Prince Mohammad Bin Fahd University

(Under Registration)

UNDERGRADUATE INFORMATION TECHNOLOGY AND COMPUTER SCIENCE PROGRAMS

Final Report

13 August 2004

TEXAS INTERNATIONAL EDUCATION CONSORTIUM

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PREFACE

This report, ***Undergraduate Information Technology and Computer Science Programs***, is submitted in fulfillment of Item IV.I. of the Contract between the Texas International Education Consortium (TIEC) and the Prince Mohammad Bin Fahd University (PMU) Founding Committee to facilitate the establishment of the PMU. This report is the final version of the combined deliverables being prepared by TIEC Task Team I on Undergraduate Information Technology and Computer Science Programs under the guidance of the TIEC Project Management Team. The task team consists of experts from several TIEC-affiliated universities who are experienced in the development and delivery of undergraduate programs in the field of computer sciences.

The curricula presented in this document provide for awarding three bachelor's degrees, one each in Information Technology, Computer Science, and Computer Engineering. All three of these programs contain closely-related subject areas, and common courses are shared in several instances. In addition, the program in Computer Engineering is related to the bachelor's degree in Electrical Engineering that is being developed by Task Team J. Members of the two teams collaborated in the development of the programs in Computer Engineering and Electrical Engineering.

The efficient delivery of these degree programs requires the coordination of faculty effort across common subject areas. Consequently, it will be important to select faculty who will maintain a cross-disciplinary attitude to delivering both the common courses in addition to specialty courses. An additional efficiency factor limits the number of elective courses, and these courses will need to draw upon selected part-time practitioners who can add a practical orientation to the curricula through real-world applications and thereby achieve the PMU mission of serving the workplace.

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Nick L. Poulton, Ph.D.
President
Texas International Education Consortium
13 August 2004

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UNDERGRADUATE INFORMATION TECHNOLOGY AND COMPUTER SCIENCE PROGRAMS

FINAL REPORT

TABLE OF CONTENTS

Item **Page**

UNDERGRADUATE INFORMATION TECHNOLOGY AND COMPUTER SCIENCE PROGRAMS

I. EXECUTIVE SUMMARY

This report, *Undergraduate Information Technology and Computer Science Programs*, outlines the four-year degree programs for students wishing to pursue undergraduate degree programs in Information Technology, Computer Science, or Computer Engineering within the College of Information Technology at Prince Mohammad Bin Fahd University (PMU).

The integrated institutional structure for the new university will be based on the North American model of education, English as the language of instruction, and a number of individual courses and subject areas that must be mastered by every student. Distinguishing characteristics of the PMU, which will set the university apart from existing institutions in the Kingdom of Saudi Arabia, will be a pervasive use of technology in its learning environment and a commitment to a set of six competencies and learning outcomes that will be integrated throughout the curriculum in a developmental manner.

The College of Information Technology will accept successful male and female students from the PMU Preparation Year Program. The classroom experience for students in the College of Information Technology will be highly student-centered, interactive, and communicative. Wherever appropriate, courses will combine both theoretical and conceptual content, enhanced with practical and laboratory opportunities. Syllabi will include techniques for incorporating opportunities for students to develop communication, teamwork, and leadership skills as part of an overall strategy for achieving the PMU core competencies. Graduates from the College of Information Technology will be self-directed, motivated, technically competent professionals with strong communication skills, capable of effective teamwork and leadership.

This report presents the academic program structures within the College of Information Technology and establishes the relationship between the degree program offerings within the college and the distinguishing PMU competencies. The degree programs within the College of Information technology will be:

- **The Bachelor of Science in Information Technology**. This degree program will provide appropriate professional preparation for students working toward careers in Information Technology departments supporting the management and administration of information systems in commercial and public organizations.

- **The Bachelor of Science in Computer Science**. This degree program will provide appropriate professional preparation for students working toward careers in software engineering, network administration and database administration for both commercial and public organizations. This program also will offer excellent preparation for students intending to study at the advanced degree level.
- **The Bachelor of Science in Computer Engineering**. This degree program will provide appropriate professional preparation for students working toward careers in hardware and network design, and systems integration. This program will offer excellent preparation for students intending to study at the advanced degree level.

II. PROGRAM DEFINITION

A. PURPOSE

The College of Information Technology will provide the structure and organization for male and female students to successfully pursue degree programs in Information Technology, Computer Science, and Computer Engineering at the undergraduate level.

B. VISION

The College of Information Technology will provide a unique and distinguished academic unit that participates in:

- Preparing future Information Technology and Computer Science and Engineering professionals and leaders who can support the emergence of Saudi Arabia as a global IT resource.
- Enriching and developing Information Technology intellectual resources.
- Exploring innovative instructional methodologies and technologies to provide the highest quality effective preparation of information technology professionals.
- Establishing communication and the exchange of ideas between the academic and business communities.

C. MISSION

The College of Information Technology will achieve the following objectives:

- Contribute to advancement of human intelligence and to the promulgation and development of knowledge and understanding in the Information Technology domain.
- Prepare professionals in Information Technology and Computer Science and Engineering, through the utilization of innovative educational processes, in a modern technological environment.
- Transform the graduate to play a pioneering and leading role in the community, enabling him or her to take responsibilities and contribute to solving problems through innovative thinking, collective work, reflection, and self-development.
- Link academic programs and specializations with actual requirements of the surrounding work environment. This will be achieved by maintaining effective partnerships between the university and local business and industry.
- Guide research activities to create solutions for persistent problems in surrounding communities through applied research and technical consultation. The importance of performing basic scientific research for enriching human intelligence should not be neglected.
- Provide community service through continuous training and education.

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III. ADMINISTRATION AND FACULTY

A. COLLEGE ADMINISTRATION

The College of Information Technology will fall under the authority of the Vice Rector of Academic Affairs and will be administered by the Dean of the College of Information Technology.

The College of Information Technology will be responsible for the organization and administration of three-degree programs:

- Bachelor of Science in Information Technology
- Bachelor of Science in Computer Science
- Bachelor of Science in Computer Engineering

(Detailed discussion of the duties of the Vice Rector of Academic Affairs, the Dean of the College of Information Technology and the Chairs and Associate Chairs of the college's departments is provided in the report *PMU Organization*.)

