ABET
SELF STUDY REPORT

for the

Computer Engineering Program

at

Texas A&M University

College Station, Texas

July 1, 2010

CONFIDENTIAL

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Contents

Background Information

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.B Program History

The undergraduate computer engineering program at Texas A&M University was originated in the late 1980s as a Computer Science and Engineering program, administered by the Computer Science Department, with help from the Electrical Engineering Department in providing courses in circuits, logic design, and electronics. In the early 1990s the program became a Computer Engineering program administered jointly by the departments of Computer Science and Electrical

Engineering[1] with the structure it has now with separate tracks for students in each department.

The administrative structure of the program has proven to be an effective one, and it has remained unchanged until today.

Since the last accreditation visit in 2004 the program has undergone a significant change in terms of curriculum. The introduction of a new curriculum in the academic year 2008-09 was in response to input from students, employers, and faculty, who all expressed the need to (a) further bring the classes and requirements in line with modern requirements and technologies, (b) offer a more flexible, core-and-tracks based curriculum, and (c) organize the flow of courses in a way that allows students to be better prepared for internships by the end of their Sophomore year. Details of the curriculum change are described in detail in Chapter V.

.C Options

There are two tracks in the Computer Engineering Program (CE), one housed in the **Computer Science and Engineering Department** (CSE) and the other in the **Electrical and Computer Engineering Department** (ECE). The tracks have very minor differences in emphasis, and culminate in the same CE degree. Although students are required to select a track upon entering the CE Program, it is possible to change tracks as late as the junior year.

We call CE students in the CSE track **CECN** students, while students in the ECE track are denoted as **CEEN** students. We will be using this notation in the following whenever reference must be made to the track of a student; we use the term “CE student” if no distinction needs to be made. Students graduate with a degree in Computer Engineering, without mention of the chosen track and of the home department.

.D Organizational Structure

The CE Program is offered jointly by the **Computer Science and Engineering Department** (CSE) and by the **Electrical Engineering Department** (ECE) and is managed by the **Computer Engineering Coordination Committee** (CECC) with members from both departments. The CE Program consists of two tracks, one housed in the CSE and the other in the ECE Department. Both tracks are substantially similar (with slightly different emphasis), and culminate in the same CE degree. Although students are required to select a track upon entering the CE Program, it is possible to change tracks as late as the junior year.

All aspects of the CE Program are **formulated, managed, and monitored** by the **Computer Engineering Coordination Committee (CECC)**. The CECC consists of the two department heads as co-chairs, six faculty members from both departments, including the ABET coordinator for computer engineering, and two ex-officio members that includes two student advisors, one from

[1] Today these departments are called Department of Computer Science *and Engineering* and Department of Electrical *and Computer* Engineering to better reflect the importance of the Computer Engineering Program within the home departments.

department. The CECC meets regularly (on average every two months) to set the direction of the program, monitor its implementation, and assess the progress. (Minutes of these meetings are available.) In particular, the CECC formulates and monitors the following aspects of the CE Program:

- **Curriculum:** While the details of the administration of classes (assignment of instructors, scheduling, room assignment, evaluation of instructors) stays with the home departments, the curriculum is laid out and monitored by the CECC, in collaboration with faculty from the home departments. For example, the CECC discussed the feedback from constituencies and initiated and led the efforts to define and put in place the "new curriculum" for the CE Program.
- **Formulation and Assessment of ABET criteria:** All of the program's constituents (see Section II.D) are involved in helping formulate and assess the program's mission statement, the objectives, and the outcomes. The CECC is charged with evaluating the constituents' feedback and deciding on whether and what measures need to be taken to address shortcomings that are identified as part of this process. If the measures target individual courses, the detailed implementation is the responsibility of the home department offering the course. Similarly, the CECC is responsible for evaluating the level at which the other ABET criteria are met. If measures need to be taken, this is naturally brought to the attention to the department heads, who head the CECC. If measures affect individual courses, the implementation is the responsibility of the home department offering the course.
- **Other aspects of importance to the CE Program:** The CECC establishes the guidelines for, and monitors the implementation of, a number of aspects that affect the program as a whole. For example, it oversees the operation of the program's web site. Similarly, it participated in the re-organization of the ENGR 111 and ENGR 112 (Introduction to Engineering, see Section IV.B), which were put in place in Fall 2003 and Spring 2004, respectively.

While the CECC manages the program as a whole, the details of the two CE tracks are **implemented and administered** in their respective home departments. This means that the following operational aspects of each program are managed within its respective home department:

- **Student advising:** The students are advised and their progress monitored by the Student Advising offices in the two home departments, in collaboration with faculty in the departments. (More on this in Section I.C and Section I.B.)
- **Teaching and administration of courses:** The detailed course management is handled in the home departments. This entails course assignment and scheduling, evaluation of instructors, and other aspects that pertain to the operation of courses.
- **Teaching Laboratories:** The home departments operate the departmental teaching facilities, such as course-specific laboratories and departmental open-access laboratories. The departments provide the necessary space. They purchase, maintain, and upgrade the equipment, and provide and train the necessary staff. (E-mail and directory services for students are increasingly provided by the institution, under auspices of the Computing and Information Services (see Chapter VII).

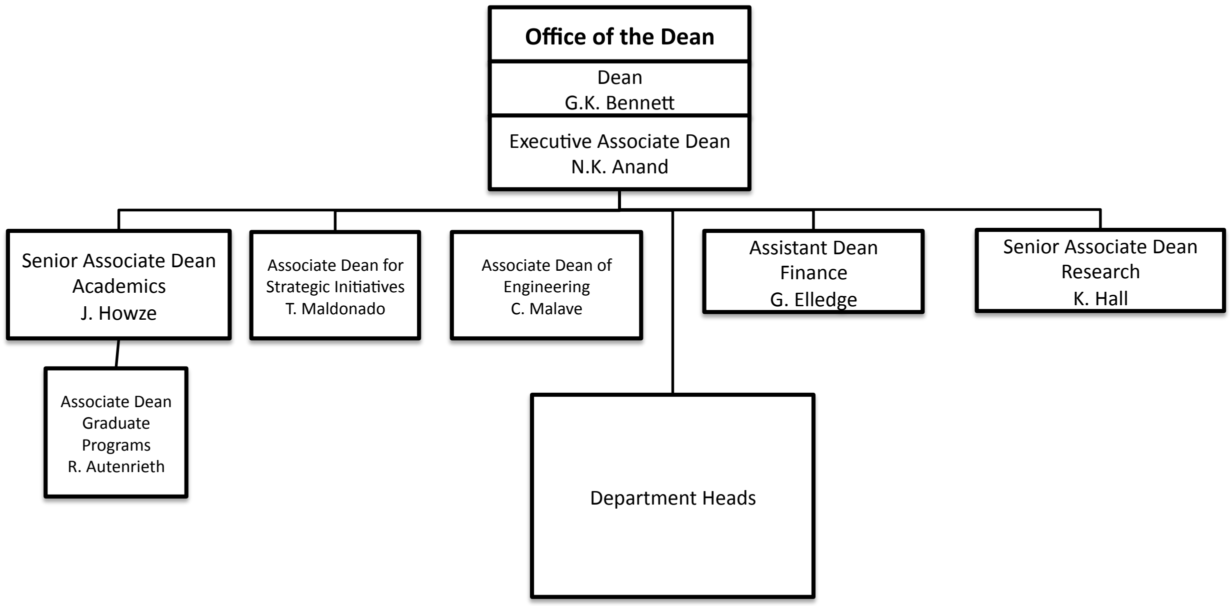

Figure 1: Organization Chart of the Dwight Look College of Engineering at Texas A&M.

- **ABET procedures:** Some of the low-level monitoring procedures for ABET, such as self-assessment surveys of course outcomes, are handled within the home departments.

Both home departments of the Computer Engineering Program are part of the Dwight Look College of Engineering. Figure 1 describes the organization of the College.

.E Program Delivery Modes

The program is a full-time student program with approximately 20% of the majors participating in the University's optional Cooperative Education Program.

.F Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions taken to Address them

As a result of the 2004 ABET visit, a small number of concerns were to be addressed, both at institutional and program level. We list the shortcomings, and the measures taken to address them, separately.

.F.1 Previous Institutional Concerns

- *Criterion 7. Institutional Support and Financial Resources:* *Criterion 7 requires that "Resources ... must be sufficient to acquire, maintain, and operate facilities and equipment appropriate for the engineering program. In addition, support personnel and institutional services must be adequate to meet program needs." The significant increase in faculty hiring is causing short-term pressure due to the time and expense of recruiting and start up packages. More significant is the reduction in operating budgets during a time of growth. In addition, the space requirements of the faculty must be met. The long-term strategy must provide sufficient operating budget and space to meet the needs of the program.*
  - Due-process response: The EAC acknowledges the receipt of letters acknowledging the institution's concern for this issue.
  - The concern remains.

  Actions Taken since the Past General Review (2004): Started in 2004, the The Dwight Look College of Engineering has completed its Faculty Reinvestment Program which provided for 112 new faculty positions bring the total number of tenured/tenure-track faculty to 418, which represent approximately 35% increase since 2004.

  To respond to the need for additional laboratory space as well as space for faculty, staff and graduate students, the College of Engineering has added significant building space since 2005 as shown in Table 1.

Building	Net Assignable sq.ft.(NASF)	Comments
Jack. E. Brown Building	90,086	New Building housing Chemical Engineering
Graphics Services Building	6,787	Renovated; formally TAMU space
Astronomy & Space Science Engineering Building	3,607	Renovated; formally TAMU space
Reed McDonald Building	19,695	Renovated; formally TAMU space
Teague Building	8,136	Renovated; formally TAMU space
Wisenbaker	19,313	Renovated; formally TEES space
Total NASF	**147,624**	

Table 1: Additional Engineering Building Space Added Since 2005

In addition, construction is currently underway for the $104M Emerging Technologies and Economic Development Building (ETED). Scheduled for occupancy in June 2011, the ETED Building will provide approximately 120,000 net assignable sq. ft. and will support university engineering and allied teaching and research programs and will contain offices, classroom, faculty research labs (wet and dry), computer based teaching classrooms and a computer server room, and a computational science and visualization areas. Approximately 2/3 of the space will house the Biomedical Engineering and Industrial and Systems Engineering departments (currently located in the Zachry Engineering Building). The remaining 1/3 of the space will house engineering and other faculty members who are collaborating on strategic initiatives. The computational science and visualization area is scheduled to bring together related elements currently in the College of Architecture, College of Science and the Department of Mathetatics.

Once the ETED building is brought online, space formally used by the Biomedical Engineering and Industrial and Systems Engineering departments in the Zachry Engineering Building will be made available for the needs of the other departments currently in Zachry (including the Electrical and Computer Engineering and Nuclear Engineering programs).

Lastly, with the move of the Physics Department to their new facilities during 2010, this will allow the Mechanical Engineering program to expand into space formally shared with Physics in the Engineering-Physics Building. In is anticipated that this will provide approximately 20,000 NASF in office and laboratory space for Mechanical Engineering.

While progress has been made in meeting the physical space needs of the engineering programs, the issue of sufficient operating budget continues to be a concern for the College of Engineering. Traditionally, engineering programs have augmented State appropriations for academic expenditures through the use of overhead return on externally funded research projects administered through the Texas Engineering Experiment Station (TEES). As mentioned in the section on Organizational Structure, TEES Divisions/Departments receive 54% of the F&A/overhead generated on externally funded research projects. Many of the engineering programs continue to use these funds to supplement the State appropriated academic funds in order to meet operating budget requirements.

While the State appropriations for academic expenditures had seen slight increases during the past five years, there was a 2.5% reduction in State Appropriations for FY2010 and another 2.5% for FY2011. As a result of this budget reduction, there will be no merit raises for faculty and staff for FY 2011. In order to meet current and anticipated shortfalls in State revenues, the Texas Legislative Review Board (LBB) has directed all state agencies to submit a plan to reduce their budgets by 10% from current FY2011 levels, which have already been reduced to 5% as a result of the previous reduction. This means that the University and TEES must each reduce their state appropriations by an additional 5% for FY2012 and again 5% for FY2013. The University is in the process of planning for this mandated reduction and is also setting aside a merit raise pool for FY2012 and FY 2013, resulting in a total required reduction of $60M. The Colleges portion of this reduction amounts to $5.5M. The College must provide the University with a plan to meet this reduction by July 15. Since TEES is a separate state agency, in order to meet the State's mandate, TEEX must also reduce its TEES state appropriation by $2.959M. At this point, it is not known whether this plan will be carried out or whether some revised plan with lesser reductions will be required. Texas A&M Engineering is strong and will remain strong. The program will continue to grow in quality and stature and we will not let this reduction stop our forward progress.

.F.2 Previous Program Concerns

- *Criterion 7. Institutional Support and Financial Resources* *"Institutional support ... and constructive leadership must be adequate to assure the quality and continuity of the engineering program." The computer engineering program is currently administered by both the Departments of Electrical Engineering and the Computer Science through a committee that is jointly chaired by the heads of electrical engineering and computer science and whose members are the two ABET coordinators, one from EE and one from CS, and two additional faculty members from each department. It is a concern that this type of management will not insure that the computer engineering program can compete, in the long term, for needed resources with other subdisciplines within electrical engineering and computer science.*

  Program's Response: Both the CECC and the Program's constituents are surprised to hear about this concern. The CE Program is not in competition with other subdisciplines within the home departments. Rather, the home departments find themselves in a friendly competition in backing the CE Program, knowing well that by not providing the necessary support to the Program, a home department may risk losing it to the other home department. In this context it may be relevant to point out that both departments have changed their names over the recent years to reflect the level at which CE is being embraced within the home departments, with the Electrical Engineering Department changing its name to Electrical *and Computer* Engineering Department, and the Computer Science Department changing its name to Computer Science *and Engineering* Department. As we will lay out in this document, the CE Program is a vigorous one, with excellent enrollment numbers that are balanced across the home departments, a strong and dedicated faculty, and ample financial and administrative support.

CRITERION I: STUDENTS

I.A Student Admissions

Review of freshman applicants is performed by the Registrar's office. In-state high school students who are either in the top 10% of their graduating class or are in the top 50% with a minimum SAT score of 1300 gain automatic admission. Also, out-of-state high school students in the top 25% of their graduating class with a minimum SAT score of 1300 are given automatic admission. Applicants that do not meet these standards are then evaluated and the remaining slots are filled on a competitive basis. Table I.1 illustrate the admission standards for our freshmen and Master students, respectively.

Academic Year	Composite ACT		Composite SAT		Percentile Rank in High School	
	MIN.	AVG.	MIN.	AVG.	MIN.	AVG.
Data for CECN Students						
2005-2006	18	27	670	1245	51	86
2006-2007	15	26	750	1218	56	88
2007-2008	15	26	780	1248	61	92
2008-2009	18	28	920	1289	66	91
2009-2010	17	27	980	1290	54	89
Data for CEEN Students						
2005-2006	14	27	780	1260	37	87
2006-2007	18	26	840	1223	57	87
2007-2008	17	26	780	1265	58	91
2008-2009	15	27	930	1275	59	91
2009-2010	19	29	850	1275	64	90

Table I.1: History of Admission Standards for Freshmen Admissions for Past Five Years

I.B Evaluating Student Performance

Student progress is monitored in several ways, and some details of the monitoring process vary based on the home department of the student, since the two advising offices have developed their own ways to do things over the years.

The University makes use of a sophisticated student information and management system to support registration and monitoring of student. However, we believe that students, in particular incoming students, need the personal attention of advisors and conselors, faculty, and supporting staff to make best use of the educational resources at Texas A&M. As students progress through the program, they rely increasingly on on-line facilities for registration and for general information.

Incoming Students: Incoming students attend a *New Student Conference*. At that conference an academic advisor presents the program curriculum to new students and each required course and elective option is explained. Students are then advised on how to select a set of courses for their first semester. If the student is a transfer from another college, the determination of equivalencies is made at that time based on the syllabus for the course, level of the textbook and chapters covered, and quality of sample student work (for details see Section I.D). Based on this advice, students develop a tentative schedule (usually overnight.) The next day an advisor sits with each student and goes over the selected classes. The advisor checks for appropriate level of course work (for example in mathematics some students, based on testing scores are able to begin with Calculus 1 or Calculus 2 while others must first take Pre-Calculus or in extreme cases must begin with College Algebra and Trigonometry.) For CEEN students, the advisors review the students' previous coursework and suggested math courses, and give the students a suggested schedule on the first day of the New Student Conference. On the second day of the conference, all the students meet again with the advisors and register themselves for the courses that were suggested to them. Once a student is registered, he/she brings their registered schedule and suggested schedule to the advisors for approval. Advisors also check for prerequisites, an appropriate total number of hours (considering other factors such as participation in the Corps of Cadets or a requirement to work on a job), as well as appropriate balance between technical and non-technical coursework.

Progress Monitoring For following semesters, students are encouraged and always welcome to come to the advisors' office for advice and assistance in registering for courses. On the other hand, students who know what they want to register for and do not desire assistance, may register on their own, using the University's web-based registration program as long as they are making reasonable progress toward graduation. Students who fall below 2.0 GPR are placed on probation and called in for counseling to try to identify the problem and get them back on track for success.

Spot checks are made looking for students who may be taking inappropriate courses or who are having trouble with their grades. Frequently instructors alert one of the advisors that a particular student seems to be having difficulty. Sometimes parents call or visit and ask an advisor to talk to their son or daughter.

At some point (30 hr mark for CECN and approximately second year for CEEN, i.e. when student is enrolled in the first Circuits course) all CE students must complete a **degree plan**, which shows how the student intends to schedule each of the courses, required for graduation. CECN students are required, and CEEN students are encouraged but not required to submit the degree plan to the academic advisor, who then reviews and checks, noting any deficiencies and pointing out any suggested changes. If things are out of line the student is called in for a counseling session.

Students who have completed fewer than 30 credit hours at this university are given midterm grades. This allows the new student to receive timely feedback on his progress. Those who are academically deficient at midterm are not permitted to pre-register for the next term until the final grades are determined.

At the end of each term all grade sheets are reviewed. Students who had already been on academic probation are not released to register for the next semester until their progress is evaluated. Academically deficient students, students not following the Computer Engineering curriculum or specific requirements that were set for them, and students not making satisfactory progress towards the degree, are notified of their deficiencies. Depending on the situation a student may be told that future registration will be blocked, that a change of major is required, or that he or she may continue in the program on academic probation and must meet certain conditions to continue beyond the next term. Students on academic probation are not permitted to pre-register for the next term until they have cleared through an advisor.

Transfer to Upper Division in Engineering: Students who meet the University and college entrance requirements enter the Look College of Engineering with a **lower-division** classification. Enrollment in sophomore-, junior- and senior-level engineering courses will be restricted to those students who have been moved from that lower division to a major degree sequence (**upper division**) within the Look College of Engineering. In order to be admitted to upper division, the student must satisfy two requirements:

1. A minimum overall grade point average (currently 2.75 for CECN students and 2.85 for CEEN students).

2. Completion of the Common Body of Knowledge (CBK) courses, i.e., the first two calculus courses (MATH 151 and 152), chemistry (CHEM 107), physics (PHYS 218 and 208), rhetoric and composition (ENGL 104), and the engineering introduction courses (ENGR 111 and 112), with a minimum grade point average (currently 2.75 for CECN students and 2.85 for CEEN students) [1].

Each term, the records of all students in lower division are evaluated to determine if they have completed the prescribed set of courses necessary for admission to upper division. Students are advised of any deficiencies and told what courses remain to be taken. Students may be allowed to remain as a lower-division student up to 60 hours, provided that they are in good standing and making progress as defined by their major department. At the 60-hour limit, students may be blocked from further registration in that department if the CBK and overall grade point average requirements for upper division have not been achieved.

[1] The detailed admission criteria have traditionally been defined by the home departments, and differences in admission criteria are due to historical reasons. The CECC is working toward unifying them, thus making these required grade point averages identical for CECN and CEEN students.)

Satisfying Prerequisites Each instructor is required to prepare a course syllabus for distribution during the first day of class. Among the items covered on the syllabus are the pre-requisite and co-requisite course work required for the course. Since pre-registration for the following term (or terms) takes place before the current course work is completed, it is the student's responsibility to ensure that all pre-requisites are met for any class they register. Information about pre-requisites for all courses can be found in the Course Catalog.

In the past there was no automated way to determine if registered students actually have the pre-requisites for each course, and the problem is complicated by late transcripts from summer school. However, first-day roll sheets are examined for anomalies. For example, students in other majors, students who are still in lower division, or students who are on the probation lists, are checked to see if they are in appropriate courses. If they do not meet the prerequisite requirements or are not in upper division due to deficiencies in course work or grade point average, they are dropped from the course and notified. The instructor does, however, have the authority to drop any students from the course who have not met the necessary prerequisites.

In CSCE, class rosters are checked multiple times by the advisors prior to the beginning of the semester for selected ECEN upper division classes (such as ECEN 248 and ECEN 214) and CECN students who are in the wrong course are dropped and notified. CSCE upper-division classes (300 and above) require upper-division standing before registration is permitted, so no manual checking is required or carried out for those courses. This is enforced by settings in the university's course registration system. CSCE has implemented an automated force request system in which the students can request to be enrolled in such upper division classes since they cannot register for them directly. These requests are evaluated by the advisors and by the Associate Department Head.

I.C Advising Students

Student Advising The student advising is centralized in the respective home department of the student. **April Place** (`aplace@ece.tamu.edu`) is the Academic Advisor, and Mr. John Tyler (senior lecturer, `tyler@ece.tamu.edu`) and **Jackie Perez** (`jperez@ece.tamu.edu`) are the Senior Academic Advisor in the ECE Department (handling both EE students and CEEN students). **Dr. Richard Furuta** (`furuta@cse.tamu.edu`) is the faculty advisor for CECN students (in the CSE Department), and **Mrs. Marilyn Payton** is the Undergraduate Counselor for all CS and CECN students. Staff Assistants support the advisors with routine matters. These individuals are well versed in the courses and requirements of the undergraduate curriculum and in university policies and procedures. The faculty advisors are all full-time members of the faculty of the CSE or ECE Department, with many years of advising experience each. Students who have detailed questions on course content, specific questions about fields of study, or plans for graduate study in specific areas, etc. are referred to members of the faculty who have expertise in those areas.

Advisors are available to provide assistance to students who come to the office and ask for help during the pre-registration process or at any other time that assistance is required. Walk-in requests are handled on the spot when possible. Otherwise, a secretary is available during office hours to schedule appointments with academic advisors, or the advisors can be contacted directly. When necessary, advisors work extended hours to meet student advising requirements.

The CSE Department has also secretaries who can assist students with many of the routine requests such as submitting Q-drop requests or co-enrollment forms. Such documents can then be passed to an advisor or counselor for review, signature, or perhaps to set up an appointment to talk to the student.

In summary, students have access to very qualified professionals for advising.

Advising is provided in a very timely fashion. Some time periods are heavier than others, like the last week to drop classes and during pre-registration, but appointment schedule delays are seldom more than a day or two.

Student Mentoring The courses in the Computer Engineering curriculum are structured to ensure effective interaction between faculty/teaching assistants and students in lower division courses and between faculty and students in upper division courses.

All faculty teaching courses at Texas A&M are required to provide a course syllabus to students on the first day of class. The syllabus includes office hours for the instructor.

In large courses students may attend lectures in a large group, but they also attend labs in groups of about 20 or fewer. The lab sessions are conducted by teaching assistants who are able to provide individual attention and personal interaction with the students. In addition, the large introductory classes also have **Peer Teachers** assigned to the labs. Peer teachers are paid employees, who are upper-level undergraduate students in the major and who have successfully completed the course. Peer teachers attend lab sessions to coach students through difficulties with course material. Instructors and teaching assistants hold regular office hours to assist students. Peer teachers hold supplemental instruction sessions to assist students on an as-needed basis.

Being a part of the faculty at Texas A&M University carries the responsibility of effective interaction with all students. For CSE Department faculty, for example, a part of each year's faculty review consists of answering a set of questions depicting the respective faculty's student interaction. There is no choice to opt out of such involvement, and the Department Head mandates it. In the ECE Department, one of the items in the faculty review information is the involvement of the faculty in undergraduate research, and this information is part of the faculty review process.

In addition, the CSE Department has identified a **Faculty "Mentor Pool"** (`http://www.cse.tamu.edu/academics/mentoring/`) that draws faculty and students together. Such mentor meetings involves discussions over a wide spectrum of issues: courses, graduate school, personal issues, industry opportunities, and others. Students are encouraged to meet more than one faculty member, in order to get a range of opinions of the issue of interest.

Many members of the faculty are also members of the **ATMentors University Mentors Program** (`http://mentors.tamu.edu/`), providing additional interaction between faculty and students. ATMentors is a group of faculty , staff, and administrators who volunteer to be available to students who "just want to talk to someone."

Finally, **ECE Connect** is a new initiative from the Electrical and Computer Engineering Department (ECEN).

(`http://www.ece.tamu.edu/Undergraduate/ECEConnectProgram.php`)
ECE Connect is focused on improving first year retention, motivation and success of current ECEN students. Former Texas A&M Engineering students will mentor one to three first generation college freshmen students. The department hopes to expand the program to all incoming freshmen students by fall 2012. The undergraduate advising office will strive to match students interests with the mentors experience.

As the students move into the upper level there are many opportunities for them to interact with faculty. Besides the office hours, mentoring programs, and the other opportunities to interact with the faculty described above, the students may become involved in research and specialized studies in the form of term projects in upper-level courses, *independent study courses* (CSCE 485, ECEN 485), research projects required for the **Engineering Scholars Program** (`http://www.tamu.edu/esp/`), and research projects that involve a stipend, as part of the **Research Experiences for Undergraduates** Program (REU). Faculty with NSF-funded projects can easily get small supplements to engage undergraduates in research projects via the NSF REU Program. Further, for example, the CSE Department has in the past regularly received funding to have an **NSF REU Site Program**. The funding for this program includes support for several students to participate in research full-time during the summer and for several more students during the academic year. For Summer 2010, for example, the CSE Department is hosting 27 REU students with interest in Computer Science and in Computer Engineering (`http://www.cse.tamu.edu/reu/websites`.)

