Senior Software Engineer GEC-Marconi Electornics Systems, 1984-1991.

Electronics Engineer CECOM Fort Monmouth, 1981-1984.

Security Clearance

U.S. Secret while working at GEC-Marconi.

U.S. Confidential while working at Fort Monmouth.

Volunteer Experience

Puerto Rico Council of Higher Education in a licensing committee evaluating a
private institution, 2000-2002, 2007.

Director of Information Technology Puerto Rico Federation of Amateur Boxing, since 1993 - 1994.

Publications   **Book**: "Excel Rapidito!", Editorial Jon Louis Von Neumann, 2004.

June 26, 2012

Omar Díaz

Personal Information

Omar Díaz-Rivera
omar.diaz4@upr.edu
http://www.uprb.edu/profesor/odiaz/

Academics

D.B.A. Information Systems,
Turabo University, (currently-pursuing).

M.A. Educational Computing,
Inter-american University, 1999.

B.S. Computer Science,
University of Puerto Rico at Bayamón, 1986.

Teaching Experience

Instructor University of Puerto Rico at Bayamón,
Computer Science Department, since 2000.

Adjunct Professor American University of Puerto Rico, Bayamón Campus,
Computer Science Department, 1999 - 2000.

Industrial Experience

Senior Programmer "Banco Popular de Puerto Rico", 1993 - 2003.

Computer Center Director University of Puerto Rico, Carolina Campus, 1992-1993.

Part-time Instructor Dr. Victor Irrizary & Associates, 1992-1998.

Operational Programmer I San Juan Municipality, 1990-1992. item **Electronic Systems Programmer II** University of Puerto Rico, Humacao Campus, 1986-1990.

June 26, 2012

Antonio Huertas

Personal Information

Antonio F. Huertas-Bermudez
ahuertas@prw.net
antonio.huertas@upr.edu
http://www.uprb.edu/profesor/ahuertas

Academics

Ed.D. Higher Education,
Inter-american University (currently-pursuing).

M.S. Open Information Systems,
Inter-american University, 2008.

M.S. Information Systems,
EDP College of Puerto Rico, 1997.

B.S. Mathematics (Computer Science option),
University of Puerto Rico, Mayagüez, 1994.

Teaching Experience

Assistant Professor University of Puerto Rico at Bayamón
Computer Science Department, since 1996

Adjunct Professor Inter-american University of Puerto Rico at Bayamón
Computer Science Department, 2000 - 2005.

Adjunct Professor EDP College of Puerto Rico
Computer Science Program, 1995, 1997.

Adjunct Professor "Universidad del Este"
Computer Science Program, 1997.

Industrial Experience

Electronic Information Systems Programmer: Department of Labor and
Human Resources, Hato Rey, (1995 - 1996).

Computer Programmer Teacher: Micro Tech, Inc, Caguas, 1995.

Achievements

Highest Honor for Master Degree. 1998.

President of the Graduate Student Association, program of Information Systems, 1996 - 1997.

June 26, 2012

Elio Lozano

Personal Information

Elio Lozano-Inca
elozanoi@gmail.com
elio.lozano@upr.edu
http://www.uprb.edu/profesor/elozano

Academics

Ph.D. Computing and Information Science and Engineering,
University of Puerto Rico, at Mayagüez, 2006.

M.S. Scientific Computing,
University of Puerto Rico, at Mayagüez, 2003.

B.A. Mathematics,
"Universidad Nacional de San Antonio Abad del Cusco", 2000.

Teaching Experience

Tenure-track Assistant Professor University of Puerto Rico at Bayamón,
Computer Science Department, since 2009.

Tenure-track Assistant Professor Polytechnic University of Puerto Rico
Computer Science Department, 2006 - 2009.

Teaching Assistant "Pontificia Universidad Católica del Perú"
Department of Mathematics, 2001.

Research Related Activities

Co PI in the project "Caribbean Computer Center for Excellence CCCE Alliance"
leaded by Dr. Juan Arratia at UMET. Aug. 2011.

PI in the project "Machine Vision System Libraries to Improve Computer Science Curriculum", Academic Research Program at University of Puerto Rico at Bayamón, Aug. 2011.

Co PI in the project "How to implement a Smart Building, Academic Research Program at University of Puerto Rico at Bayamón, Aug. 2010.

Co PI in the project "Physical Environmental Variables Acquisition Using Universal Serial Bus", Academic Research Program at University of Puerto Rico at Bayamón, 2009.

Co PI in the project "Infrastructure to Enhance Research of Education in High Performance Computing, Visualization, Game Technology and Data Mining in Puerto Rico" DOD (ONR) GRANT #DURIPARO, 2007

Graduate Research fellowship supported by The Office of Naval Research (ONR) GRANT #N00014-00-1-0360, 2003.

Graduate Research Fellowship CONCYTEC, Perú 2001.

Publications   J. Olaya, E. Lozano, A. Cruz. 2012. "Hybrids: Genetic Algorithm with K-means and Fuzzy C-means". to appear in MLDM'12 proceedings of the International Conference on Machine Learning and Data Mining, Berlin (2012).

D. Sanchez, E. Lozano and J. Solá-Sloan, "An Approach for Constraint Based Heuristic Method of Generating Houses and Building Blueprints for Real-time Applications." GSTF: Global Science and Technology Forum: Journal on Computing, Vol 2., No. 1, pp. 220 - 225, April. 2012.

E. Lozano and E. Acua. "Comparing Clustering and Metaclustering Algorithms", MLDM'11 Proceedings of the 7th international conference on Machine learning and data mining in pattern recognition, pp. 306-319. 2011.

E. Lozano and E. Acua. "High dimensional Data Visualization using Star Coordinates on Three Dimensions". Proceedings of (InSciT06) International Conference on Multidisciplinary Information Sciences and Technologies , Mérida, Spain. 2006.

E. Lozano and E. Acua. "Parallel algorithms for distance-based and density-based outliers". Proceedings of (ICDM'05) IEEE International Conference on Data Mining. pp. 729-732. 2005.

E. Lozano and E. Acua. "Parallel computation of kernel density estimates classifiers and their ensembles". Proceedings of the International Conference on Computer, Communication and Control Technologies, Orlando Florida, USA. 2003.

Professional Association

Member #85009269 of IEEE Computer Society

June 26, 2012

René Rodríguez

Personal Information

René A. Rodríguez
starskypr@gmail.com
rene.rodriguez@upr.edu

Academics

M.S. Computer Science,
Nova Southeastern University, 2003.

M.S. Applied Mathematics,
University of Puerto Rico, Río Piedras, 1991.

B.S. Mathematics,
University of Puerto Rico, Río Piedras, 1983.

Teaching Experience

Associate Professor University of Puerto Rico at Bayamón,
Computer Science Department, since 1995

Instructor Bayamón Central University,
Computer Information Systems
Business Administration Department, (1991 - 1995).

Teaching Assistant University of Puerto Rico, Río Piedras
Department of Mathematics, (1983 - 1984).

Industrial Experience

Operating Systems Specialist, Regional Colleges Administration, Universidad
de Puerto Rico, Río Piedras, (1984-1991).

Achievements

Honored Mention Outstanding Young Men of America, 1986.

June 26, 2012

Juan M. Solá-Sloan

Personal Information

Juan M. Solá-Sloan
juansolasloan@gmail.com
juan.sola@upr.edu
http://www.uprb.edu/profesor/jsola

Academics

Ph.D. Computing and Information Science and Engineering,
Universidad de Puerto Rico en Mayagüez, 2009.

M.S. Computer Engineering,
Universidad de Puerto Rico en Mayagüez, 1998.

B.S. Computer Science,
Universidad de Puerto Rico en Bayamón.

Teaching Experience

Tenure-track Assistant Professor University of Puerto Rico at Bayamón,
Computer Science Department, since 2009

Adjunct Professor Polythecnic University of Puerto Rico,
Computer Science and Engineering Graduate Program, 2009-2012

Computer Science Instructor University of Puerto Rico at Bayamón,
Computer Science Department, 1998-2001

Computer Science Instructor Polythecnic University of Puerto Rico,
Computer Engineering Department, 1998 - 1999

Research Related Activities

Reviewer for CAHSI Annual Meeting,
Poster Session 2011

Proposal Reviewer for various NSF Grants, 2010

Reviewer for CAHSI Annual Meeting,
Poster Session 2010

Achievements

Won third place for Scientific Presentation at the AGEM Winter Symposium, 2007

Co-founder of the Computer Science Student Asociation, 1993.

Co-founder of the Puerto Rican Commodore Computer Young Programmers League, 1988.

Publications Daniel Sanchez, Elio Lozano and Juan M. Solá-Sloan, "An Approach for Constraint Based Heuristic Method of Generating Houses and Building Blueprints for Real-time Applications." GSTF: Global Science and Technology Forum: Journal on Computing, Vol 2., No. 1, pp. 220 - 225, April. 2012.

Juan M. Sol-Sloan and Isidoro Couvertier, "TOE-Em: The TCP Offload Engine Emulator for Approximating the Impact of Removing TCP/IP Protocol Processing From Apache HTTP Server". IJEI: International Journal of Engineering and Industries, Vol 2., No. 4, pp. 1 - 11, Jan. 2012. (Invited Paper)

Juan M. Sol-Sloan and Isidoro Couvertier, "A TCP Offload Engine Emulator for Estimating the Impact of Removing Protocol Processing From a Host Running Apache HTTP Server". In Proceedings *SCS ACM/SIGSIM 12th Communications and Networking Simulation Symposium (CNS'09)*. San Diego California (USA), March 22 - 27, 2009.

Juan M. Sol-Sloan and Isidoro Couvertier, "The Front-End Processor Resurrection in a World Dominated by Gigabit Ethernet". In Proceedings of the *Computing Research Conference 2004*, Mayagüez Puerto Rico, April 2, 2004

Juan M. Sol-Sloan and Isidoro Couvertier, "A Parallel TCP/IP Offloading Framework for TOE Devices". In Proceedings of the *SCS ACM/SIGSIM ATS'03 Advance Telecommunications Symposium 2003*, pages 115-121, Orlando Florida (USA), March 2003.

Juan M. Sol-Sloan and Isidoro Couvertier, "A TCP/IP Offloading Framework for TCP/IP Offload Devices". Proceedings of the *IP System on Chip Based Design*. pages 443-448. Grenoble France.

Isidoro Couvertier and Juan M. Sol-Sloan, "TCP/IP Offloading in an Intelligent Network Interface Card". In Proceedings of the *Computing Research Conference*. pages 1-4. March 16, 2002, Mayagüez Puerto Rico.

Professional Association

Member #6665583 of ACM

Industrial Experience

Consultant for the deployment of the LINUX FPCGI for the NPS System. (Summer 2004).

Consultant for MINI Computer Information Systems. Consultant Computer Programmer, Manager of Information System and Network Technician in the Y2K

COBOL conversion. (1998-1999)

June 26, 2012

Nelliud Torres

Personal Information

Nelliud Torres-Batista
nelliud.torres@upr.edu
http://www.uprb.edu/profesor/ntorres

Academics

D.B.A. Information Systems,
Turabo University, 2011.