B. DEPARTMENTAL ADMINISTRATION

Responsibility and authority for the daily operation of the college's three degree programs will lie in its two departments: the Department of Information Technology and the Department of Computer Science and Engineering.

- The Department of Information Technology will be responsible for the operation, administration and management of the degree program, including degree-specific and elective requirements, for the Bachelor of Science in Information Technology. It also will administer the general IT (GEIT) courses that are required of all students in the college.
- The Department of Computer Science and Engineering will be responsible for the operation, administration and management of the degree programs, including degree-specific and elective requirements, for the Bachelor of Science in Computer Science and the Bachelor of Science in Computer Engineering.

In each department, a Chair will oversee instruction of male students and an Associate Chair will oversee instruction of female students.

1. The Two-Department Structure

Though the college will offer three major fields of study, this report recommends the establishment of two, rather than three, departments for a number of reasons. Two departments will:

- Lower the cost of administration. This organization will require only two Chairs and two Associate Chairs for the departments.
- Encourage cooperation and coordination. In some institutions, programs in computer science and computer engineering find themselves competing for resources. One department overseeing two programs will encourage cooperation.

2. Departmental Responsibilities

The departments within the College of Information Technology will set the tone for the entire college, including the relationships among faculty, students, and potential employing organizations. Smoothly run operations, therefore, will be essential to the success or the program. Each department will be responsible for:

- Appropriate academic advising for students: The department will strive to provide academic advising to students on an individual basis so as to determine the most appropriate course of study.
- Tutoring and remediation: In cooperation with the PMU Learning Resources Center, the faculty of the college will create tutoring and supplementary instructional programs to assist students who need extra assistance with academic programs or study skills. (A detailed discussion of such offerings and the organization that will provide them is provided in the report *Learning Resources Center*.)
- Maintenance and development of the curriculum. The department will manage continuous curriculum review and improvement. This function will be primarily the responsibility of the professorial faculty.
- Provision of course materials to students. Each student should be provided with all course materials by the program administration. These materials will include: textbooks, cases, articles, and in general any readings that the students are expected to prepare. Providing these materials will ensure that all students will receive the same material, will protect the copyrights of the material, and will be an added benefit to the students.
- Maintaining the class calendar. The calendar for each class of entering students will be published and followed from the first day of each academic semester. This calendar will show class meeting dates. It also will let students know in advance the dates for which they must prepare materials.

- Evaluation of faculty. The department will be responsible for the implementation of PMU policies and procedures for the evaluation of faculty. Each department will be responsible for providing appropriate data and information to the College of Information Technology and to the university as required.

C. FACULTY SELECTION

The quality of faculty will be a critical component of the quality and success of each degree program within the College of Information Technology. Faculty will be academically well prepared and will be proven effective teachers. Faculty will be able to demonstrate a history and currency in providing quality education that aligns well with the PMU core competencies and with the PMU educational philosophy and methods that provide a student-centered and positive environment. The criteria for faculty will be:

1. Degrees and Teaching Experience

Faculty appointed to Professorial ranks will hold a Ph.D. in a relevant discipline. Faculty appointed to Instructor ranks will hold at least a Masters degree in a relevant field and should have experience of working in a professional environment. Upper division (3000 and 4000 level courses) will normally only be taught by faculty in Professorial ranks.

The college will strive to maximize the proportion of faculty with terminal degrees. The college will also ensure that faculty have significant prior teaching experience at the university level. This requirement can be established through statements of teaching philosophy and through demonstration of teaching techniques during an interview.

Preference will be given to faculty who possess prior experience in teaching in cooperative and collaborative learning environments.

2. English Language Skills

All faculty will be proficient in the English language. Preference will be given to faculty who are either native English speakers or have achieved native-level proficiency as demonstrated by a band score of 8.0 or higher on the IELTS, with minimum component test scores of at least 7.5 (or equivalent score on a comparable exam).

3. Alignment to PMU Values

The PMU has established defining institutional characteristics that have a significant impact on the nature of the university and its degree programs. These characteristics also will impact the nature of faculty who will teach within the college. Those characteristics include:

- A student-centered approach to education and instruction including utilization, engagement, feedback and repetition (as identified in the report *Undergraduate Core Curriculum Design*).
- A willingness to undertake professional development activities necessary to learn how to implement a student-centered, communicative classroom environment. Such activities will be supported by the PMU Teaching Development Center.
- A personal and professional commitment of lifelong learning. Faculty will promote lifelong learning attitudes and concepts, not only through their teaching, but also by modeling such attitudes by their personal and professional continuing education activities.
- Sensitivity to Arab cultural and Islamic religious practices and expectations.

4. Student/Faculty Ratios

In order to enhance opportunities for class participation and individual attention, the student/faculty ratio in classes and labs of College of Information Technology will be kept as low as possible.

The College of Information Technology will maintain a maximum student/faculty ratio of approximately 24/1 for lecture and laboratory classes. The college will establish a general class size maximum of 30 students for any single non-laboratory class. Classes that have laboratory components should be restricted to no more than 24 students in order to ensure that appropriate facilities are available to those classes. The college will further work to ensure that the largest classes are distributed across the faculty to minimize inequalities in workload.

The two introductory courses GEIT 1411: Computer Science I and GEIT 1412: Computer Science II may be taught via a combination of large lectures and smaller sections at the discretion of the Departments of Information Technology and Computer Science and Engineering. Calculus courses will be taught via a combination of lecture classes and smaller recitation sections.

IV. STUDENT ENROLLMENT

A. STUDENT BENEFITS

In order to meet the established and growing needs for skilled computer professionals, the PMU College of Information Technology will seek to achieve a number of learning objectives for its graduates.

Students graduating from the College of Information Technology will be well prepared professionally, capable of meeting or exceeding the demands of professional employment in the region, and committed to continued professional development and improvement.

Students will graduate with the skills and experiences necessary to be technically competent in their field; capable of effective communication, cooperation and collaboration with professional peers; and able to provide leadership where appropriate.

The degree programs within the College of Information Technology will:

- Create an understanding of the concepts and practices in the information technology professional fields and provide practical skills in support of those practices.
- Foster teamwork and leadership in the professional environment.
- Enhance the professional communication skills of the participants.