Career Advising There are several avenues for our students to explore while deciding on a career. The University is equipped with a **Career Center** (`http://careercenter.tamu.edu/`), where our students can post their resume and work with an advisor to become aware of companies offering employment. The TAMU Career Center is one of the most effective career centers in the US. The number of companies bringing interview teams to TAMU far exceeds virtually all other institutions. The Career Center undoubtedly helps many CE students find their first professional position.

The College in collaboration with the Student Engineers' Council (`http://sec.tamu.edu`,) also offers two **Engineering career fairs** per year. The career fairs are planned, organized, and staffed by the Student Engineers' Council and are some of the largest student-run engineering career fairs in the nation. Historically, as many as 4,000 engineering and industrial distribution students attend the career fair each semester seeking internships, co-ops, and full-time positions. Our students are highly encouraged to attend these fairs as early as their freshman year to start making contacts with the corporate environment. Students also have the opportunity to participate in internships and cooperative education, as well as study-abroad programs, to broaden their knowledge of the possibilities that are available to them.

The faculty (e.g., the University Mentors Program – see above) also helps students with career advising. Finally, the required Undergraduate Seminar course (CSCE 481) includes several industrial speakers talking about their careers.

I.D Transfer Students and Transfer Courses

Transfer Students Applications to the university as transfer students from other colleges and universities are handled by the registrar's office. Transfer applicants must have completed at least 24 credit hours of graded transferable course work at the time of application from a list of degree-track-approved courses (see undergraduate catalog for more details) all with a grade of C or better. Furthermore a minimum GPR of 2.5 must have been earned for those courses. Applicants that meet these minimum criteria are forwarded to the College of Engineering for further processing. The departments will then select individual applicants for admission on a competitive basis.

Experience has shown that these procedures work. For example, in a 2004 study we compared the cumulative GPA for the 33 CEEN students (CE students in the ECE Department) graduating in Spring 2004 and found the following results:

Admit Type	Program	Number of Students	Cumulative GPA
Freshman	CEEN	28	3.00
Readmit		1	2.77
Transfer		4	2.87

Starting from the premise that the cumulative GPA of a student gives some indication at least of how that student succeeds in the program, this data indicates that graduating transfer students do just as well as graduating non-transfer students. We conclude that the procedures in place clearly worked for this batch of students.

Academic Year	Number of Transfer Students Enrolled
2005-2006	17
2006-2007	12
2007-2008	19
2008-2009	27
2009-2010	20

Table I.2: Transfer Students for Past Five Academic Years

Table I.2 gives an overview of the number of transfer students admitted to the program in the recent past.

Transfer Courses All transfer credits are approved by the University Transfer Admissions office before transfer credits are accepted by the University. Unless a course is accepted as equivalent to a specific Texas A&M course, it must also be reviewed by an academic advisor for substitution for a course on the student's degree plan. All course substitutions for transfer courses (except direct equivalences) from other colleges or universities or from other similar courses on campus must be approved by an academic advisor and processed by the registrar's office before they may be applied to a student's degree plan.

In practice, incoming transfer students meet with one of the academic advisors who will determine which transfer courses will satisfy degree requirements. This determination is made based on the syllabus of the course, level of the textbook and chapters covered, and quality of student sample work. If necessary, the department advisor may ask faculty with expertise in a specific area to help make that determination.

Experience shows that these procedures are working. In the semester that a student has applied to graduate, an official audit is conducted by the University Audit Office and a list of students is provided to the department advisors' office showing which students do not appear to meet graduation requirements. At this point all the cases are flagged where a course from another school has not been submitted or must be substituted for proper credit. In the past, each problem has been resolved at this point.

I.E Graduation Requirements

At the beginning of a student's senior year, the University Audit office conducts a computer audit of each students progress toward graduation based on the student's major and catalog. The program is set up so that any student who is cleared by the program will have met the university core curriculum requirements, the published curriculum in CE (math, science, engineering science, etc., with humanities and social sciences constrained to insure depth and breadth), and chosen elective courses in the major that meet certain distribution requirements and insure depth. Students may access their degree audit on-line at any time. Copies of this audit are sent to each student and to the department advisors' office when the student reaches the 95th hour of course work. The audit shows which course requirements have been met and which are still incomplete. A note to the student accompanies the audit notice, advising the student to contact the advisors' office for assistance if anything is unclear.

In the semester that a student has applied to graduate, another official audit is conducted by the university audit office and a list of students is provided to the department advisors' office showing which students do not appear to meet graduation requirements. Each of these students is contacted to discuss the discrepancy. It is usually something simple like a course from another school that has not been submitted or must be substituted for proper credit. Sometimes it is a matter of a recent course grade that is below standard, and that requires the student to retake a course. Whatever the case, each problem is resolved or the student's options (stay for another semester, take a course at another school, etc.) are clearly explained.

Substitution for required courses is monitored and approved by the academic avisors. In the case where the student wishes to take a more intensive course than required (for example, quantum mechanics instead of modern physics for engineers) the student must obtain the written pre-approval of an advisor. Likewise, if a required course that was supposed to be offered in the student's final term is not available, a close substitution may be approved. The individuals responsible for such determinations are the department undergraduate advisors.

In the last two years the advisors had to deal with a number of substitutions due to the transition from the old curriculum to the new "Curriculum-2008" (see Chapter V for details.)

Students are advised to visit with their advisor a semester or two before they expect to graduate to discuss their progress and to make sure everything is in line for them to graduate. Most students comply with this advice.

I.F Student Assistance

Texas A&M has a large number of organizations that offer free tutoring and other resources on campus that students find very helpful. Examples are:

- Student Counseling Center (`http://scs.tamu.edu/`) The Student Counseling Center offers services suchas general counseling needs, academic and career counseling, The PASS Certificate Program, crisis intervention and the emergency hotline.
- PASS Learning Skills Certificate Program (`http://scs.tamu.edu/academic/LSC.asp`) Program by the Student Counseling Center that helps develop knowledge, skills, and attitudes that will enhance study and exam-taking ability, while decreasing anxiety related to academic performance. Services include individual and group counseling, assessment of study behaviors, screening for learning disabilities, an extensive collection of self-help resources, and weekly workshops on a variety of study skills topics.
- Student Learning Center (`http://slc.tamu.edu/` Offers free tutoring for A&M students.
- Math Week in Review Schedule (`http://www.math.tamu.edu/courses/weekinreview.html`) The Math Department hosts free week-in-review sessions for additional help in math classes such as 151, 152, etc.
- Campus Help Desk Contact Information (`http://disability.tamu.edu/resources/tutoring.asp`) General information about departmental help desks offered.
- Multicultural Student Services Tutoring (`http://tutor.tamu.edu/`) Free tutoring for current students; registration required.
- College of Engineering Student Services (`http://engineering.tamu.edu/studentservices/` Student assistance offered by the College of Engineering.
- Disability Services (`http://disability.tamu.edu/`) Department on campus to help with students with learning and/or physical disabilities.
- Learning Disability and AD/ADHD Screening (`http://scs.tamu.edu/academic/LD.asp`)

I.G Enrollment and Graduation Trends

The recent trends in enrollment and graduation are illustrated in Table I.3 and Table I.4.

Table I.3: Enrollment Trends for Past Five Academic Years

Year	Full-time Students	Part-time Students	Student FTE[2]	Degrees Granted
2004-2005				110
2005-2006	456	36	445.8	114
2006-2007	452	28	440.7	90
2007-2008	417	27	405.5	57
2008-2009	410	23	397.3	79
2009-2010	382	22	369.1	54

Table I.4: Program Graduates

	Student Name	Program	Year Graduated	Year Matriculated	Initial or Current Employment Job Title / Other Placement
1	Atkinson, Corbin	CEEN	Spring 2010	Fall 2006	National Instruments; Software Engineer
2	Manka, Garrett	CEEN	Spring 2010	Fall 2006	Lockheed Martin, Embedded Software Engineer
3	Nguyen, Allen	CEEN	Spring 2010	Fall 2006	Pariveda Solutions; Dallas, TX; Consultant(C1)
4	Pustka, Andrew	CEEN	Spring 2010	Fall 2006	Lockheed Martin; Software Engineer
5	Reese, Skylyn	CEEN	Spring 2010	Fall 2006	unknown
6	Soulen, Steven	CEEN	Spring 2010	Fall 2006	Macquarie, Houston, Tx Unix System Admin
7	Spratlen, Brock	CEEN	Spring 2010	Fall 2006	Pariveda Solutions, Dallas, TX, C1 Consultant
8	Elliott, Michael	CECN	Spring 2010	Fall 2005	Lockheed Martin; Software Engineer
9	Engelking, Eric	CECN	Spring 2010	Fall 2005	Alliant Systems; Developer
10	Faires, Jacob	CECN	Spring 2010	Fall 2005	General Dynamics AIS
11	Frye, Justin	CECN	Spring 2010	Fall 2005	Graduate school - TAMU CSE
12	Garner, Edwin	CECN	Spring 2010	Fall 2007	York Technical Solutions Corp.
13	Gruben, Daniel	CECN	Spring 2010	Fall 2005	Undecided

(continued)

Table I.4: (continued)

	Student Name	Program	Year Graduated	Year Matriculated	Initial or Current Employment Job Title / Other Placement
14	Jennings, Craig	CECN	Spring 2010	Fall 2006	National Instruments; Software Engineer
15	Leake, Jonathan	CECN	Spring 2010	Fall 2006	Graduate School - TAMU Mathematics
16	Mai, Stefan	CECN	Spring 2010	Fall 2006	Pariveda Solutions
17	Maier, Shaun	CECN	Spring 2010	Fall 2006	Capsher Technology Inc., Software Developer
18	Marvin, Grant	CECN	Spring 2010	Fall 2005	Meraki; UI Engineering
19	McMillin, Jessica	CECN	Spring 2010	Fall 2005	unknown
20	Minton, Kyle	CECN	Spring 2010	Fall 2005	unknown
21	Moeller, Jonathan	CECN	Spring 2010	Fall 2004	Graduate school - TAMU
22	Nash, Nicholas	CECN	Spring 2010	Fall 2004	unknown
23	Nolan, David	CECN	Spring 2010	Fall 2006	graduate school - South Easter Seminary
24	Olson, Christopher	CECN	Spring 2010	Fall 2005	Raytheon; System Engineer
25	Post, Jason	CECN	Spring 2010	Fall 2006	John Hopkins APL; Air Missile Defense

CRITERION II: PROGRAM EDUCATIONAL OBJECTIVES

II.A Mission Statement

The mission of **Texas A&M University** reads as follows[1]:

Texas A&M University Mission Statement
"Texas A&M University is dedicated to the discovery, development, communication, and application of knowledge in a wide range of academic and professional fields. Its mission of providing the highest quality undergraduate and graduate programs is inseparable from its mission of developing new understanding through research and creativity. "It prepares students to assume roles of leadership, responsibility, and service to society. Texas A&M University assumes as its historic trust the maintenance of freedom of inquiry and an intellectual environment nurturing the human mind and spirit. "It welcomes and seeks to serve persons of all racial, ethnic, and geographic groups, women and men alike, as it addresses the needs of an increasingly diverse population and a global economy. "In the twenty-first century, Texas A&M University seeks to assume a place of preeminence among public universities while respecting its history and traditions."

The Mission Statement and Statement of Goals of the **Engineering Academic Program Office** at Texas A&M University read as follows[2]:

[1]Source: Texas A&M University Undergraduate Catalog, edition 132, 2009-2010. Enclosure IA(a): Mission Statement: Texas A&M University)

[2]Source: Texas A&M University Undergraduate Catalog, edition 132, 2009-2010, p. 357. Dwight Look College of Engineering: General Statement

Texas A&M University Dwight Look College of Engineering Mission Statement
To serve the state, nation and global community by providing engineering graduates who are well founded in engineering fundamentals, instilled with the highest standards of professional and ethical behavior, and are prepared to meet the complex technical challenges of society. To achieve this mission the college is committed to: • ensuring an academic environment conducive to our faculties achieving the highest levels of academic and research excellence; • building upon our traditional partnerships with industry, engineering practitioners and former students, to enhance our impact on the profession of engineering; • encouraging excellence, innovation and cross-disciplinary initiatives in education and research; • providing national and international leadership in undergraduate and graduate engineering education; • becoming the engineering college of choice for the increasing diverse citizenry of the state; and • encouraging and supporting opportunities for our students to grow beyond their chosen disciplines by participation in ethics, leadership programs, study-abroad programs and research.

The Mission Statement of the **Computer Engineering Program** at Texas A&M University reads as follows [3]:

Computer Engineering Program Mission Statement
The Computer Engineering program provides students with an education that ensures an excellent understanding of hardware and software systems and the necessary system design and development skills, and that fosters professional curiosity and imagination that drives them throughout their career. The program will stimulate and challenge the students with an exceptional, highly motivated faculty that shares its knowledge and excitement about Computer Engineering, well designed undergraduate and graduate curricula, research opportunities at all levels, and a first-class educational infrastructure. The program strives to produce graduates who are well prepared to excel in industry, academia and government, and who will take on leadership roles in shaping the technological landscape of the future.

[3] Source: Texas A&M University Undergraduate Catalog, edition 132, 2009-2010, p. 383. Computer Engineering: Program Mission

II.B Program Educational Objectives

The following educational objectives were defined after input from all constituencies of the Program. These objectives are published in the Undergraduate Catalog and can be accessed on the Program's web site (`http://ce.tamu.edu`).

Note: During the ABET process evaluation on 2009 we came to the conclusion that the CE objectives as currently define are worded too much as outcomes. We are in the process of re-defining our objectives. Please refer to Section II.G for a description of the new objectives and a discussion of the appropriateness of the current assessment process when applied for the new set of objectives.

Educational Objectives of the CE Program at Texas A&M University
Objective 1 - Graduates of the Program have the necessary knowledge, both in breadth and depth, to pursue the practice, or advanced study, of computer engineering.
Objective 2 - Graduates of the Program understand the importance of life-long learning, and be prepared to learn and understand new technological developments in their field.
Objective 3 - Graduates of the Program understand the technical, social, and ethical context of their engineering contributions.
Objective 4 - Graduates of the Program have the communication, teamwork, and leadership skills necessary to carry on the legacy of excellence of an Aggie Engineer.

II.C Consistency of the Program Educational Objectives with the Mission of the Institution

The CE Program's objectives are aligned to the Mission Statement for Texas A&M University (see Section II.A) as follows:

Mission statement: "Texas A&M University is dedicated to the discovery, development, communication, and application of knowledge in a wide range of academic and professional fields."

> The CE Program objectives, taken together, support the discovery, development, communication, and application of knowledge in the academic and professional fields of Computer Engineering.

Mission statement: "Its mission of providing the highest quality undergraduate and graduate programs is inseparable from its mission of developing new understandings through research and creativity."

The CE Program objectives, taken together, support the development of the highest quality graduates. Specifically Objective 1, Objective 2, and Objective 4 work to integrate the teaching program with the development of new understandings through research and creativity.

Mission statement: "It prepares students to assume roles of leadership, responsibility, and service to society."

Generally, the technical competence and confidence, gained throughout the CE Program, contribute to students ability to assume leadership roles both in school and after graduation. In addition, Objective 4 specifically promotes the preparation of our graduates for leadership in their profession through focus on communication, teamwork, and leadership skills and on professional integrity.

Mission statement: "Texas A&M University assumes as its historic trust the maintenance of freedom of inquiry and an intellectual environment nurturing the human mind and spirit."

The CE Program Objective 1, Objective 2, and Objective 3 promote the maintenance of freedom of inquiry and an intellectual environment nurturing the human mind and spirit: Objective 1 "... have the necessary knowledge, both in breadth and depth, to pursue the practice, or advanced study, of computer engineering". Objective 2 "...understand the importance of life-long learning, and be prepared to learn and understand new technological developments in their field". Objective 3 "...understand the technical, social, and ethical context of their engineering contributions".

Mission statement: "It welcomes and seeks to serve persons of all racial, ethnic, and geographic groups, women and men alike, as it addresses the needs of an increasingly diverse population and a global economy."

The CE Program Objective 3 and Objective 4 foster the awareness and sensitivity necessary for service to persons of all racial, ethnic, and geographic groups, women and men alike, and address the needs of an increasingly diverse population and a global economy: Objective 3 "... understand the technical, social, and ethical context of their engineering contributions". Objective 4 "...communication, teamwork, and leadership skills necessary to carry on the legacy of excellence of an Aggie Engineer".

Mission statement: "In the twenty-first century, Texas A&M University seeks to assume a place of preeminence among public universities while respecting its history and traditions."

The CE Program objectives, taken together, will enhance the University's ability to assume a place of preeminence among public universities while respecting its history and traditions.

II.D Program Constituencies

In order to fulfill its mission, the program must serve several different constituencies. We distinguish between **primary** and **secondary** constituencies. Primary constituencies are involved in the establishment, review, and assessment of the program objectives and outcomes. The secondary constituencies are not directly involved in this process.

Constituencies of the CE Program	
Primary Constituencies	Students of the Program Alumni of the Program Employers and potential employers of graduates of the Program
Secondary Constituencies	Citizens of the State of Texas Professional societies

Two important bodies for constituent involvement are the **Department of Electrical and Computer Engineering's External Advisory Development Council (EADC)** and the **Department of Computer Science and Engineering's Industrial Affiliates Program (IAP)**. These boards consist of alumni and employers and meet regularly to provide feedback to the departments about their programs. Since they both have representation from all of our primary constituencies, they play a crucial role in providing guidance to all aspects of our program improvement efforts. The EADC has been involved in establishment, evaluation, and assessment of program mission and objectives. Similarly, the IAP is fully aware of and participates in our ABET processes. Both bodies are tied into the feedback process necessary for the well-being of the program.

Throughout the establishment and ongoing evaluation of the objectives, feedback is sought also from the faculty and the ABET coordinators in the two home departments, in order to ensure some level of compatibility.

There has been some minor involvement from other bodies including the Texas Society of Professional Engineers and the Texas Higher Education Coordinating Board (THECB). We also hired a team of consultants to review our processes and provide feedback. The College of Engineering has provided much guidance throughout the process as well.

We have made a number of attempts to get input from our current students; we have one student member on one of our ABET committees. In general, however, we have found little or no interest on the students' part in being involved in these activities.

II.E Process for Establishing Program Educational Objectives

The formulation of the Educational Objectives of the CE program was initiated in Spring 2003, based on preparatory work done and experiences gained in the two home departments. In Spring 2003, the Computer Engineering Coordination Committee (CECC) held a series of meetings to formulate the CE Objectives. Feedback from various participants (faculty, constituencies, hired experts) was requested starting early in this process.

- A first version of the objectives was presented and feedback was requested during the faculty retreats of both CS and EE Departments in May 2003.
- In August 2003, the list of objectives was discussed with student representatives.
- In October 2003, the list of objectives was discussed with external consultants as part of a review of the Program's EC 2000 process. As a result of these discussions, the formulation of the objectives was somewhat streamlined. Specifically, we decided to eliminate "understanding of business context of engineering contributions" from Objective 3 because of concerns about assessment.
- In November 2003 the CE EC 2000 process was presented and discussed during the Fall meeting of the EADC. Feedback was requested on objectives. Overall, the EADC was satisfied with the list of objectives. Some discussion was held about the "business" issue (see item above). As expected, the EADC would have liked more understanding of business issues in our graduates. There was a general agreement, however, that devoting an entire course to this topic would be unnecessary. The EADC agreed that an assessment of the graduates' business acumen with the accuracy needed to "close the loop" on such an objective would be difficult, and it was agreed to leave this particular topic off the list of objectives for now, but to re-visit the issue soon.
- In Spring 2004, a survey was sent to CE alumni, which – among other things – invited the alumni to provide feedback about mission, objectives, and outcomes of the CE Program. While this survey provided much helpful information, the alumni did not express any opinion about objectives.
- In May 2004 the revised set of objectives was proposed for feedback in the CS faculty retreat.

Since 2005, we collect feedback from the following parties and constituencies, according to the following time table:

- faculty, during faculty meetings and during annual retreat (annually),
- students, through meetings with student representatives (we attempt to do this annually, but often there is little interest from our student constituencies),
- alumni, employers, and potential employers, during our EADC and IAP meetings (annually),
- alumni and employers, through surveys (every three years).
- external consultants, as part of the review of the Program's ABET process (typically, the year before the ABET visit, i.e., 2003, 2009). **Note:** See Section II.G for a discussion of the problems with the current objectives and proposed new objectives.

Until recently, our objectives have been standing the test of time very well, and all constituencies have been satisfied with them. Two issues have been identified:

- Both during our CECC meetings and our EADC and IAP meetings we regularly re-visit the missing of a “business” objective (see item above). This is probably part of the general problem of our objectives being too much worded as outcomes. We deal with this particular class of requests from our constituents within the context of outcomes rather than objectives.
- During the Fall 2009 review of the CE Program’s ABET process by a set of external consultants we identified a problem with our current objectives. **Note:** See Section II.G for a discussion of the problems with the current objectives and proposed new objectives.

II.F Achievement of Program Educational Objectives

II.F.1 Assessment Process; Overview

The level at which program objectives are met is assessed in two general ways:

1. Surveys of alumni and employers.
2. Performance data of our graduates **after graduation**.

This data is collected every three years, and the findings are discussed the following spring (or as soon as the data is available) in the CECC. If deficiencies are identified, a plan of action is laid out at that point. We collect the following data:

Alumni Surveys: Every three years, we collect survey data from alumni alumni of the CE Program. For the 2004 survey, we contacted alumni **that were out for three and five years**, respectively, which meant the graduates of Calendar Year 1998 and 2000. For the 2007 survey we moved to a College-level on-line system, and we collected data from graduates of Calendar Year 2002, 2003, and 2004. The 2009 survey collects information about data from 2004, 2005, and 2006 graduates. Alumni are asked about their current position, graduate school, and about their opinion of the level at which program objectives were met. In Spring 2004 we received 29 responses, in 2007 we had 50 responses, and in 2009 29 responses.

Employer/Supervisor Surveys: Every three years, we collect survey data from employers and supervisors of our graduates. The surveys ask about the satisfaction with graduates from the Program and about comparative information with graduates from other programs. The surveys also ask specifically about the level of preparedness of our graduates with respect to our objectives. In 2003 a series of surveys was sent from the home departments (ECE and CSE) to employers. Starting in 2007, we moved to a College-level on-line system, where a slightly modified set surveys is handled together with the alumni survey. Both alumni and non-alumni supervisors of our graduates participate in this survey. In 2003, a total of 30 surveys were returned, in 2007 we had 8 responses, and in 2009 the number of responses was from 25 supervisors who indicated that they supervised a total of 114 recent TAMU CE graduates, i.e., from 2005-2009.

In the following we describe the evidence collection process, define the **goals** for success as formulated by the CECC, and discuss the collected data for each objective.

All rankings are on a 5-point Likert scale (from 1 "poor / strongly disagree" to 5 "excellent / strongly agree").

II.F.2 Objective 1: “Graduates of the Program have the necessary knowledge, both in breadth and depth, to pursue the practice, or advanced study, of computer engineering.”

II.F.2.1 Objective 1: Measurement Process and Success Goals

Measurement	Goal
Alumni are asked to which extent they agree that Objective 1 was met as a result of them attending the CE Program.	Alumni should agree at a level of at least 3.8 on a 5-point Likert scale. [4]
Employers are asked to rate the skill set of our graduates.	Employers should agree at a level of at least 4.0 on a 5-point Likert scale.
	Our graduates should receive higher ratings than those from non-TAMU programs.

II.F.2.2 Objective 1: Data Collection Results and Discussion

Year	Measurement Point	Result
2004	**Alumni Survey:**	
	“I have the necessary knowledge, both in breadth and depth, to pursue the practice an advanced study, of computer engineering.”	4.0
	EE Employer Survey:	
	Rate level of satisfaction for quality of the alumni employed in recent years. Also rate non-A&M graduates for comparison.	
	Knowledge of Fundamental Skills (TAMU / non-TAMU)	3.86 / 3.17
	CS Employer Survey:	
	Based on your association with CS [5] graduates of Texas A&M, do you agree that they demonstrate...	
	“An ability to apply knowledge of math, science, and computing.”	4.5
	“An ability to design and conduce experiments – analyze and interpret data.”	4.04
	“An ability to design a system, component or process to meet desired needs.”	4.2
	“An ability to identify, formulate, and solve computing problems.”	4.36
	“An ability to use the techniques, skills and modern computing tools necessary for computer engineering practice.”	4.08

(continued)

[4] Note that the goal is lower than that of other measurement points. We discuss in Section III.F.2.1 how and why alumni tend to rate the depth of their preparation rather harshly.

[5] This includes CPSC and CECN.

Table II.4: (continued)

Year	Measurement Point	Result
	Discussion: *Feedback shows that we met two out of three goals. While the employers rate the knowledge of fundamental skills slightly below 4.0 in general, the results are much higher (all above 4.0) when the questions asked are more specific (e.g. "knowledge of math, science, and computing", "ability to identify, formulate, and solve computing problems", etc.). Overall, we do not see this as a problem with the program.*	
2007	**Alumni Survey:** "I have the necessary knowledge, both in breadth and depth, to pursue the practice an advanced study, of computer engineering."	4.06
	CE Supervisor Survey: Rate level of satisfaction for quality of the alumni employed in recent years. Also rate non-A&M graduates for comparison. Knowledge of Fundamental Skills (TAMU / non-TAMU)	4.22 / 3.63
	Discussion: *Feedback shows that we met all our goals. Both alumni and supervisors agree that our students have learned the necessary fundamental skills.*	
2009	**Alumni Survey:** "I have the necessary knowledge, both in breadth and depth, to pursue the practice an advanced study, of computer engineering."	4.11
	CE Supervisor Survey: Rate level of satisfaction for quality of the alumni employed in recent years. Also rate non-A&M graduates for comparison. Knowledge of Fundamental Skills (TAMU / non-TAMU)	3.8 / 3.57
	Discussion: *Feedback shows that we met two out of three goals. When asked how the program can better prepare its graduates ("...which areas should the Computer Engineering Program focus on in its future curriculum...,") the feedback fundamental skills only marginally. Instead, supervisors focus on the need for communication and teamwork. We will continue to monitor this data point.*	

II.F.3 Objective 2 : "Graduates of the Program understand the importance of life-long learning, and be prepared to learn and understand new technological developments in their field."