M.S. Information Systems,
EDP College of Puerto Rico, 1995.

B.S. Computer Science,
University of Puerto Rico at Bayamón. 1984.

Teaching Experience

Professor University of Puerto Rico at Bayamón,
Computer Science Department, since 1995.

Adjunct Professor Inter-american University of Puerto Rico, Bayamón Campus
Computer Science Department
(Graduate and Undergraduate Programs), since 1999.

Instructor Allied Schools of Puerto Rico, Bayamón Campus
Computer Science Program, 1986 - 1988.

Publications

Books:
"Aplicaciones Office 2007", Editorial John Louis von Neumann, 2008.
"Aplicaciones Office 2003", Editorial John Louis von Neumann, 2004.
"Aplicaciones Office XP", Editorial John Louis von Neumann, 2002.
"Prende y aprende con tu PC: Aplicaciones Office XP", Editorial John Louis von Neumann, 2001.
"Aplicaciones Office 2000", Editorial John Louis von Neumann, 2000.

Industrial Experience

Operating Systems Specialist University of Puerto Rico, Administration of

Regional Colleges, 1984 - 1994.

June 26, 2012

Miguel Vélez

Personal Information

Miguel Vélez-Rubio
mvelez@universia.pr
mvelez@uprb.edu
http://www.uprb.edu/profesor/mvelez

Academics

Ph.D. Information Technology,
Capella University, (currently-pursuing)

M.S. Computer Engineering,
University of Puerto Rico, Mayagüez, 2000.

B.S. Computer Science,
University of Puerto Rico at Bayamón, 1989.

Certifications

AutoCad Level II Certification from AutoDesk, 1995

Teaching Experience

Associate Professor: University of Puerto Rico at Bayamón,
Computer Science Department, since 1998.

Industrial Experience

Laboratory Technician II: University of Puerto Rico at Bayamón, 1989-1998.

Puerto Rico Council of Higher Education, consultative board member 2002-2003.

Consultant and Trainer: Some companies and individuals, since 1998.

June 26, 2012

Part II

Adjunct Professors

Gerardo Ortega

Personal Information

Gerardo Ortega
gerardo.t.ortega@gmail.com

Academics

M.S. Information Systems Auditing,
Sacred Heart University, 2010.

B.S. Installation and Repair of Computerized Information Systems and Networks,
Inter-american University of Puerto Rico, Bayamón Campus, 2006.

Certifications

MCP, MCTS, A+, Network +, IC3
Microsoft 5 Star Program Windows Server 2003: First Star

Teaching Experience

Adjunct Professor University of Puerto Rico at Bayamón,
Computer Science Department, since 2010.

Adjunct Professor Inter-american University of Puerto Rico, Bayamón Campus,
since 2010.

Leadership

Education Director at Information Systems Security Association (ISSA), Puerto
Rico Chapter, 2012.

Coordinator of Information Technology Week at Inter-american University of Puerto
Rico, Bayamón Campus, 2012.

Coordinator of Information Technology Week at Inter-American University of
Puerto Rico, Bayamón Campus, 2006.

June 26, 2012

Jaime Miranda

Personal Information

Jaime Miranda-Ruiz
jmiranda@alacran.ice.org

Academics

M.S. Mathematics,
University of Puerto Rico, Río Piedras, 1993.

B.S. Computer Science,
Sacred Heart University, 1989.

Teaching Experience

Professor Inter-american University, Department of Mathematics, since 1993.

Adjunct Professor Sacred Heart University, Department of Matematics, sice 1989.

Adjunct Professor University of Puerto Rico at Bayamón, Department of Mathematics, since 1994.

Adjunct Professor Polytechnic University of Puerto Rico, Department of Mathematics and Computer Science, 1991 - 1992.

Teaching Assistant University of Puerto Rico, Río Piedras, Department of Mathematics, 1989-1993.

Adjunct Professor National College of Puerto Rico,
Department of Mathematics, 1991.

Industrial Experience

Computer Programmer: Resource Center for Science and Mathematics, Sacred Heart University, 1988 - 1989.

June 26, 2012

Rafael Nieves

Personal Information

Rafael A. Nieves-Rivera
rafnieves@bayamon.inter.edu

Academics

D.B.A. Information Systems,
Turabo University, 2012

M.S. Information Systems ,
EDP College, 1994.

MBA. Business Administration,
Turabo University, 1988.

B.A. Computer Science,
Inter-american University of Puerto Rico, 1985.

A.D. Industrial Engineering,
University of Puerto Rico at Bayamón, 1982.

Teaching Experience

Associate Professor Inter-american University of Puerto Rico, Bayamón Campus,
Computer Science Department, since 1995.

Adjunct Professor "Colegio Universitario del Este",
Computer Science Department, since 1989.

Adjunct Professor Caribbean University,
Computer Science Department, 1988-1994.

Industrial Experience

Computer Consultant: "Oficina de Servicios al Ciudadano", Corozal Municipality, 1993.

Consultant: Melissa Sales Corp. 1990-1994.

Program Coordinator: Allied School of Puerto Rico, 1985 - 1988.

June 26, 2012

Carlos Olivares

Personal Information

Carlos J. Olivares-Pacheco
colivares@bc.inter.edu

Academics

Ph.D. Managerial and Entrepreneurial Business,
Inter-american University of Puerto Rico,

MBA. Management of Information Systems,
Sacred Heart University,

MBA. Accounting,
Inter-american University of Puerto Rico,

B.S. Computer Science,
Sacred Heart University,

Teaching Experience

Associate Professor Inter-american University of Puerto Rico,
Bayamón Campus, Computer Science Department, since 2004.

Assistant Professor Inter-american University of Puerto Rico,
Bayamón Campus, Information Science and Telecommunications Department Chairman, 1997-2004.

Instructor Inter-american University of Puerto Rico, Ponce Campus,
Computer Science Department, 1993-1997.

Adjunct Professor Inter-american University of Puerto Rico, Bayamón Campus,
Computer Science Department, 1993.

June 26, 2012

Carlos Rodríguez

Personal Information

Carlos A. Rodríguez-Sánchez
c_rodriguez41@yahoo.com
http://crodriguez41.tripod.com

Academics

M.B.A. Management of Information Systems,
Sacred Heart University, 1997.

B.S. Computer Science,
University of Puerto Rico at Bayamón, 1984.

Teaching Experience

Bayamón Central University,
Computer Information Systems
Business Administration Department, since 1999.

Adjunct Professor University of Puerto Rico at Bayamón,
Computer Science Department, since 2002.

Adjunct Professor Bayamón Central University,
Computer Information Systems
Business Administration Department, 1998 - 1999.

Industrial Experience

Information System Technician: Bayamón Central University, 1986 - 1999.

Puerto Rico Council of Higher Education in a licensing committee evaluating a
private institution, 1991-2001.

June 26, 2012

José Rodríguez

Personal Information

José A. Rodríguez
jarodriguez@bayamon.inter.edu

Academics

M.S. Computer Science,
John Hopkins University, 1999.

B.S. Computer Science,
Inter-american University, 1995.

Teaching Experience

Instructor Inter-american University, Bayamón Campus
Computer Science Department, since 2003.

Instructor Inter-american University at Barranquitas,
Computer Science Department, 2001 - 2003.

Industrial Experience

Software Engineer: Pro-Object Co., Hanover MD., 2000 - 2001.

Computer Scientist: Department of Defense, Ft. Meade, 1995 - 2000.

Information System Consultant: Property Concepts, Guaynabo, PR. 1995.

Security Clearance

TS//SI (Polygraph) 2001.

June 26, 2012

Edgardo Román

Personal Information

Edgardo Román-Ruiz
profesorroman@gmail.com
eroman@bc.inter.edu
http://facultad.bayamon.inter.edu/eroman/

Academics

M.S. Computer Science Education,
Barry University, North Miami, Florida, 1989

B.S. Computer Science,
Inter-american University of Puerto Rico, 1986.

Teaching Experience

Instructor Inter-american University of Puerto Rico, Bayamón Campus,
Computer Science Department, since 1990.

Industrial Experience

Computer Analyst/Programmer: Information Systems Consultants, 1989-1990.

Computer Operator Ramp-Agent: International Aircraft Services, 1989.

Computer Programmer: Caparra Hardware, 1985.

June 26, 2012

Madeline Ross

Personal Information

Madeline Ross-Caraballo
edist.mr@gmail.com

Academics

M.A. Educational Computing,
Inter-american University, 2004.

B.S. Computer Science,
University of Puerto Rico, at Bayamón, 1984.

Certifications

Virtual Courses Evaluator,(CALED), 2009

Internet and Computing Core Certification (IC^3), Centiport, 2009.

Online Computer Courses Professor, Puerto Rico Department of Education, 2008.

Computer Specialist Teacher, Puerto Rico Department of Education, 2004.

Teaching Experience

Associate Professor: University of Puerto Rico at Bayamón,
Computer Science Department, since 1998.

Industrial Experience

System Programmer: Puerto Rico Department of Education, 2006 - 2010.

Math Teacher: Puerto Rico Department of Education, 1985, 2003 - 2006.

June 26, 2012

José Valles

Personal Information

José R. Valles-Sifre
jvalles@intermetro.edu

Academics

Ph.D. Organization and Management,
Information Technology Management Specialization
Capella University, 2008.

A.B.D. Information Systems,
Nova Southeastern University

M.A. Educational Computing,
Inter-american University of Puerto Rico, 1995.

B.S. Statistics,
West Virginia University, 1986.

Teaching Experience

Associate Professor Inter-american University of Puerto Rico,
Computer Science Department, since 1995.

Adjunct Professor University of Puerto Rico at Bayamón,
Computer Science Department, since 1996.

Adjunct Professor Polytechnic University of Puerto Rico,
Information Systems Graduate Program, 2000 - 2007

Certifications

Oracle 7.0 Master Certification, Oracle Caribbean, 1996
Security Certified Program, Sistemas Plus, Inc., 2006.

Industrial Experience

Computer Teacher/Trainer: Sistemas Plus, Inc., 2005.

Security Certified Program, Sistemas Plus, Inc., 2006.

Consultant: Marchand ICS Group, 2000-2001.

Information Technology Consultant: Ramírez College of Business & Technology, 1995 - 1997.

Information Systems Consultant: Institute for Hemispheric Studies, 1992 - 1994.

June 26, 2012

Appendix B

Syllabus

This appendix presents the Syllabus of the courses taught in the Computer Science program at the University of Puerto Rico at Bayamón.

<table>
<tr><td colspan="2" align="center">

UNIVERSITY OF PUERTO RICO AT BAYAMON
Department of Computer Science

Course Syllabus

</td></tr>
</table>

Course code:	Course Title:		Classification:	Credits:
COTI 3101	Algorithms & Prog. Dev. I		Required	4.00
Prerequisites:	**Co- requisites:**		**Schedule:**	
NONE	NONE		Four hours weekly	

Course Description:

This is the first of two courses that offer an initial view of computer science, focusing in modern programming techniques for problems solving. In this one-year sequence the following topics are studied: basic computer concepts, the design of algorithms and the development of computer programs using object-oriented language. Also, the course analyzes the impact of computer science in modern society and ethical aspects related to the development and implementation of computer programs.