Students graduating from PMU with a degree from the College of Information Technology will have the appropriate background, experiences and qualifications to immediately enter the professional workplace in Information Technology, or Computer Science and Engineering. There is significant and well-established current need for professionals in information technology, and computer science and engineering. The Kingdom of Saudi Arabia, through its Human Resources Development Fund, also has targeted IT as a significant part of its development strategy.* These trends can have the potential consequence of creating greater demand for graduates with IT and CSE skills and qualifications

**"HRDF Unveils Saudization Strategy",* Arab News *newspaper, 24 May 2004*

B. PMU CORE COMPETENCIES

As they work toward achieving the educational benefits outlined above for students, each of the degree programs within the College of Information Technology will maintain values consistent with the undergraduate goals of the university. The development of six distinctive competencies (discussed in detail in the report *Undergraduate Core Curriculum*) is considered to be of value to all effective professionals, whether they are advancing their education at the graduate or undergraduate levels. The six PMU defining competencies are:

- Communication
- Technological competence
- Critical thinking and problem solving
- Professional competence.
- Teamwork
- Leadership

1. Building Competencies in the Classroom

The College of Information Technology will provide an environment in which these core competencies will be recognized for their importance and centrality to the degree programs as well as actively pursued within each degree program. The course syllabi within each of the degree programs (see Section VIII, Course Syllabi, of this report) include specifications of the learning environment and activities and assignments designed specifically to:

- Foster improved communication through classroom and other presentations and through discussion and critique of those presentations.
- Enhance analysis, synthesis and other critical thinking and problem solving components through programming and other projects throughout the curriculum. These competencies will be addressed specifically through the three-course capstone sequence GEIT 3351: Software Engineering I, GEIT 4351: Software Engineering II and ASSE 4311: Learning Outcome Assessment III.
- Provide opportunities for teamwork and leadership skills to be practiced through group projects within much of the curriculum and particularly within the capstone sequence.
- Require reflective self-assessment by students through the use of journaling techniques in much of the curriculum.

2. Building Competencies in the Community

In order to simultaneously build student competencies and meet the PMU goal of serving the surrounding community, the College of Information Technology will offer an elective internship in which students may receive academic credit for working in local business and industry.

Titled Practical Training, the course will require students to apply PMU competencies including professional competence, critical thinking, communication, leadership and teamwork. Faculty will supervise the internship and provide feedback on the student's performance and competencies.

A student who wishes to take the Practical Training elective but who is unable to arrange an internship in business or industry may be allowed to take a directed study course that will provide practical experience under the supervision of a faculty member.

Additionally, it is recommended that the PMU establish a Community Technology Resource Center, which will provide students with work opportunities and will provide members of the community with sources of professional advice for small technology projects.

The center will be jointly operated by the PMU College of Information Technology and the PMU Center for Research Development and Continuing Education. It will be run as a non-profit business, though fees will be charged to cover overhead, pay student wages, and provide additional income for faculty supervisors.

C. ADMISSIONS PROCESS AND REQUIREMENTS

The character and quality of students entering the College of Information Technology will define the quality of the degree programs within the college as well as the quality of the graduates entering Information Technology professional environments after successfully completing the PMU program.

Admissions to the College of Information Technology will be open to students who have successfully completed the PMU Preparation Year Program or who have met the university criteria for bypassing the program.

The degree programs in the College of Information Technology will be designed to accept both male and female students**.**

1. Required Courses in the Preparation Year Program

The PMU Preparation Year Program (as described in the report *Preparation Program Design*) concentrates on English language, mathematics, and study skills and learning strategies. English language, study skills, and the first semester math course, PRPM 0011: Introductory Algebra, are required of all students. However, during the second semester of mathematics, students have a choice of two tracks, depending on their desired major at the university.

Students seeking entrance to the College of Information Technology will be required to take PRPM 0022: Pre-Calculus, during the second semester of the Preparation Year Program.

2. Application for Admission

Upon completion (or waiver) of the Preparation Year Program, students make application to the college in which they wish to study. This application will include:

- Preparation Year Program Certificate of Completion
- PMU Placement Test results
- Interview with the college
- Essay on a topic assigned by the college

(A detailed discussion of admissions requirements and procedures is contained in the report *PMU Admissions Plan*.)

D. PERFORMANCE EXPECTATIONS

The College of Information Technology will provide for minimum standards of academic performance from its students. Using a 4.0 scale for course grades, the College of Information Technology will require that students maintain minimum grade point averages (GPA) for various categories of courses consisting of:

- 2.0 GPA in courses from the PMU Core Curriculum
- 2.0 GPA in degree-specific courses (courses from the Core Curriculum that IT students must complete beyond the minimum requirement)
- 2.25 GPA in courses required by the college (GEIT prefix)
- 2.5 GPA in courses within the academic discipline

A student who receives a D or F in any course will be required to repeat the course (in the case of an elective, another elective may be selected) and to achieve the required grade point average for that category of course. These students will be required to participate in tutoring and remediation programs offered by the college faculty and the PMU Learning Resources Center. (See Section III. B. 2, Departmental Responsibilities, Tutoring and Remediation, above.)

Students may repeat a course one time, with additional repeats allowed at the discretion of the faculty. However, no more than 10 repeated courses will be allowed over the student's career at the PMU. After the first repeat, prior grades will count toward the student's GPA. For example: A student who receives a D followed by an A will have the D erased and replaced with the A on the transcript. A student who receives an F followed by a D followed by an A will have the F erased, and both the D and the A will be averaged into the GPA.

In order to graduate, all students at the PMU will be required to maintain an overall GPA of 2.0.

V. THE EDUCATIONAL EXPERIENCE

A. TECHNOLOGY-INFUSED ENVIRONMENT

Information technology is central and critical to all degree programs in Information Technology. This will be especially true at the PMU where technology competencies are a hallmark of the successful student, and a technology-infused environment is a distinguishing characteristic of the university.

In the College of Information Technology, the quality of access to technology will be a primary determinant in the quality of the educational experience of the student and the eventual professional competence of its graduates. The college will base its assumptions concerning learning and the learning experience on the universal availability of technology resources at all points on the university campus and from outside the campus through Internet-based resources.