II.F.3.1 Objective 2: Measurement Process and Success Goals

Measurement	Goal
Alumni are asked to which extent they agree that Objective 2 was met as a result of them attending the CE Program.	Alumni should agree at a level of at least 4.0 on a 5-point Likert scale.
Alumni are asked whether they completed or are enrolled in graduate school.	At least 25% of our graduates should continue to graduate school.
Alumni are asked whether they are members of professional organizations.	At least 25% of our graduates should be member of at least one professional organization.

II.F.3.2 Objective 2: Data Collection Results and Discussion

Year	Measurement Point	Result
2004	**Alumni Survey:**	
	"I understand the importance of life-long learning, and I am prepared to learn and understand new technological development in my field."	4.5
	Percentage of alumni who attend or completed graduate school	31%
	Percentage of alumni who are member of professional organizations	28%
	CS Employer Survey:	
	Based on your association with CS graduates of Texas A&M, do you agree that they demonstrate...	
	"A recognition of the need for, and an ability to engage in life-long learning."	4.23
	Discussion: *All goals set for this objective have been met. Alumni and employers agree that the objective is met, and our graduates follow up with action: A significant percentage continues to graduate school, and many of our graduates are members of professional organizations.* *The last two results are particularly significant since (a) many of our graduates entered the work force at a time of unprecedented demand for computer engineers, and (b) the direct benefits of a membership in a professional organization are diminishing, given that literature in the field can be easily accessed through subscriptions of the employer or by other means.*	
2007	**Alumni Survey:**	
	"I understand the importance of life-long learning, and I am prepared to learn and understand new technological development in my field."	4.25

(continued)

Table II.6: (continued)

Year	Measurement Point	Result
	Percentage of alumni who attend or completed graduate school	48%
	Percentage of alumni who are member of professional organizations	62%
	Discussion: *All goals set for this objective have been met. Alumni rank us very highly on life-long learning. More importantly, they follow up with action: nearly half of our alumni 3 to 5 years out went on to graduate school, and nearly two thirds of the same alumni are members of professional organizations.* *We were very surprised by the large increase in the last two measures (graduate school and professional organizations) over the 2004 survey, and we were concerned that this may reflect a change in bias due to the transition from paper to on-line surveys. To better compare the results, we asked the 1999-2001 graduates the same questions about graduate school and professional organizations again as part of the 2007 on-line survey. The results were 31% and 49%, respectively. The response to the first question (graduate school) is identical to the 2004 survey, and the increase in the response to the second question (professional organization) can be explained with the increased seniority of the students after several years on the job. In general these comparisons increase our confidence in the collected data.*	
2007	**Alumni Survey:**	
	"I understand the importance of life-long learning, and I am prepared to learn and understand new technological development in my field."	4.5
	Percentage of alumni who attend or completed graduate school	21%
	Percentage of alumni who are member of professional organizations	22%
	Discussion: *The alumni continue to grade us very highly on life-long learning. Unfortunately, this batch of alumni does not appear to follow up at the level that we would like. In fact, we are missing our target both in terms of fraction of students going to graduate school and having memberships in professional societies. A more detailed analysis of the graduate-school data indicates that there was a pronounced decrease in graduate school numbers in the last few years, with 36% of 2004 graduates (5 out of 14 respondents) went to grad school. Similarly, we are surprised by the steep decrease in membership in professional societies. Some of this may be due to alumni using other mechanisms to stay current (the web) and stay in touch with colleagues in the industry (for example, linkedin.com or similar services.) We will certainly keep monitoring these numbers.*	

II.F.4 Objective 3: "Graduates of the Program understand the technical, social, and ethical context of their engineering contributions."

II.F.4.1 Objective 3: Measurement Process and Success Goals

Measurement	Goal
Alumni are asked to which extent they agree that Objective 3 was met as a result of them attending the CE Program.	Alumni should agree at a level of at least 4.0 on a 5-point Likert scale.
Employers are asked to rate our graduates' understanding of the technical, social, and ethical context of their engineering contributions.	Employers should agree at a level of at least 4.0 on a 5-point Likert scale.

II.F.4.2 Objective 3: Data Collection Results and Discussion

Year	Measurement Point	Result
2004	**Alumni Survey:** "I understand the technical, social, and ethical context of my engineering contributions."	4.3
	CS Employer Survey: Based on your association with CS graduates of Texas A&M, do you agree that they demonstrate...	
	"An understanding of professional and ethical responsibility."	4.23
	"A broad education necessary to understand the impact of computing solutions in a global and societal context."	3.8
	Discussion: *Feedback indicates that we satisfied our goals only in part. While the self-assessment of our graduates indicates no problem, this is not backed up by the assessment data we collected from their employers. (See Section IV.B for discussion of actions taken to correct these shortcomings).*	
2007	**Alumni Survey:** "I understand the technical, social, and ethical context of my engineering contributions."	4.19
	Discussion: *Alumni continue to rank us highly on this objective. We therefore consider the goals for this objective met.*	
2009	**Alumni Survey:** "I understand the technical, social, and ethical context of my engineering contributions."	4.61
	Discussion: *Alumni continue to rank us highly on this objective. We therefore consider the goals for this objective met.*	

II.F.5 Objective 4: "Graduates of the Program have the communication, teamwork, and leadership skills necessary to carry on the legacy of excellence of an Aggie Engineer."

II.F.5.1 Objective 4: Measurement Process and Success Goals

Measurement	Goal
Alumni are asked to which extent they agree that Objective 4 was met as a result of them attending the CE Program.	Alumni should agree at a level of at least 4.0 on a 5-point Likert scale.
Employers are asked to rate teamwork and leadership abilities of our graduates.	Employers should agree at a level of at least 4.0 on a 5-point Likert scale.
	Our graduates should receive higher ratings than those from non-TAMU programs.

II.F.5.2 Objective 4: Data Collection Results and Discussion

Year	Measurement Point	Result
2004	**Alumni Survey:** "I have the communication, teamwork, and leadership skills necessary to carry on the legacy of excellence of an Aggie Engineer."	4.13
	EE Employer Survey: Rate level of satisfaction for quality of the alumni employed in recent years. Also rate non-A&M graduates for comparison.	
	Teamwork (TAMU / non-TAMU)	4.57 / 3.50
	Leadership Abilities (TAMU / non-TAMU)	4.43 / 3.83
	CS Employer Survey: Based on your association with CS graduates of Texas A&M, do you agree that they demonstrate...	
	"An ability to function on multi-disciplinary teams."	4.54
	"An ability to communicate effectively – oral and written."	4.19
	Discussion: *All goals for this objective have been met. Alumni are in agreement, and the facts indicate that our graduates do carry on the Legacy of an Aggie Engineer: According to the employers, our graduates rank very high in teamwork and leadership abilities, and that they proceed to leadership positions in their organization at much higher rate than graduates from non-TAMU programs.*	
2007	**Alumni Survey:**	

(continued)

Table II.10: (continued)

Year	Measurement Point	Result
	"I have the communication, teamwork, and leadership skills necessary to carry on the legacy of excellence of an Aggie Engineer."	4.31
	CE Supervisor Survey: Rate level of satisfaction for quality of the alumni employed in recent years. Also rate non-A&M graduates for comparison.	
	Teamwork (TAMU / non-TAMU)	4.56 / 4.13
	Leadership Abilities (TAMU / non-TAMU)	4.11 / 3.75
	Discussion: *Both alumni and supervisors rank us very highly on this objective. Alumni consider themselves prepared, and supervisors rank our alumni very highly on teamwork and on leadership abilities. In addition, our graduates are ranked significantly higher than graduates from non-TAMU programs.*	
2009	**Alumni Survey:** "I have the communication, teamwork, and leadership skills necessary to carry on the legacy of excellence of an Aggie Engineer."	4.32
	CE Supervisor Survey: Rate level of satisfaction for quality of the alumni employed in recent years. Also rate non-A&M graduates for comparison.	
	Teamwork (TAMU / non-TAMU)	4.13 / 3.5
	Leadership Abilities (TAMU / non-TAMU)	3.8 / 3.29
	Discussion: *Alumni continue to rank us very highly on this objective. Alumni consider themselves prepared, and supervisors rank our alumni very highly on teamwork. In addition, our graduates are ranked significantly higher than graduates from non-TAMU programs, both in terms of teamwork and leadership abilities.*	

II.F.6 Non-Scheduled Assessment of Objectives: 2002 LASSI Test

In addition to the regular assessment process described above, in 2002 the College of Engineering performed an in-depth analysis of our students' capabilities for life-long learning (Objective 2) using the **Learning and Study Skills Inventory** (LASSI). A comparison of LASSI scores at the beginning of ENGR 111 and CVEN 349 led to the conclusion that there was, at best, no change and in some cases significant decline in students' lifelong learning ability as a consequence of the then current ENGR 111/112. [6]

II.F.7 Summary of Objectives Assessment (Spring 2010)

Overall, the CECC is of the opinion that we are achieving our goals for the objectives. Employers rate our graduates highly. While highly fluctuating, the percentage of students who continue to graduate school is generally high, as is the portion of students who join professional societies.

The CECC is concerned with the recent steep drop in the portion of our graduates who continue to graduate school. Similarly, the steep decline in number of students joining professional societies raises concerns.

As described in Chapter IV (Improvement) and Chapter V (Curriculum), the CE Program is transitioning to a new curriculum ("Curriculum-2008",) which uses a "core-and-track" model designed to offer more flexibility for students to shape their curriculum. The CECC is hopeful that this change will further improve the achievement of our objectives.

II.G Planned Modifications to Program Objectives

During our Fall 2009 Review of the CE Program's ABET process we came to the conclusion that the CE Program objectives are worded too much as outcomes. Rather than being "... broad statements that describe the career and professional accomplishments that the program is preparing the graduates to achieve," the objectives read like descriptions of the level of preparation for their chosen career paths.

The CECC initiated a comprehensive re-evaluation of the current objectives and a formulation of a set of more appropriate objectives in November 2009. It was decided that this process would come to conclusion only after the ABET visit in Fall 2010. Given the importance of collecting and addressing feedback from the constituencies, the CECC agreed that it would not be possible to put a new set of objectives in place and to publish it (among others in the Student Catalog) in time for the Fall 2010 ABET visit.

In the following we will briefly describe the set of objectives currently under discussion, the process for introducing the new set of objectives, and the adequacy of the current assessment process for the new set of objectives.

[6] Source: D. Fowler, D. Maxwell, and J. Froyd, "Learning Strategy Growth Not What Expected After Two Years through Engineering Curriculum." ASEE 2003 Conference. A copy of this publication is available and can be supplied.

II.G.1 Proposed New Program Objectives (Strawman)

The intent of the new set of program objectives is to better "... describe the carrer and professional accomplishments that the program is preparing the graduates to achieve." The new set of objectives that is currently under consideration by the CECC[7] looks as follows:

New Objective 1: Graduates who choose to pursue a career in industry or government will become productive and valuable computer engineers.

New Objective 2: Graduates who choose to pursue advanced degrees will be able to gain admission to graduate programs and will become successful graduate students.

New Objective 3: In keeping with the legacy of an Aggie Engineer, graduates will be successful in attaining positions of leadership in their professional careers.

The current set of objectives relates to the proposed new objectives as follows:

- The current Objective 1 ("Graduates of the Program have the necessary knowledge, both in breadth and depth, to pursue the practice, or advanced study, of computer engineering.") is now addressed in the New Objective 1 ("... career in industry and government ...") and Objective 2 ("... pursue advanced degrees ..."). Moreover, the two new objectives focus on the career and professional accomplishments rather than on the preparation to achieve them.
- The current Objective 2 ("... understand the importance of life-long learning, ...") is deleted. It is addressed by Outcome 9.
- The current Objective 3 ("... understand the technical, social, and ethical context ...") is deleted. It is largely addressed by Outcome 8.
- The current Objective 4 ("Graduates of the Program have the communication, teamwork, and leadership skills necessary to carry on the legacy of excellence of an Aggie Engineer.") has been re-formulated to focus on career and professional accomplishments rather than on the preparation to achieve them.

II.G.2 Timeline for Introduction of New Objectives

The New Objectives have been discussed in the CECC and with the ABET coordinators for the programs in the home departments[8]. They have also been presented to the faculty, and feedback has been collected. In Fall 2010 we will collect feedback from the EADC in ECE and from the IAP in CSE during their Fall meetings. During summer and early fall 2010 we will be collecting feedback from selected student bodies, among other from the Texas A&M Computer Science Society (TACS), from UPE, and the CE representatives in the Student Engineering Council (SEC). We plan to finalize the new set of Objectives in October 2010, for publication in the Student Catalog for Academic Year 2011.

[7] This set of objectives is a strawman, and it has not been reviewed by all our constituencies yet.

[8] While the objectives and outcomes need not be identical across the three programs in the two departments, they have to be *consistent*.

II.G.3 Adequacy of the Current Assessment Process

While the current assessment process is geared towards the current set of objectives, the collected assessment data directly applicable to the assessment of the proposed set of New Objectives.

Table II.11: Proposed Assessment Process for “New Objectives”

Measurement	Goal
Objective 1 *Graduates who choose to pursue a career in industry or government will become productive and valuable engineers.*	
Employers are asked to rate the productivity of our graduates.	Employers should agree at a level of at least 4.0 on a 5-point Likert scale.
	Our graduates should receive higher ratings than those from non-TAMU programs.
Employers are asked to rate the value to the company of our graduates.	Employers should agree at a level of at least 4.0 on a 5-point Likert scale.
	Our graduates should receive higher ratings than those from non-TAMU programs.
Employers are asked to rate the skill set of our graduates.	Employers should agree at a level of at least 4.0 on a 5-point Likert scale.
	Our graduates should receive higher ratings than those from non-TAMU programs.
Objective 2 *Graduates who choose to pursue advanced degrees will be able to gain admission to graduate programs.*	
Alumni up to 5 years out are asked whether they completed or are enrolled in graduate school.	At least 25% of our graduates should continue to graduate school.
Objective 3 *In keeping with the legacy of an Aggie Engineer, graduates will be successful in attaining positions of leadership in their professional careers.*	
(*) Alumni up to 5 years out are asked whether they experienced professional advancement or promotion since graduating from TAMU.	Graduates should agree at a level of at least 4.0 on a 5-point Likert scale.
Employers are asked to rate teamwork and leadership abilities of our graduates.	Employers should agree at a level of at least 4.0 on a 5-point Likert scale.
	Our graduates should receive higher ratings than those from non-TAMU programs.
(*) Employers are asked to state the percentage of recent graduates (up to 5 years out) who have attained a position of leadership (e.g., project leader, senior engineer, manager) in their company.	Our graduates should have higher numbers than those from non-TAMU programs.

CRITERION III:
PROGRAM OUTCOMES AND ASSESSMENT

III.A Process for Establishing and Revising Program Outcomes

The Program Outcomes were established by the Computer Engineering Coordination Committee (CECC) and finalized over a series of meetings to gather feedback from constituencies. In particular, feedback was gathered in several CE faculty meetings during Spring 2003. Feedback from the Department of Electrical Engineering's External Advisory Development Council (EADC) was gathered during their meeting in Fall 2003. A team of consultants hired in Fall 2003 to review our processes and provide feedback gave us input to the outcomes as well. As a result, we trimmed down an initially rather baroque set of outcomes to the current set.

Since the achievement of the outcomes is largely determined by the curriculum and by the courses in the curriculum, and these courses in turn are administered in the two home departments, the CECC naturally had to work closely with the home departments in establishing the outcomes. While the outcomes may – and in fact should to a certain point – be different, *they should not be inconsistent*. As a result, the three programs (CE, CS, and EE) have settled to a set of outcomes that have minor, program-specific differences. In fact, the list of outcomes was eventually pruned largely to the ones listed in Criterion III. Compatibility of outcomes among the three programs was therefore easily achieved.

The Program Outcomes are periodically reviewed by faculty, alumni, and industry representatives. This happens typically once a year, in the CECC, in faculty retreats, and in meetings with industry representatives, such as the CSE Industry Affiliates Program (IAP).

Overall, the constituencies are satisfied with the current set of outcomes. Periodically, individual industry representatives mention the wish to see ”business” related skills as part of the outcomes. There is no agreement yet, however, on what these skills should be, how they should be evaluated. We will keep monitoring this.

In Fall 2009 the CECC decided to edit Outcome 3 (ABET Outcome (c)) and Outcome 8 (ABET Outcome (h)) to reflect the current ABET wording of the Outcomes. As a result, we added the wording "... within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability" to Outcome 3 and the wording "... economic, environmental, ..." to Outcome 8. While we typically request input from our constituencies when we consider changes to our outcomes, these most recent changes were considered to be required to make us compliant with ABET, and adoption process was limited to a vote in the CECC. The changes were unanimously approved during the November 2009 meeting of the CECC.

III.B Program Outcomes

The Outcomes are listed in the following table. For comparison, the respective ABET outcomes (i.e. the minimum set of outcomes listed in Criterium III) are listed as well.

CE Program Outcomes	
Outcome 1	Knowledge of differential and integral calculus, differential equations, linear algebra, complex variables, discrete mathematics, probability and statistics. *ABET Outcome (a) : Ability to apply knowledge of mathematics, science, and engineering.*
Outcome 2.	An ability to design and conduct experiments, as well as to analyze and interpret data. *ABET Outcome (b) : (same)*
Outcome 3.	An ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. *ABET Outcome (c) : (same)*
Outcome 4.	An ability to collaborate with a multidisciplinary team. *ABET Outcome (d) : An ability to function on multi-disciplinary teams.*
Outcome 5.	An ability to identify, formulate, and solve *computer* engineering problems. *ABET Outcome (e) : An ability to identify, formulate, and solve engineering problems*
Outcome 6.	An understanding of professional and ethical responsibility. *ABET Outcome (f) : (same)*
Outcome 7.	An ability to communicate effectively. *ABET Outcome (g) : (same)*
Outcome 8.	The broad education necessary to understand the impact of *computing* solutions in a global, economic, environmental, and societal context. *ABET Outcome (h) : The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.*
Outcome 9.	A recognition of the need for, and an ability to engage in, life-long learning *ABET Outcome (i) : (same)*
Outcome 10.	Knowledge of contemporary issues. *ABET Outcome (j) : (same)*
Outcome 11.	An ability to use the techniques, skills and modern computing tools necessary for *computer* engineering practice.

(continued)

(continued)

CE Program Outcomes
ABET Outcome (k) : An ability to use the techniques, skills and modern computing tools necessary for engineering practice.

III.C Program Outcomes and Relation to Educational Objectives of Program

The CE Outcomes are aligned to the CE Educational Objectives (see Chapter II) as follows:

CE Objective 1: "... the necessary knowledge, both in breadth and depth, to pursue the practice, or advanced study, of computer engineering."

Outcomes 1, 2, 3, 5, and 11 support the technical competence required for our graduates to "pursue the practice, or advanced study, of computer engineering."

CE Objective 2: "... understand the importance of life-long learning, and be prepared to learn and understand new technological developments in their field."

The field of Computer Engineering is characterized by a very high rate of change, both of technology and processes. The understanding of life-long learning is therefore critical. Outcome 9 naturally supports this objective.

CE Objective 3: "... understand the technical, social, and ethical context of their engineering contributions."

Outcomes 8 and 10 directly support this objective.

CE Objective 4: "... have the communication, teamwork, and leadership skills necessary to carry on the legacy of excellence of an Aggie Engineer."

We expect our graduates to attain and excel in leadership positions. Outcomes 4, 6, and 7 directly support this objective.

The following table illustrates the relation between objectives and supporting outcomes:

	Outcomes										
Objective	1	2	3	4	5	6	7	8	9	10	11
Objective 1.	X	X	X		X						X
Objective 2.									X		
Objective 3.								X		X	
Objective 4.				X		X	X				

III.D Relationship of Courses in the Curriculum to the Program Outcomes

The program outcomes are supported by courses within the CSE and ECE departments as well as courses in supporting areas, such sciences, math, ethics, and social and general studies. The following tables focus on the courses in the curriculum that are used to collect evidence for the outcome assessment of the program. Other courses may address one or more of the outcomes as well. Table III.2 illustrate this relation for the "old curriculum", while Table III.3 does the same for the new curriculum ("Curriculum-2008".)

Table III.2: Relationship between Courses and Program Outcomes ("Old Curriculum")

	Outcomes										
Course No.	1	2	3	4	5	6	7	8	9	10	11
ENGR 111				X		X		X	X		
MATH 152/251/253	X										
ENGL 210/301/310							X				
STAT 211/414	X										
ECEN 248	X										
MATH 302	X										
MATH 308	X										
MATH 311	X										
CSCE 410	X	X			X						X
ECEN 314	X										X
CSCE 431		X	X				X	X	X		
CSCE 321 / ECEN 350	X		X		X				X	X	X
ECEN 325											X
ECEN 405 / CSCE 483		X	X	X	X		X	X	X	X	X
ENGR 482						X	X				

Table III.3: Relationship between Courses and Program Outcomes ("Curriculum-2008")

	Outcomes										
Course No.	1	2	3	4	5	6	7	8	9	10	11
ENGR 111				X		X		X	X		
MATH 152/251/253	X										
ENGL 210/301/310							X				

(continued)

Table III.3: (continued)

Course No.	Outcomes 1	2	3	4	5	6	7	8	9	10	11
STAT 211/414	X										
ECEN 248	X										
CSCE 222	X										
MATH 308	X										
MATH 311	X										
CSCE 313	X	X			X						X
ECEN 314	X										X
CSCE 315			X	X	X	X	X	X		X	X
CSCE/ECEN 350	X		X		X				X		X
ECEN 325											X
ECEN 405 / CSCE 483		X	X	X	X		X	X	X	X	X
ENGR 482						X	X				

III.E Documentation

In the past, we have been presenting the ABET evaluation team with two complementary displays:

Outcome-oriented Displays: We will provide per-outcome displays that allow the evaluation team to review in detail where, how, and to what level the various outcomes are covered in the program. The display is typically organized in form of binders, one for each outcome, which contain highlighted portions of syllabi, annotated selected course content, annotated student work, annotated exams, and highlighted reports from the IAARP. **All material used as basis for the evaluation described in this report will be available as part of the outcome-oriented displays.**

Course-oriented Displays: Here we structure the displays by course. This makes it easy for the evaluation team to associate the material covered, the textbooks, and laboratories, and any produced artifact (student work, project artifacts) in a context that is easily accessible.

Appropriate cross-referencing, in conjunction with hyperlinking in softcopies of the presented documents will simplify the navigation in the presented material.

Note: We welcome suggestions from the evaluation team before the visit on how to improve the presented documentation in order to make the visit itself as productive as possible.

III.F Achievement of Program Outcomes

In the following, we describe our process of evidence-based assessment of the Program's outcomes. We proceed by giving an overview of the evidence collection and analysis process in Section III.F.1, where we describe the evicence collection cycles, the type of data collected, the success goals, and the processes to evaluate the collected evidence. In Section III.F.2 we describe the data collection process chronologically. In the following sections we elaborate on the collected data and discuss the assessment results that feed into the improvement efforts described in Chapter IV.

III.F.1 Assessment of Outcomes: Process

The extent to which student outcomes are met by the program is assessed in four general ways:

1. **Evaluation of courses and student course work.** Objective evaluation by faculty, and evaluation of courses through surveys of students, instructors, and course coordinators. (see Section III.F.1.1)
2. **Evaluation of capstone design project** by industry experts. (see Section III.F.1.2)
3. **Exit interviews** of graduating students by industry experts. (see Section III.F.1.3)
4. **Collection of survey data** from recent graduates, i.e., one year after their graduation. (see Section III.F.1.4)

As a result, we have a good mix of self assessment (student and faculty surveys, student work, pre-and-post tests) and "arm's-length" assessment (surveys of recent alumni, evaluations through industry experts). We describe each of these five ways separately.

In addition to the material collected in the CSE and ECE departments, a number of engineering courses are regularly assessed as well. For a description of the assessment of ENGR 482 (Engineering Ethics) refer to Appendix E.E.

Note: Be aware that in the following we describe evaluations from data that has been collected in two departments (CSE and ECE), each of which is using its own evaluation instruments. In addition, we collect material that is specific to the CE Program as well. This may make the evaluation process look a bit baroque at first sight. The fact that the CE Program is undergoing a significant change in curriculum adds to the confusion, as we are collecting data from students in both curricula during the transition period. In the following we will do our best to clearly state for which curriculum the data is applicable.

Evaluation and Response Process: Every spring the assessment results from the previous calendar year are discussed in the CECC, with a follow-up discussion with the faculty in the home departments (for example in the yearly retreat of the CSE faculty in May). Experience has shown that while some measures tend to be steady (such as surveys of former students), some others, such as course surveys and evaluations by industry representatives, tend to fluctuate. For example, the

IAARP numbers have shown to be sensitive to the group dynamics in the panel. Similarly, course evaluations tend to reflect student perception about instructor effectiveness rather than about the course, and thus tend to vary from one instructor to the other. The CECC therefore monitors trends over a period of two years at least before deciding on significant remedial actions. The rationale for this is that the *status quo* of the CE Program is a very satisfying one: Our program is highly respected, its graduates are very much in demand, and its alumni are doing well at all levels of their profession. It would therefore be ill-advised for the CECC to chase short-term variations in the assessed data rather than focus on long-term trends.

III.F.1.1 Evaluation of Courses and Student Course Work

The evaluation of student work is done in four ways, namely *Evaluation of Student Work*, *Consensus Measure*, and *Course Grade*.

Evaluation of Student Work: Faculty of certain courses are required to submit a spreadsheet rating each student in their course on the program outcome(s) in question. The evaluation can be either on a "4-level-scale" or a "2-level-scale". In the case of a 4-level-scale, the faculty will evaluate the students according to the following scale:

0 - Student has little or no mastery of the outcome,

1 - Student has marginal mastery of the outcome,

2 - Student has good (sometimes "accomplished") mastery of the outcome,

3 - Student has outstanding mastery of the outcome.