Textbook:

Gaddis, T. (2009). *Starting Out with Java: From Control Structures through Objects* (4th ed.). Boston, MA: Addison-Wesley.

References:

Dale, N. & Weems, C. (2007). *Programming and Problem Solving with Java* (2nd ed.). Sudbury, MA: Jones and Bartlett Publishers.

Deitel, H. M. & Deitel, P. J. (2009). *Java How to Program Late Object Version* (8th ed.). Englewood Cliffs, NJ: Prentice-Hall.

Eck, D. (2011). *Introduction to Programming Using Java* (6th ed.). http://math.hws.edu/javanotes6

Farrell, J. (2007). *An Object-Oriented Approach to Programming Logic and Design - Comprehensive* (2nd ed.). Boston, MA: Course Technology.

Liang, Y. D. (2010). *Introduction to Java Programming -- Comprehensive* (8th ed.).
NJ: Prentice-Hall, Inc.

Sun Microsystems, Inc. (2008). *The Java Tutorials*. Santa Clara, CA. http://java.sun.com/docs/books/tutorial/index.html

Course Objectives (Learning Outcomes):
1. Students will know historical development of computers and their impact in society.
2. Students will be able to describe basic computer's components: hardware and software.
3. Students will be able to analyze problem requirements and develop an algorithm for its solution.
4. Students will be able to use structure charts, flowcharts and pseudo-code to analyze and document a problem's solution.
5. Students will be able to implement algorithms using a modern programming language. For this they will be able to use different control structures such as sequence, selection and repetition.
6. They will be able to use methods/procedures of different types for organizing programs.

Contribution of Course to Program Outcomes (Performance Indicators)

1a-Select the appropriate algorithm for a specific situation (Cog-Knowledge).

1c-Apply mathematical concepts in the solution of a given problem (Cog-Application).
2a-Analyze a problem (Cog. Analysis)
2c-Choose the appropriate software and/or hardware tools to meet the desired goals (Cog-Evaluation).
3a-Design a solution for a given problem using a structured approach (Cog-Synthesis).
3b-Design a solution for a given problem using the object-oriented approach (Cog-Synthesis).
3c-Implement an algorithm using the appropriate programming language (Cog-Application).
3d-Impement abstract solutions using pseudo code, flowchart or natural language (Cog-Synthesis).
3e-Perform both unit and systems testing (Cog-Evaluation).
4c-Assist its team mates when needed (Affective-Responding).
6b-Explain technical concepts using the correct terminology (Affective-Valuing).
7a-Identify the contribution of computing and other related professionals to society (Cog-Knowledge).
9b-Recognize emerging technologies and their implication to the practice of the profession (Cog-Knowledge).

Contribution of Course to Meeting Requirements of Criteria 5:
        This course contributes to the development of the technical content core knowledge.

Main Topics Covered:
1. **Computer history**
2. **Computer components**
3. **Tools for analyzing problem's solution: problem analysis chart, structure chart, flowchart and pseudo code.**
4. **Introduction to programming with Java**
5. **Control structures: sequence, selection, repetition**
6. **Methods and parameters**

Evaluation Criteria:
1. Exams   50%
2. Project   25%
3. Homework's   25%

By Prof. Lillian Bras   **Date: 22/Nov/2011**

Course code:	Course Title:		Classification:	Credits:
COTI 3102	Algorithms & Programs Development II		Required	4.00
Prerequisites:	**Co- requisites:**		**Schedule:**	
COTI 3101	NONE		Four hours weekly	

Course Description:

This is the second of two courses that provide an initial overview of Computer Science, emphasizing modern programming techniques to solve problems. This one-year sequence of curses covers, in theory and practice, basic computer concepts examines the impact of Computer Science in contemporary society and discusses the ethical aspects related to the development and implementation of programs.

Textbook:

Gaddis, T. (2009). *Starting Out with Java: From Control Structures through Objects* (4th ed.). Boston, MA: Addison-Wesley.

References:

Dale, N. y Weems, C. (2007). *Programming and Problem Solving with Java* (2nd ed.). Sudbury, MA: Jones and Bartlett Publishers.

Deitel, H. M. & Deitel, P. J. (2009). *Java How to Program* (8th ed.). Englewood Cliffs, NJ: Prentice-Hall.

Farrell, J. (2007). *An Object-Oriented Approach to Programming Logic and Design -- Comprehensive* (2nd ed.). Boston, MA: Course Technology.

Gaddis, T. & Muganda, G. (2011). Starting Out with Java: From Control Structures through Data Structures (2nd ed.). Boston, MA: Addison-Wesley.

Liang, Y. D. (2010). *Introduction to Java Programming -- Comprehensive* (8th ed.). NJ: Prentice-Hall, Inc.

The Java Tutorials (1995 - 2008). Santa Clara, CA: Sun Microsystems, Inc. Web Site: http://java.sun.com/docs/books/tutorial/index.html

Course Objectives (Learning Outcomes):

1.

Contribution of Course to Program Outcomes (Performance Indicators)

1a-Select the appropriate algorithm for a specific situation (Cog-Knowledge).

1c-Apply mathematical concepts in the solution of a given problem (Cog-Application).

3a-Design a solution for a given problem using the structured approach (Cog-Synthesis).

3b-Design a solution for a given problem using the object-oriented approach (Cog-Synthesis).

3e-Perform both unit and systems testing (Cog-Evaluation).

4c-Assist its team mates when needed (Affective-Responding).

4d-Complete its duties assigned within a team environment (Affective-Valuing).

10c-Determine the most appropriate data structure needed to solve a given problem (Cog-Evaluation).

10f-Determine the most appropriate programming paradigm needed to solve a problem (Cog-Evaluation).

11b-Perform object oriented and structure analysis and design of software systems (Cog-Application).

Contribution of Course to Meeting Requirements of Criteria 5:
This course contributes to the development of the technical content core knowledge.

Main Topics Covered:
1. One-dimensional arrays	8
2. Multidimensional arrays and ArrayList class	8
3. Inheritance and polymorphism	8
4. Object-Oriented Modeling	8
5. Exception Handling	6
6. Files Management	10
7. Principles of GUI Programming	12

Evaluation Criteria:
1.	Exams	50%
2.	Project	25%
3.	Homeworks	25%

By Prof. Jose Juán Díaz Caballero   **Date: 11/04/2011**

UNIVERSITY OF PUERTO RICO AT BAYAMON
Department of Computer Science

Course Syllabus

Course code:	Course Title:	Classification:	Credits:
COTI 3205	Computer Organization	Required	3.00
Prerequisites:	**Co- requisites:**	**Schedule:**	
COTI 3102		Three hours weekly	

Course Description:

This course emphasizes the study of general concepts associated to the internal organization of any computer. During his professional life current students will find computer from different manufactures, with diverse organizations and different instructions sets. Therefore, concepts and techniques will apply to a large class of computers.

Textbook:

Kjell,   B.   (2007).   *Programmed   Introduction   to   MIPS   Assembly   Language*.   Disponible   en
http://programmedlessons.org/AssemblyTutorial

References:

Britton, Robert L. (2004). *MIPS Assembly Language Programming*. Upper Saddle River, NJ: Prentice Hall.

Ellard, Daniel J. (1994). *MIPS Assembly Language Programming: CS50 Discussion and Project Book.* Disponible en
http://www.eecs.harvard.edu/~ellard/Courses/cs50-asm.pdf

Null, L. (2011). *The Essentials of Computer Organization and Architecture* (3rd ed.). Sudburry, MA: Jones and Bartlett.

Patterson, D. & Hennessy, J. (2009). *Computer Organization and Design: The Hardware Software Interface* (4th ed.). Boston, MA: Morgan Kaufman.

Stallings, W. (2010). *Computer Organization and Architecture: Designing for Performance* (8th ed.). Upper Saddle River, NJ: Prentice Hall.

Stokes, J. (2006). *Inside the Machine: An Illustrated Introduction to Microprocessors and Computer Architecture.* San Francisco, CA: No Starch Press, Inc.

Tanenbaum, A. (2006). *Structured Computer Organization* (5th ed.). Upper Saddle River, NJ: Prentice Hall

Course Objectives (Learning Outcomes):

1c-Apply mathematical concepts in the solution of a given problem (Cog-Application).
2a- Analyze a problem (Cog-Analysis).
3a-Design a solution for a given problem using the structured approach (Cog-Synthesis).
3c-Implement an algorithm using the appropriate programming language (Cog-Application).
3d-Implement abstract solutions using pseudo code, flowchart or natural language (Cog-Synthesis).
10a-Solve problems using the principles from discrete and continuous mathematics (Cog-Application).

Contribution of Course to Program Outcomes (Performance Indicators)

a. Apply basic mathematical concepts in the solution of a given problem.
b. Recognition of the theoretical aspects of the field.

e. Design a computational solution for a given problem.

h. Implement abstract solutions using pseudo code, flowchart or natural language.

i. Implement an algorithm using a programming language.

Contribution of Course to Meeting Requirements of Criteria 5:

This course contributes to the development of the technical content core knowledge.

Main Topics Covered:

I. Introduction to Computer Organization
    a) Components of a Computer System
        1. Processor
        2. Memory
        3. I/O
    - Von Neumann architecture
    - Levels of abstraction in a computer system
II. Data Representation
    - Introduction to positional number systems
    - Integer representations
    - Floating pint representations
    - Character representation
III. Instruction Sets
    - Instruction formats
    - Types of instructions
    - Assembly Language of different processors according to their instruction formats
IV. Addressing Modes
    - Direct addressing modes
    - Indirect addressing modes

Evaluation Criteria:

1. Exams   50%
2. Project   25%
3. Homeworks   25%

By Prof. Xxxxx Xxxxx   **Date: 10/*xx*/2011**

Course code:	Course Title:	Classification:	Credits:
COTI 4150	INFORMATION SYSTEMS PROGRAMMING	Required – Information Systems and Technologies	3

Prerequisites:	Co- requisites:	Schedule:
COTI 3102	NONE	Three hours weekly

Course Description:

This course studies the design and development of information systems using structured programming or an object-oriented approach.   In addition, studies the ways to organize files: sequential, relative, indexed and databases.   This course use one or more programming languages as medium to teach the concepts and with a commercial approach.

Textbook:

Starting out with Visual Basic 2010, 5th ed.

Gaddis, T., & Irvine, K. R.

(2010).. Boston: Addison-Wesley.