1. Technology and the Classroom

Access to technology within the classroom will be a necessary component of the degree programs within the College of Information Technology. Faculty and students involved in classroom presentations will have access to modern presentation technology connected to university computing and library resources as well as to the Internet. (Facilities recommended for "smart" classrooms are discussed in the report *PMU Infrastructure Specifications.)*

2. Student Computing Requirements

Like all other students at the PMU, students within the College of Information Technology will be required to have personal laptop computers. They will have access to the university-wide technology-infused environment including wireless Internet access. However, students in the college will have specific computing requirements that extend beyond the standard Microsoft Office applications of a typical laptop. They will require access to compilers, design tools, and specialized computing environments.

Many of these specific computing requirements must be available through the university's technology infrastructure to students' laptop computers. Specialized computing facilities including access to distributed and parallel computing facilities and isolated network resources will be provided in general access and specialized laboratory facilities. (For a more detailed discussion of the college's specialized laboratory requirements see Section VII., Laboratory Requirements, in this report.)

Technologies such as interactive television, video conferencing and Blackboard or WebCT will be central to maintaining effective communication between faculty and students and among students. The College of Information Technology will make extensive use of these resources to provide equal opportunities in learning within the context of gender separation. The college also will provide for student-oriented discussion through Instant Messaging and online discussion groups. Technology will enable students to directly submit materials, assignments and examinations, and to receive efficient communication of grades and faculty instructions.

The majority of major textbook publishers today provide electronic supplements to their books. Most of the textbooks recommended for the degree programs in the College of Information Technology include such supplements, which the instructor may choose to use as appropriate.

B. THE CLASSROOM EXPERIENCE

The College of Information Technology will make full use of specific classroom characteristics that reflect the defining characteristics of the university. These characteristics will include:

- A technology-infused classroom experience.
- A practical and hands-on orientation to the curriculum, including many laboratory-based classes.
- A curriculum that values teamwork through the use of group assignments and laboratory-based projects.
- A curriculum that values student communication through classroom-based presentations by students and ensuing class discussions.
- A curriculum that values formative self-assessment through the use of journaling and portfolio assessment.

These characteristics are implemented through specific formative and summative assessment requirements as described in individual syllabi. (Syllabi for courses offered by the College of Information Technology appear in Section VIII., Course Syllabi, of this report.)

1. The Degree Programs

Each degree program will consist of a minimum of 128 semester credit hours in conformity to standards typical of American universities as specified in the document *Defining Characteristics and Critical Path.*

Each of the degree programs offered within the college of Information Technology will consist of five components:

- General Education Requirements. These requirements for the University Core Curriculum and College Core Curriculum include 60 credit hours of courses in the PMU core competencies, communication, Arabic Language and Islamic Studies, physical education, mathematics, laboratory science, and social and behavioral sciences. (A detailed discussion of these requirements appears in the report *Undergraduate Core Curriculum Design*.)
- Degree-Specific Requirements. Each degree program will have requirements for additional courses from the College Core Curriculum in support of the degree program. Those courses will primarily be drawn from mathematics and laboratory science courses taught by the Core Curriculum faculty and business courses taught by the College of Business Administration. The degree-specific requirements are unique to each degree program.
- College of Information Technology Requirements. These requirements will consist of seven courses totaling 22 credit hours that are common to all degree programs within the College of Information Technology. They represent a base of knowledge that is presumed for all IT and computing professionals. The courses within the College of Information Technology that meet these requirements are designated with the prefix GEIT. The GEIT courses include the following:
  - GEIT 1411: Computer Science I
  - GEIT 1412: Computer Science II
  - GEIT 1321: Computer Organization
  - GEIT 2291: Professional Ethics
  - GEIT 3341: Database Design
  - GEIT 3351: Software Engineering I
  - GEIT 4351: Software Engineering II

These common courses will administered by the Department of Information Technology.

- Degree Program Requirements. Each degree program will have unique requirements that differentiate the program from others within the college.
- Electives. Each degree program will identify the available electives and any constraints that will apply to the elective selection.

2. The College of Information Technology Capstone Series

One of the critical components in the degree structure with the College of Information Technology will be the capstone series, a sequence of three courses beginning in the junior year that will integrate conceptual materials and practical experience in the development of professional grade application development.

Building on the Capstone Series required by the PMU Core Curriculum (which begins in the sophomore year with ASSE 2111: Learning Outcome Assessment I and continues in the junior year with ASSE 3211: Learning Outcome Assessment II), the series will comprise three courses, GEIT 3351: Software Engineering I, GEIT 4351: Software Engineering II and ASSE 4311: Learning Assessment III. Each course in the series will center on a different facet of software engineering.

- GEIT 3351: Software Engineering I will examine the theory and practice of software development and maintenance with the focus being on the full software development life cycle, including coverage of tools, techniques, principles, and guidelines for software requirements, specification, design and implementation.
- GEIT 4351: Software Engineering II will focus on the application of that theory and practice in the design of a solution to a significant software engineering problem. This course will culminate in the development of full design documentation for such a solution.
- ASSE 4311: Learning Assessment III will concentrate on the implementation, testing, debugging and maintenance of a designed software engineering solution.

The series of courses will lead students through conceptual understanding of how professional software development is managed and the tools and techniques used to do so.

VI. DEPARTMENTS AND MAJORS

A. DEPARTMENT OF INFORMATION TECHNOLOGY

The Department of Information Technology will be administered as a division of the College of Information Technology. As such, it will fall under the senior leadership of the Vice Rector of Academic Affairs and the Dean of the College of Information Technology.

Responsibility for the operation, administration and management of the Department of Information Technology will rest in the Chair of the Department of Information Technology. The chair will oversee the department as a whole, with primary responsibility for instruction of male students. He will delegate responsibilities as appropriate to the Associate Chair, who will oversee instruction for female students.

The Department of Information Technology is charged with the responsibility of maintaining, administering and managing the College of Information Technology degree requirements; those requirements that are common to all degree programs within the college; and the degree requirements of the Bachelor of Science in Information Technology.

1. Content of the Information Technology Degree Program

The Bachelor of Science in Information Technology is comprised of five components:

- The PMU Core Curriculum. This core curriculum consists of 60 hours of coursework as defined in the report *Undergraduate Core Curriculum Design.*
- Degree-Specific Requirements. These requirements represent support courses in mathematics, laboratory science and business. These requirements both specify and extend Core Curriculum requirements. The degree-specific requirements add 7 credit hours to the degree program.