Evaluations using a "2-level-scale" are similar to the 4-level-scale evaluations: The faculty evaluates the students according to the following binary scale:

0 - Student has not achieved adequate (sometimes "satisfactory") mastery of the outcome,

1 - Student has achieved adequate (sometimes "satisfactory") mastery of the outcome.

In either case, instructors identify certain course evaluation tools (e.g., specific exam problems, homework problems, portions of projects or lab assignments) which specifically cover the outcome being assessed. The instructor then defines how the grades from those specific problems/assignments are mapped into an overall outcome rating. At the end of the semester, the instructor provides the ABET committee with a spreadsheet documenting the rating *of each student* in their course for the outcomes assigned to that course and how that rating was obtained.

This evaluation instrument is used for ECE courses.

Success Goal: This measure calls for attention when the average grades on a 4-level scale fall below a value of 2.0 ("good mastery") or when less than 80% of the students succeed and receive a value of 1 ("adequate mastery") on a 2-level scale.

Consensus Measure: Each semester, students are surveyed concerning the effectiveness of the course in terms of meeting student outcomes. Course coordinators and instructors are surveyed as well. These surveys ask questions of the type "How much do you agree that this course helped you to progress toward each of the following learning objectives?" Responses are on a 5-level Likert scale, from 1 ("Strongly Disagree") to 5 ("Strongly Agree").

The results of these evaluations are condensed to a single number from 1 to 5 according to the following procedure:

1. Survey the instructors and average.
2. Survey the course coordinator.
3. Select the lower of the coordinator grade and the average instructor grade.
4. Student response is calculated as the *percentage* of all students who entered a 4 ("Agree") or 5 ("Strongly Agree") on the survey.
5. The student *percentage* from Step 4 is multiplied by the coordinator/instructor grade from Step 3 to get the final number.

As a result, we get a conservative estimate of the amount of consensus among course coordinators, instructors, and students as to which level a course adequately covers a particular outcome and how well the students perform on the outcome.

This evaluation instrument is used for CSE courses.

Note: For this data, we make use of all surveys and all data collected in the classes. We do not distinguish between CE students and non-CE students, as the instruments measure course outcomes rather than program outcomes.

These consensus measures have a number of problems. First and foremost, they are perception based rather than objective. As a result of this, we considered phasing them out after 2004. Starting in 2007 we integrated this measure as part of the routine on-line course evaluations of the CSE Department. Given that the data now comes at little or no cost, we keep the instrument in order to monitor long-term trends. Responses in the new on-line survey are on a 5-level scale: A ("deserves award"), B ("very good"), C ("good"), D ("does not perform well"), E ("serious deficiencies"). We adapt the computation of the consensus measure by computing the percentage of "agreeable" students in Step 4 above to be the percentage of students who respond with a C or higher.

Success Goal: This measure is used for trend monitoring. It calls for attention when the collected data drops below 4.0 over extended periods of time.

Course Grade: A number of courses exclusively address one particular outcome. For example, ENGR 482 (Engineering Ethics) exclusively addresses Outcome 6 ("... understanding of professional and ethical responsibility"), while ENGL 210 does so for Outcome 7 ("... ability to communicate effectively"). In such cases, we use course grades to measure how the respective outcomes have been met.

We represent the course grade information as a tuple (N, P, F), where N is the total number of CE students in the course, P stands for the average grade of all passing students (i.e. with grade "D" or above) in the course, and F denotes the percentage of CE students that failed or dropped the course. The rationale for using P is that a good grade in the particular course is indication of mastery of the outcome primarily addressed in that course. In addition, we monitor the failure rate F to identify possible problems with the course.

Success Goal: We monitor this data qualitatively and act should grades significantly drop or the percentage of students failing unduly increase.

The following table gives an overview over the type of data collected for outcome assessment. The courses listed for each outcome represent courses that would typically be used to assess that specific outcome. Actual courses used may vary a bit depending on course offering and sometimes quality of the collected data (e.g., sample sizes).

Table III.4: Evaluation of Courses and Student Course Work

Outcome		Means of Evaluation			
		4-Level Std.Wrk	2-Level Std.Wrk	Consensus	Grade
1	differential and integral calculus				MATH 152 MATH 251/253[1]
	diff. equations				MATH 308
	linear algebra				MATH 311
	discrete math.	ECEN 248			MATH 302
	complex var.	ECEN 314			
	probability and statistics				STAT 211 STAT 414
	overall			CSCE 321 CSCE 410	
2				CSCE 410 CSCE 431	
3				CSCE 321 CSCE 431	
4			ENGR 111		
5				CSCE 321 CSCE 410	
6			ENGR 111		ENGR 482
7		ECEN 405		CSCE 431	ENGL 210 ENGL 301 ENGL 310

(continued)

[1]MATH 253 is a 4-credit version of MATH 251.

Table III.4: (continued)

Outcome		Means of Evaluation			
		4-Level Std.Wrk	2-Level Std.Wrk	Consensus	Grade
8		ECEN 405	ENGR 111	CSCE 431	
9		ECEN 405	ENGR 111	CSCE 321 CSCE 431	
10		ECEN 405		CSCE 321	
11	overall			CSCE 321 CSCE 410	
	lab equipment	ECEN 325			
	Matlab	ECEN 314			
	Spice	ECEN 325			

III.F.1.2 Evaluation of Capstone Design Projects by Industry Experts

Every May we invite a group of industry representatives to evaluate the projects and project presentations of the CECN Capstone Design Course (CSCE 483). During an on-site visit, these experts have the opportunity to talk to the students, inspect the project artifacts and documentation produced as part of the course, and listen to the student presentations.

The visitors are asked to complete a survey form (one form for each project group and each visitor), where they indicate how well each project group did on a number of criteria related to program outcomes. In addition, the survey also collects general comments, which are then reviewed by the CECC and by the faculty. Since this course is required for all CECN students, and is very rarely taken by students in other programs, this evaluation is an excellent instrument for outcome assessment in the CE Program.

The capstone design project review was formalized to become part of the Industry Academic Assessment and Review Panel (IAARP) evaluation for the first time in 2007. The format of the review and the information provided to the panel ("training of the panel") is tuned a bit every year, in order to get the most helpful data as a result of the review.

Copies of the survey instruments used for the Project Reviews are given in Section E.B of the Appendix. See Section E.B.7 for a copy of the May 2010 Project Review Form, which includes an evaluation rubric.

Note: The rationale to use project reviews for program outcome assessment is two-fold. First, by definition, the capstone design project brings together and exercises many of the skills and capabilities acquired by the student as part of the entire program. Examples are communication skills, technical capabilities, understanding of engineering and environmental constraints, ethical considerations, and so on. Second, the project presentations happen literally a few days before graduation. This is as close as we can get to present a well-rounded picture of our graduating students to outside reviewers. There is a temptation by some reviewers to do a course assessment rather than a student- and project-based program outcome assessment. We try to minimize this by appropriate briefing of the reviewers.

Performance Criteria and Mapping to Outcomes: The worksheets for the reviewers list a set of performance criteria to be used to evaluate the projects and the project presentations. The following table lists the performance criteria, which are represented as questions on the work sheets.

Performance Criteria		Outcome	Evaluated
1.	Was the problem clearly stated and requirements identified?	Outcomes 2, 5	Outcome 5
2.	Were design alternatives considered, as well as a rationale for choosing among them?	Outcome 3	Outcome 3
3.	Was the system-level functional description well thought-out?	Outcomes 2, 5	
4.	Were the designs for each system component technically sound?	Outcome 5	
5.	Did the students demonstrate in-depth knowledge about the project?	Outcomes 5, 10, 11	
6.	Was there evidence of effective teamwork?	Outcome 4	Outcome 4
7.	Were engineering standards (safety, economics, ethics) properly addressed?	Outcome 3, 8	Outcome 8
8.	Did the students demonstrate effective communication skills?	Outcome 7	Outcome 7

In 2004 and 2007 we mapped the performance criteria to outcomes in the way described in the table (column "Outcomes"). In order to not unduly complicate the interpretation of the data, we focused on at most one outcome per question (column "Evaluated").

Summary Reports: Starting in 2008, we asked the IAARP to summarize its findings and give us a **summary evaluation for each outcome directly**, rather than quantitative data with respect to the performance criteria. Compared to the 2004 and 2007 project reviews, the reviews from 2008 on reflect the consensus of the review panel on how we satisfy the outcomes, rather than the performance criteria. The IAARP panel reports on all outcomes other than Outcome 6 ("Understanding of professional and ethical responsibility"), Outcome 9 ("... life-long learning"), and Outcome 10 ("Knowledge of contemporary issues"). These 3 outcomes are not included because we have better instruments to assess them. Copies of the IAARP project review reports for 2008, 2009, and 2010 are given in Section E.B.5 of the Appendix.

Rating and Grading: The reviewers are asked to rate the performance criteria and (from 2008 on the outcomes) using a scale from 1 ("poor") to 5("excellent"). The numerical rating has the following meaning:

1 - poor
2 - fair
3 - good

4 - very good
5 - excellent[2]

As part of our ongoing effort to improve the training of our IAARP reviewers, in 2009 we added a better description of the meaning of the rating scale used in the project reviews and exit interviews:

1 - Students show no or almost no competency in this area. It is an embarrassment that graduating students would demonstrate this low of a level of competency. Major coordinated effort for improvement will be needed for this outcome to be met.
2 - Students show only a minimal competency in this area, with their deficiencies clearly outweighing their positives. We would be disappointed to find a graduating student had this poor of a level of achievement in this area. The outcome is not being satisfied and many improvements will be needed in order to remedy it.
3 - While students demonstrate some competence in this area, there are significant deficiencies. This is not at a level we would expect of students graduating with a B.S. degree in this area. There are several ways in which this area could be improved.
4 - Students have demonstrated a good understanding of this area. It is in line with or somewhat exceeds the level we would expect of graduating students. The outcome is satisfied but there is still room for improvement.
5 - The students demonstrate a full mastery of this area. This has been demonstrated to us at the highest level we would reasonably expect from graduating students. The outcome is satisfied, and compared to other areas, this should not be a focus of improvement.

The CECN Capstone Design Course ECEN 405 also has industry representatives come and evaluate projects. This has been done rather qualitatively, and we are not using this data yet for outcome assessment.

Success Goal: This measurement point calls attention when the consensus rating for an outcome drops below 3.5 (“good - very good”). For the single case of 2007 the success goal was set to 4.0 (“quite agreeable”).

III.F.1.3 Exit Interviews of Graduating Students

Starting in 2007, we invite a group of industry representatives every year in May to perform in-depth exit interviews with our graduating students. Members of the Industry Academic Assessment and Review Panel (IAARP) visit our campus and spend one day interviewing our students in small groups, for about 90 minutes each. At the end of the day, the panel convenes, exchanges notes, and writes a report that represents a consensus on how our students perform on the outcomes, and about perceived strengths and weaknesses of the program, together with recommendations on how to improve the program. This report is presented by the panel to the CECC. Copies of the IAARP Exit Interview reports are given in Section E.D in the Appendix.

[2] An exception is the 2007 Project Review, which used the following numerical rating: 0 for “not at all agreeable”, 1 for “not agreeable”, 2 for “slightly agreeable”, 3 for “somewhat agreeable”, 4 for “quite agreeable”, 5 for “strongly agreeable”, and 6 for “extremely agreeable”. We treat this rating separately, and we define a separate success goal for this review.

Rating and Grading The reviewers are asked to rate how we satisfy the outcomes based on the exit interviwers base on the same scale as used for the project reviews, i.e. using a scale from 1 ("poor") to 5("excellent"). The rating rubric is identical to the one used for the capstone project review and is described in Section III.F.1.2.

Success Goal: We take action when the consensus rating for an outcome drops below 3.5 ("good - very good").

III.F.1.4 Survey of Recent Graduates

Every two or three years (2004, 2007, 2009) we send out a survey to CE alumni who graduated during the previous academic year. We expect to get an "arms-length" perspective on how well we do by asking our graduates who (a) have their experience at Texas A&M still fresh in their mind, but (b) have already an early professional experience and opportunity to compare against peers who graduated from other programs.

In these surveys we ask students to rank how the CE Program helped them towards reaching the CE outcomes. Specifically, the survey asks the following question:

> "Please indicate - based on your professional experience - how much you agree that the Computer Engineering Program at Texas A&M helped you progress toward each of the following objectives." [3]

The survey asks to respond to the question above by giving a Likert scale rating from 1 ("strongly disagree") to 5 ("strongly agree") for each outcome.

Success Goal: We take action when the average rating for an outcome falls below 4.0 ("agree").

[3]We thought this survey to be the wrong venue to englighten our alumni with a discourse on Objectives vs. Outcomes. Therefore, we ask recent graduates about "Objectives" when we mean "Outcomes".

III.F.2 Outcome Assessment: Chronology

In this section we give a chronology of the outcome collection and assessment process. We will focus primarily on the development of the process and on experiences gained. A discussion of the collected evidence will be given in Section III.F.3.1, and we describe program improvement steps in Chapter IV.

III.F.2.1 Outcome Assessment: Year 2004

A pilot run of this assessment process was implemented in the Spring Semester of 2003. Both in the EE and the CS department, course survey data was collected. The purpose of this pilot run was mainly to test the assessment process to make sure it would run smoothly and produce reasonable data.

FE Exam Data: In addition, we collected details about the FE Exam subject area results for the exam administered in October 2003. A grand total of four TAMU Electrical Engineering students took the ELECTRICAL FE exam, and all four passed. (Given the small sample – four students – this data is of course at best anecdotal.) A summary of some of the results is given in the following table:

Topic/Outcome	No. of Questions	% Correct CE TAMU	% Correct Nat.l Avg.
Mathematics / 1	24	88	72
Computers /	7	79	72
Ethics / 6	5	80	65
Comp. Hardware Eng./	3	33	50
Comp. Num. Methods / 11	3	33	33
Comp. Software Eng./ 11	3	67	66

Discussion of 2004 Results: After the 2003 outcome assessment data was collected and organized, the ABET committees of the EE and the CS Programs and the CECC met to **discuss the process and the results**. The available data was also discussed during the Spring 2004 meeting of the EE External Advisory Council (EADC), which consists mainly of alumni and employers.

- It was generally felt that the process itself ran fairly smoothly. Almost all faculty members who were asked to return outcome assessment reports did so. No faculty member indicated that the process seemed too burdensome and hence we believe that the process as implemented is quite sustainable.
- Much of the data collected seemed reasonable and consistent with what we already knew and hence we have every reason to believe that the data collected is meaningful and can be used to draw reasonable conclusions about students' abilities relative to the stated outcomes.
- Overall, the data does not show significant deficiencies. The rather low ranking given by recent graduates for Outcome 10 ("knowledge of contemporary issues") and Outcome 11

("... ability to use the techniques, skills, and modern computing tools ...") stand out, however. This overall issue was discussed during the Spring 2004 EADC meeting, where members provided the following valuable insight:

> When new graduates enter the work force, they often encounter specific tools that they are not familiar with that may be specific to the company they have joined. There is naturally a certain learning period when new employees must become familiar with the tools used by their new company. Graduates will often blame their lack of familiarity with these tools on a lack of depth in academic preparation. In reality, it is unreasonable to expect their academic preparation to prepare them for every possible tool they might encounter in industry.

There is a general agreement that the low ranking given to Outcome 10 and Outcome 11 may be attributed to unrealistic expectations by recent alumni rather than primarily to a deficiency in the program.

III.F.2.2 Outcome Assessment: Year 2007

A number of new assessment instruments were introduced in 2007. We discuss each of them separately:

Industry Academic Assessment and Review Panel (IAARP) We established the IAARP as a venue for industry representatives to evaluate our graduating students through the review of their capstone design course project presentations and through in-depth exit interviews. A group of typically eight practicing computer engineers from a mix of companies (aerospace, energy, services, design automation, instrumentation, etc.) visit the University and evaluate our graduating students through project reviews and exit interviews:

IAARP Project Reviews: The panel observes and evaluates the presentations of the CSCE 483 Capstone Design projects of our CECN students. Based on notes collected during the presentations and the Q&A sessions, each panel members writes a report that addresses each outcome and a description of strenghts and weaknesses of the program, together with recommendations on how to improve the program.

IAARP Exit Interviews: The panel interviews the graduating CECN students of that semester, and each panel member writes a report that addresses each outcome, together with strenghts and weaknesses of the program and recommendations for improvements.

The 2007 IAARP was run as a pilot, and the experience was thoroughly positive. A number of observations were made:

- The single-day format of the pilot was too short. It was noted that the panel had no time to develop a cohesive picture of the program based on the very short visit.
- The briefing (training) of the panel had to be done much better. Without significant guidance, there was a temptation during the interviews to elaborate on individual courses and instructors rather than on outcomes of the program.
- The quality of the reports can be improved. This will be addressed next year.

- Due to a communication error, the rating scale for this year's project reviews was different than in previous years. Instead of a scale from "poor" to "excellent", this year's review sheets had a perception-based scale from "not at all agreeable" to "extremely agreeable". We will be returning to the old rating scale for next year.

On-Line Student Course Surveys Starting with this year, the student course surveys used for the computation of the Consensus measure are implemented on-line. We implement this by adding the survey questions at the end of the routine student course evaluations, which starting in 2007 are implemented on-line. Students are asked to rate the course using questions like "The course helped me develop an ability to apply knowledge of math, science, and computing" on a scale from "A" to "F". We made the following observations with the new survey system:

- Data collection is very easy, and response levels are very high. Instructors don't have to devote class time to give out the surveys. Since the system is fully automated, there is no opportunity for instructors to forget giving out the surveys.
- We experience difficulties in appropriately briefing the students about the nature of this survey. In the paper-based versions of this survey, students were instructed as follows:

  > "The purpose of this survey is to collect data in preparation for the ABET Accreditation Evaluation to be conducted by ABET. Please answer the questions below ot the best of your abilities. This survey is about the course, not necessarily about the instructor."

  We have no way to add similar information to the course evaluations, which causes many students to interpret the questions primarily in terms of instructor effectiveness. This adds more variability to the responses, which in turn results in lower consensus results.
- We have to deal with a shift in the rating scale. While the paper-based surveys used a 5-point Likert scale (from "strongly agree" to "strongly disagree"), the on-line surveys use the following grade-based ranking
  A - deserves an award in this area, excellent
  B - very good
  C - good
  D - does not perform well in this area
  E - has serious deficiencies in the area
  In order to compute the consensus measure, we now count responses with an "A", "B", or "C" in Step 4 of the consensus computation (see Section III.F.1.1).

On-Line Surveys of Recent Graduates Starting this year, we participate in a College-level effort to distributed surveys to recent graduates on-line. The Engineering College maintains a web-based survey portal and an associated database of recent graduates, and in Summer 2007 a large number of invitations were sent out to our graduates. The survey is structured so that recent graduates are asked outcome-oriented questions, while older graduates are directed to objective-oriented or supervisor-oriented questions. The data of this first round was made available in late 2008. After some further analysis, results were available in time for a discussion in the CECC in

Spring 2009. Overall, the College-level on-line survey is a very helpful tool, and we are looking forward to its use in 2010 with 2009 data and then again in 2013.

III.F.2.3 Outcome Assessment: Year 2008

Improvements to the Industry Academic Assessment and Review Panel (IAARP) Based on the experience gathered in 2007, we several made changes to the IAARP:

1. We extended the length of the IAARP from one day to two. The first day is spent with project reviews, and the second with exit interviews. The additional time is used for better briefing, report writing, and for social interaction that enrichens the experience for our panel visitors.
2. Instead of relying on individual reports by the panel members, we require the panel to give us two reports (one based on project reviews, and the other based on exit interviews), which represent the consensus of the panel on quality of the program, its strenghts and weaknesses, and recommendations for improvements.
3. At the end of the second day, we ask the panel to present the reports to the CECC and to field questions and requests for clarifications.
4. In the 2007 pilot, we focused on CECN students for the exit interviews. For the 2008 exit interviews we targeted **all CE students** (i.e., both CECN and CEEN students).

Again, the 2008 IAARP was a great success. We made the following positive observations:

- The additional time was greatly appreciated by the panel. This is reflected in the quality of the reports and in the many requests to be included in future IAARP's by our visitors.
- Our request to have the panel convene, discuss their observations, and develop a single report greatly improved the quality of the latter. During their deliberations[4] the panel members realized that typical "shopping-bag"-style recommendations (i.e., of the type "more language X", "more development framework Y", etc.) are not realistic when representatives of a half dozen company cultures must come to an agreement. With great pleasure and satisfaction we observed how the panel members stepped back and started focusing on principles. The result was a high-quality and eminently useful final report.
- This year we spent more effort in training the panel to ask better questions. Rather than having them focus on individual courses, we briefed the panel members to use course-related questions as "ice-breakers" to be followed up with requests for specific examples. As a result, we heard back less "venting" about courses and instructors, and more about material covered and concepts conveyed.
- Next year we will be further improving the training of panel members. The objective is to have them focus directly on outcomes, and mention courses only incidentally.

III.F.2.4 Outcome Assessment: Year 2009

Further Improvements to the Industry Academic Assessment and Review Panel (IAARP) We have significantly redesigned the material handed out to members of the IAARP in prepara-

[4] Since this was the first time we tried this format, we asked for and received permission for the Program's ABET Coordinator to be present in the IAARP's deliberations as a silent observer.

tion for the exit interviews. The panel members are now given examples of “poor” vs. “better” questions, such as “What did you learn in your Software Engineering class?” (poor) vs. “If you were asked to develop a piece of software for a client, what steps would you follow?” (better), or “Did you discuss privacy or security issues in your courses here?” (poor) vs. “Let us say you are building a major software system for a credit card company to use to keep track of all purchases. Can you tell me some of the non-technical issues you would need to consider? How would you approach these?” (better). The panel members are also given a set of example questions that we would classify as “better” to help them in the exit interviews.

This improved support material and our additional briefings (together with the fact that some of the panel members are experienced interviewers by now) clearly has netted us better evidence of the performance of our program, and we are looking forward to another successful IAARP visit next year.

Regular Student-work Assessment of Outcome 6 (Ethics) in ENGR/PHIL 482 (Engineering Ethics) Starting in Spring 2009 a regular course outcome assessment is performed to help understand how the “Engineering Ethics” course (ENGR 482, PHIL 482) helps students gain an understanding of professional and ethical responsibility.

Student work assessment is measured in percentage of correct answers on the “Ethics” portion (as opposed to “professionalism”) of the final exam of the course. This assessment point is listed under the rubric “2-Level Student Work” in the assessment summary. For details of the assessment instrument please refer to Section E.E.

In this course students learn engineering and computing professional codes. Common and new features (such as the hierarchy of professional and ethical responsibility, and environmental and sustainability concerns) of professional codes are covered. They learn classical ethical theory such as utilitarianism and respect for persons. They discuss and listen to lectures about important ethical problems from scientific and engineering cases, and they learn techniques such as creative middle way and line-drawing for resolving professional and ethical dilemmas.

Evaluation of the 2009 College-Level On-Line Survey Summer 2009 marked the second iteration of the college-level on-line survey for CE alumni and supervisors of CE graduates. We used data from students that graduated up to two years ago, i.e, graduates from 2009, 2008, and 2007. We received 22 replies to the survey.

No Grade Information in 2009 and 2010! The year 2009 also marked the introduction of the new student information system COMPASS, which requires a new process to query and collect per-program grade information in specific courses. At this point we are experiencing diffulties in collecting this information in an feasible manner. Therefore, we are temporarily using placeholders for this data, with the hope that we will be able to generate the grade information by the time of the visit.

III.F.2.5 Outcome Assessment: Year 2010

Industry Academic Assessment and Review Panel We are pleased to notice that – after several iterations – the IAARP now has gained significant experience in running very effective exit interviews. The panel by now has collected a proven set of tools that they confidently use to assess our students' capabilities. As a result, the Spring 2010 IAARP visit was a very successful one, and the reports are very insightful to the CECC and the faculty at large.

Outcome Revision: Outcome 3 and Outcome 8 In Fall 2009 the CECC decided to modify the CE Program's Outcome 3 and Outcome 3 to align them with ABET's Outcome (c) and Outcome (h), respectively. The updated outcomes now read as follows (emphasized portions have been added):

> **Outcome 3.** An ability to design a system, component or process to meet desired needs *within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability*.
>
> **Outcome 8.** The broad education necessary to understand the impact of computing solutions in a global*, economic, environmental,* and societal context.

We are updating the assessment instruments to reflect these changes as soon as possible. The online surveys at department and College level will take some time ot update. The material used by the IAARP, on the other hand, was updated for the Spring 2010 IAARP meeting.

III.F.3 Outcome Assessment: Data Collection Results and Discussion

III.F.3.1 Outcome 1: "Knowledge of differential and integral calculus, differential equations, linear algebra, complex variables, discrete mathematics, probability and statistics."