References:

1. Boehm, A. (2007). Murach's ADO.NET 2.0 Database Programming with VB 2005. Mike Murach & Associates.
2. Elmasri, R. & Navathe, S. (2007). Fundamentals of Database Systems (5th ed.). Addison Wesley.
3. Gaddis, T. & Irvine, K. (2008). Starting Out with Visual Basic 2008 (4th ed.). Addison Wesley.
4. Irvine, K. & Gaddis, T. (2007). Advanced Visual Basic 2005 (4th ed.). Addison Wesley.
5. Mabbut, D. (2008). Visual Basic .NET 2008 Express - A "From the Ground Up" Tutorial.
6. Web site: http://visualbasic.about.com/od/learnvbnet/a/LVBE_L1.htm
7. Peck, G. (2005). Crystal Reports XI: The Complete Reference. McGraw-Hill.
8. Quackit.com (2008). Database Tutorial. Web site: http://www.quackit.com/database/tutorial/
9. Tharp, A. L. (1988). File Organization and Processing. John Wiley & Sons.

Course Objectives (Learning Outcomes):

1. Develop complete applications with graphical interface and easy to use by users.
2. Develop programs using the structured or object-oriented design paradigms.
3. Know the essentials concepts of file organizations.
4. Development application programs that use both traditional file databases.

Contribution of Course to Program Outcomes (Performance Indicators)

1a- Select the appropriate algorithm for a specific situation (Cog-Knowledge).
1c-Apply mathematical concepts in the solution of a given problem (Cog-Application).
2a-Analyze a problem (Cog-Analysis)
3a-Design a solution for a given problem using the structured approach (Cog-Synthesis).
3c-Implement an algorithm using the appropriate programming language (Cog-Application).
3d-Implement abstract solutions using pseudo code, flowchart or natural language (Cog-Synthesis).
3e- Perform both unit and systems testing (Cog-Evaluation).
4d-Completes its duties assigned within a team environment (Affective-Valuing).
6b-Explain technical concepts using the correct terminology (Affective-Valuing).
8b-Use diverse information resources when performing assigned duties (Cog-Application).
9a-Use hardware and software tools currently available (Cog-Application).
9b-Recognize emerging technologies and their implication to the practice of the profession (Cog-Knowledge).
10c-Determine the most appropriate data structure needed to solve a given problem (Cog-Evaluation)
10f-Determine the most appropriate programming paradigm needed to solve a problem (Cog-Evaluation).
11b- Perform object oriented and structure analysis and design of software systems (Cog-Application).

Contribution of Course to Meeting Requirements of Criteria 5:
        This course contributes to the development of the technical content core knowledge.

Main Topics Covered:

1. Introduction to file systems
2. Introduction to programming
3. Troubleshooting
4. Variables and calculations
5. Decisions
6. Cycles
7. Procedures and functions
8. Using files
9. Arrays of one, two and three dimensions
10. Use of multiple forms and menus modules
11. Programming with databases

Evaluation Criteria:

1.	Exams	50%
2.	Project	25%
3.	Homeworks	25%

By Prof. Omar Díaz   **Date: 11/04/2011**

Course code:	Course Title:	Classification:	Credits:
COTI 4250	Introduction to the Theory of Computation	Required for the Applied CS Area of Emphasis	03

Prerequisites:	Co- requisites:	Schedule:
MATE 3015, MATE3175, SICI4036	NONE	Three hours weekly

Course Description:

This course addresses traditional areas of the theory of computation: automata, computability and complexity. These areas address the possibilities and limitations of computers. The course will study topics such as finite automata, regular expressions and languages, context-free grammars, Turing machines, decidable languages, undecidability, complexity of algorithms and the classes P and NP.

Textbook:

Carol Critchlow & David Eck (2011) Foundations of Computation. Department of Mathematics and Computer Science. Hobart and William Smith Colleges, Geneva, NY 14456.

References:
1. Arindama Singh (2009) Elements of Computation Theory. Springer.

2. Cooper, B. S. (2003). Computability Theory. Chapman & Hall/CRC.

3. Cooper, B. S. & Löwe, B. (2005). New Computational Paradigms: First Conference on Computability in Europe, CiE 2005, Amsterdam, The Netherlands, June 8-12, 2005, Proceedings (1st ed.). Springer.

4. Dexter C. Kozen (2011) Theory of Computation. Springer.

5. Homer, S. & Selman, A. L. (2006). Computability and Complexity Theory (1st ed.). Springer.

6. Hopcroft, J. E., Motwani, R. & Ullman, J. D. (2006). Introduction to Automata Theory, Languages,
7. and Computation (3rd ed.). Addison Wesley.

8. Kozen, D. (2011). Theory of Computation. Springer-Verlag: London, UK.

9. Martin, J. (2002). Introduction to Languages and the Theory of Computation. New York, NY: McGraw Hill.

10. MIT Open Courseware (2006). Theory of Computation.
    Web site: http://ocw.mit.edu/courses/mathematics/18-404j-theory-of-computation-fall-2006/

11. Natarajan, A.M., Tamilarasi, A., Balasubramani, P.   (2008) Theory of Computation. New Age International.

12. Simonson, S. (2001). Theory of Computarion. Web site: http://www.aduni.org/courses/theory/

13. Sipser, M. (2006). Introduction to the Theory of Computation (2nd ed.). Thomson Course Technology.

Course Objectives (Learning Outcomes):
At the end of this course, the student will be able to:
1. Explain the theoretical limits of computational solutions to both complex and undecidable problems.
2. Describe specific examples of undecidable or not feasible problems.
3. Determine and analyze the complexity of procedures to determine the properties of limited computing automata.
4. Understand formal definitions of different models of machines.
5. Prove the undecidability or complexity of different problems.

a. Apply basic mathematical concepts in the solution of a given problem.
b. Recognition of the theoretical aspects of the field.
c. Analyze the asymptotic running time of simple algorithms using big-O notation.
h. Implement abstract solutions using pseudo code, flowchart or natural language.

Contribution of Course to Meeting Requirements of Criteria 5:

1a-Select the appropriate algorithm for a specific situation (Cog-Knowledge).
1b-Analyze the asymptotic running time of simple algorithms using big-O notation (Cog-Analysis).
1c-Apply mathematical concepts in the solution of a given problem (Cog-Application).
2a-Analyze a problem (Cog-Analysis).
10b- Perform basic algorithmic analysis using big-O notation (Cog-Analysis).
10e-Appraise whether a given problem has a computational solution (Cog-Evaluation).

Main Topics Covered:
1. Review of material from Discrete Structures and introduction to formal Languages

2. Languages, grammars, and Deterministic and nondeterministic Finite automata

3. Computability Theory, decidable and undecidable languages

4. Complexity Theory, P and NP classes

Evaluation Criteria:
1. Exams   75%
2. Homeworks   25%

By Dr. Elio Lozano   **Date: 10/*19*/2011**

Course code:	Course Title:	Classification:	Credits:
COTI 4430	INFORMATION SYSTEMS PROJECT MANAGEMENT	Required – Information Systems and Technologies	3

Prerequisites:	Co- requisites:	Schedule:
COTI 3102	NONE	Three hours weekly

Course Description:

This course study project management roles and work environments, the project and software development life cycle and various techniques for work planning, procurement, control an evaluation to achieve project objectives. In addition, we will study the most important tools for project management.

Textbook:

Information Technology Project Management, 6th Edition

Katy Schwalbe

Cengage Learning

References:
1. Bidgoli, H. (2011). MIS(Instructor ed.). Boston, MA: Course Technology Cengage Learning.
2. Brewer, J. L., & Dittman, K. C. (2010). Methods of IT project management . Boston: Prentice Hall.
3. Gido, J., & Clements, J. P. (2009). Successful project management   (4th ed.). Mason, OH: South-Western Cengage Learning.
4. Kloppenborg, T. J. (2009). Contemporary project management: organize, plan, perform. Mason, OH: South-Western Cengage Learning.
5. Lemke, J. (2007). Microsoft Office Visio 2007 step by step . Redmond, Wash.: Microsoft Press.
6. Tsui, F. F. (2011). Managing systems and IT projects . Sudbury, Mass.: Jones & Bartlett Learning.

Course Objectives (Learning Outcomes):
1. Create a real-life environment where the student, as part of a project team, participates in   the management, planning, analysis, design, development, implementation, and documentation of an information system project.
2. Define the characteristics of a project and explain the need for project management.
3. Identify leadership styles of project managers.
4. Analyze optimal resources utilization for cost effectiveness and schedule efficiency.
5. Develop cost estimates and budgets to plan project expenditures.
6. Describe how project managers conduct audit of project performances to apply cost and schedule constraints.
7. Explain how project managers must communicate results to stakeholders in order to manage expectations.
8. Identify causes associated with project success and failure.
9. Specify ways in which a project can be terminated upon completion.

Contribution of Course to Program Outcomes (Performance Indicators)

2a-Analyze a problem (Cog-Analysis)
2b-Identify and define the computational requirements needed in a real situation (Cog-Synthesis).
2c-Choose the appropriate software and/or hardware tools to meet the desired goals (Cog-Evaluation).
3a-Design a solution for a given problem using the structured approach (Cog-Synthesis).
3b-Design a solution for a given problem using the object-oriented approach (Cog-Synthesis).
3d-Implement abstract solutions using pseudo code, flowchart or natural language (Cog-Synthesis).
4a- Evaluate a given problem within a team environment (Cog-Evaluation).
4b-Perform the tasks assigned when working on a team (Affective-Responding).
4c-Assist its team mates when needed (Affective-Responding).
4d-Complete its duties assigned within a team environment (Affective-Valuing).
5a-Evaluate the ethical implications of an issue in the computing discipline (Cog-Evaluation).
5b-Evaluate the social impact of a given computing technology (Cog-Evaluation).
5c-Recognize the responsibilities inherent to the profession of computing (Cog-Knowledge).
6a-Present different topics both orally and in writing (Affective-Responding).
6b-Explain technical concepts using the correct terminology (Affective-Valuing).
6c-Display knowledge of technical report writing skills (Cog-Knowledge).
7a-Identify the contribution of computing and other related professionals to society (Cog-Knowledge).
8a-Recognize options of continuing studies after degree completion (Cog-Knowledge).
8b-Use diverse information resources when performing assigned duties (Cog-Application).
9a-Use hardware and software tools currently available (Cog-Application).
9b-Recognize emerging technologies and their implication to the practice of the profession (Cog-Knowledge).
10f- Determine the most appropriate programming paradigm needed to solve a problem (Cog-Evaluation).
11a- Determine the feasibility of a proposed software system (Cog-Evaluation).
11b-Perform object oriented and structure analysis and design of software systems (Cog-Application).
11c-Analyze and evaluate alternatives for acquiring or developing a software system (Cog-Evaluation).
11d- Construct a complete software system (Cog-Synthesis).
12a-Display basic knowledge of accounting and management principles (Cog-Comprehension).
12b-Analyze the information flow in an organization (Cog-Analysis).
12c-Understand the process operations within an organization (Cog-Comprehension).
12d-An ability to discern between a transactional, management of information and decision support system (Cog-Evaluation).
12e-Recommends viable solutions using computer systems as main solution (Cog-Evaluation).
12f-Construct an Information System (Cog-Synthesis).