  The University Core Curriculum requires six semester hours of mathematics. The Information Technology degree program extends that requirement to nine semester credit hours of mathematics and specifies that the courses will be:

  - MATH 1311 Finite Mathematics for Business
  - MATH 1331 Pre-Calculus Mathematics
  - MATH 1321 Statistical Methods

  University Core Curriculum requires eight semester hours of Natural and Physical Science. The Information Technology degree program extends that requirement to 12 semester credit hours and specifies that the courses will be:

- PHYS 1412 Physics for Engineers I
- PHYS 1413 Physics for Engineers II
- Natural Science elective

- The College of Information Technology Requirements. These requirements consist of 20 hours of coursework contained in the seven college courses designated with the GEIT prefix. This coursework represents conceptual and skill-based knowledge that is common to all degree programs within the College of Information Technology. (See Section V.B.1., Degree Programs, of this report.)

- The Degree Program Requirements. These requirements consist of 27 hours of coursework as follows:

  - ITAP 2381: Operations Research
  - ITAP 2431: Network Management
  - ITAP 3471: Web Server Management
  - ITAP 3381: Business Process Redesign
  - ITAP 3382: Business Intelligence
  - ITAP 3383: Enterprise Resource Planning Systems
  - ITAP 3431: Network Security
  - ITAP 4371: e-Commerce

- Electives: The Information Technology degree program will require six semester credit hours from the College of Business:

  - A three-hour Management Information Science elective
  - Any other three-hour course from the College of Business

  The Information Technology Degree Program will require three semester credit hours of elective to be taken from an approved list of 3000 level and 4000 level courses within the College of Information Technology. The course GEIT 4361: Practical Training also may be taken as an elective.

A proposed model eight-semester course sequence follows:

FRESHMAN PROGRAM – IT CURRICULUM					
FIRST SEMESTER			**SECOND SEMESTER**		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
COMM 1311	Written Communication	3	COMM 1312	Writing and Research	3
	Arabic / Islamic Studies	2		Arabic / Islamic Studies	2
	Physical Education	1		Physical Education	1
UNIV 1211	Prof. Development and Competencies	2	UNIV 1212	Critical Thinking and Problem Solving	2
MATH 1311	Finite Mathematics for Students of Business	3	MATH 1331	Pre-Calculus Mathematics	3
PHYS 1421	Physics for Engineers I	4	PHYS 1422	Physics for Engineers II	4
GEIT 1411	Computer Science I	4	GEIT 1412	Computer Science II	4
	Total	**19**		**Total**	**19**

SOPHOMORE PROGRAM – IT CURRICULUM					
FIRST SEMESTER			**SECOND SEMESTER**		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
COMM 2311	Oral Communication	3	COMM 2312	Technical and Professional Communications	3
	Arabic / Islamic Studies	2		Arabic / Islamic Studies	2
UNIV 1213	Leadership and Teamwork	2		Social Sciences Elective*	3
ASSE 2111	Learning Outcome Assessment I	1	GEIT 1311	Computer Organization I	3
MATH 1312	Calculus for Students of Business	3	ITAP 2431	Network Management	4
MATH 1321	Statistical Methods	3	ITAP 2381	Operations Research	3
GEIT 2291	Professional Ethics in IT	2			
	Total	**16**		**Total**	**18**

**Select any Social Science course from the College Core Curriculum.*

JUNIOR PROGRAM – IT CURRICULUM					
FIRST SEMESTER			**SECOND SEMESTER**		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
	Arabic / Islamic Studies	2		Arabic / Islamic Studies	2
ASSE 3211	Learning Outcome Assessment II	2	GEIT 3351	Software Engineering I	3
GEIT 3341	Database Design	3	ITAP 3382	Business Intelligence	3
ITAP 3471	Web Server Management	4	ITAP 3431	Network Security	4
ITAP 3383	Enterprise Resource Planning Systems	3	ITAP 3381	Business Process Redesign	3
	Total	**14**		**Total**	**15**

SENIOR PROGRAM – IT CURRICULUM					
FIRST SEMESTER			**SECOND SEMESTER**		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
	Arabic / Islamic Studies	2	ASSE 4311	Learning Assessment III (Capstone)	3
GEIT 4351	Software Engineering II	3		MIS Elective*	3
ITAP 4371	e-Commerce	3		College of Business Elective*	3
	IT Elective*	3		Social Science Elective**	3
	Natural Sciences Elective***	4			
	Total	**15**		**Total**	**12**

**Elective should be a 4000-level course*

***Select any Social Science course from the College Core Curriculum.*

****Select any science from the College Core Curriculum except Introductory Physics*

IT PROGRAM TOTAL DEGREE CREDIT HOURS	**128**

IT PROGRAM CURRICULUM ELECTIVES					
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
COEN 4331	Network Theory	3	ITAP 4341	Database Management	3
COSC 3343	Database Theory	3	ITAP 4372	e-Collaboration	3
GEIT 4361	Practical Training	3			

B. DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

The Department of Computer Science and Engineering will be administered as a division of the College of Information Technology. As such, it will fall under the senior leadership of the Vice Rector of Academic Affairs and the Dean of the College of Information Technology.

Responsibility for the operation, administration and management of the department will be vested in the Chair of the Department of Computer Science and Engineering. The chair will oversee the department as a whole, with primary responsibility for instruction of male students. He will delegate responsibilities as appropriate to the Associate Chair, who will oversee instruction for female students.

The Department of Computer Science and Engineering will be charged with the responsibility of maintaining, administering, and managing the degree requirements of the Bachelor of Science in Computer Science and the degree requirements for the Bachelor of Science in Computer Engineering.

1. Content of the Computer Science Degree Program

The Bachelor of Science in Computer Science is comprised of four components:

- The PMU Core Curriculum. This core curriculum consists of 60 hours of coursework as defined in the report *Undergraduate Core Curriculum Design.*
- Degree-Specific Requirements. These requirements represent support courses in mathematics, laboratory science and business. These requirements both specify and extend Core Curriculum requirements. The degree-specific requirements add 12 credit hours to the degree program.