Year	Outcome	Measurement Point	Result	Goal
2004	differential and integral calculus	Course Grade MATH 151	(159, 2.55, 20%)	
		Course Grade MATH 251	(57, 2.83, 30%)	
		Course Grade MATH 253	(9, 2.63, 11%)	
	diff. equations	Course Grade MATH 308	(47, 2.80, 13%)	
	linear algebra	Course Grade MATH 311	(67, 2.73, 9%)	
	discrete math.	Course Grade MATH 302	(63, 2.65, 22%)	
		4-Level-Scale ECEN 248	2.5	2.0
	complex var.	4-Level-Scale ECEN 314	2.2	2.0
	probability and statistics	Course Grade STAT 211	(78, 3.14, 9%)	
		Course Grade STAT 414	(3, 3.7 , 0%)	
	overall	Consensus Grade CSCE 321	4.7	4.0
		Consensus Grade CSCE 410	4.4	4.0
		Alumni Survey	4.6	4.0
	Discussion: 1. *Students' abilities in Calculus, and Discrete Math were found to be adequate.* 2. *Problems were noted with regard to Complex Variables and Probability and Statistics (see Section IV.B in Chapter IV for a discussion of actions taken to correct these deficiencies).* 3. *Some inconsistencies were noted with regard to the collected Linear Algebra data. After meeting with the faculty involved in collection of the Linear Algebra data and discussing the data collected and the methods used, it was determined that there is probably not a problem here, but that we would monitor this area closely in the future.*			
2005	differential and integral calculus	Course Grade MATH 152	(116, 2.32, 33%)	
		Course Grade MATH 251	(69, 2.56, 16%)	
		Course Grade MATH 253	(9, 2.63, 11%)	
	diff. equations	Course Grade MATH 308	(86, 3.04, 16%)	
	linear algebra	Course Grade MATH 311	(92, 2.91, 12%)	
	discrete math.	Course Grade MATH 302	(86, 2.99, 16%)	
	probability and statistics	Course Grade STAT 211	(79, 3.08, 6%)	
		Course Grade STAT 414	(0, –, –)	

(continued)

Table III.5: (continued)

Year	Outcome	Measurement Point	Result	Goal
	Discussion: 1. *Overall, the students' abilities in differential equations, linear algebra, and discrete math are considered adequate.* 2. *One source of concern is certainly the high failure rate in the introductory calculus classes.*			
2006	differential and integral calculus	Course Grade MATH 152 Course Grade MATH 251 Course Grade MATH 253	(106, 2.31, 23%) (69, 2.46, 25%) (4, 3.0 , 0%)	
	diff. equations	Course Grade MATH 308	(75, 2.67, 15%)	
	linear algebra	Course Grade MATH 311	(88, 2.91, 20%)	
	discrete math.	Course Grade MATH 302	(69, 2.86, 16%)	
	probability and statistics	Course Grade STAT 211 Course Grade STAT 414	(73, 2.92, 11%) (2, 2.50, 0%)	
	overall	Consensus Grade CSCE 410 (Spring)	4.66	4.0
	Discussion: 1. *Evidence continues to indicate that our students do well.* 2. *Failure rates in introductory calculus classes continue to be very high. The CECC is worried that this affects retention. Measures are being considered to use peer teachers to help our students in the MATH classes (see Section IV.D in Chapter IV for details).* 3. *The relatively high failure rate in MATH 302 (Discrete Math.) is troubling to the CECC. This is a pattern that is observed in the CS program as well, and a revision of the course is being planned with the objective to better integrate discrete structures and algorithmic thinking.*			
2007	differential and integral calculus	Course Grade MATH 152 Course Grade MATH 251 Course Grade MATH 253	(107, 2.41, 20%) (90, 2.48, 20%) (3, 3.0 , 0%)	
	diff. equations	Course Grade MATH 308	(63, 2.74, 17%)	
	linear algebra	Course Grade MATH 311	(73, 2.80, 12%)	
	discrete math.	Course Grade MATH 302 4-Level-Scale ECEN 248	(84, 2.78, 17%) *[N/A]*	 2.0
	complex var.	4-Level-Scale ECEN 314	2.0	2.0
	probability and statistics	Course Grade STAT 211 Course Grade STAT 414	(81, 2.8, 9%) (1, 3.0 , 0%)	

(continued)

Table III.5: (continued)

Year	Outcome	Measurement Point	Result	Goal
	overall	Consensus Grade CSCE 321 (Fall)	4.71	4.0
		Consensus Grade CSCE 410 (Fall)	5.00	4.0
		4-Level-Scale ECEN 214 (Spring)	3.0	2.0
		4-Level-Scale ECEN 325 (Spring)	2.5	2.0
		Alumni Survey	4.05	4.0
		(new!) IAARP Exit Interview	4.0	3.5
	Discussion: *Overall, the collected evidence continues to indicate that students do well. The following observations stand out:* 1. *The failure rate in the introductory calculus classes has slightly dropped.* 2. *The low rating from alumni may be an artifact of the move to an on-line survey tool. We will be monitoring this in 2010 and beyond.*			
2008	differential and integral calculus	Course Grade MATH 152	(108, 2.54, 22%)	
		Course Grade MATH 251	(91, 2.4 , 17%)	
		Course Grade MATH 253	(5, 2.0 , 17%)	
	diff. equations	Course Grade MATH 308	(99, 2.52, 15%)	
	linear algebra	Course Grade MATH 311	(64, 2.81, 8.6%)	
	discrete math.	Course Grade MATH 302	(99, 2.53, 21%)	
	probability and statistics	Course Grade STAT 211	(97, 2.71, 13%)	
		Course Grade STAT 414	(0, N/A , N/A%)	
	overall	Consensus Grade CSCE 321 (Spring)	4.23	4.0
		Consensus Grade CSCE 410 (Spring)	5.00	4.0
		(new!) IAARP Project Review (Spring)	4.0	3.5
		IAARP Exit Interview (Spring)	4.0	3.5
	Discussion: *All collected evidence continues to indicate that students do well.*			
2009	differential and integral calculus	Course Grade MATH 151	(XXX, XXX, XX%)	
		Course Grade MATH 251	(XXX, XXX, XX%)	
		Course Grade MATH 253	(XXX, XXX, XX%)	
	diff. equations	Course Grade MATH 308	(XXX, XXX, XXX%)	
	linear algebra	Course Grade MATH 311	(XXX, XXX, XXX%)	
	discrete math.	Course Grade MATH 302	(XXX, XXX, XXX%)	
	probability and statistics	Course Grade STAT 211	(XXX, XXX, XXX%)	
		Course Grade STAT 414	(XXX, XXX ,XXX%)	
	overall	Consensus Grade CSCE 321 (Spring)	4.59	4.0

(continued)

Table III.5: (continued)

Year	Outcome	Measurement Point	Result	Goal
		Consensus Grade CSCE 410 (Spring)	4.74	4.0
		Alumni Survey	4.18	4.0
		IAARP Project Review	4.0	3.5
		IAARP Exit Interview	4.16	3.5
	Discussion: *All collected evidence continues to indicate that students do well. Course grades will be added and discussed as soon as a collection procedure is in place for the new student information system COMPASS.*			
2010		IAARP Project Review	4.0	3.5
		IAARP Exit Interview	4.0	3.5

III.F.3.2 Outcome 2: "An ability to design and conduct experiments, as well as to analyze and interpret data."

Year	Measurement Point	Result	Goal
2004	Consensus Grade CSCE 410	4.0	4.0
	Consensus Grade CSCE 431	4.1	4.0
	Alumni Survey	4.7	4.0
	Discussion: *All data indicate that student performance was found to be adequate for this outcome.*		
2006	Consensus Grade CSCE 410 (Spring)	4.34	4.0
	Discussion: *The collected data does not point to problems with this outcome.*		
2007	Consensus Grade CSCE 410 (Fall)	4.2	4.0
	Consensus Grade CSCE 431 (Summer)	4.85	4.0
	Alumni Survey	3.95	4.0
	(new!) IAARP Exit Interview	3.13	3.5
	Discussion: *While the consensus data remains strong, alumni surveys and exit interviews point to problems:* *1. The survey of recent graduates does not give us a strong grade, but detailed comments do not provide us with any usable feedback either. We will continue monitoring this in 2010 and beyond.* *2. The poor result from the exit interviews reflects a number of problems with courses that have been replaced in the meantime ("very poor opinion of 111/211") and also indicates opportunities for better preparation of the panel members (e.g. to avoid questions of the type "Do you feel that CSCE 431 and CSCE 410 gave you the ability to design, conduct, analyze and interpret data?"). It will be interesting therefore to see how this data point will develop in the short term and in the longer term after the introduction of the new curriculum.*		
2008	Consensus Grade CSCE 410 (Spring)	4.46	4.0
	Consensus Grade CSCE 431 (Spring)	4.62	4.0
	(new!) IAARP Project Review (Spring)	4.0	3.5
	IAARP Exit Interview (Spring)	3.0	3.5
	Discussion: *1. The exit interviews still point to a problem with this outcome. The rating is still "good", but the panel report states that "There was an ability, but it was unrecognized by the students, and there was limited opportunity to apply."* *2. We will be addressing this issue in the new curriculum, which will better integrate concepts across multiple classes.*		

(continued)

Table III.6: (continued)

Year	Measurement Point	Result	Goal
2009	Consensus Grade CSCE 410 (Spring)	4.17	4.0
	Consensus Grade CSCE 431 (Spring)	5	4.0
	Alumni Survey	4.0	4.0
	IAARP Project Review	3.5	3.5
	IAARP Exit Interview	4.0	3.5
	Discussion: 1. *The relatively low score on the project reviews may be due to limited time available to students to properly collect data. The panel points to a single project that "did not document or display any test results." The panel recommends that students finish projects possibly two weeks before deadline in order to conduct true analysis of their systems. While this may be difficult with the current single-semester version of the capstone course, more emphasis on testing and evaluation may be given in the planned two-semester version of CEEN capstone course. (See Chapter IV for details.)* 2. *The exit interview panel report points to "great improvements" over last year, in particular in relation to Critical Design Reviews and checkpoints in the capstone course.* 3. *Overall, we are satisfied with the results for this outcome.*		
2010	IAARP Project Review	3.0	3.5
	IAARP Exit Interview	4.5	3.5
	Discussion: 1. *The Project Review panel report points to time constraints in the testing. We are aware of this problem, and - starting in Fall 2010 the CEEN capstone course will be extended to be a 2-semester course.*		

III.F.3.3 Outcome 3: "An ability to design a system, component or process to meet desired needs."

Year	Measurement Point	Result	Goal
2004	Consensus Grade CSCE 321	4.9	4.0
	Consensus Grade CSCE 431	4.5	4.0
	Alumni Survey	4.4	4.0
	Industry Evaluation of CSCE 483	2.8	3.5
	Discussion: *There is a large gap between self assessment and "arms-length" assessment on one hand, and industry assessment on the other. While the former is very positive, the latter is less so. We are not sure if we are using an adequate instrument for the industry assessment of this outcome: Currently, we ask the industry expert to evaluate the capstone design on the following question: "Were design alternatives considered, as well as a rationale for choosing among them?" We will closely monitor and evaluate this instrument in the future.*		
2005	Industry Evaluation of CSCE 483	3.8	3.5
	Discussion: *This year the project reviewers rated our students higher on this outcome. Except for one project, which was rated very poorly by a single reviewer, all projects did well.*		
2006	Industry Evaluation of CSCE 483	4.75	3.5
	Discussion: *The collected evidence from the project reviews does not point to a problem.*		
2007	Consensus Grade CSCE 321 (Fall)	4.71	4.0
	Consensus Grade CSCE 431 (Summer)	5.00	4.0
	Alumni Survey	4.05	4.0
	Industry Evaluation of CSCE 483	3.94	4.0
	(new!) IAARP Exit Interview	3.5	3.5
	Discussion: 1. *Both the project reviews and the exit interviews appear to point to potential problems in this area.* 2. *The exit interview panel for example report that "The projects in the courses are too small for a formal design process."* 3. *We will be addressing this in the planned "Programming Studio" course, which we will be introducing as a lower-level capstone design course in the new curriculum.*		
2008	Consensus Grade CSCE 321 (Spring)	4.49	4.0
	Consensus Grade CSCE 431 (Spring)	4.62	4.0
	(new!) IAARP Project Review (Spring)	5.0	3.5
	IAARP Exit Interview (Spring)	3.0	3.5

(continued)

Table III.7: (continued)

Year	Measurement Point	Result	Goal
	Discussion: 1. *Both self assessment in selected classes and the project evaluations indicate that our students do well.* 2. *The exit interviews, however, point to potential problems. The IAARP reports that "Ability to design a system seemed to be internalized late in the program. Individual projects were not lengthy or sizeable enough to really accomplish the goal. Some of the knowledge was gained outside core curriculum. That said, the end result appears to be a class that has met this outcome."* 3. *We plan to address exactly these issues in the planned "Programming Studio" course in the new curriculum.*		
2009	(new!)Consensus Grade CSCE 350 (Spring)	5.00	4.0
	Consensus Grade CSCE 431 (Spring)	5.00	4.0
	Alumni Survey	4.27	4.0
	IAARP Project Review	3.75	3.5
	IAARP Exit Interview	4.16	3.5
	Discussion: 1. *The project review report indicates that "projects were lacking in user validation". This may be due partly because of lack of time, which we plan to address with the two-course sequence for CEEN students.* 2. *The exit interviews point to uneven preparation in this area. "Some bright spots were apparent...", but that "some teams lacked basic understanding of design concepts and processes."* 3. *While the numerical results are satisfactory, we will need to monitor this outcome.*		
2010	IAARP Project Review	4.0	3.5
	IAARP Exit Interview	4.5	3.5

III.F.3.4 Outcome 4: “An ability to collaborate with a multidisciplinary team.”

Year	Measurement Point	Result	Goal
2004	2-level-scale ECEN 405 (Fall ’03)	1.0	0.8
	2-level-scale ECEN 405 (Spring ’04)	0.97	0.8
	2-level-scale ENGR111	99.1%[5]	88%
	Alumni Survey	4.1	4.0
	Discussion: *Data indicate that ability to collaborate in a multidisciplinary team is adequate. This is to be expected, given that Computer Engineering is inherently an interdisciplinary field.*		
2005	Industry Evalutation of CSCE 483	4.25	3.5
	Discussion: *The project review team saw good evidence of the effectiveness of our students in multidisciplinary teams.*		
2006	Industry Evalutation of CSCE 483	5.0	3.5
	Discussion: *The project review team continues to be satisfied with the effectiveness of our students in multidisciplinary teams.*		
2007	2-level-scale ECEN 405 (Spring)	1.0	0.8
	Alumni Survey	4.15	4.0
	Industry Evalutation of CSCE 483	4.7	4.0
	(new!) IAARP Exit Interview	4.375	3.5
	Discussion: 1. *All collected evidence indicates that students are able to collaborate in multidisciplinary teams.*		
2008	(new!) IAARP Project Review (Spring)	N/A	3.5
	IAARP Exit Interview (Spring)	4.0	3.5
	Discussion: 1. *The Project Review Panel found itself unable to assess this outcome. The report notes that “We believe the students could work on multi-disciplinary teams, and they showed division of responsibility within the team. However, they are all CPE students.”* 2. *The Exit Interviews Report notes that “small-team experience was significant,” but that “larger teams would be helpful,” as would be “more mentoring”.* 3. *We describe in Section IV.F how we attempt to address some of the criticisms through a variety of efforts – such as the EPICS project courses - to increase multidisciplinary collaboration offerings to our students.*		
2009	Alumni Survey	4.1	4.0

(continued)

[5] Plus all the labs required collaboration in teams of 2 people chosen with diverse set of skills/backgrounds.

Table III.8: (continued)

Year	Measurement Point	Result	Goal
	IAARP Project Review	4.0	3.5
	IAARP Exit Interview	3.8	3.5
	Discussion: 1. *The Project Review panel was satisfied with this outcome, although the report notes that "It would be an improvement to include students from other departments outside of college of engineering acting as subject matter experts."* 2. *The Exit Interviews Report notes that students "understood what makes an effective team", but that "exposure to other disciplines was limited" and that "more coaching would be helpful".* 3. *Team work is an important component in the new lower-division capstone course CSCE-315. Experience with our Computer Science students, who are already taking this course, is very promising, and we expect that the transition to the new curriculum will be benefitial for this outcome as well.*		
2010	IAARP Project Review	5.0	3.5
	IAARP Exit Interview	4.25	3.5

III.F.3.5 Outcome 5: "An ability to identify, formulate, and solve computer engineering problems."

Year	Measurement Point	Result	Goal
2004	Consensus Grade CSCE 321	4.8	4.0
	Consensus Grade CSCE 410	4.5	4.0
	Alumni Survey	4.0	4.0
	Industry Evaluation of CSCE 483	4.0	3.5
	Discussion: *Self-Assessment data clearly indicate that ability to identify, formulate, and solve computer engineering problems is adequate. So does industry evaluation data. Data from recent graduates is more critical. While we will not take immediate remedial action for this outcome, we will more accurately monitor this outcome.*		
2005	Industry Evaluation of CSCE 483	4.4	3.5
	Discussion: *Industry evaluation data indicates that we continue to do well with this outcome.*		
2006	Consensus Grade CSCE 410 (Spring)	4.34	4.0
	Industry Evaluation of CSCE 483	4.125	3.5
	Discussion: 1. *Both the available consensus data and the industry evaluation indicate that our students do well with this outcome.*		
2007	Consensus Grade CSCE 321 (Fall)	4.71	4.0
	Consensus Grade CSCE 410 (Fall)	4.35	4.0
	Alumni Survey	4.3	4.0
	Industry Eval. of CSCE 483	4.38	4.0
	(new!) IAARP Exit Interview	4.25	3.5
	Discussion: 1. *All data points (consensus, alumni survey, and industry evaluation) clearly indicate that we do well with this outcome.* 2. *Starting next year, we will be asking the IAARP panel to write a detailed report, which will include qualitative indications about how well our students are doing.*		
2008	Consensus Grade CSCE 321 (Spring)	4.61	4.0
	Consensus Grade CSCE 410 (Spring)	4.67	4.0
	(new!) IAARP Project Review (Spring)	5	3.5
	IAARP Exit Interview (Spring)	3.5	3.5

(continued)

Table III.9: (continued)

Year	Measurement Point	Result	Goal
	Discussion: 1. *Overall, we do well with this outcome.* 2. *While the IAARP Project Review Panel we satisfied, the Exit Interview Panel Report points to a "lack of support for formal learning of techniques and methodologies for problem solving."*		
2009	Consensus Grade CSCE 321 (Spring)	5.00	4.0
	Consensus Grade CSCE 410 (Spring)	4.17	4.0
	Alumni Survey	4.36	4.0
	IAARP Project Review	4	3.5
	IAARP Exit Interview	3.75	3.5
	Discussion: 1. *The Project Review Panel was very satisfied with this outcome: "Given the time and financial constraints given to them the students did very well."* 2. *The Exit Interview Panel continues to criticize the "inconsistent use of structured processes".*		
2010	IAARP Project Review	3.0	3.5
	IAARP Exit Interview	4.5	3.5
	Discussion: 1. *The Project Review panel states: "... The teams seem to have been 'guided' so that they would have something demonstrable by the end of the semester instead of giving them room to fail." The low rating on Project Review therefore points more toward a problem with the course layout in this particular year rather than a problem with the program. (We have to be careful each year about making clear to the panel that this is an assessment of the program, and not of the course. Sometimes this does not get through to all panel members.) This is substantiated by the very high rating by the Exit Interview Panel.*		

III.F.3.6 Outcome 6: "An understanding of professional and ethical responsibility."

Year	Measurement Point	Result	Goal
2004	2-level Scale ENGR111	0.98	0.8
	Course Grade ENGR/PHIL482	(75, 3.01, 4%)	
	Alumni Survey	4.0	4.0
	Discussion: *All the data (self assessment, external assessment, FE exams) indicate that the students' performance was found to be adequate for this outcome. Nevertheless, we will see increased coverage of this outcome in CSCE 431 (Software Engineering), as discussed in Section IV.B.*		
2005	Course Grade ENGR482	(53, 3.09, 0%)	
	Course Grade PHIL482	(36, 2.53, 6%)	
	Discussion: *Our students continue to do well in the designated "Engineering Ethics" courses. This data does not give reasons for concerns.*		
2006	Course Grade ENGR482	(40, 3.10, 8%)	
	Course Grade PHIL482	(19, 3.00, 0%)	
	Discussion: *Our students continue to do well in the designated "Engineering Ethics" courses.*		
2007	Course Grade ENGR/PHIL482	(59, 3.4, 5%)	
	Alumni Survey	4.1	4.0
	(new!) IAARP Exit Interview	2.0	3.5
	Discussion: 1. *Students continue to do well in the designated "Engineering Ethics" courses.* 2. *the alumni survey indicates that the students were well prepared for this outcome.* 3. *This year we evaluate for the first time this outcome as part of the IAARP exit interviews, and the result is very low. Feedback from the IAARP Exit Interviews Panel focuses primarily on the mechanics fo the "Engineering Ethics" courses: "ENGR 482 [Engineering Ethics] not really worthwile", "students thought that the Ethics course was 80% common sense and 20% interesting case studies".* 4. *The CECC thinks that the low exit interview results stem from a lack of training of the IAARP panel, which appears to focus too much on course perception and satisfcation rather than on student mastery of the outcome. We will be monitoring this data point closely. In general, the the "Engineering Ethics" courses are very effective for other engineering program.*		
2008	Course Grade ENGR/PHIL482	(56, 3.31, 7%)	
	(new!) IAARP Project Review (Spring)	3	3.5
	IAARP Exit Interview (Spring)	3.5	3.5

(continued)

Table III.10: (continued)

<table>
<tr><th>Year</th><th>Measurement Point</th><th>Result</th><th>Goal</th></tr>
<tr><td></td><td colspan="3">Discussion:
1. Students continue to do well in the designated "Engineering Ethics" courses.
2. The IAARP Project Review Report states that "all teams addressed ethical issues", but that "only one team integrated ethical issues into their project".
3. Again, the panel identifies the varied reception and effect of the "Engineering Ethics" courses.
4. The panel notes "overall and understanding of ethical concepts", but it is "not sure of ability to apply them".</td></tr>
<tr><td>2009</td><td>Course Grade ENGR/PHIL482</td><td>(XXX, XXX, XXX%)</td><td></td></tr>
<tr><td></td><td>2-level Scale ENGR/PHIL482</td><td>0.85</td><td>0.8</td></tr>
<tr><td></td><td>Alumni Survey</td><td>4.36</td><td>4.0</td></tr>
<tr><td></td><td>IAARP Project Review</td><td>N/A</td><td>3.5</td></tr>
<tr><td></td><td>IAARP Exit Interview</td><td>3.75</td><td>3.5</td></tr>
<tr><td></td><td colspan="3">Discussion:
• We are waiting for grade information. It will be added as soon as available.
• The numbers for ENGR/PHIL 482 (Engineering Ethics) indicate that the CE Program does satisfactorily on this outcome.
• This outcome was not addressed in this year's Project Review.
• The feedback from the exit interview notes that emphasis within the department [i.e. program] is excellent. The problem is with the perceived "lack of domain specificity, superficiality" of the ethics course.</td></tr>
<tr><td>2010</td><td>IAARP Project Review</td><td>N/A</td><td>3.5</td></tr>
<tr><td></td><td>IAARP Exit Interview</td><td>4.0</td><td>3.5</td></tr>
</table>

III.F.3.7 Outcome 7: “ An ability to communicate effectively.”

Year	Measurement Point	Result	Goal
2004	Consensus Grade CSCE 431	4.5	4.0
	4-Level-Scale ECEN 405 (Spring ’03)	3.0	2.0
	4-Level-Scale ECEN 405 (Fall ’03)	2.1	2.0
	4-Level-Scale ECEN 405 (Spring ’04)	1.85	2.0
	Course Grade ENGL210	(10, 3.1 , 0%)	
	Course Grade ENGL311	(11, 3.44, 18%)	
	Alumni Survey	4.2	4.0
	Industry Eval. CSCE 483	3.8	3.5
	Discussion: *All the data indicate that the preparation of our students to communicate effectively is adequate. The two “arms-length” (recent graduates, industry evaluation) measures however, are borderline. Program-level intervention at this point is not necessary, because University-level efforts are being made. (See “Writing-Intensive Courses” in Section IV.B for discussion of actions taken to address possible deficiencies.)*		
2005	Course Grade ENGL210	(5, 3.6, 0%)	
	Course Grade ENGL301	(57, 3.31, 9%)	
	Industry Eval. CSCE 483	4.15	3.5
	Discussion: *All the data indicates that the students’ ability to communicate is adequate. We note that for this year the industry reviewers argree that our students communicate effectively.*		
2006	Course Grade ENGL210	(8, 3.14, 13%)	
	Course Grade ENGL301	(47, 3.13, 4%)	
	Industry Eval. CSCE 483	4.75	3.5
	Discussion: 1. *All the data continues to indicate that our students communicate effectively.*		
2007	Consensus Grade CSCE 431 (Summer)	5.00	4.0
	4-Level-Scale ECEN 405 (Spring)	3.0	2.0
	Course Grade ENGL210	(9, 3.5, 10%)	
	Course Grade ENGL301	(40, 3.43, 11%)	
	Alumni Survey	3.7	4.0
	Industry Eval. CSCE 483	4.0	4.0
	(new!) IAARP Exit Interview	4.375	3.5

(continued)

Table III.11: (continued)

Year	Measurement Point	Result	Goal
	Discussion: 1. *The 2007 data paints a mixed picture. On one hand, the self assessment data and the exit interviews indicate strong communication skill. On the other hand, the alumni survey and the evaluation of the project presentations point to problems.* 2. *Note that the alumni survey data does not reflect the newly introduced "writing intensive" courses yet. We will have to wait for the 2010 data to see any effects of these efforts.* 3. *While the alumni survey does not rank us highly on this outcome, only one alumni response encourages us to have a greater emphasis on "oral communication".* 4. *As we describe in Chapter IV, we try to address this shortcoming in part by the planned lower-division capstone design course that is being introduced with the new curriculum.*		
2008	Consensus Grade CSCE 431 (Spring)	5.00	4.0
	Course Grade ENGL210	(6, 3.0, 0%)	
	Course Grade ENGL301	(33, 3.48, 15%)	
	(new!) IAARP Project Review (Spring)	4.0	3.5
	IAARP Exit Interview (Spring)	3.0	3.5
	Discussion: 1. *We continue to see the pattern of high grades for self assessment and lower ones by the IAARP.* 2. *The IAARP exit interviews report states that "The program has limited, specific classwork that provides communication skills. The students generally do communicate well, but this does not seem to be directly related to the curriculum."* 3. *Similarly, the report identifies as a eakness that "Soft-skills training (technical writing, speech communication) is lacking". The statement about lack of technical writing is puzzling to us, as all our students take a technical writing course, be it ENGL 210 ("Scientific and Technical Writing") or ENGL 301 ("Technical Writing"). We will keep monitoring this outcome.*		
2009	Consensus Grade CSCE 431 (Spring)	5.00	4.0
	Alumni Survey	4.0	4.0
	IAARP Project Review	3.5	3.5
	IAARP Exit Interview	3.4	3.5

(continued)

Table III.11: (continued)

Year	Measurement Point	Result	Goal
	Discussion: 1. *The IAARP Exit Interview Report reads: “Mixed results. Some polished communicators, but curriculum should be more effective at helping students with weak communication skill sets.” However, the report does not list communication as a weakness.* 2. *The IAARP Project Review Report reads: “The ability ranges widely from 1 to 5. The program would benefit from formal training in presentation and public speaking.”* 3. *One of the recommendations of the IAARP Exit Interview Report is “Increased opportunities to make presentations early on, as well as better coaching.” We expect that this will be addressed by the lower-division capstone project course (CSCE 315 - Programming Studio) in the new curriculum.*		
2010	IAARP Project Review IAARP Exit Interview	4.5 4.5	3.5 3.5

III.F.3.8 Outcome 8: "The broad education necessary to understand the impact of computing solutions in a global and societal context ."