Contribution of Course to Meeting Requirements of Criteria 5:
    This course contributes to the development of the technical content core knowledge.

Main Topics Covered:
1. Introduction to Project Management
2. The Project Management and Information Technology
3. Microsoft Visio Workshop
4. The Project Management Process Group
5. Project Integration Management
6. Project Scope Management
7. Microsoft Project Workshop
8. Project Time Management

9. Project Cost Management
10. Project Quality Management
11. Project Human Resource Management
12. Project Communications Management
13. Project Risk Management
14. Project Procurement Management

Evaluation Criteria:

1. Exams   50%
2. Project   25%
3. Homeworks   25%

By Prof. Omar Díaz   **Date: 11/04/2011**

UNIVERSITY OF PUERTO RICO AT BAYAMON
Department of Computer Science

Course Syllabus

Course code:	Course Title:	Classification:	Credits:
SICI 3015	ANALYSIS DESIGN INF SYST	Required	3.00
Prerequisites:	**Co- requisites:**	**Schedule:**	
SICI 3012 or COTI 3102 & SICI 3002	NONE	Three hours weekly	

Course Description:

This course provides to the student the skills to develop competences in analysis, design and implementation of computerized systems. It includes the discussion, application and solution of real problems in industry.

Textbook:

Systems Analysis and Design in a Changing World, 5th ed.

John Satzinger, Robert Jackson, & Stephen Burd

(2009).. Boston, MA: Course Technology.

References:

Ashrafi, N. (2008). Object-oriented systems analysis and design . Upper Saddle River, NJ: Prentice Hall.

Galitz, W. O. (2007). The essential guide to user interface design: an introduction to GUI design principles and techniques (3rd ed.). Indianapolis, IN: Wiley Pub.

Kendall, K. E., & Kendall, J. E. (2011). Systems analysis and design (8th ed.). Upper Saddle River, N.J.: Pearson Prentice Hall.

Kloppenborg, T. J. (2011).Contemporary Project Management (2nd ed.). Mason, OH: Cengage Learning South-Western.

Shelly, G. B., Cashman, T. J., & Rosenblatt, H. J. (2010).Systems analysis and design(8th ed.). Boston, Mass.: Thomson Course Technology.

Whitten, J. L., & Bentley, L. D. (2008). Introduction to systems analysis and design . Boston: McGraw Hill Irwin.

Course Objectives (Learning Outcomes):

1. Understand the concepts related with the Software Development Life Cycle (SDLC).
2. Develop skills to solve problems, using basics principles of the SDLC.
3. Learn to identify inputs and outputs for the software development.
4. Learn teamwork skills.
5. Create models and diagrams related with software design.
6. Develop detail and accurate systems specifications.
7. Design solutions using structured diagrams.
8. Recognize the principles of ethics in computing.

Contribution of Course to Program Outcomes (Performance Indicators)

2a- Analyze a problem (Cog-Analysis).
2b- Identify and define the computational requirements needed in a real situation
   (Cog-Synthesis).
2c- Choose the appropriate software and/or hardware tools to meet the desired goals
   (Cog-Evaluation).
3a- Design a solution for a given problem using the structured approach (Cog-Synthesis).
3b- Design a solution for a given problem using the object-oriented approach
   (Cog-Synthesis).
3d- Implement abstract solutions using pseudo code, flowchart or natural language
   (Cog-Synthesis).
4a- Evaluate a given problem within a team environment (Cog-Evaluation)
4b- Perform the tasks assigned when working on a team (Affective-Responding).
4c- Assist its team mates when needed (Affective-Responding).
4d- Complete its duties assigned within a team environment (Affective-Valuing).
5a- Evaluate the ethical implications of an issue in the computing discipline (cog-Evaluation)
5b- Evaluate the social impact of a given computing technology (Cog-Evaluation).
5c- Recognize the responsibilities inherent to the profession of computing (Cog-knowledge).
6b- Explain technical concepts using the correct terminology (Affective-Valuing).
6c- Display knowledge of technical report writing skills (Cog-knowledge).
7a- Identify the contributing of computing and other related professionals to society
   (Cog-knowledge)
7b- Understand computational or technological advances and their impact to the profession
   (Cog-Comprehension).
8a- Recognize options of continuing studies after degree completion (Cog-knowledge).
9a- Use hardware and software tools currently available (Cog-Application).
10f- Determine the most appropriate programming paradigm needed to solve a problem
   (Cog-Evaluation).
11a- Determine the feasibility of a proud software system (Cog-Evaluation).
11b- Perform object oriented and structure analysis and design of software systems
   (Cog-Application).
11c- Analyze and evaluate alternatives for acquiring or developing a software system
   (Cog-Evaluation).
11d- Construct a complete software system (Cog-Synthesis).
12b- Analyze the information flow in an organization (Cog-Analysis).
12c- Understand the process operations within an organization (Cog-Comprehension).
12d- An ability to discern between a transactional, management of information and decision
   Support system (Cog-Evaluation).
12e- Recommends viable solutions using computer systems as main solution (Cog-
   Evaluation)
12f- Construct an information System (Cog-Synthesis).

Contribution of Course to Meeting Requirements of Criteria 5:
   This course contributes to the development of the technical content core knowledge.

Main Topics Covered:

1. Introduction to analysis and design

2. Information systems planning
3. Information systems analysis
4. Data and process modeling tools
5. System analysis and development strategies
6. Completing the system analysis process
7. System output and user interface specifications design
8. Database design techniques
9. Software architectures
10. Completing system design process
11. System development and implementation
12. Completing the system development and implementation
13. Training strategies
14. System upgrades strategies
15. Systems operations, support and security

Evaluation Criteria:
1. Exams   50%
2. Project   25%
3. Homeworks   25%

By Prof. Omar Díaz   **Date: 11/4/2011**

UNIVERSITY OF PUERTO RICO AT BAYAMON
Department of Computer Science

Course Syllabus

Course code:	Course Title:	Classification:	Credits:
SICI 3039	Comparative Programming Languages	Required – Applied Computer Science	3.00

Prerequisites:	Co- requisites:	Schedule:
COTI 3102 or SICI 3012	NONE	Three hours weekly

Course Description:

Introduction to principles of programming languages design and implementation. This course includes an examination of the problems of automatic translation and the syntactic features of a variety of modern programming languages. The main programming paradigms (imperative/procedural, object-oriented, functional and logic) will be compared using appropriate languages.

Textbook:

Webber, A.B. (2010). *Modern Programming Languages: A Practical Introduction* (2nd ed.). Sherwood, OR: Franklin, Beedle & Associates.

References:

Gabrielli, M. & Martini, S. (2010). Programming Languages: Principles and Paradigms. London, UK: Springer.

Mitchell, J. (2003). Concepts in Programming Languages (2nd ed.). Cambridge, UK: Cambridge University Press.

Scott, M. (2009). Programming Languages Pragmatics (3rd ed.). San Francisco, CA: Morgan Kaufmann.

Sebesta, R. (2009). Concepts of Programming Languages (9th ed.). Boston, MA:: Addison-Wesley.

Tate, B.A. (2010). Seven Languages in Seven Weeks: A Pragmatic Guide to Learning Programming Languages. The Pragmatic Programmers.

Tucker, A. & Noonan, R. (2007). Programming Languages: Principles and Paradigms (2nd ed.). New York, NY: McGraw-Hill.

Watt, D. (2004). Programming Languages Design Concepts. Hoboker, NJ: John Wiley & Sons.

Course Objectives (Learning Outcomes):

At the end of this course, the student will be able to:

1. Define the syntax and semantics of various programming languages using formal notations such as (Extended) Backus-Naur Form, Syntax Diagrams, and natural semantics.
2. Describe the main phases in the compilation process and compare compilation with other processing mechanisms such as interpretation.
3. Compare and contrast the main characteristics of the principal programming paradigms, such as imperative/procedural, object-oriented, functional and logic paradigms.
4. Select the most appropriate programming paradigm for the development of specific application.

5.	Write programs in representative languages for each of the paradigms studied.

Contribution of Course to Program Outcomes (Performance Indicators)

1a-Select the appropriate algorithm for a specific situation (Cog-Knowledge).
1c-Apply mathematical concepts in the solution of a given problem (Cog-Application).
2a-Analyze a problem (Cog-Analysis).
2b-Identify and define the computational requirements needed in a real situation (Cog-Synthesis).
2c-Choose the appropriate software and/or hardware tools to meet the desired goals (Cog-Evaluation).
3a-Design a solution for a given problem using the structured approach (Cog-Synthesis).
3b-Design a solution for a given problem using the object-oriented approach (Cog-Synthesis).
3c-Implement an algorithm using the appropriate programming language (Cog-Application).
6b-Explain technical concepts using the correct terminology (Affective-Valuing).
7b-Understand computational or technological advances and their impact to the profession (Cog-Comprehension).
9a-Use hardware and software tools currently available (Cog-Application).
9b-Recognize emerging technologies and their implication to the practice of the profession (Cog-Knowledge).
10f-Determine the most appropriate programming paradigm needed to solve a problem (Cog-Evaluation).

Contribution of Course to Meeting Requirements of Criteria 5:
       This course contributes to the development of the technical content core knowledge.

Main Topics Covered:
1. Introduction to the theory of programming languages
2. Imperative/procedural programming
3. Object-oriented programming
4. Functional programming
5. Logic programming

Evaluation Criteria:
1. Exams and/or quizzes   60%
2. Final exam or quiz   20%
3. Home works   20%

By Prof. Antonio F. Huertas   **Date: 11/04/2011**

UNIVERSITY OF PUERTO RICO AT BAYAMON
Department of Computer Science

Course Syllabus

Course code:	Course Title:	Classification:	Credits:
SICI 4019	Computer Architecture	Required	3.00
Prerequisites:	**Co- requisites:**	**Schedule:**	
SICI 3008 ó COTI 3205	NONE	Three hours weekly	

Course Description:

Provides the description, organization and design of a computer. It explains how the different computer systems and components are related. Topics discussed may include: operating systems, microprogramming, central processing unit (cpu), and disk.

Textbook:

Stallings, W. (2010). *Computer Organization and Architecture: Designing for Performance* (8th ed.). Upper Saddle River, NJ: Prentice Hall.

References:

Britton, Robert L. (2004). *MIPS Assembly Language Programming*. Upper Saddle River, NJ: Prentice Hall.

Ellard, Daniel J. (1994). *MIPS Assembly Language Programming: CS50 Discussion and Project Book*. Disponible en http://www.eecs.harvard.edu/~ellard/Courses/cs50-asm.pdf

Kjell, B. (2007). *Programmed Introduction to MIPS Assembly Language*. Disponible en http://programmedlessons.org/AssemblyTutorial

Null, L. (2011). *The Essentials of Computer Organization and Architecture* (3rd ed.). Sudbury, MA: Jones and Bartlett.

Patterson, D. & Hennessy, J. (2009). *Computer Organization and Design: The Hardware Software Interface* (4th ed.). Boston, MA: Morgan Kaufman.