  The University Core Curriculum requires six semester hours of mathematics. The Computer Science degree program extends that requirement to 14 semester credit hours of mathematics and specifies that the courses will be:

  - MATH 1432: Calculus I
  - MATH 1433: Calculus II
  - MATH 1321: Statistical Methods
  - MATH 2332: Linear Algebra

University Core Curriculum requires eight semester hours of Natural and Physical Science. The Computer Science degree program extends that requirement to 12 semester credit hours of Natural and Physical Science and specifies that the courses will be:

- PHYS 1412 Physics for Engineers I
- PHYS 1413 Physics for Engineers II
- Natural Science elective

- The College of Information Technology Requirements. These requirements consist of 20 hours of coursework contained in the seven college courses designated with the GEIT prefix. This coursework represents conceptual and skill-based knowledge that is common to all degree programs within the College of Information Technology. (See Section V.B.1., Degree Programs, of this report.)
- The Degree Program Requirements. These requirements consist of coursework as follows.
  - COSC 2332: Discrete Structures
  - COSC 3343: Database Theory
  - COSC 3351: Algorithms
  - COSC 3411: System Programming
  - COSC 3421: Data Structures
  - COSC 4361: Operating Systems
  - COSC 4362: Artificial Intelligence
  - COSC 4363: Automata Theory
  - COSC 4461: Programming Languages
  - Electives: The Computer Science Degree Program will require 6-8 semester credit hours of elective to be taken from an approved list of 4000 level courses within the College of Information Technology. The course GEIT 4361: Practical Training also may be taken as an elective.

A proposed model eight-semester course sequence follows:

FRESHMAN PROGRAM – COMPUTER SCIENCE CURRICULUM					
FIRST SEMESTER			**SECOND SEMESTER**		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
COMM 1311	Written Communication	3	COMM 1312	Writing and Research	3
	Arabic / Islamic Studies	2		Arabic / Islamic Studies	2
	Physical Education	1		Physical Education	1
UNIV 1211	Prof. Development and Competencies	2	UNIV 1212	Critical Thinking and Problem Solving	2
MATH 1422	Calculus I	4	MATH 1423	Calculus II	4
GEIT 1411	Computer Science I	4	GEIT 1412	Computer Science II	4
			GEIT 1311	Computer Organization	3
	Total	**16**		**Total**	**19**

SOPHOMORE PROGRAM – COMPUTER SCIENCE CURRICULUM					
FIRST SEMESTER			**SECOND SEMESTER**		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
COMM 2311	Oral Communication	3	COMM 2312	Technical and Professional Communications	3
	Arabic / Islamic Studies	2		Arabic / Islamic Studies	2
UNIV 1213	Leadership and Teamwork	2		Social Sciences Elective	3
ASSE 2111	Learning Outcome Assessment I	1	COSC 2332	Discrete Structures	3
PHYS 1421	Physics for Engineers I	4	PHYS 1422	Physics for Engineers II	4
MATH 1321	Statistical Methods	3	GEIT 3341	Database Design	3
	Total	**15**		**Total**	**18**

**Select any science elective from the College Core Curriculum except Introductory Physics*

JUNIOR PROGRAM – COMPUTER SCIENCE CURRICULUM					
FIRST SEMESTER			**SECOND SEMESTER**		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
	Arabic / Islamic Studies	2		Arabic / Islamic Studies	2
ASSE 3211	Learning Outcome Assessment II	2	GEIT 3351	Software Engineering I	3
MATH 2332	Linear Algebra	3	COSC 3343	Database Theory	3
COSC 3411	System Programming	4	COSC 3351	Algorithms	3
COSC 3421	Data Structures	4		Natural Science Elective	4
GEIT 2291	Professional Ethics	2			
	Total	**17**		**Total**	**15**

SENIOR PROGRAM – COMPUTER SCIENCE CURRICULUM					
FIRST SEMESTER			**SECOND SEMESTER**		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
	Arabic / Islamic Studies	2	ASSE 4311	Learning Assessment III (Capstone)	3
GEIT 4351	Software Engineering II	3	COSC 4362	Artificial Intelligence	3
COSC 4361	Operating Systems	3	COSC 4363	Automata Theory	3
COSC 4461	Programming Languages	4		Social Science Elective**	3
	IT Elective*	3-4		IT Elective*	3-4
	Total	**15-16**		**Total**	**15-16**

**Select any 4000-level course from the Information Technology curriculum.*

***Select any Social Science course from the College Core Curriculum*

COMPUTER SCIENCE PROGRAM TOTAL DEGREE CREDIT HOURS	**130-132**

COMPUTR SCIENCE PROGRAM CURRICULUM ELECTIVES					
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
COEN 4331	Network Theory	3	ITAP 4341	Database Management	3
COSC 4311	Parallel Computing	3	ITAP 4372	e-Collaboration	3
COSC 4364	Compilers	3	GEIT 4361	Practical Training	3

2. Content of the Computer Engineering Degree Program

The Bachelor of Science in Computer Engineering is comprised of five components:

- The PMU Core Curriculum. This core curriculum consists of 60 hours of coursework as defined in the report *Undergraduate Core Curriculum Design*
- Degree Specific Requirements. These requirements represent support courses in mathematics, laboratory science and business. These requirements both specify and extend Core Curriculum requirements. The degree-specific requirements add 15 credit hours to the degree program.

  The University Core Curriculum requires six semester hours of mathematics. The Computer Science degree program extends that requirement to 17 semester credit hours of mathematics and specifies that the courses will be:

  - MATH 1422: Calculus I
  - MATH 1423: Calculus II
  - MATH 1324: Calculus III
  - MATH 2332: Differential Equations
  - MATH 2331: Linear Algebra

  University Core Curriculum requires eight semester hours of Natural and Physical Science. The Computer Science degree program extends that requirement to 12 semester credit hours of Natural and Physical Science and specifies that the courses will be:

  - PHYS 1421: Physics for Engineers I
  - PHYS 1422: Physics for Engineers II
  - Natural Science elective
- The College of Information Technology Requirements. These requirements consist of 20 hours of coursework contained in the seven college courses designated with the GEIT prefix. This coursework represents conceptual and skill-based knowledge that is common to all degree programs within the College of Information Technology.