Year	Measurement Point	Result	Goal
2004	Consensus Grade CSCE 431	4.5	4.0
	2-Level-Scale ECEN 405 (Spring '03)	1.0	0.8
	2-Level-Scale ECEN 405 (Fall '03)	0.78	0.8
	2-Level-Scale ECEN 405 (Spring '04)	1.0	0.8
	2-Level-Scale ENGR 111	0.86	0.8
	Alumni Survey	3.7	4.0
	Discussion: *Self assessment indicates adequate performance for this outcome. "Arms-length" assessment by recent graduates indicates poor performance. We think that shortcomings with this outcome have been addressed in the changes to ENGR 111/112 (see Section IV.B for discussion of actions taken to address shortcomings.) It will take some time to see what effect this change has on the assessment by our graduates. In addition, CSCE 211 (Data Structures) will be modified to increasingly cover this outcome (see Section IV.B for discussion of actions taken).*		
2007	Consensus Grade CSCE 431 (Summer)	5.00	4.0
	2-Level-Scale ECEN 405	1.0	0.8
	Alumni Survey	3.7	4.0
	(new!) IAARP Exit Interview	3.25	3.5
	Discussion: 1. *The measures for consensus and evaluation of student work give good grades to the program.* 2. *The alumni survey data continues to indicate poor performance.* 3. *The IAARP Exit Interviews Report gives us a bad grade as well.* 4. *We did nto receive qualitative information from either the surveys or the IAARP intervies to guide us in improving the program. we will closely monitor this outcome.*		
2008	Consensus Grade CSCE 431 (Spring)	5.00	4.0
	IAARP Exit Interview (Spring)	2	3.5
	Discussion: • *The IAARP Exit Interviews Report notes that "the overall TAMU education is reasonably broad". It criticizes that "the CS education does not effectively relate to broader concepts due to its theoretical nature".* • *We are not sure if the IAARP data reports on student perception rather than on student performance. We will be following this outcome very closely.*		
2009	Consensus Grade CSCE 431 (Spring)	4.54	4.0
	Alumni Survey	3.73	4.0

(continued)

Table III.12: (continued)

Year	Measurement Point	Result	Goal
	(new!) IAARP Project Review	4.0	3.5
	IAARP Exit Interview	4.3	3.5
	Discussion: 1. *We will have to follow up in the 2012 Alumni Survey, as the alumni rating is too low.* 2. *The CECC is relieved to notice that year both IAARP reports give us much higher marks for this outcome. We think we can attribute this to better training of the pannel members. As a result, the reports are less a reflection of anectotal data as perceived by the students, but rather of student performance proper.* 3. *For example, the IAARP Exit Interview Report reads: "Students were well aware of role of computing and value to society."*		
2010	IAARP Project Review	N/A	3.5
	IAARP Exit Interview	4.25	3.5

III.F.3.9 Outcome 9: "A recognition of the need for, and an ability to engage in, life-long learning ."

Year	Measurement Point	Result	Goal
2004	Consensus Grade CSCE 321	4.3	4.0
	Consensus Grade CSCE 431	4.2	4.0
	2-Level-Scale ECEN 405 (Spring '03)	1.0	0.8
	2-Level-Scale ECEN 405 (Fall '03)	0.95	0.8
	2-Level-Scale ECEN 405 (Spring '04)	1.0	0.8
	2-Level-Scale ENGR 111	1.0	0.8
	Alumni Survey	4.3	4.0
	Discussion: *This outcome is identical to Objective 2. Therefore, in terms of "closing the loop", we deal with this outcome as an objective.*		
2007	Consensus Grade CSCE 321 (Fall)	4.12	4.0
	Consensus Grade CSCE 431 (Summer)	5.00	4.0
	2-Level-Scale ECEN 405	1.0	0.8
	Alumni Survey	4.0	4.0
	(new!) IAARP Exit Interview	4.5	3.5
	Discussion: 1. *All data indicates that our students continue to do well with this outcome.* 2. *While the alumni survey data may not look very strong, other data from that survey (e.g., membership in professional societies, continuing education and graduate school) paint a very good picture of our students' recognition of life-long learning.*		
2008	Consensus Grade CSCE 321 (Spring)	*[3.21]*	4.0
	Consensus Grade CSCE 431 (Spring)	5.00	4.0
	IAARP Exit Interview (Spring)	3	3.5

(continued)

Table III.13: (continued)

Year	Measurement Point	Result	Goal
	Discussion: 1. *The data collected this year paints a very mixed picture.* 2. *The consensus grade in CSCE 321 should not be taken as being indicative of a systemic problem. It is more a reflection of communication problems within this particular class. It is not a curriculum issue.* 3. *The IAARP Exit Interviews Report states: "Mixed level of formal learning of the benefits of life-long learning. Desire was to focus on practical needs some expected knowledge to come to them. Some were exceptions with a reasonable number expecting to achieve advanced degrees."* 4. *While we obviously need to keep monitoring this outcome, the actions of our recent graduates (e.g. professional organizations, continuing education, graduate school) indicate that we probably do quite well with this outcome, and athat the evaluation by the IAARP was probably quite pessimistic.*		
2009	(new!) Consensus Grade CSCE 350 (Spring)	4.17	4.0
	Consensus Grade CSCE 431 (Spring)	4.09	4.0
	Alumni Survey	4.27	4.0
	IAARP Exit Interview	4.16	3.5
	Discussion: 1. *The IAARP Exit Interviews Report notes that "Pragmatic approach to life-long learning was cultivated through the program."* 2. **Dicussion of this data will be added in 2010.**		
2010	IAARP Exit Interview	4.0	3.5

III.F.3.10 Outcome 10: "Knowledge of contemporary issues."

Year	Measurement Point	Result	Goal
2004	Consensus Grade CSCE 321 [6]	4.1	4.0
	2-Level-Scale ECEN 405 (Spring '03)	1.0	0.8
	2-Level-Scale ECEN 405 (Fall '03)	0.54	0.8
	2-Level-Scale ECEN 405 (Spring '04)	0.91	0.8
	Alumni Survey	3.2	4.0
	Discussion: 1. *While self-assessment indicates adequate performance of this outcome, "arms-length" assessment by recent graduates indicates poor performance. We think that shortcomings with this outcome have been addressed by the changes to ENGR 111/112 (see Section IV.B for discussion of actions taken to address deficiencies.) It will take some time to see what effect this change has on the assessment by our graduates. In addition, we expect that the planned changes to CSCE 211 will address these shortcomings as well.* 2. *Generally, duscussions with advisory committees make us believe that the low assessment by recent graduates may also be caused by unrealistic expectations (see Section III.F.2.1).*		
2006	Consensus Grade CSCE 410 (Spring)	4.48	4.0
	Discussion: 1. *The consensus data collected this year is not indicative of problems with this outcome.*		
2007	Consensus Grade CSCE 410 (Fall)	5.00	4.0
	2-Level-Scale ECEN 405	1.0	0.8
	Alumni Survey	3.4	4.0
	(new!) IAARP Exit Interview	4.0	3.5
	Discussion: 1. *The data collected this year is indicative of what we have seen in the past. While consensus data and course work evaluation gives high grades, recent graduates are rather more critical of our performance related to this outcome.* 2. *We attribute the low numbers in the alumni survey to high expectations of the students by the students.* 3. *In addition, the IAARP exit interviews indicate that we do well with this outcome.*		
2008	Consensus Grade CSCE 410 (Spring)	5.00	4.0

(continued)

[6] This course is required for CECN students. CEEN students take ECEN 350, which is very similar.

Table III.14: (continued)

<table>
<tr><th>Year</th><th>Measurement Point</th><th>Result</th><th>Goal</th></tr>
<tr><td rowspan="2"></td><td>IAARP Exit Interview. (Spring)</td><td>1.5</td><td>3.5</td></tr>
<tr><td colspan="3">Discussion:
1. The IAARP Exit Interview Report notes that program “seems focused on theory and research”, and “many lecturers focus on research and considered teaching a distraction”.
2. The last statement is conflicting with at least some of the consensus data collected, where students clearly state that in some courses (most prominently CSCE 410) contemporary issues are addressed rather strongly.
3. We will keep monitoring this outcome. Incidentally, we expect that this outcome will likely be addressed by the new lower-division capstone project course in the new curriculum.</td></tr>
<tr><td rowspan="4">2009</td><td>Consensus Grade CSCE 410 (Spring)</td><td>4.48</td><td>4.0</td></tr>
<tr><td>Alumni Survey</td><td>3.32</td><td>4.0</td></tr>
<tr><td>IAARP Exit Interviews</td><td>3.25</td><td>3.5</td></tr>
<tr><td colspan="3">Discussion:
1. The ratings from alumni are very low, and the number from the IAARP continue to be low as well. While we should be acting on this, we refrain for now and wait until we get data in from students who graduate from the new curriculum.
2. The IAARP Exit Interviews Report points out that students “Need more encouragement or opportunity to engage in understanding contemporary issues and industry trends”.</td></tr>
<tr><td rowspan="2">2010</td><td>IAARP Exit Interviews</td><td>4.25</td><td>3.5</td></tr>
<tr><td colspan="3">Discussion: We are glad to notice that the numbers are finally getting better. While the IAARP report is not specifically addressing reason for the high rating of Outcome 10, we conjecture that the improvement is due to students starting to be exposed to the new curriculum.</td></tr>
</table>

III.F.3.11 Outcome 11: "An ability to use the techniques, skills and modern computing tools necessary for computer engineering practice."

Year	Measurement Point	Result	Goal
2004	overall: Consensus Grade CSCE 321	4.7	4.0
	overall: Consensus Grade CSCE 410	4.6	4.0
	overall: Alumni Survey	3.7	4.0
	lab equipment: 4-Level-Scale ECEN 325	2.3	2.0
	MatLab : 4-Level-Scale ECEN 314	2.2	2.0
	SPICE : 4-Level-Scale ECEN 325	2.4	2.0
	Discussion: 1. *Students' ability to use common lab equipment and software tools were found to be adequate.* 2. *It was agreed that the low self-assessment of recent graduates probably does not point to a problem. In fact, discussions with advisory committees make us believe that the low assessment by recent graduates may also be caused by unrealistic expectations (see Section III.F.2.1).*		
2006	overall: Consensus Grade CSCE 410 (Spring)	4.66	4.0
	Discussion: 1. *The data collected this year does not indicate any deficiency.*		
2007	Consensus Grade CSCE 321 (Spring)	5.00	4.0
	Consensus Grade CSCE 410 (Fall)	4.66	4.0
	2-Level-Scale ECEN 405	1.0	0.8
	4-Level-Scale ECEN 325	3.0	2.0
	4-Level-Scale ECEN 350	2.5	2.0
	Alumni Survey	4.05	4.0
	(new!) IAARP Exit Interview	3.75	3.5

(continued)

Table III.15: (continued)

Year	Measurement Point	Result	Goal
	Discussion: 1. *All the numbers indicate that the Program does well with this outcome.* 2. *The consensus measures and the course-work evaluations are very positive.* 3. *The survey of recent graduates has improved compared to the 2004 round.* 4. *The feedback received by the IAARP Exit Interviews Panel was positive, but left us with the impression that it was driven by anecdotal student perception rather than evidence of student ability. So we find comments like "Students feel that professors provice them with the tools necessary for a practicing computer engineer. Variability in T.A.s was much more of an issue". We have mentioned repeatedly mentioned that a better training is needed for the IAARP panels.*		
2008	overall: Consensus Grade CSCE 321 (Spring)	*[3.92]*	4.0
	overall: Consensus Grade CSCE 410 (Spring)	4.78	4.0
	(new!) overall: IAARP Project Review (Spring)	5	3.5
	overall: IAARP Exit Interview (Spring)	2.5	3.5

(continued)

Table III.15: (continued)

Year	Measurement Point	Result	Goal
	Discussion: 1. *The consensus grade in CSCE 321 should not be taken as being indicative of a systemic problem. It is more a reflection of communication problems within this particular class; it is not a curriculum issue.* 2. *The CSCE 410 (Operating Systems) consensus grade is very positive.* 3. *The IAARP Project Review Panel was very impressed with the mastery of modern tools by our students. The report reads: "Teams used VC++, Csharp, MFC, LabVIEW, ZigBEE, ... nothing that was out of date.".* 4. *The IAARP Exit Interviews Panel was decidedly unimpressed, however. The report reads: "Use of technical programming tools seems to be reasonably solid. Testing (unit, integration, system, nonfunctional) seems to be absent as does debugging. Project management/scheduling and business modeling tools are also underrepresented at best." This point is part of the larger issue about lack of formal processes, which the IAARP has singled out earlier. One major reason for this defficiency is that we do not expose students to sizeable projects until the capstone design course. We are optimistic that this will be effectively addressed by the new lower-division capstone design course (CSCE 315 - Programming Studio) in the new curriculum.* 5. *Similarly, with the introduction of the Programming Studio we hope to address a number of recommendations formulated in the IAARP Exit Interviews Report:* • *"Integration of more contemporary methods, practices, and technologies into core coursework. (Design Patterns, project management discipline, UML/whiteboard design/formal design)."* • *"More practical project experience early in curriculum."* • *"Capstone design (and earlier projects) should be longer if possible - spanning multiple semesters - and should involve larger teams."*		
2009	(new!) overall: Consensus Grade CSCE 350 (Spring)	4.09	4.0
	overall: Consensus Grade CSCE 410 (Spring)	4.48	4.0
	overall: Alumni Survey	4.0	4.0
	overall: IAARP Project Review	3.5	3.5
	overall: IAARP Exit Interview	3.75	3.5

(continued)

Table III.15: (continued)

Year	Measurement Point	Result	Goal
	Discussion: 1. *The IAARP Project Review Report states: "There are some high points; however, more emphasis and support should be placed in area by the university. The students were able to achieve this through their own initiative and creativity." We consider the fact that students are able to acquire expertise in modern tools as part of their capstone design project to be a strong proof for the success of the Program.* 2. *The IAARP Exit Interviews Report states: "Need more exposure to industry tools (IDEs, debugging, source control). Good understanding of theory and principles behind the languages."* 3. **This data will be discussed in 2010.**		
2010	overall: IAARP Project Review	5.0	3.5
	overall: IAARP Exit Interview	4.0	3.5
	Discussion: *The IAARP is very satisfied with this outcome. The new curriculum appears to be working!*		

III.F.4 Summary of Outcome Assessment Results

As the detaile discussions show, we are mostly meeting our Outcome goals. Whenever we identify a problem, we first monitor it closely, and then address it through course or curriculum improvements (see Chapter IV for details.) In Spring 2010 the IAARP has been interviewing students and examining projects of students who have been exposed to the new curriculum. While these students may be graduating from older catalogs, they have been exposed to new courses during the current transition period. According to the IAARP Exit Interview report, this seems to show, and the assessment numbers are extremely positive.

Criterion IV
Continuous Improvement

The program improvement process follows these general lines: During the spring semester, at least one meeting of the CECC is dedicated to the review of assessment data collected during the previous year. A general agreement is reached in the CECC on what the focus point should be for the improvement. During subsequent meetings the CECC decides on a line of action that is put in place as schedules and other constraints on the program allow. Effects of any changes are monitored as part of the on-going assessment process and reviewed by the CECC. The CECC considers different sources of input when deciding on the need to change/improve aspects of the Curriculum and on how to proceed to achieve the desired outcomes:

- **Assessment Data.** The CECC carefully evaluates data collected as part of Criterion II and Criterion III. As pointed out earlier, the CECC refrains from reacting to short-term changes in the data. Rather, the CECC responds as result of observed long-term (i.e. at least two consecutive years) trends.
- **Input from Advisory Committees.** Representatives from the CECC regularly discuss the well-being of the Program with the ECE's External Advisory Development (EADC) and the CSE's Industry Affiliates Program (IAP) members. And the advisory committees' concerns and recommendations are fed back to the CECC.
- **Industry Input.** We have many occasions to listen to input from employers. For example, we collect data from employers and supervisors during the on-line College-level surveys (in 2007, 2010, and again in 2013). During the yearly IAARP meetings we schedule significant time for industry representatives and faculty members to interact. This improves the "training" of the panel members and gives us a feeling of industry concerns.
- **The National and International Academic, Industry, and Technological Landscape.** Many innovative developments at top institutions world-wide, such as course offerings, curriculum developments, assessment procedures, and so on, are just a mouse click away. This gives us the opportunity to observe what other institutions are doing and to calibrate our efforts with peer programs.
- **Faculty Input.** The CE Program is blessed with a highly innovative faculty with many dedicated educators, and we have come to appreciate the benefits of listening to them. This effectively complements the evidence-based assessment processes that we have in place by (a) identifying problems early on and (b) by pinpointing problems that may be missed by other processes.

In practice, this process is affected by a number of external influences, such as changes to curriculum requirements by the University (see for example the introduction of writing-intensive courses starting in 2004) or by the College (for example restructuring of ENGR 111/112 courses in 2003, and relaxation of ENGR 2XX courses in the following years). Similarly, the CE Program must adapt to curriculum changes in the home departments. Of particular importance was the major curriculum revision that the CS home department started for the CS Program in 2004 and started offering to students in Fall 2007. The CE Program leveraged these changes and implemented a major curriculum revision starting in 2005 that was offered for the first time to students in Fall 2008.

As previously noted, the CECC focuses primarily on curricular issues, and typically leaves course implementation details with the home departments. Such issues as instructor performance and allocation, equipment, and others are therefore handled usually at department level, leaving the CECC to focus on the medium and long-term planning for the program.

IV.A Improvement Plans: Overview

The cyclic improvement process described above has been proceeding in parallel to a major effort to re-design the curriculum, which culminated in the so-called **Curriculum-2008**. The discussions that led to this curriculum started in 2005, and the curriculum was offered to students for the first time with the Catalog 131 in Fall 2008.

While the data collection and program assessment were not affected by the curriculum re-design (see Chapter III, Section III.F.2), realities of such a major re-design of the curriculum meant that after 2004 the CECC focused on how to best integrate the insights from collected evidence into the new curriculum. Any improvement plan would have to be compatible with and sustainable in the new curriculum. As a result, relatively few short-term improvements plans were laid out before the phase-in of Curriculum-2008.

IV.B Improvement Plan 2004

Appropriate changes to the program aimed at addressing the shortcomings during the 2004 and earlier cycles are described below.

Objective 2 and Objective 3– Changes in ENGR 111/112: Given the results from the 2002 LASSI and other feedback (student surveys, faculty surveys, feedback, the College of Engineering re-structured the ENGR 111/112 courses, starting Fall 2003.

The content of these freshman level courses has been significantly changed. One major change is that starting in Fall ’03, three different versions (sections) of these courses are offered in order to allow the course content to be adapted to the needs of specific programs. In the version of this course for students planning on entering Computer Engineering, the course ENGR 111 gives an overview over Electrical and Computer Engineering, and the course ENGR 112 focuses on computers and computer programming. Both courses have a strong project component.

We expect that the project component will support Objective 2. In addition, the technical, societal and human context of computing is explicit part of the material covered in these courses.

The new format for 111/112 was first taught in the 2003-2004 academic year. Initially evidence seems to indicate that these courses are a vast improvement over the previous versions. However, we will not be able to formally assess the effects of these changes for a few years (i.e., until some of these freshmen have entered into the upper levels of the EE program).

Objective 3 – Changes to CPSC 211: In addition to the changes in ENGR 111/112, CPSC 211 (Data Structures) will be modified to include more material about global and societal context of the field of computing. This change was prompted by the CS Program identifying similar weaknesses with their Outcome (h). Since CS students do not take ENGR 111/112, the CS program had to find other venues to cover this outcome. This change was decided upon at the CS Department faculty retreat in May 2004, with participation of the CE faculty. We expect that this change will benefit our students.

Outcome 1 – Minor Changes to ELEN 314: In order to address the shortcoming in complex variables, we have made some minor modifications to the course ELEN 314 Linear Circuit Analysis. This course is a standard course in signals and systems. In order to enhance students' ability to use complex numbers, we have added more time to the beginning of this course in which students will be exposed to the basics of using complex numbers. After a thorough treatment of the pure mathematics, the students are also exposed to applications of complex numbers in this course through phasors and Fourier/Laplace Transforms. It is believed that by putting a greater emphasis on mastery of complex numbers in this course, student assessment of this outcome will improve. The faculty did not feel that it was necessary to devote an entire course to this subject in order to bring student performance to an acceptable level. These changes have been incorporated starting in some sections of the course in the Fall of 2003 and in all sections in the Spring of 2004. Assessment results from the Fall of 2003 show that students in those sections incorporating the new changes showed much better abilities working with complex variables than those in the section not incorporating the new changes.

Outcome 6 – Changes to CPSC 431: While the outcome data indicates that our students perform well on this outcome, Fall 2004 will see revisions to CPSC 431 (Software Engineering) to include more material on Ethics. This is was prompted by difficulties encountered with the assessment of this outcome **in the CS Program**. Since students in the CS Program don't take ENGR 111, and never take the FE Exam, it was felt that insufficient data is available outside of grades from ENGR 482 (Engr. Ethics) to accurately assess Outcome 6. This issue was discussed at the CS Department faculty retreat in May 2004 and voted upon, with participation of the CE faculty. The revision will take place in Fall 2004. While this change was not triggered by deficiencies identified in the CE Program, we expect that CE students will benefit from this change as well.

Outcome 7 – Writing-Intensive Courses: Some data indicate that communication skills of our students could be improved. There are University-wide efforts to address this possible shortcoming: Fall 2004 will mark the first offerings of Texas A&M's new writing-intensive – or

"W" – courses, designed to improve the writing skills of our graduates. These W courses were first proposed by the University Core Curriculum Review Committee in 2000 and approved by the Faculty Senate and by the President in 2003. Starting in Fall 2004 undergraduates will be required to complete a W course within the major of their degree. For a typical three-credit hour course, one third of course-work must focus on the teaching of writing. All W courses must be approved by the W Course Advisory Committee, comprised of representatives from each academic college as well as the main library and student government. The University Writing Center `http://uwc.tamu.edu` supports faculty with the development of W courses.

Outcome 8 – Changes to CPSC 211: Assessment data indicates a weakness with this outcome. We expect that the changes to ENGR 111/112 will improve the situation. In addition, CPSC 211 (Data Structures) will be modified to include more material about global and societal context of the field of computing. This change was prompted by the CS Program identifying similar weaknesses with this outcome. Since CS students do not take ENGR 111/112, the CS program had to find other venues to cover this outcome. This change was decided upon at the CS Department faculty retreat in May 2004, with participation of the CE faculty. We expect that this change will benefit our students.

IV.C Improvement Plan 2005

Based upon industry and faculty feedback, the CECC starts devising a new curriculum for phase-in in 2008 ("Curriculum-2008") that has the following characteristics:

- More integrated courses, such as algorithms integrated with data structures, so that students do not learn concepts in isolations.
- More project-based learning used in courses with significant projects and such courses being offered early in the curriculum, for example during the sophomore year and throughout the junior and senior years.
- Revisions of the freshman and sophomore introductory classes to give students a solid preparation for internships and co-ops by the end of their sophomore year.
- The core computer engineering material has been integrated into a smaller set of introductory classes, allowing for more flexibility in upper level courses that follow a track system. The tracks include software, systems, algorithms and theory, and information and intelligent systems.

Input from constituencies collected during the cycles 2006, 2007, and 2008 (primarily from the IAARP) indicate that we are moving in the right direction, as they keep pointing the need for us to address issues that will be considered by the new curriculum. Details about Curriculum-2008 can be found in Chapter V.

IV.D Improvement Plan 2006

Outcome 1 – Peer Teachers in Introductory Math Classes: In response to the high failure rates in introductory calculus classes we are extending the use of so-called Peer Teachers to support our students in these classes. Peer Teachers have been used with great success for several years in a number of courses in the CSE home department: Senior undergraduate students who performed well in a given course can apply to be Peer Teachers for that course. The rationale is to give students in classes an informal venue for interaction and help. The Peer Teacher program has been very successful in CSE courses. We expect that our students will benefit greatly from having somebody to work with who has a similar education background, rather than a TA who is working on a MATH PhD.

Multiple Outcomes, Industry Input – Sophomore-level Engineering Courses: The sophomore-level engineering courses ENGR 211 (Conservation Principles of Engineering Mechanics) (3 credits) and ENGR 212 (Conservation Principles in Thermal Sciences) (3 credits) courses were removed as required courses in the CE curriculum and replaced with 6 credits of technical electives. The students are provided with a list of engineering courses that could be used to fulfill the technical electives requirement. ENGR 211 and 212 were included on that list in addition to courses in aerospace engineering (numerical methods), physics (optics), and mathematics (cryptography, wavelets, etc.). This change was made based on recommendations from industry feedback to provide the students with options from a broader set of technical electives beyond mechanical engineering.

IV.E Improvement Plan 2007

After two years of planning, the new curriculum is discussed and approved during the CE Faculty during the CE Faculty / CECC Meeting on April 30, 2007. From the minutes:

> Dr. Reddy discussed the proposed curriculum changes that the CECC Committee has been discussing. The CE Faculty seemed very pleased with the time and effort of the committee. A few items listed below were suggested for minor changes. Dr. Taylor moved a motion to vote on the proposed changes and the CE Faculty unanimously agreed on the changes to the curriculum.