Stokes, J. (2006). *Inside the Machine: An Illustrated Introduction to Microprocessors and Computer Architecture.* San Francisco, CA: No Starch Press, Inc.

Tanenbaum, A. (2006). *Structured Computer Organization* (5th ed.). Upper Saddle River, NJ: Prentice Hall.

Course Objectives (Learning Outcomes):
1. Know the historic development of modern imputer technology.
2. Apply digital logic concepts the design of logical circuits.
3. Understand on Newman's architecture
4. Understand systems inter conexions including port and bases.
5. Understand the difference among memory medias.
6. Understand how the professor works and its interaction with other system's components.

Contribution of Course to Program Outcomes (Performance Indicators)

1c-Apply mathematical concepts in the solution of a given problem (Cog-Application).
2a-Analyze a problem (Cog-Analysis).
2b-Identify and define the computational requirements needed in a real situation (Cog-Synthesis).
3a-Design a solution for a given problem using the structured approach (Cog-Synthesis).
3c-Implement an algorithm using the appropriate programming language (Cog-Application).

3d-Implement abstract solutions using pseudo code, flowchart or natural language (Cog-Synthesis).
4a-Evaluate a given problem within a team environment (Cog-Evaluation).
4b-Perform the tasks assigned when working on a team (Affective-Responding).
4c-Assist its team mates when needed (Affective-Responding).
4d-Complete its duties assigned within a team environment (Affective-Valuing).
6a-Present different topics both orally and in writing (Affective-Responding).
6b-Explain technical concepts using the correct terminology (Affective-Valuing).
6c-Display knowledge of technical report writing skills (Cog-Knowledge).
8b-Use diverse information resources when performing assigned duties (Cog-Application).
9a-Use hardware and software tools currently available (Cog-Application).
9b-Recognize emerging technologies and their implication to the practice of the profession (Cog-Knowledge).

Contribution of Course to Meeting Requirements of Criteria 5:

This course contributes to the development of the technical content core knowledge.

Main Topics Covered:
1. Introduction to Computer Architecture
   a. Computer structure and function
   b. Levels abstraction
   c. History of computer development
   d. John von Neumann's model
   e. IAS computer
2. Boolean Algebra and Digital Logic
   a. Boolean Algebra
   b. Logic gates
   c. Digital components
   d. Combinatorial circuits
   e. Sequential circuits
   f. Circuit design
3. Main Memory
   a. Registers
   b. Cache memory implementation
   c. Direct mapping
   d. Associative mapping
   e. Set-associative mapping
   f. Replacement algorithms
4. Secondary Memory
   a. CPU structure and function
   b. Instruction cycle
   c. ALU
   d. CU
   e. Microprogramming
   f. Pipeline

Evaluation Criteria:
1. Exams   50%
2. Project   25%

3. Homeworks	25%
By Prof. Xxxxx Xxxxx	**Date: 10/*xx*/2011**

Course code:	Course Title:	Classification:	Credits:
SICI 4028	Computer Operations Research for Computer Science	Required	3.00

Prerequisites:	Co- requisites:	Schedule:
MATE 3015 & SICI 4009	NONE	Three hours weekly

Course Description:

The course covers various basic aspects of the operational study used in planning and research related to computer information systematization.   Topics discussed include: PERT, CPM, linear models, inventory schedules, dynamic programming, optimization of inventory models and simulation.

Textbook:

Hillier, F. S. & Lieberman, G. J. (2005). *Introduction to Operations Research (* 8th ed.). McGraw-Hill.

References

www.usna.edu/Users/weapsys/avramov/.../LP.pdf-theory.stanford.edu/~megiddo/pdf/lpencyc1.pdf

Linear Programming with Excel: www.mccd.edu/faculty/powerd/M15/m15_LinProgLab.htm

Introduction to Queuing Theory: www.research.rutgers.edu/~xili/cs352/queuing-theory.pdf

Queuing Theory: cswilliams.ncat.edu/comp755/Q.pdf

www.ee.cktyu.edu.hk/~zuderman/c/assnotes.pdf

Queuing Theory Calculator. www.supositorio.com

Hillier, F. S. & Lieberman, G. J. (2005). *Introduction to Operations Research (* 8th ed.). McGraw-Hill.

Jensen, P. A. & Bard, J. F. (2003). *Operations Research Models and Methods*. John Wiley and Sons, Inc.

Moskowitz, H. & Wright, G. P. (1979). *Operations Research Techniques for Management*. Prentice-Hall.

Problem Solving Techniques (1995-2006). London, UK: Mind Tools, Ltd.
    Web site: http://www.mindtools.com/pages/main/newMN_TMC.htm.

Project Planning & Management Tools (1995-2006). London, UK: Mind Tools, Ltd.
    Web site: http://www.mindtools.com/pages/main/newMN_PPM.htm.

Rardin, R.L. & Horton, M. (1997). *Optimization in Operations Research*. Prentice-Hall.

Taha, H. A. (2003). *Operations Research: An Introduction* (7th ed.). Prentice-Hall.

Taylor III, B. W. (2004). *Introduction to Management Science* (8th ed). NJ: Prentice Hall.

Course Objectives (Learning Outcomes):

At the end of the course, the student will be able to:

1. Use relevant algorithms to maximize profits and productivity while minimizing costs and the use of external resources in a variety of situations and/or projects.
2. Discuss the merits of mathematical functions for maximization, linear programming, the concept of duality, the simplex method, queuing theory and PERT/CPM for project management.
3. Make recommendations for the best way to optimize services and process in an enterprise using concepts from Operations Research.
4. Use of network analysis to solve classical network problems such as finding the shortest path.

Contribution of Course to Program Outcomes (Performance Indicators)

1a-Select the appropriate algorithm for a specific situation (Cog-Knowledge).
1c-Apply mathematical concepts in the solution of a given problem (Cog-Application).
2a-Analyze a problem (Cog-Analysis)
2b-Identify and define the computational requirements needed in a real situation (Cog-Synthesis).
2c-Choose the appropriate software and/or hardware tools to meet the desired goals (Cog-Evaluation).
3a-Design a solution for a given problem using the structured approach (Cog-Synthesis).
3d-Implement abstract solutions using pseudo code, flowchart or natural language (Cog-Synthesis).
4a-Evaluate a given problem within a team environment (Cog-Evaluation).
4b-Perform the tasks assigned when working on a team (Affective-Responding).
4c-Assist its team mates when needed (Affective-Responding).
4d-Complete its duties assigned within a team environment (Affective-Valuing).
6b-Explain technical concepts using the correct terminology (Affective-Valuing).
7b-Understand computational or technological advances and their impact to the profession (Cog-Comprehension).

Contribution of Course to Meeting Requirements of Criteria 5:

This course contributes to the development of the technical content core knowledge.

Main Topics Covered:

1. Linear Programming
2. Proyect Management
3. Queuing Theory
4. Break-even point

Evaluation Criteria:

1. Exams 70%
2. Project 20%
3. Homeworks 10%

By Prof. Filiberto Arniella   **Date: may /18/2012**

Course code:	Course Title:	Classification:	Credits:
SICI 4029	Fundamentals of Operating Systems	Required	3.00

Prerequisites:	Co- requisites:	Schedule:
SICI 4019	NONE	Three hours weekly

Course Description:
An extensive study of the general principles of Operating Systems. The basics of multiprocessing, managing real and virtual memories, merging of processes and resources, solution to deadlocks.

Textbook:

References:
1. Stallings, Williams *Computer Organization and Architecture*. Upper Saddle River, NJ: Prentice Hall, 2010. http://www.williamstallings.com/COA5e.html

2. Stallings, Williams *Operating Systems*   Fourth Edition. Upper Saddle River, NJ: Prentice Hall, 2009.

3. The ACM Computing Classification System (1998) . Association for Computing Machinery. 21 June 2004 <http://www.acm.org/class/1998/homepage.html>.

4. Tanenbaum, Andrew S. *Modern Operating Systems* Second Edition. Upper Saddle River, NJ: Prentice Hall, 2001.

Course Objectives (Learning Outcomes):
1. Know the history of the operating Systems.
2. Understand the von Neumann architecture and cycle with the interrupt concept.
3. Understand the concept of Process.
4. Know the different between Process and Thread.
5. Understand the concept of Virtual Memory.
6. Know all the major functions of the Operating System.

Contribution of Course to Program Outcomes (Performance Indicators)

1a-Select the appropriate algorithm for a specific situation (Cog-Knowledge).
2a-Analyze a problem (Cog-Analysis).
3b-Design a solution for a given problem using the object-oriented approach (Cog-Synthesis).
3c-Implement an algorithm using the appropriate programming language (Cog-Application).
4d-Complete its duties assigned within a team environment (Affective-Valuing).
7b-Understand computational or technological advances and their impact to the profession (Cog-Comprehension).
8a-Recognize options of continuing studies after degree completion (Cog-Knowledge).
9a-Use hardware and software tools currently available (Cog-Application).

10d-Demonstrates basic knowledge of scientific computing using numerical analysis (Cog-Comprehension).

Contribution of Course to Meeting Requirements of Criteria 5:
This course contributes to the development of the technical content core knowledge.

Main Topics Covered:

1. Introduction
   Structure and function
   History of Computers
2. Process
   Process Control Block
   Thread Control Block
3. Concurrency
4. Memory Management
5. Scheduling
6. File System
7. RAID
8. Security and Protection
9. Telecommunications

Evaluation Criteria:
1. Exams   50%
2. Project   25%
3. Homeworks   25%

By Prof. Xxxxx Xxxxx   **Date: 10/xx/2011**

Course code:	Course Title:		Classification:	Credits:
SICI 4030	DATABASE PROGRAM DEVELOPM		Required	3.00
Prerequisites:	**Co- requisites:**		**Schedule:**	
SICI 3009 ó COTI 3102	NONE		Three hours weekly	

Course Description:

Main characteristics and database management systems (DBMS) is discussed. Design and database implementation is also explained. The course emphasize in creation, query and update of databases using different tools available in the market. Explanation of concepts like: Database models, file organization mechanics, entity relation model, and query a database. Practice experience in database design and manipulation is provided.

Textbook:

Hoffer, J. A., Venkataraman, R. & Topi, H. (2010). *Modern Database Management* (10th). Upper Saddle River, NJ: Prentice Hall.

References:

Connolly, T. M. & Begg, C. E. (2009). *Database Systems: A Practical Approach to Design, Implementation and Management* (5th ed.). Addison-Wesley.

Coronel, C, Morris, S. & Rob, P. (2010). *Database Systems: Design, Implementation and Management* (9th ed.). Boston, MA: Course Technology.

Elmasri, R. & Navathe, S. (2011). *Fundamentals of Database Systems* (6th ed.). Addison Wesley.

García Molina, H., Ullman, J. & Widom, J. (2009). *Database Systems: The Complete Book* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.

Course Objectives (Learning Outcomes):
1. Understand differences between traditional file systems and Database systems.
2. Realize database Rol and database applications in contemporary organizations.
3. Model data using entity-relation diagrams.
4. Design normalize tables in relational databases.
5. Analyze database impact in applications' structure.
6. Use SQL language to create, query and update relational databases.
7. Knowledge about languages and tools used to connect databases.
8. Learn about database administrator's functions and responsibilities.