- The Degree Program Requirements. These requirements consist of 21 hours of coursework as identified below.
  - COEN 2311: Circuits I*
  - COEN 2111: Circuits I Lab
  - COEN 3421: Electronics I*
  - COEN 3323: Digital Systems*
  - COEN 3312 : Circuits II*
  - COEN 3322: Signals and Systems*
  - ITAP 3431: Network Security

**Courses cross-listed with the General Engineering and Electrical Engineering curricula. See syllabi for engineering course numbering.*

- Electives: The Computer Science Degree Program will require 6-8 semester credit hours of elective to be taken from an approved list of 4000 level courses within the College of Information Technology or the Department of Electrical Engineering in the College of Engineering.. The course GEIT 4361: Practical Training also may be taken as an elective.

A proposed model eight-semester course sequence follows:

FRESHMAN PROGRAM – COMPUTER ENGINEERING CURRICULUM					
FIRST SEMESTER			**SECOND SEMESTER**		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
COMM 1311	Written Communication	3	COMM 1312	Writing and Research	3
	Arabic / Islamic Studies	2		Arabic / Islamic Studies	2
	Physical Education	1		Physical Education	1
UNIV 1211	Prof. Development and Competencies	2	UNIV 1212	Critical Thinking and Problem Solving	2
MATH 1432	Calculus I	4	PHYS 1421	Physics for Engineers I	4
GEIT 1411	Computer Science I	4	MATH 1433	Calculus II	4
			GEIT 1412	Computer Science II	4
	Total	**16**		**Total**	**20**

SOPHOMORE PROGRAM – COMPUTER ENGINEERING CURRICULUM					
FIRST SEMESTER			**SECOND SEMESTER**		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
COMM 2311	Oral Communication	3	COMM 2312	Technical and Professional Communications	3
	Arabic / Islamic Studies	2		Arabic / Islamic Studies	2
UNIV 1213	Leadership and Teamwork	2		Social Science Elective*	3
ASSE 2111	Learning Outcome Assessment I	1	COEN 2311	Circuits I	3
MATH 1324	Calculus III	3	COEN 2111	Circuits Lab	1
GEIT 2291	Professional Ethics	2	GEIT 1311	Computer Organization	3
PHYS 1422	Physics for Engineers II	4	MATH 2332	Differential Equations	3
	Total	**17**		**Total**	**18**

**Select any Social Science course from the College Core Curriculum*

JUNIOR PROGRAM – COMPUTER ENGINEERING CURRICULUM					
FIRST SEMESTER			**SECOND SEMESTER**		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
	Arabic / Islamic Studies	2		Arabic / Islamic Studies	2
ASSE 3211	Learning Outcome Assessment II	2	GEIT 3351	Software Engineering I	3
COEN 3323	Digital Systems (with Lab)	3	COEN 3322	Signals and Systems	3
GEIT 3341	Database Design	3		Lab Science Elective*	4
COEN 3312	Circuits II	3	MATH 2331	Linear Algebra	3
COEN 3421	Electronics I (with Lab)	4			
	Total	**17**		**Total**	**15**

**Select any Chemistry or Biology course from the College Core Curriculum*

SENIOR PROGRAM – COMPUTER ENGINEERING CURRICULUM					
FIRST SEMESTER			**SECOND SEMESTER**		
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
	Arabic / Islamic Studies	2	ASSE 4311	Learning Assessment III (Capstone)	3
GEIT 4351	Software Engineering II	3		EE or IT Elective*	3-4
ITAP 3431	Network Security	4		EE or IT Elective*	3-4
COEN 4322	Digital Signal Processing	3		Social Science Elective**	3
	EE or IT Elective*	3-4			
	Total	**15-16**		**Total**	**12-14**

**Select any 4000-level course from Electrical Engineering or Information Technology*
***Select any Social Science course from the College Core Curriculum*

COMPUTER ENGINEERING PROGRAM TOTAL DEGREE CREDIT HOURS	**130-133**

COMPUTER ENGINEERING PROGRAM CURRICULUM ELECTIVES					
Course Number	**Course Title**	**Credit Hours**	**Course Number**	**Course Title**	**Credit Hours**
COEN 4331	Network Theory	3	GEIT 4361	Practical Training	3

Electives also may be selected from 4000-level courses offered by the Department of Electrical Engineering in the College of Engineering.

VII. LABORATORY REQUIREMENTS

The College of Information Technology will provide laboratory space to accommodate students within the college. As noted in the May 3, 2004 memorandum, *PMU Space Program: Report of Zuhair Fayez Architect visit to Austin, Texas*, computer labs will typically be built to a size that allocates 2 square meters per student.

Because of the nature of the college, two specific types of physical laboratory space are required

A. GENERAL PURPOSE / OPEN ACCESS COMPUTER LABORATORIES

These laboratories will provide state-of-the-art computing equipment with access to university-wide software resources and to Internet communication. The general-purpose computing laboratories will provide the facilities necessary for many of the classes that include lab components.

1. Lab Design

General-purpose computing laboratories will be designed to accommodate 24 students. This would require providing 24 networked computer systems in each lab. These computer systems should be grouped into pods of four to facilitate group projects. Each pod should have access to scanning and printing facilities. A conceptual design of the laboratory space is shown below.