IV.F Improvement Plan 2008

Outcome 4 – Engineering Projects in Community Service (EPICS): All assessment instruments indicate that, while we still satisfy Outcome 4, we should improve the ability of our students to work in multidisciplinary teams. EPICS, which stands for *Engineering Projects in Community Service*, is a program in which teams of undergraduates earn academic credit with multiyear, multidisciplinary projects that solve engineering and technology-based problems for community service and education organizations. EPICS is patterned after a similar program that started in 1995 at Purdue University. EPICS at Texas A&M started in Spring 2007. Starting in Spring 2009, we are actively offering and supporting this course for students in CE. For details, see `http://epics.cs.tamu.edu/`. This course is not mandatory for CE students.

Program Criterion "Discrete Math" - Replace MATH 302 by CPSC 222: The weaknesses of having the Program Criteria "Discrete Math" covered by MATH 302 (Discrete Mathematics) is discussed in Spring 2008, and a decision to replace this course by CSCE 222 (Discrete Structures in Computing) is taken during the CECC meeting in March 2008.

IV.G Improvement Plan 2009

Multiple Outcomes, esp. Outcome 3 – Two-course sequence for Capstone Course: The CECC decided in Fall 2009 to delete ECEN 405 (Electrical Design Lab) from the curriculum and replaced it with a new 2-semester sequence of ECEN 403 (Electrical Design Lab I) and (ECEN 404- Electrical Design Lab II). This change was due to input to the ECE department head from graduating seniors in 2008 and the CECC's evaluation of assessment data in April 2009.

The first course of the new sequence focuses on proposal writing, design concepts evaluation considering realistic design constraints, design analysis through simulation, experimental, or analytical approaches, and project management theory, culminating in student project design proposals submitted for faculty approval. The second course focuses on implementation of the project as designed in the first course, giving students ample time for extensive testing and verification of their proposed design. Starting in Fall 2010, all CEEN students are required to take the two-course sequence. There will be a handful of Fall 2010 graduating seniors who will take only the one semester course (ECEN 405) that semester because they were on a co-op assignment in Spring 2010.

Note: This change only affects CEEN students. CECN students from the CSE program will for now continue to take CSCE 483. The CECC encourages a better integration of the CSCE 463 (Microcomputer Lab) with CSCE 483 (Capstone).

CRITERION V: CURRICULUM

In response to a number of considerations, many of them stemming from the then freshly established assessment processes across the Computer Engineering Program and the College of Engineering as a whole, we started offering a newly designed Computer Engineering Curriculum (named **Curriculum-2008**) by Fall 2008. (The process that led to the establishment of the new curriculum is detailed in Chapter IV – "Improvement".)

Whenever we need to distinguish between the two versions of the Curriculum, we will use the term "Old Curriculum" to denote the curriculum valid for students starting the program under Catalog 130 or earlier. Students who start the program under Catalog 131 (Fall 2008) or later are said to follow the "Curriculum-2008".

Having students from two quite different curricula in the program during the transition leads to several complications, both in terms of assessing the effects of the improvements and in terms of providing students a smooth learning experience during the transition period. (Both of these points have been discussed in Chapter III – "Program Outcomes.")

In the following we will give a detailed description of both the old the the new curriculum (i.e., Curriculum-2008). For each curriculum, we will give a self-contained description of the course sequences, of the professional component, and of the curriculum analysis. As result, the material will occasionally be repetitive. Instructions are given on what material can be skipped in order to streamline the study of both curricula.

V.A Curriculum for Catalog 130 and Earlier ("Old Curriculum")

Note: *The content of this section is very similar to that of Section V.B – "Curriculum 2008." Readers who are primarily interested in the new curriculum should skip this section and jump to the next section – "Curriculum 2008" – directly. Readers who want to read about both curricula should read this section first. Instructions are given at the beginning of the next section on how to streamline the reading of the presented material.*

The curriculum for the Bachelor of Science Degree in Computer Engineering for students starting before Fall 2008 (i.e., Catalog 130 and earlier) is summarized in the following table showing the recommended sequence of courses to be taken by semester. There are two tracts in this curriculum, the CSE track and the ECE track, both culminating in the same CE degree. The tracks are have a very slightly different emphasis, but each provides a broad coverage of the CE disciplines. (For example, the ECE track of the CE degree places stronger emphasis on digital VLSI circuits and systems, microprocessor interfacing and systems design, and computer system architecture and design.)

Wherever the two tracks differ, this is appropriately noted in the following summary. As can be seen from the tables below, the CSE and ECE tracks are integrated. The two tracks are essentially the same except for the following four courses.

- CSCE 321 (4 hours) - ECEN 350 (3 hours)
- CSCE 462 (3 hours) - ECEN 449 (4 hours)
- CSCE 483 (3 hours) - ECEN 405 (3 hours) - both are design capstone courses
- CE Elective (3 hours) - ECEN 454 (3 hours)

The **University Core Curriculum** requirements consists of 3 hours of visual and performing arts, 3 hours of social and behavior sciences, 6 hours of US history, 6 hours from POLS 206 (US govt.) and POLS 207 (Texas govt.) and 6 hours of international and cultural diversity (which may be satisfied by some of the previous courses, see undergraduate catalog for more details). This requirement ensures that all graduates have a breadth of education across more than just engineering topics that will allow graduates to function in a diverse society and to understand the impact of engineering on that society, and so work towards Objective 3 (... understand the technical, business, social, ethical, and human context of their engineering contributions).

The courses in the CE curriculum focus mainly on principles that underlie engineering analysis and design approaches and current technologies. This ensures that the knowledge imparted as part of the curriculum retains a long “life time”. In addition, parts of ENGR 111 (Introduction to Engineering) and of CSCE 481 (Seminar) are specifically devoted to the topic of lifelong learning. Together, this will ensure achievement of Program Objective 2 (“...will understand the importance of life-long learning, and be prepared to easily learn and understand new technological developments in their field...”).

Also, the emphasis on teamwork, communication skills, and characteristics of leadership in many of the required courses including (but certainly not limited to) ENGR 111, 112, 482, the seminar (CSCE 481), and the capstone design course (CSCE 483 / ECEN 405) ensures the achievement of Program Objective 4 (“... will develop the communication, teamwork, and leadership skills ...”).

Table V.1: Basic-Level Curriculum
(Computer Engineering - CECN Track - OLD CURRICULUM)

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours) Math & Basic Sciences	Engineering Topics *Check if contains significant* Design (✓)	General Education	Other
1st	ENGL 104 Comp. and Rhetoric		( )	3	
	ENGR 111 Foundations in Engineering I		2 (✓)		
	MATH 151 Engineering Math I	4	( )		
	PHYS 218 Mechanics	4	( )		
	Univ. Core Elective		( )	3	
	KINE 198 Health and Fitness Activity		( )		1
2nd	CHEM 107 Chemistry for Engineers	4	( )		
	ENGR 112 Foundations in Engineering II		2 (✓)		
	MATH 152 Engineering Mathematics II	4	( )		
	PHYS 208 Electricity and Optics	4	( )		
	University Core Curriculum elective		( )	3	
	KINE 199 Required Physical Activity		( )		1
3rd	CPSC 111 Introduction to Computer Science and Programming		4 (✓)		
	ENGR 211 Conservation Principles of Engineering Mechanics		3 ( )		
	ENGR 212 Conservation Principles in Thermal Sciences		3 ( )		
	MATH 251 Engineering Math III	3	( )		
	University Core Curriculum Elective		( )	3	
4th	CPSC 211 Data Struct. and Imp.		4 (✓)		
	MATH 302 Discrete Math	3	( )		
	ELEN 214 Electrical Circuit Theory		4 ( )		
	MATH 308 Differential Equations	3	( )		
	Univ. Core Elective		( )	3	
5th	CPSC 311 Analysis of Algorithms		3 ( )		
	ELEN 314 Linear Circuit Analysis		3 ( )		
	ELEN 248 Introduction to Digital Systems Design		4 (✓)		
	MATH 311 Topics in Applied Mathematics I	3	( )		
	University Core Curriculum Elective		( )	3	

(continued)

Table V.1: (continued)

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours) Math & Basic Sciences	Engineering Topics *Check if contains significant* Design (✓)	General Education	Other
6th	CPSC 321 Computer Architecture		4 (✓)		
	ELEN 325 Electronics		4 (✓)		
	STAT 211Principles of Statistics I	3	( )		
	University Core Curriculum Elective		( )	3	
7th	CPSC 410 Operating Systems		3 (✓)		
	CPSC 431 Software Engineering		3 (✓)		
	CPSC 462 Microcomputer Systems		3 (✓)		
	CPSC 481 Seminar		1 ( )		
	Computer Engineering Elective		3 (*)		
	Elective (approved by Students Advisor)		3 (*)		
8th	CPSC 483 Comp. Sys. Design		3 (✓)		
	ENGR 482 Ethics and Engineering		( )		3
	English Elective		( )	3	
	Computer Engineering Elective		7 (*)		
TOTALS-ABET BASIC-LEVEL REQUIREMENTS		35	66	24	5
OVERALL TOTAL FOR DEGREE: **130**					
PERCENT OF TOTAL		27%	51%	18%	4%
Totals must	Minimum semester credit hours	32 hrs	48 hrs		
satisfy one set	Minimum percentage	25%	37.5%		

* Some elective courses contain significant design content. Actual design content of elective courses will depend on the specific electives chosen.

Table V.2: Basic-Level Curriculum
(Computer Engineering - CEEN Track - OLD CURRICULUM)

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours)			
		Math & Basic Sciences	Engineering Topics *Check if contains significant* Design (✓)	General Education	Other
1st	ENGL 104 Comp. and Rhetoric		( )	3	
	ENGR 111 Foundations in Engineering I		2 (✓)		
	MATH 151 Engineering Math I	4	( )		
	PHYS 218 Mechanics	4	( )		
	Univ. Core Elective		( )	3	
	KINE 198 Health and Fitness Activity		( )		1
2nd	CHEM 107 Chemistry for Engineers	4	( )		
	ENGR 112 Foundations in Engineering II		2 (✓)		
	MATH 152 Engineering Mathematics II	4	( )		
	PHYS 208 Electricity and Optics	4	( )		
	University Core Curriculum elective		( )	3	
	KINE 199 Required Physical Activity		( )		1
3rd	CPSC 111 Introduction to Computer Science and Programming		4 (✓)		
	ENGR 211 Conservation Principles of Engineering Mechanics		3 ( )		
	ENGR 212 Conservation Principles in Thermal Sciences		3 ( )		
	MATH 251 Engineering Math III	3	( )		
	University Core Curriculum Elective		( )	3	
4th	CPSC 211 Data Struct. and Imp.		4 (✓)		
	ELEN 248 Digital Systems Design		4 (✓)		
	ELEN 214 Electrical Circuit Theory		4 ( )		
	MATH 308 Differential Equations	3	( )		
5th	ECEN 325 Electronics		4 (✓)		
	ELEN 314 Linear Circuit Analysis		3 ( )		
	ELEN 350 Comp. Arch. and Design		3 (✓)		
	University Core Curriculum Elective		( )	3	
	MATH 302 Discrete Mathematics	3	( )		
6th	ELEN 449 Microproc. Sys. Design		4 (✓)		
	CPSC 311 Analysis of Algorithm		3 ( )		
	ELEN 454 Digital Int. Cir. Design		3 ( )		

(continued)

Table V.2: (continued)

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours) Math & Basic Sciences	Engineering Topics *Check if contains significant* Design (✓)	General Education	Other
7th	STAT 211 Principles of Statistics I or STAT 414 Mathematical Statistics	3	( )		
	University Core Curriculum Elective		( )	3	
	MATH 311 Topics in App. Math. I	3	( )		
	ENGL 210 Sci. and Tech. Writing or ENGL 310 Technical Writing		( )	3	
	CPSC 481 Seminar		1 ( )		
	Computer Engineering Elective		3 (*)		
8th	Elective (approved by Students Advisor)		3 (*)		
	ELEN 405 Digital Design Lab.		3 (✓)		
	ENGR 482 Ethics and Engineering		( )		3
	CPSC 410 Operating Systems		3 (✓)		
	CPSC 431 Software Engineering		3 (✓)		
	Computer Engineering Elective		7 (*)		
TOTALS-ABET BASIC-LEVEL REQUIREMENTS		35	66	24	5
OVERALL TOTAL FOR DEGREE: **130**					
PERCENT OF TOTAL		27%	51%	18%	4%
Totals must satisfy one set	Minimum semester credit hours	32 hrs	48 hrs		
	Minimum percentage	25%	37.5%		

* Some elective courses contain significant design content. Actual design content of elective courses will depend on the specific electives chosen.

V.A.1 Professional Component

V.A.1.1 Mathematics and Basic Sciences

The basic mathematics and science requirements (35 units, of which 23 units of mathematics and statistics and 12 units of science) exceed the minimum specified by ABET. Furthermore, some of the core engineering courses also focus primarily on basic math and sciences and hence the curriculum provides a very strong foundation in fundamentals. This will ensure the achievement of Program Objective 1 ("... will have the necessary knowledge, both in breadth and depth ...").

V.A.1.2 Engineering Sciences and Engineering Design

The CE curriculum is characterized by a large number of courses across all areas of the CE spectrum (circuits and logic design, architecture, systems, and software), which are complemented by a number of technical electives. Technical electives can be selected from a "shopping menu" of junior and senior level courses. This ensures a good combination of breadth and depth of knowledge across the field of Computer Engineering. Together, these depth and breadth constraints on CE courses, as well as the general education requirements, will ensure achievement of Program Objective 1 ("... will have the necessary knowledge, both in breadth and depth ...").

V.A.1.3 General Education Component

The University Core Curriculum requirements consists of 3 hours of visual and performing arts, 3 hours of social and behavior sciences, 6 hours of US history, 6 hours from POLS 206 (US govt.) and POLS 207 (Texas govt.) and 6 hours of international and cultural diversity (which may be satisfied by some of the previous courses, see undergraduate catalog for more details).

V.A.1.4 Engineering Design Experience

The basic nature of design in our Computer Engineering Program is to tightly integrate the computer, laboratory, and design experience that our students receive. The software development that our students carry out in most courses incorporates, of necessity, an open-ended design process. By utilizing advanced hardware simulation tools such as SPICE and GALAXY, students are able to explore much more advanced design concepts than could be done by hand. State-of-the-art software engineering development tools help them design more realistic software systems. In total, our computer facilities and laboratories provide a comprehensive set of computer-based design tools that students use throughout their careers in both structured and unstructured laboratories. Thus, to obtain a full picture of our design activities, one must review the descriptions of our computer use and laboratories as well as examining the design content of each of our courses.

Design is taught beginning in ENGR 111 and 112, and design continues to be taught in CSCE 111, CSCE 211, ECEN 214, ECEN 248, ECEN 314, CSCE 321, ECEN 325, and CSCE 410. Strong aspects of software design are taught in CSCE 431 "Software Engineering", while strong aspects of hardware design are taught in ECEN 449/CSCE 462 "Microcomputer Systems". The culminating effort and coalescing of engineering design abilities occurs in CSCE 483/ECEN 405, the senior project design course (see Section V.B.2). This course begins with students being assigned to design/programming teams, each team choosing a specific problem having interest for the entire team. The students work together as a team to go through a discovery process to determine the true requirements of the problem. They then go through successive stages of specification, design, implementation, and testing. Each phase requires both an oral and written report.

The economic factors, constraint issues, reliability, safety, aesthetics, ethics, and social impact issues have been developed in hardware and software course sequences leading to the CSCE 483/ECEN 405 Capstone Design courses, that is, ECEN 248 "Intro Digital Systems Design", CSCE 321/ECEN 350 "Computer Architecture," and CSCE 462/ECEN 449 "Microcomputer Systems" on the hardware side and CSCE 120 Programming II, CSCE 211 "Data Structures and Implementation" and CSCE 410 "Operating Systems" through CSCE 431 "Software Engineering" on the software side. The importance of recording constraints and tracing throughout the life cycle of development is emphasized along with frequent design reviews.

The beginning course ENGR 111 also touches ethics and social impact, which are addressed in much more detail in ENGR 482 "Ethics and Engineering". CSCE 481 "Seminar" deals with professionalism, ethics, the interviewing process and client industries, and graduate education and the place the B.S., M.S., and Ph.D. have in industry.

V.A.1.5 Curriculum Analysis

Table V.1 and Table V.2 give a breakdown of the CE curriculum (CSE Track and ECE Track) and how it satisfies the professional component. A strong background in mathematics and basic sciences is fundamental to achieving all of the Program Objectives. All students are required to take 6 semesters of mathematics courses, one semester of chemistry, 3 semesters of physics, as well as 4 semesters of general engineering courses. This grounding in basic math, science, and general engineering will help graduates to relate to and to work with other engineers from a wide variety of disciplines and will also be valuable for those who wish to pursue graduate studies (Objective 1). We believe this solid grounding in fundamentals will also be helpful for those who ultimately take on management/leadership roles in their careers (Objective 4). The 35 credits of basic math and sciences exceeds the ABET minimum requirement without including the general engineering science courses (some of which could be considered basic sciences).

As shown in Table V.1 and Table V.2, the CE curriculum requires students to take at least 66 hours of engineering topics. This far exceeds the 48 hours ABET minimum requirement. The curriculum provides both breadth and depth in its coverage of engineering topics. Breadth across the field of engineering is provided through the general engineering courses ENGR 111, 112, 211, 212, and 482. Within the field of Computer Engineering depth and breadth are provided through a selected set of required courses and a small set of elective courses. This structure insures all students have a solid grounding in all areas of Computer Engineering while still allowing some flexibility for students to pursue their individual interests in a widely diverse field.

The University Core Curriculum requirement insures that all students attain breadth in general education including: visual and performing arts, social and behavioral sciences, American history, US and Texas Government, and international and cultural diversity (see Section V.A.1.3 and the undergraduate catalog for more details). This breadth of education will help graduating engineers to function in a multi-disciplinary and culturally diverse world.

V.B Curriculum for Catalog 131 and Later ("Curriculum-2008")

Note: *The content of this section is very similar to that of Section V.A – "Old Curriculum" and may read like a duplicate. For readers who are unfamiliar with Section V.A, this material will read as a self-contained entity. Readers who come from reading Section V.A should focus on the following curriculum table with the following description, and then jump to sections V.B.1.2, V.B.1.4, and V.B.1.5 directly.*

A brief summary of changes to the curriculum is listed below. For details see the following sections.

1. *The two sophomore-level engineering courses ENGR 211 (Conservation Principles of Engineering Mechanics) and ENGR 212 (Conservation Principles of Thermal Science) are replaced by one Engineering Elective and one Area Elective course.*
2. *The "Introduction to Programming" course sequence has been modified from the sequence ENGR 112B (Introduction Programming and Software), CSCE 111 (Introduction to Computer Science and*

Programming), CSCE 211 (Data Structures and Implementation), and CSCE 311 (Analysis of Algorithms) to the new streamlined sequence ENGR 112B (Introduction to Programming and Software), CSCE 113 (Integrated Programming and Design), and CSCE 221 (Data Structures and Algorithms). The new sequence is shorter and therefore more appropriate for the core-and-tracks format of the new curriculum.

3. *The University Core Curriculum has been more clearly formulated in the CE curriculum, with POLS 206 (US govt.) and POLS 207 (Texas govt.) explicitely listed in the CE curriculum. Similarly, the 3 hours of social and behavior science stipulated in the University curriculum are now explicitely listed as Social Science Elective in the CE curriculum, as are the 3 hours of Visual and Performing Arts elective.*

4. *A new Discrete Math course with a more application-oriented perspective has been developed, and the CE curriculum now requires students to take CSCE 222 (Discrete Structures for Computing) rather than the old MATH 302 (Discrete Mathematics).*

5. *The architecture course has been harmonized, and all CE students now take CSCE/ECEN 350 (Computer Architecture).*

6. *The Operating Systems course CSCE 410 has been replaced by CSCE 313 (Introduction to Computer Systems,) a system programming course. The Operating Systems course is now an elective.*

7. *The new CE curriculum now has a low-level software capstone design course, CSCE 315 (Programming Studio), which replaces the requirement for CSCE 431 (Software Engineering). The latter course is now an elective.*

8. *The number of area electives has been increased from 10 credits (two three-credit courses and one four-credit course) in the CECN track and 7 (one three-credit and one four-credit course) in the CEEN track to 15 credits (5 three-credit courses) in both tracks.*

The curriculum for the Bachelor of Science Degree in Computer Engineering for students starting Fall 2008 and later (i.e. Catalog 131 and later) is summarized in the following table showing the recommended sequence of courses to be taken by semester. There are two tracks in this curriculum, the CSE track and the ECE track, both culminating in the same CE degree. Wherever the two tracks differ, this will be appropriately noted in the following summary. As can be seen from the table below, the CSE and ECE tracks are integrated. The two tracks are essentially the same except for the following two courses.

- CSCE 462 (3 hours) - ECEN 449 (3 hours) - both are microprocessor courses.
- CSCE 483 (3 hours) - ECEN 405 (3 hours) - both are design capstone courses

The two microprocessor courses are very similar, as are the two capstone courses. CEEN students, who take ECEN 449 and ECEN 405 (while CECN students take the two CSCE courses) benefit from taking the courses together with EE students.

Table V.3: Basic-Level Curriculum
(Computer Engineering - CECN and CEEN Track - CURRICULUM-2008)

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours) Math & Basic Sciences	Engineering Topics *Check if contains <u>significant</u>* Design (✓)	General Education	Other
1st	ENGL 104 Comp. and Rhetoric		( )	3	
	ENGR 111 Foundations in Engineering I		2 (✓)		
	MATH 151 Engineering Math I	4	( )		
	PHYS 218 Mechanics	4	( )		
	University Core Elective		( )	3	
	KINE 198 Health and Fitness Activity		( )		1
2nd	CHEM 107 Chemistry for Engineers	4	( )		
	ENGR 112 Foundations in Engineering II		2 (✓)		
	MATH 152 Engineering Mathematics II	4	( )		
	PHYS 208 Electricity and Optics	4	( )		
	University Core Elective		( )	3	
	KINE 199 Required Physical Activity		( )		1
3rd	CSCE 113 Integrated Progr. and Design		2 (✓)		
	CSCE 222 Discr. Struct. for Computing		3 ( )		
	ECEN 248 Digital Systems Design		4 (✓)		
	ENGL 210 Sci. and Tech. Writing or ENGL 310 Technical Writing		( )	3	
	MATH 251 Engineering Math III	3	( )		
4th	CSCE 221 Data Struct. and Alg.		4 (✓)		
	ECEN 214 Electrical Circuit Theory		4 ( )		
	MATH 308 Differential Equations	3	( )		
	POLS 206 American Government		( )	3	
	STAT 211 Principles of Statistics I	3	( )		
5th	CSCE 313 Intro to Computer Systems		4 (✓)		
	CSCE/ECEN 350 Comp. Arch. and Design		4 (✓)		
	CSCE 481 Seminar		1 ( )		
	ECEN 314 Signals and Systems		3 ( )		
	POLS 207 State and Local Government		( )	3	
6th	CSCE 315 Programming Studio		3 (✓)		
	CSCE 462 Microcomputer Systems or ECEN 449 Microprocessor Sys. Design		3 (✓)		

(continued)

Table V.3: (continued)

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours) Math & Basic Sciences	Engineering Topics *Check if contains significant* Design (✓)	General Education	Other
	ECEN 325 Electronics		4 (✓)		
	ECEN 454 Digital Int. Circuit Design		3 ( )		
	MATH 311 Topics in App. Math. I	3	( )		
7th	ENGR 482 Ethics and Engineering		( )		3
	Engineering Elective		3 (*)		
	Area Elective		9 (*)		
8th	CSCE 483 Digital System Design or ECEN 405 Digital Design Lab		3 (✓)		
	Area Elective		6 (*)		
	Social Sciences Elective		( )	3	
	Visual and Perf. Arts Elective		( )	3	
TOTALS-ABET BASIC-LEVEL REQUIREMENTS		32	67	24	5
OVERALL TOTAL FOR DEGREE: **128**					
PERCENT OF TOTAL		25%	52%	19%	4%
Totals must	Minimum semester credit hours	32 hrs	48 hrs		
satisfy one set	Minimum percentage	25%	37.5%		

* Some elective courses contain significant design content. Actual design content of elective courses will depend on the specific electives chosen.

The **University Core Curriculum** requirements consist of 6 hours of communication, 3 hours of visual and performing arts, 3 hours of social and behavior sciences, 6 hours of history, 6 hours from POLS 206 (US govt.) and POLS 207 (Texas govt.) and 6 hours of international and cultural diversity (which may be satisfied by some of the previous courses, see undergraduate catalog for more details). This requirement ensures that all graduates have a breadth of education across more than just engineering topics that will allow graduates to function in a diverse society and to understand the impact of engineering on that society, and so work towards Objective 3 (... understand the technical, business, social, ethical, and human context of their engineering contributions).