Contribution of Course to Program Outcomes (Performance Indicators)

1a-Select the appropriate algorithm for a specific situation (Cog-Knowledge).
2a-Analyze a problem (Cog-Analysis).
2b-Identify and define the computational requirements needed in a real situation (Cog-Synthesis).
3a-Design a solution for a given problem using the structured approach (Cog-Synthesis).
3c-Implement an algorithm using the appropriate programming language (Cog-Application).
3d-Implement abstract solutions using pseudo code, flowchart or natural language (Cog-Synthesis).
3e-Perform both unit and systems testing (Cog-Evaluation).
5a-Evaluate the ethical implications of an issue in the computing discipline (Cog-Evaluation).

5b-Evaluate the social impact of a given computing technology (Cog-Evaluation). 5c-Recognize the responsibilities inherent to the profession of computing (Cog-Knowledge).
Contribution of Course to Meeting Requirements of Criteria 5:   This course contributes to the development of the technical content core knowledge.
Main Topics Covered: 1.

Evaluation Criteria:
    1.   Exams   50%
    2.   Project   25%
    3.   Homeworks   25%

By Prof. Xxxxx Xxxxx   **Date: 10/*xx*/2011**

UNIVERSITY OF PUERTO RICO AT BAYAMON
Department of Computer Science

Course Syllabus

Course code:	Course Title:	Classification:	Credits:
SICI 4036	Data Structures	Required	3.00
Prerequisites:	**Co- requisites:**	**Schedule:**	
COTI 3102 or SICI 3012		Three hours weekly	

Course Description:
Concepts of terminology related to the most common data structures such as arrays, records, linked list, stacks, queues and trees. Sorting and searching algorithms are also covered.

Textbook:

Lewis, J., DePasquale, P.J., & Chase, J. (2010). *Java Software Structures: Designing and Using Data Structures* (3rd ed.). Boston, MA: Pearson Education.

References:

Dale, N.B., Joyce, D.T., & Weems, C. (2006). *Object-Oriented Data Structures Using Java* (2nd ed.). Sudbury, MA: Jones and Bartlett.

Deitel, H.M., & Deitel, P.J. (2010). *Java How to Program: Early Objects Version* (8th ed.). Upper Saddle River, NJ: Prentice Hall.

Lewis, J., DePasquale, P.J., & Chase, J. (2010). *Java Foundations: Introduction to Program Design & Data Structures* (2nd ed.). Boston, MA: Pearson Education.

Prichard, J., & Carrano, F. (2006). *Data Abstraction and Problem Solving with Java: Walls & Mirrors* (3rd ed.). Boston, MA: Addison Wesley.

Sun Microsystems. (2010). *The Java Tutorials*. Retrieved from http://java.sun.com/docs/books/tutorial/index.html

Swartz, F. (2007). *Java Notes*. Retrieved from http://leepoint.net/notes-java/index.html

Weiss, M.A. (2006). *Data Structures and Problem Solving Using Java* (3rd ed.). Boston, MA: Addison Wesley.

William, P. (2005). *Data Structures*. Retrieved from http://www.informatics.susx.ac.uk/courses/dats/notes/html/index.html

Course Objectives (Learning Outcomes):
At the end of this course, the student will be able to:
1. Select the most appropriate data structure to store and organize a collection of data so that it can be used efficiently.
2. Implement and analyze the most common sorting and searching algorithms.
3. Determine when an iterative problem should be solved using recursion or loops.
4. Design and code programs of medium complexity in a modern language that supports object-oriented programming.
5. Explain the importance of abstraction and abstract data types in Computer Science.

6.	Implement the most common abstract data types such as stacks, queues, lists, and trees using the data structures such as arrays and linked structures.

Contribution of Course to Program Outcomes (Performance Indicators)

1a-Select the appropriate algorithm for a specific situation (Cog-Knowledge).
1b-Analyze the asymptotic running time of simple algorithms using big-O notation (Cog-Analysis).
1c-Apply mathematical concepts in the solution of a given problem (Cog-Application).
2a-Analyze a problem (Cog-Analysis).
2b-Identify and define the computational requirements needed in a real situation (Cog-Synthesis).
3a-Design a solution for a given problem using the structured approach (Cog-Synthesis).
3b-Design a solution for a given problem using the object-oriented approach (Cog-Synthesis).
3c-Implement an algorithm using the appropriate programming language (Cog-Application).
3e-Perform both unit and systems testing (Cog-Evaluation).
6b-Explain technical concepts using the correct terminology (Affective-Valuing).
9a-Use hardware and software tools currently available (Cog-Application).
9b-Recognize emerging technologies and their implication to the practice of the profession (Cog-Knowledge).
10a-Solve problems using the principles from discrete and continuous mathematics (Cog-Application).
10b-Perform basic algorithmic analysis using big-O notation (Cog-Analysis).
10c-Determine the most appropriate data structure needed to solve a given problem (Cog-Evaluation).
10f-Determine the most appropriate programming paradigm needed to solve a problem (Cog-Evaluation).
11b-Perform object oriented and structure analysis and design of software systems (Cog-Application).

Contribution of Course to Meeting Requirements of Criteria 5:
    This course contributes to the development of the technical content core knowledge.

Main Topics Covered:
1. Review of object-oriented programming
2. Analysis of algorithms: the searching and sorting problem
3. Basic data structures: arrays and linked structures
4. The indexed list abstract data type and its implementation
5. The stack abstract data type and its implementation
6. The queue abstract data type and its implementation
7. Recursive algorithms
8. The binary search tree abstract data type and its implementation
9. The hash table abstract data type and its implementation

Evaluation Criteria:
1. Exams and/or quizzes   60%
2. Final exam or quiz   20%
3. Home works   20%

By Prof. Antonio F. Huertas   **Date: 11/04/2011**

Course code:	Course Title:	Classification:	Credits:
SICI 4037	DATA COMMUNICATION	Required	3.00
Prerequisites:	**Co- requisites:**	**Schedule:**	
SICI 4019 SICI 4029	NONE	Three hours weekly	

Course Description:

Provides the basic knowledge of the systems and methods used in data communication. The course covers all aspects of data communication: terminals, modems, telephone lines, data communication language, considerations for installation of hardware, software communication and networking.

Textbook:

Comer, D. E. (2009). Computer Networks and Internets (5th ed.). Upper Saddle River, NJ: Prentice Hall.

References:

Comer, D. E. (2005). *Hands-on Networking with Internet Technologies* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.

Comer, D. E. (2006). *Internetworking with TCP/IP Principles Protocols and Architectures* (5th ed.). Upper Saddle River, NJ: Prentice Hall.

Stallings, W. (2011). *Data and Computer Communications* (9th ed.). Upper Saddle River, NJ: Prentice Hall.

Stevens, R., Fenner B. and Rudoff, A. (2004). UNIX Networking Programming, Networking APIs: Sockets and XTI, (3rd ed.).   Upper Saddle River, NJ: Prentice Hall.

Thomas, T. (2000). Thomas' Concise Telecom & Networking Dictionary, (1st ed.).   McGraw-Hill.

Course Objectives (Learning Outcomes):
1. Learn about the history and main components of data communication.
2. Understand the OSI and Internet interconnection models which are used to achieve the design of data communication mechanisms.
3. Understand the communication protocols used for the effective management of communication in the cloud.
4. Concepts about local and wide area networks.
5. Know the fundamental characteristics between wired and wireless networks.
6. Understanding of the main characteristics of the media (guided or unguided) used in data communications.
7. Knowledge of the technologies used to provide Internet access to consumers and business

8. Understand the differences between packet and circuit switch networks.
9. Knowledge that enables the recommendation of equipment in real situations.
10. Attain the conceptual tools that enable the design of computer networks based on the requirements of an organization's infrastructure.

Contribution of Course to Program Outcomes (Performance Indicators)

1c-Apply mathematical concepts in the solution of a given problem (Cog-Application).
2b-Identify and define the computational requirements needed in a real situation (Cog-Synthesis).
2c-Choose the appropriate software and/or hardware tools to meet the desired goals (Cog-Evaluation).
3c-Implement an algorithm using the appropriate programming language (Cog-Application).
4a-Evaluate a given problem within a team environment (Cog-Evaluation).
4b-Perform the tasks assigned when working on a team (Affective-Responding).
4c-Assist its team mates when needed (Affective-Responding).
4d-Complete its duties assigned within a team environment (Affective-Valuing).
6a-Present different topics both orally and in writing (Affective-Responding).
6b-Explain technical concepts using the correct terminology (Affective-Valuing).
7a-Identify the contribution of computing and other related professionals to society (Cog-Knowledge).
7b-Understand computational or technological advances and their impact to the profession (Cog-Comprehension).
8b-Use diverse information resources when performing assigned duties (Cog-Application).
9b-Recognize emerging technologies and their implication to the practice of the profession (Cog-Knowledge).
10a-Solve problems using the principles from discrete and continuous mathematics (Cog-Application).
11d-Construct a complete software system (Cog-Synthesis).

Contribution of Course to Meeting Requirements of Criteria 5:
This course contributes to the development of the technical content core knowledge.

Main Topics Covered:
1. General concepts of data communications
2. The physical layer and media used.
3. Features of network communication
4. Topologies, Network Interface Layer
5. Networking Technologies (LAN, WLAN, WAN)
6. Internetworking (TCP/IP)
7. Socket Interface

Evaluation Criteria:
1. Exams   50%
2. Project   25%
3. Homeworks   25%

By Prof. Juan M. Sola Sloan   **Date:** *11/04/2011*

<table>
<tr><td colspan="2" align="center">

UNIVERSITY OF PUERTO RICO AT BAYAMON
Department of Computer Science

Course Syllabus

</td></tr>
</table>

Course code:	**Course Title:**	**Classification:**	**Credits:**
SICI 4038	RESEARCH WORKSHOP	Required	4.00
Prerequisites:	**Co- requisites:**	**Schedule:**	
SICI 4029, SICI 4037 & SICI 3016	NONE	Four hours weekly	

Course Description:

The course provides the metodoly to research and computer systems development. All phases are included, from problem identification the physical implementation. Problems are selected according to actual tendencies in market. The student must prepare their conclusion an solutions in a document.

Textbook:

Hoffer, J. A., George, J. & Valacich, J. (2010). *Modern Systems Analysis and Design* (6th ed.). Upper Saddle River, New Jersey. Web site:
http://www.mypearsonstore.com/bookstore/product.asp?isbn=013608821X

References:

Shelly, G. B. & Rosenblatt, H. J. (2011). *System Analysis and Design (Shelly Cashman)*. Course Technology.

Course Objectives (Learning Outcomes):

1. Prove required skills in research, planning and development of an information system.
2.   Document and recommends viable solutions using computer systems as a main solution.
3. Analyze objectives, functions and information flow to understand user's process operations.
4. Analyze and integrate elements that form the actual operational system.
5. Analyze and evaluate new alternatives looking for procedures that could fit a viable solution to a problem.
6. Design a computer database using the alternative that fills the required users' need.
7. Design, implementation and documentation of a development system.
8. Design an users' manual.