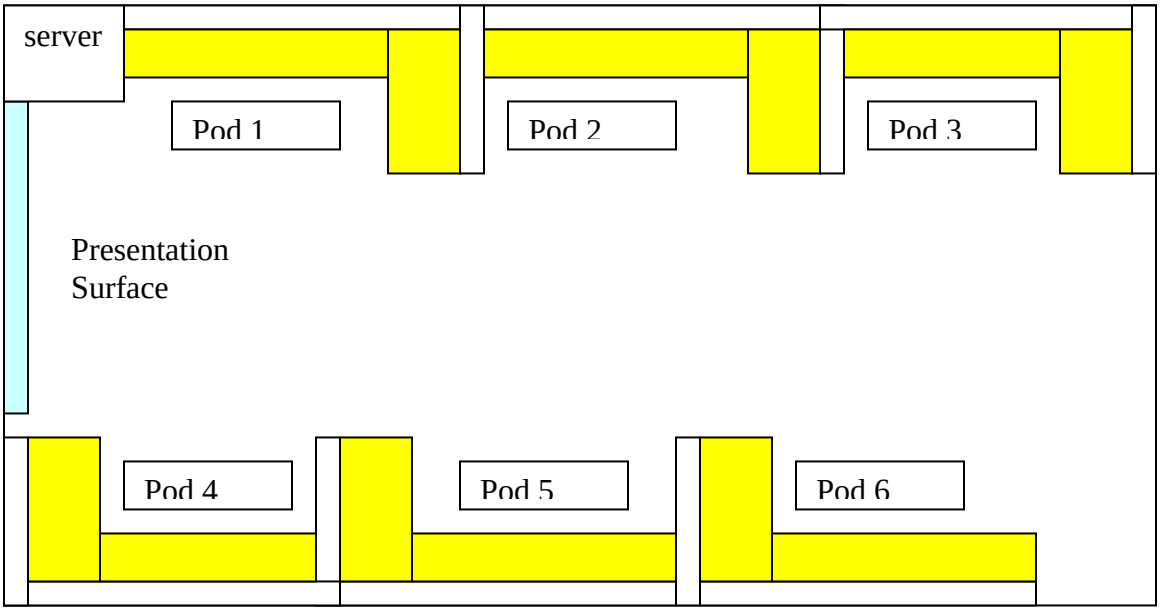

Figure 1: Organizing computer systems in pods facilitates group lab projects.

2. Equipping the Labs

In order to provide students with the kinds of experience necessary for a comprehensive understanding of professional systems, students at the PMU will have access to a wide variety of hardware, operating systems, and professional tools. In order to provide students with the most up-to-date equipment best matched to the needs of their courses, a detailed analysis of the lab needs and hardware/software specifications should be provided by the faculty of the College of Information Technology in the months before the PMU's opening. Laboratory resources, however, should incorporate at least one facility that provides dual Windows/Linux boot capability and access to proprietary Unix facilities.

3. Lab Oversight

Responsibility for scheduling the use of the laboratories will reside in the College of Information Technology. During times when the laboratories are not scheduled for class use, they should be available to all students in the College of Information Technology as open access facilities.

The general-purpose computer laboratories should be under the control and jurisdiction of the College of Information Technology. Support for these labs will be provided by the university-wide computer service department under the office of the PMU Chief Information Officer (CIO). This support organization will ensure the maintenance, security and integrity of the hardware. It also will provide supervision services for the facilities during times when they are used as open access resources. (A discussion of the university's support organization as it relates to discipline-specific applications appears in the report *Information Technology Strategy.)*

B. SPECIAL PURPOSE LABORATORIES

A number of courses within the Information Technology, Computer Science and Computer Engineering degree programs will require specialized equipment and laboratory facilities. The College of Information Technology will provide the following in support of those courses:

1. Network Management Laboratory

The course ITAP 2431: Network Management will require a specialized laboratory in which students may establish and develop network environments. Because of the constructive and experimental nature of this course, the network laboratory must be isolated from the university technology infrastructure. It also cannot easily be used as a general purpose or open access facility. The Network Management Laboratory should consist of six small network pods, each containing three workstations and a server. Each pod should also contain both wired and wireless routing hardware and printing facilities. The College of Information Technology through the Department of Information Technology will have control and jurisdiction over this facility.

2. Network Security Laboratory

The course ITAP 3431: Network Security will require the use of a specialized laboratory in which students may establish and develop techniques for securing network environments. This laboratory must be isolated from the university technology infrastructure and cannot easily be used as a general purpose or open access facility. The Network Management Laboratory facilities cannot easily be leveraged to accommodate this purpose. The Network Security Laboratory should consist of 24 computer systems and printing facilities. The College of Information Technology through the office of the university CIO will have control and jurisdiction over this facility.

3. Parallel Computing Laboratory

The course COSC 4311: Parallel Computing will not require laboratory space. However, the College of Information Technology will need to provide parallel computing facilities that may be physically housed in one of the special purpose laboratories but accessed remotely by students during the course. The College of Information Technology through the Department of Computer Science and Engineering will have control and jurisdiction over this facility.

4. Digital Signal Processing Laboratory

The course COEN 4322: Digital Signal Processing will require facilities for the design and implementation of special purpose processors and their application to specific problems. The facility should contain equipment to support the programming and erasing of memory devices and hardware and software for testing and debugging. The facility should consist of 24 computer systems each equipped with DSP boards and software. The College of Information Technology through the Department of Computer Science and Engineering will have control and jurisdiction over this facility.

5. Circuits Laboratory

The course COEN 2111: Circuits I Lab will require facilities for providing hands-on experience working with electrical systems. Courses for male students may use the Circuits Lab facilities of the Department of Electrical Engineering, or the College of Information Technology may elect to provide its own lab facilities. Courses for female students will require a Circuits Lab on the female campus of the PMU.

A Circuits Lab will include the use of analog and digital electronics; communication, computer, and control systems; instrumentation, machinery, and power systems. The laboratory space should be designed as six self-contained areas duplicating the circuits equipment. The College of Information Technology through the Department of Computer Science and Engineering will have control and jurisdiction over the Circuits Lab facilities in the IT buildings.

VIII. COURSE SYLLABI

A. COURSE NUMBERING SYSTEM

A common system for naming courses will be applied throughout all academic programs at the PMU. The system is structured as follows:

Each course title begins with four letters that indicate the subject matter of the course. For syllabi in the report *Undergraduate Information Technology and Computer Science Programs*, these letterings include:

- ASSE Assessment Capstone Series
- GEIT General IT courses
- ITAP Information Technology
- COEN Computer Engineering
- COSC Computer Science

The letters are followed by four numbers:

- First digit indicates the earliest year a course can be taken. A number 1 course may be taken at any time.
- Second digit indicates credit hours. Most courses carry 3 hours of credit. Science courses with labs carry 4 hours of credit. A small number of courses carry 1 or 2 hours of credit.
- Third digit indicates a course that is part of a group or family of courses. For example, calculus courses are assigned the number 2. More advanced math courses are assigned the number 3.
- Fourth digit serves only to differentiate courses from one another within a family. For example, the four calculus courses are numbered 1, 2, 3, and 4.