Contribution of Course to Program Outcomes (Performance Indicators)

1b-Analyze the asymptotic running time of simple algorithms using big-O notation (Cog-Analysis).
1c-Apply mathematical concepts in the solution of a given problem (Cog-Application).
2a-Analyze a problem (Cog-Analysis).
2b-Identify and define the computational requirements needed in a real situation (Cog-Synthesis).
2c-Choose the appropriate software and/or hardware tools to meet the desired goals (Cog-Evaluation).
3a-Design a solution for a given problem using the structured approach (Cog-Synthesis).
3b-Design a solution for a given problem using the object-oriented approach (Cog-Synthesis).
3c-Implement an algorithm using the appropriate programming language (Cog-Application).
3d-Implement abstract solutions using pseudo code, flowchart or natural language (Cog-Synthesis).
3e-Perform both unit and systems testing (Cog-Evaluation).
4a-Evaluate a given problem within a team environment (Cog-Evaluation).
4b-Perform the tasks assigned when working on a team (Affective-Responding).
4c-Assist its team mates when needed (Affective-Responding).

4d-Complete its duties assigned within a team environment (Affective-Valuing).
5b-Evaluate the social impact of a given computing technology (Cog-Evaluation).
5c-Recognize the responsibilities inherent to the profession of computing (Cog-Knowledge).
6a-Present different topics both orally and in writing (Affective-Responding).
6b-Explain technical concepts using the correct terminology (Affective-Valuing).
6c-Display knowledge of technical report writing skills (Cog-Knowledge).
7a-Identify the contribution of computing and other related professionals to society (Cog-Knowledge).
8a-Recognize options of continuing studies after degree completion (Cog-Knowledge).
8b-Use diverse information resources when performing assigned duties (Cog-Application).
9a-Use hardware and software tools currently available (Cog-Application).
9b-Recognize emerging technologies and their implication to the practice of the profession (Cog-Knowledge).
10b-Perform basic algorithmic analysis using big-O notation (Cog-Analysis).
11a-Determine the feasibility of a proposed software system (Cog-Evaluation).
11c-Analyze and evaluate alternatives for acquiring or developing a software system (Cog-Evaluation).
11d-Construct a complete software system (Cog-Synthesis).
12a-Display basic knowledge of accounting and management principles (Cog-Comprehension).
12b-Analyze the information flow in an organization (Cog-Analysis).
12c-Understand the process operations within an organization (Cog-Comprehension).
12d-An ability to discern between a transactional, management of information and decision support system (Cog-Evaluation).
12e-Recommends viable solutions using computer systems as main solution (Cog-Evaluation).
12f-Construct an Information System (Cog-Synthesis).

Contribution of Course to Meeting Requirements of Criteria 5:
        This course contributes to the development of the technical content core knowledge.

Main Topics Covered:
   1.

Evaluation Criteria:

1.	Exams	50%
2.	Project	25%
3.	Homeworks	25%

By Prof. Xxxxx Xxxxx   **Date: 10/*xx*/2011**

<table>
<tr><td colspan="2" align="center">**UNIVERSITY OF PUERTO RICO AT BAYAMON**
Department of Computer Science

Course Syllabus</td></tr>
</table>

Course code: COTI 4210	**Course Title:** Web Applic. Programming	**Classification:** Required	**Credits:** 03
Prerequisites: COTI 3102 & SICI 3012 SICI 3020	**Co- requisites:** NONE	**Schedule:** Three hours weekly	

Course Description:

This course provides a comprehensive introduction to the tools and skills required to build and maintain dynamic web sites that provide interactivity to users. Both client-side and server-side programming tools are presented

Textbook:

Sebesta, R.W. (2011). *Programming the World Wide Web* (6th ed.). Boston, MA: Pearson Addison Wesley.

References:

1. Comer, D. E. (2007). *The Internet Book* (4th ed.). Upper Saddle River, NJ: Pearson Prentice-Hall, Inc.

2. Deitel, H. M. & Deitel, P. J. (2008). *Internet & World Wide Web: How to Program* (4th ed.). Upper Saddle River, NJ: Pearson Prentice-Hall, Inc.

3. Felke-Morris, T. (2009). *Web Development and Design Foundations* (4th ed.). Boston, MA: Pearson Addison Wesley.

4. *Internet Society*. (2008). Reston, VA: ISOC. Web Site: http://www.isoc.org

5. Sosinsky, B. & Hilley, V. (2004). *Programming the Web* (1st ed.). New York, NY: McGraw-Hill Technology Education.

6. *World Wide Web Consortium*. (2008). Cambridge, MA: W3C, MIT. Web Site: http://www.w3c.org

Course Objectives (Learning Outcomes):

At the end of this course, the student will be able to
1. Arguing on general aspects of the Internet and World Wide Web in historical terms, operation and application development possibilities.
2. Arguments and recommendations on the general aspects related to programming for the Web, including client-server programming and access to databases.
3. Develop Web applications using various tools available.
4. Perform basic configuration of a Web server and necessary services.
5. Implement Internet applications developed for web servers.

Contribution of Course to Program Outcomes (Performance Indicators)

2c-Choose the appropriate software and/or hardware tools to meet the desired goals (Cog-Evaluation).
3a-Design a solution for a given problem using the structured approach (Cog-Synthesis).
3b-Design a solution for a given problem using the object-oriented approach (Cog-Synthesis).
3c-Implement an algorithm using the appropriate programming language (Cog-Application).
3d-Implement abstract solutions using pseudo code, flowchart or natural language (Cog-Synthesis).
3e-Perform both unit and systems testing (Cog-Evaluation).
9a-Use hardware and software tools currently available (Cog-Application).
9b-Recognize emerging technologies and their implication to the practice of the profession (Cog-Knowledge).

Contribution of Course to Meeting Requirements of Criteria 5:
    This course contributes to the development of the technical content core knowledge.

Main Topics Covered:
1. Fundaments of web programming

2. Basic elements, tables, frames, forms in XHTML

3. Properties of text, images, forms in CSS

4. Basic fundaments of JavaScript and Even-driven programming

5. Basic fundaments of PHP and database access

6. Database management in SQL and MySQL

Evaluation Criteria:
1. Exams   50%
2. Project   25%
3. Homeworks   25%

By Dr. Elio Lozano   **Date: 11/04/2011**

Course code:	Course Title:	Classification:	Credits:
SICI 4997	SPECIAL TOPICS IN EMERGING TECHNOLOGIES (INFORMATION SECURITY)	Elective Course	3.00

Prerequisites:	Co- requisites:	Schedule:
Determined by the professor	Determined by the professor	Three hours weekly

Course Description:

-Special topics in Computer Science and related technologies.-

This course offers a modern perspective on information security and the responsibility that entails the handling of it. The course will discuss the abstractions, mechanisms and basic services in the field of information security. The course includes an overview of the responsibility of managing information through the studies of case studies in which the students analyze and discuss techniques for maintaining the confidentiality, integrity and reliability of information systems. The course also examines the impact to society of using these techniques.

Textbook:

William Stallings, (2011). Cryptography and Network Security (5th ed.). Prentice Hall.

References:

Boneh, D. and Mitchel, J. (2009) Coursework of Standford Course CS155. [en linea en:] http://crypto.stanford.edu/cs155

Matt Bishop, (2005) Introduction to Computer Security, Addison Wesley.

Charles P. Pfleeger and Shari L. Pfleeger, (2003). Security in Computing (3rd ed.). Prentice-Hall.

Sara Baase (2003). A Gift of Fire (2nd ed.). Prentice-Hall.

T.W. Bynum and S. Rogerson. (2004). Computer Ethics and Professional Responsibility.Blackwell.

Course Objectives (Learning Outcomes):

1. Knowledge of the historical development related to information security.
2. Understanding the difference between "information assurance", information security, computer security, network security and Internet safety.
3. Concepts related to cryptography, the four cryptoanalysis techniques, symmetric and asymmetric cryptography, digital signatures, message authentication codes, "hash functions" and modes of encryption and decryption.

4. Distinguish between the different definitions and connotations of the word "hacker" on different subcultures and the general public.
5. Understand the concepts of malicious code and how to protect yourself.
6. Ability to analyze the legal, ethical, and social implications of the misuse of information systems via case studies.
7. Understand the concept of "buffer overflow" and how to create programs to reduce this effect.
8. Operating system security concepts
9. Differentiate block and stream ciphers
10. Concepts of confusion and diffusion that are used in ciphers nowadays.
11. Knowledge of current network security with special emphasis on the HTTPS, Secure HTTP, Secure Socket Layer (SSL), Transport Layer Security (TLS) and Secure Shell (SSH).
12. Differentiate between ways in which operating systems and anti-virus handle trusted and untrusted code.
13. Ability to analyze, design and implement technologies to protect information.
14. Describe the security requirements for information systems to ensure reliability, integrity and secrecy.
15. Analyze the relevance to the applicability of the mechanisms and services focused on protecting information.

Contribution of Course to Program Outcomes (Performance Indicators)

1c-Apply mathematical concepts in the solution of a given problem (Cog-Application).
3a-Design a solution for a given problem using the structured approach (Cog-Synthesis).
3c-Implement an algorithm using the appropriate programming language (Cog-Application).
3d-Implement abstract solutions using pseudo code, flowchart or natural language (Cog-Synthesis).
4a-Evaluate a given problem within a team environment (Cog-Evaluation).
4b-Perform the tasks assigned when working on a team (Affective-Responding).
4c-Assist its team mates when needed (Affective-Responding).
4d-Complete its duties assigned within a team environment (Affective-Valuing).
5c-Evaluate the social impact of a given computing technology (Cog-Evaluation).
5b-Recognize the responsibilities inherent to the profession of computing (Cog-Knowledge).
6a-Present different topics both orally and in writing (Affective-Responding).
6b-Explain technical concepts using the correct terminology (Affective-Valuing).
7a-Identify the contribution of computing and other related professionals to society (Cog-Knowledge).
8b-Use diverse information resources when performing assigned duties (Cog-Application).
9b-Recognize emerging technologies and their implication to the practice of the profession (Cog-Knowledge).

Contribution of Course to Meeting Requirements of Criteria 5:
        This course contributes to the development of the technical content core knowledge.

Main Topics Covered:
1. Introduction to information security and related fields
2. Basic concepts and definitions of the field
3. Management of computerized information ethics
4. Cryptography, and Ciphers Cryptanalysis

5. Evolution of the Ciphers
6. Modern Block and Stream Ciphers
7. Number Theory and mathematical foundations for modern security mechanisms
8. Public and Private Keys
9. Untrusted Code Management
10. Web Security

Evaluation Criteria:

1. Exams	50%	
2. Project	25%	
3. Homework	25%	

By Prof. Juan Manuel Sola Sloan   **Date: 11/4/2011**