The CE curriculum is characterized by many courses across all areas of the CE spectrum (circuits and logic design, architecture, systems, and software), in addition to a large number of **area electives**. A total of 15 hours of area electives must be selected from a "shopping menu" of junior or senior level courses from at least 2 depth sequences with each sequence requiring at least 2 courses. The remaining courses can be selected from the sequence list or any approved junior or senior level course in CSCE or ECEN. The individual tracks are currently defined as follows:

- Communications and Networks:
  - Digital Communications ECEN 455
  - Computer Networks CSCE 463
  - Comm. & Cryptography MATH 470
  - Wireless Communications ECEN 478
- VLSI
  - Advanced Logic Design ECEN 468
  - VLSI Circuit Design ECEN 474
  - Intro. to VLSI Sys. Design ECEN 475
  - Electronic Circuits ECEN 326
- Software Systems
  - Software Engineering CSCE 431
  - Compiler Design CSCE 434
  - Scientific Programming CSCE 442
  - Advanced OS CSCE 410
  - Programming Languages CSCE 314
- Signal/Image Processing & Graphics
  - Digital Signal Processing ECEN 444
  - Digital Image Processing ECEN 447
  - Computer Graphics CSCE 441
  - Real time DSP ECEN 448
- Robotics/Embedded Systems
  - Robotics CSCE 452
  - Linear Control systems ECEN 420
  - Real-time Computing CSCE 456
  - Digital Control Systems ECEN 421
  - Artificial Intelligence CSCE 420
- Information
  - Database systems CSCE 310
  - Computer human interaction CSCE 436
  - Structures of interactive info. CSCE 444
  - Information storage & retrieval CSCE 470
  - Distributed Objects CSCE 438
  - Digital Communications ECEN 455

This "core-plus-tracks" format of the curriculum ensures a good combination of breadth and depth of knowledge across the field of Computer Engineering. Together, the combination of core courses plus area tracks, as well as the general education requirements, all ensure achievement of Program Objective 1 ("... will have the necessary knowledge, both in breadth and depth ...").

The courses in the CE curriculum focus mainly on principles that underlie engineering analysis and design approaches and current technologies. This ensures that the knowledge imparted as part of the curriculum retains a long "life time". In addition, parts of ENGR 111 (Introduction to Engineering) and of CSCE 481 (Seminar) are specifically devoted to the topic of lifelong learning. Together, this will ensure achievement of Program Objective 2 ("...will understand the importance of life-long learning, and be prepared to easily learn and understand new technological developments in their field").

Also, the emphasis on teamwork, communication skills, and characteristics of leadership in many of the required courses including (but certainly not limited to) ENGR 111, 112, 482, the seminar (CSCE 481), the newly established lower-division capstone design course (CSCE 315), and the capstone design course (CSCE 483 / ECEN 405) ensure the achievement of Program Objective 4 (... will develop the communication, teamwork, and leadership skills ...).

V.B.1 Professional Component

V.B.1.1 Mathematics and Basic Sciences

The basic mathematics and science requirements (32 units, of which 20 units of mathematics, discrete structures, and statistics and 12 units of science) exceed the minimum specified by ABET. Furthermore, some of the computer engineering courses also focus primarily on basic math and sciences and hence the curriculum provides a very strong foundation in fundamentals. This will ensure the achievement of Program Objective 1 ("... will have the necessary knowledge, both in breadth and depth ...").

V.B.1.2 Engineering Sciences and Engineering Design

The CE curriculum is characterized by many courses across all areas of the CE spectrum (circuits and logic design, architecture, systems, and software), in addition to a large number of area electives. A total of 15 hours of area electives must be selected from a "shopping menu" of junior or senior level courses from at least 2 depth sequences with each sequence requiring at least 2 courses. The remaining courses can be selected from the sequence list or any approved junior or senior level course in CSCE or ECEN. This "core-plus-tracks" format of the curriculum ensures a good combination of breadth and depth of knowledge across the field of Computer Engineering.

V.B.1.3 General Education Component

The University Core Curriculum requirements consists of 3 hours of visual and performing arts, 3 hours of social and behavior sciences, 6 hours of US history, 6 hours from POLS 206 (US govt.) and POLS 207 (Texas govt.) and 6 hours of international and cultural diversity (which may be satisfied by some of the previous courses, see undergraduate catalog for more details).

V.B.1.4 Engineering Design Experience

The basic nature of design in our Computer Engineering Program is to tightly integrate the computer, laboratory and design experience that our students receive. The software development that our students carry out in most courses incorporates, of necessity, an open-ended design process. By utilizing advanced hardware simulation tools such as SPICE and GALAXY, students are able to explore much more advanced design concepts than could be done by hand. State-of-the-art software engineering development tools help them design more realistic software systems. In total, our computer facilities and laboratories provide a comprehensive set of computer based design tools that students use throughout their careers in both structured and unstructured laboratories. Thus, to obtain a full picture of our design activities, one must review the descriptions of our computer use and laboratories as well as examining the design content of each of our courses.

Design is taught beginning in ENGR 111 and 112, and design continues to be taught in CSCE 113, CSCE 221, ECEN 214, CSCE 313, ECEN 325, CSCE/ECEN 350, and ECEN 454. Strong aspects of software design are taught in CSCE 315 "Programming Studio" (the newly designed lower-division capstone design course), while strong aspects of hardware design are taught in ECEN 449/CSCE 462 "Microcomputer Systems". The culminating effort and coalescing of engineering design abilities occurs in CSCE 483/ECEN 405, the senior project design course (see Section V.B.2). This course begins with students being assigned to design/programming teams, each team choosing a specific problem having interest for the entire team. The students work together as a team to go through a discovery process to determine the true requirements of the problem. They then go through successive stages of specification, design, implementation and testing. Each phase requires both an oral and written report.

The economic factors, constraint issues, reliability, safety, aesthetics, ethics and social impact issues have been developed in hardware and software course sequences leading to the CSCE 483/ECEN 405 Capstone Design courses, that is, ECEN 248 "Intro Digital Systems Design", CSCE/ECEN 350 "Computer Architecture" and CSCE 462/ECEN 449 "Microcomputer Systems" on the hardware side and CSCE 113 "Integrated Programming and Design", CSCE 221 "Data Structures and Algorithms" and CSCE 313 "Intro to Computer Systems" through CSCE 315 "Programming Studio" (lower-division Capstone Design course) on the software side. The importance of recording constraints and tracing throughout the life cycle of development is emphasized along with frequent design reviews. The beginning course ENGR 111 also touches ethics and social impact, which are addressed in much more detail in ENGR 482 "Ethics and Engineering". CSCE 481 "Seminar" deals with professionalism, ethics, the interviewing process and client industries, and graduate education and the place the B.S., M.S., and Ph.D. have in industry.

V.B.1.5 Curriculum Analysis

Section V.B gives a breakdown of the CE curriculum (CSE Track and ECE Track) and how it satisfies the professional component. A strong background in mathematics and basic sciences is fundamental to achieving all of the Program Objectives. All students are required to take 6 semesters of mathematics courses (5 semester of MATH courses and one semester of Discrete Math), one semester of chemistry, 2 semesters of physics, as well as 3 semesters of general engineering courses (2 semesters of introduction to engineering, and one engineering elective, which currently can be selected from one of the following courses: BIOL 113, CHEN 204, ISEN 220, ISEN 303, NUEN 201, CVEN 221, CVEN 301, MEEN 221, MEEN 222, AERO 211, AERO 212, BMEN 240, and BMEN 231). This grounding in basic math, science, and general engineering will help graduates to relate and work with other engineers from a wide variety of disciplines and will also be valuable for those who wish to pursue graduate studies (Objective 1). We believe this solid grounding in fundamentals will also be helpful for those who ultimately take on management/leadership roles in their careers (Objective 4). The 32 credits of basic math and sciences listed in Table V.3 match the ABET minimum requirement without including the general engineering science courses (some of which could be considered basic sciences).

As shown in Table V.3, the CE curriculum requires students to take at least 67 hours of engineering topics. This far exceeds the 48 hours ABET minimum requirement. The curriculum provides both breadth and depth in its coverage of engineering topics. Breadth across the field of engineering is provided through the general engineering courses ENGR 111, 112, 482, and an engineering elective course. Within the field of Computer Engineering depth and breadth are provided through a selected set of required courses and a large set of elective courses. This structure insures all students have a solid grounding in all areas of Computer Engineering while still allowing some flexibility for students to pursue their individual interests in a widely diverse field.

The University Core Curriculum requirement insures that all students attain breadth in general education including: visual and performing arts, social and behavioral sciences, American history, US and Texas

Government, and international and cultural diversity (see Section V.B.1.3 and the undergraduate catalog for more details). This breadth of education will help graduating engineers to function in a multi-disciplinary and culturally diverse world.

V.B.2 Culminating Design Experience

The capstone design courses (CSCE 483 for the CSE Track and ECEN 405 for the ECE Track) challenge students to engage in a design, build, test project while introducing the concepts of professional communications, project management and organized teamwork. The goals of these design courses with respect to ABET Criterion 4 are as follows:

1. Provide students with a representative industry project in the controlled environment of academia.
2. Solidify and extend the theory and concepts presented in upper level coursework through application.
3. Create an environment that fosters professional interactions, between team members, colleagues and instructors.

The methods employed for achieving these goals are detailed below:

Teamwork Students are grouped into teams of four members or less in the first week of the course. Following the team assignment, students form specific roles according to their areas of specialization. Care is taken to form groups with multidisciplinary skill sets. Teamwork is emphasized through the assignment of responsibilities according to team member roles. Typical roles include: team leader, lead hardware engineer, lead software engineer, technical documentation specialist, lead mechanical designer, communication engineer, and test engineer. Work is accomplished as a team with evaluations of effort distributed equally across the team for deliverables. The motto of shared success and shared failure is a key aspect of teamwork. Leadership and autonomy are emphasized as teams are encouraged to overcome minor challenges within their own means while they are challenged to discern the appropriate time to seek outside assistance.

Design/Build/Test To receive credit for the course, teams must successfully complete the design, build, test cycle. The course motto of "A complete degree requires a complete project" is a testament to the resolve of this requirement. Teams submit project ideas to be evaluated on a technical merit score. Once a suitable project is defined, the team initiates the design phase. Throughout the semester, teams engage in various deliverables required to evaluate the adequacy of the design solution and the progress of the team. Upon delivery of the final design, teams partake in a critical design review with the audience including colleagues and instructors as well as industry representatives. The construction phase or "build" phase requires students to overcome challenges while remaining faithful to a performance "contract" agreed upon following the design phase. Upon completing of the build phase, teams test the project in a controlled environment and in the presence of their colleagues, instructors and industry representatives.

Formal Communications Teams are required to submit written and oral reports throughout the semester. The details vary a bit from instructor to instructor. In ECEN 405 (typically taken by CEEN and ECE students) each team is responsible for submitting a Request for Proposal (RFP), Formal Proposal, three status reports, and a Project Report. All written documentation must be suitably bound and accompanied by a letter or memo of transmittal. Teams also engage in a preliminary design review of their projects through an oral presentation of the team solution. Following the build phase and preceding the Project Report, teams present the implemented solution in a critical design review.

In CSCE 483 (typically taken by CECN students), each team submits and presents a proposal, submits a progress report, then submits and presents a Critical Design Review, then submits three more progress reports, and finally submits and presents a Final Report.

All courses culminate in a test of the project and a final presentation in an open forum in the presence of colleagues, instructors and industry representatives.

Industry Sponsored Projects Some projects are formed with the guidance and support of an industry mentor. Representatives work with the student team for 2-5 hours a week providing guidance and support from a professional viewpoint. Industry sponsorship is accompanied by financial assistance and thus provides significant resources to purchase hardware in support of the project. Industry interaction through mentorship provides student teams with an elevated prospective and assists them in tackling issues of manufacturability, scalability, social and safety concerns.

Technical Merit Assessment Teams projects are assessed a technical merit score according to the breadth and depth of knowledge required from senior level courses to successfully complete the project. This score accounts for a significant portion of the final grade, thus providing incentives for teams to undertake challenging projects that utilize the content of senior level courses. This approach has been extremely successful for increasing the technical depth of projects and allows students to receive less credit for less challenging projects.

Project Management Student teams perform detailed management of their respective projects through the use of common project management tools including: statements of work, work breakdown structures, technical specifications, labor and cost tracking, responsibility matrices, and progress evaluations with respect to the critical path. Formal management of the student project amplifies the professional environment fostered by this course and provides students with knowledge of the basic project management tools used in industry.

Engineering Constraints and Economic Factors Student teams are required to take engineering constraints (cost, size, weight, power, compatibility, physical limitations, project time constraints) into consideration and must formulate design alternatives as well as a rationale for choosing among them. These constraints must be identified and tracked in the initial proposal and the following reports. Economic factors must be explicitly considered in form of a formal budget analysis, which accompanies the initial proposal. The level at which these constraints are adequately addressed in the projects is partially assessed in industry representative surveys (CSCE 483) or student project survey forms (ECEN 405) and so feed into the outcome assessment data. In this way, deficiencies show up and can be appropriately addressed.

V.B.3 Cooperative Education

Cooperative Education is voluntary for CE students. The Cooperative Education program is administered centrally by the university's Career Center. Students who are interested in co-op attend an orientation session and then seek employment opportunities either on their own or at one of the Career Center's job fairs. Students typically do one to three co-op terms. Preferably, these co-op terms alternate with regular class semesters, but some terms entail a summer and a long semester. During each co-op semester the student writes a work experience report which is graded by the faculty advisor. Each co-op term generates one credit of CSCE 385 or ECEN 385. A total of three credits could fulfill degree requirements in the free elective category, or as technical elective credits when there was a free elective and six credits of technical electives in the curriculum.

V.C Additional Material Available for Review During the Visit

During the visit we will have the following additional material available for review: Course binders, course textbooks, outcome binders, selected student work, assessment report, reports and artifacts from capstone design courses.

V.D Tabular Data for Curriculum

Table V.4: Course and Section Size Summary (Computer Engineering)

Course	Title	No. of Sections offered in AY 2009/10	Avg. Section Enrollment	Type of Class		
				Lecture	Lab	Other
Required Courses from CSCE and ECEN						
CSCE 113	Integrated Programming and Design	7	11	25	75	
CSCE 221	Data Structures and Algorithms	13	15	100		
CSCE 222	Discrete Structures for Computing	3	52	100		
ECEN 214	Electrical Circuit Theory	25	14	50	50	
ECEN 248	Digital Systems Design	22	13	50	50	
CSCE 313	Introduction to Computer Systems	9	18	60	40	
ECEN 314	Signals and Systems	7	29	75	25	
CSCE 315	Programming Studio	4	23	50	50	
ECEN 325	Electronics	18	12	50	50	
CSCE 350	Computer Architecture and Design[1]	5	10	50	50	
ECEN 350	Computer Architecture and Design	8	13	50	50	
ECEN 449	Microprocessor System Design (CEEN track)	4	12	50	50	
ECEN 454	Digital Integrated Circuit Design	6	13	50	50	
CSCE 462	Microcomputer Systems (CECN track)	4	11	50	50	
CSCE 481	Seminar	2	61			100
CSCE 483	Computer Systems Design (CECN Capstone)	4	8	15	85	

(continued)

[1]Cross-listed with ECEN 350.

Table V.4: (continued)

Course	Title	No. of Sections offered in AY 2009/10	Avg. Section Enrollment	Type of Class		
				Lecture	Lab	Other
ECEN 405	Electrical Design Laboratory (CEEN Capstone)	4	16	16.7	83.3	
Other Relevant Courses in CSCE						
CSCE 181	Introduction to Computing	2	84	100		
CSCE 310	Database Systems	3	19	100		
CSCE 332	Programming Language Design	1	11	100		
CSCE 410	Operating Systems	1	33	75	25	
CSCE 411	Analysis of Algorithms	2	29	100		
CSCE 420	Artificial Intelligence	3	21	100		
CSCE 431	Software Engineering	7	14	50	50	
CSCE 433	Formal Languages and Automata	2	9	100		
CSCE 434	Compiler Design	2	4	100		
CSCE 436	Computer Human Interaction	1	32	100		
CSCE 438	Distributed Objects Programming	2	54	100		
CSCE 440	Quantum Algorithms	0	0	100		
CSCE 441	Computer Graphics	2	34	100		
CSCE 442	Scientific Programming	0	0	100		
CSCE 444	Structures of Interactive Information	0	0	100		
CSCE 452	Robotics and Spatial Intelligence	1	13	100		
CSCE 463	Networks and Distributed Processing	2	17	100		
CSCE 469	Advanced Computer Architecture	0	0	100		
CSCE 470	Information Storage and Retrieval	1	22	100		
Other Relevant Courses in ECEN						
ECEN 119	Practice Of Electrical & Computer Engineering	0	0	100		
ECEN 220	Introduction to Digital Design	0	0	75	25	
ECEN 303	Random Signals and Systems	3	34	100		
ECEN 322	Electric and Magnetic Fields	7	20	100		
ECEN 326	Electronic Circuits	2	10	75	25	
ECEN 338	Electromechanical Energy Conversion	0	0	75	25	

(continued)

Table V.4: (continued)

Course	Title	No. of Sections offered in AY 2009/10	Avg. Section Enrollment	Type of Class		
				Lecture	Lab	Other
ECEN 351	Applied Electromagnetic Theory	1	8	100		
ECEN 370	Electronic Properties of Materials	7	19	100		
ECEN 410	Introduction to Medical Imaging	1	34	100		
ECEN 411	Introduction to Magnetic Resonance Imaging and Magnetic Resonance Spectroscopy	0	0	50	50	
ECEN 420	Linear Control Systems	6	21	100		
ECEN 421	Digital Control Systems	1	52	100		
ECEN 422	Control Engineering and Design Methodology	0	0	67	33	
ECEN 438	Power Electronics	6	10	75	25	
ECEN 440	Introduction to Thin Film Science and Technology	1	39	100		
ECEN 441	Electronic Motor Drives	5	9	75	25	
ECEN 442	DSP Based Electromechanical Motion Control	4	7	75	25	
ECEN 444	Digital Signal Processing	1	23	100		
ECEN 447	Digital Image Processing	1	23	75	25	
ECEN 448	Real Time Digital Signal Processing	1	15	67	33	
ECEN 450	Computer Interfacing and Communications	0	0	75	25	
ECEN 451	Antenna Engineering	1	19	100		
ECEN 452	Ultra High Frequency Techniques	0	0	67	33	
ECEN 453	Microwave Solid-State Circuits and Systems	0	0	100		
ECEN 455	Digital Communications	2	9	100		
ECEN 456	Communication Theory	0	0	100		
ECEN 457	Operational Amplifiers	0	0	75	25	
ECEN 458	Active Filter Analysis and Design	1	10	75	25	
ECEN 459	Power System Fault Analysis and Protection	4	11	75	25	
ECEN 460	Power System Operation and Control	3	11	75	25	

(continued)

Table V.4: (continued)

Course	Title	No. of Sections offered in AY 2009/10	Avg. Section Enrollment	Type of Class		
				Lecture	Lab	Other
ECEN 462	Optical Communication Systems	1	22	100		
ECEN 464	Optical Engineering	0	0	100		
ECEN 468	Advanced Logic Design	2	12	75	25	
ECEN 469	Advanced Computer Architecture	0	0	100		
ECEN 472	Microelectronic Circuit Fabrication	14	3	75	25	
ECEN 473	Microelectronic Device Design	2	22	100		
ECEN 474	VLSI Circuit Design	4	13	75	25	
ECEN 475	Introduction to VLSI Systems Design	0	0	75	25	
ECEN 476	Neural Networks and Implementations	0	0	75	25	
ECEN 478	Wireless Communication	0	0	100		
ECEN 480	RF and Microwave Wireless Systems	1	15	100		
Other Courses in CSCE and ECEN						
CSCE 110	Programming I	12	19	75	25	
CSCE 111	Introduction to Computer Science Concepts and Programming	8	20	75	25	
CSCE 121	Introduction to Program Design and Concepts	13	20	75	25	
CSCE 206	Structured Programming in C	20	22	75	25	
CSCE 311	Analysis of Algorithms	1	19	100		
CSCE 312	Computer Organization	4	20	75	25	
CSCE 314 hline CSCE 482	Programming Languages Senior Capstone Design[2]	2 1	43 24	100 15	 85	
ECEN 215	Principles of Electrical Engineering	25	28	50	50	

[2]For Computer Science (CPSC) majors.

CRITERION VI: FACULTY

VI..1 Leadership Responsibilities

The primary responsibility in the operation of the CE Program stays with the department heads of the two head departments. The structures within the departments tend to be similar across departments: The Department Head is assisted in his duties by an Associate Department Head and a Graduate Advisor, both appointed by the Department Head. The Associate Department Head's primary responsibilities are in overseeing the department's undergraduate program and departmental staff. As such, the Associate Department Head chairs or is at least member of the department's Undergraduate Studies Committee (in ECE) or the Undergraduate Curriculum Committee (in CSE) that deals with curricula issues and all issues affecting our undergraduate students. The Graduate Advisor has primary responsibility in dealing with graduate student admission and all other issues pertaining to our graduate programs. Besides overseeing the undergraduate and graduate programs in the department, the Department Head has primary responsibility for faculty recruiting, hiring and mentoring. In these areas, the Department Head is assisted by a faculty hiring committee. In ECE the hiring committee is composed of seven Group Leaders one for each of seven research areas in the department, who also serve as additional de facto mentors for young faculty in their respective areas. The Group Leaders also assist the Department Head in promoting research in the various departmental research areas to external venues and also in forming research collaborations on multidisciplinary projects, both within and outside the department. In CSE, the Hiring Committee is appointed by the Department Head. Similarly, individual faculty members are teamed up to serve as Young Faculty Mentor for new faculty members. Another responsibility of the Department Head is to perform yearly faculty reviews, which consist of individual meetings with each faculty to discuss their teaching, research and service performance, based on which salary merit rate recommendations are made. Finally, the Department Head is responsible for fund-raising on behalf of the department through contacting alumni and other prospective donors. An External Advisory and Development Council (EADC) in ECE and the Industry Affiliates in CSE and a development officer, assigned to the department by the college, assist the department in fund-raising. The EADC consists of industry representatives with interest in the department and provides an outside perspective on curricula, undergraduate recruiting and mentoring, and research focus areas, in addition to assisting in fund-raising. In addition to these activities, members of the IAP are contacted for outcome assessment in the CSE department.

VI.A Authority and Responsibility of Faculty

Faculty in the department play a key role in creating, modifying and evaluating courses. New elective courses are created usually through a faculty's initiative to fill a need in the department or to enhance our curriculum, especially as new faculty are hired with new expertise. To do so, the faculty first discusses the need and/or value for a new course within his/her group (ECE) or aread (CSE). Once a need or value is verified, she/he submits for approval a request for a "Special Topics" course. The request includes a course title, syllabus, and other course information. Once the request is approved by the Department Head, who consults with the Undergraduate Studies Committee (in ECE) or the Undergraduate Curriculum Committee (in CSE), it is routed to the associate dean for academic programs for further approval. A course can be taught as a Special Topics course only twice. The third time it is to be taught, the faculty and the department must file to make it into a permanent course by going through an approval procedure that starts at the department, goes through the college curriculum committee, university curriculum committee and the faculty senate. In the process of approval, other departments and colleges vet the course to make sure there is no course duplication. If concerns about duplication of content are raised, they are conveyed to the initiating department, which has the responsibility to address them before final approval. Modifications to existing courses or creation of new required courses are typically initiated in the Undergraduate Studies Committee (in ECE) or Undergraduate Curriculum Committee (in CSE). For example, this can happen as a result of feedback from faculty or from the CECC, students to advisors, faculty or department administration, or from results of ABET outcomes evaluation. Course content for required courses is set by the faculty with expertise to potentially teach the course under final review and approval by our undergraduate studies committee. Individual instructors do have flexibility to cover additional material or to change relative emphases within the agreed upon course content. For elective courses, a similar procedure holds although faculty have more flexibility in adjusting content. Quality and consistency is achieved by periodic review of courses and from ABET outcomes assessment.

VI.B Faculty

There are 37 full-time faculty members (20 from CSE and 17 from ECE) in the Computer Engineering Program. This number does not include the Interim Provost (K. L. Watson), and the Associate Provost (P. E. Cantrell), since these individuals are primarily in administrative rather than teaching/research positions. These 37 full-time faculty members have their primary commitment to the Computer Engineering program. In addition, a number of courses (for example, CSCE 222, Discrete Structures for Computing) are taught by faculty members in the CSE and ECE departments who do not consider themselves to be members of the Computer Engineering Faculty. Thus, this program has an adequate number of faculty members. Table VI.2 shows a brief analysis of the faculty indicating a diversity of experience and expertise. Further details can be found in the attached summary CVs. From this information, it is clear that the faculty have the breadth and depth to cover all areas of the program's curriculum. A faculty workload summary for the Spring 2010 Semester is given in Table VI.1. The standard teaching load for full-time faculty in the CSE and ECE departments is three courses per year. Faculty with research support for the academic year can buy out of courses to allow themselves more time to devote to research. This teaching load is comparable to that of many peer institutions/programs and allows faculty adequate time to pursue activities such as research, professional service, consulting/industrial collaboration, and professional development. It is seen in Table VI.2 that a large number of faculty are quite active in these respects.

Table VI.1: Faculty Workload Summary (Computer Engineering)

Faculty Member (Name)	FT or PT (%)	Classes Taught (Course No. / Credit Hrs.) (Spring 2010)	Total Activity Distribution Teaching	Research	Other
Amato, Nancy	100%	CSCE 221/4	60	30	10
Bettati, R.	100%	CSCE 410/3, 611/3	60	30	10
Cantrell, P.E.	100%	Administration	0	0	100
Chai, J.	100%	CSCE 441/3, 641/3	60	40	0
Choi, G.S.	100%	ECEN 248/4	50	50	0
Daugherity, W.	100%	CSCE 121/4, 315/3, 601/3	80	10	10
Dos Reis, G.	100%	CSCE 314/3, 489/3	60	40	0
Dougherty, E.	100%	buy-out academic year		80	20
Gratz, P.	100%	ECEN 676/3	60	40	0
Gutierrez, R.	100%	CSCE 483/3, 636/3	60	30	10
Hammond, T.	100%	CSCE 436/3, 689/3	60	30	10
Hu, J.	100%	ECEN 454/3, 689/3	60	30	10
Huang, G.M.	100%	ECEN 667/3	30	30	40
Jiang, A.	100%	CSCE 629/3	60	30	10
Khatri, S.	100%	ECEN 449/3	60	30	10
Kim, E.J.	100%	CSCE 350/4, 614/3	60	30	10
Kundur, D.	100%	ECEN 314/3, 644/3	60	30	10
Leyk, T.	100%	CSCE 113/2, 221/4	80	10	10
Li, P.	100%	ECEN 681/1, 689/3	60	40	0
Liu, J.-C.	100%	CSCE 462/2	50	40	10
Lively, W.	100%	CSCE 431/3	50	25	25
Loguinov, D.	100%	CSCE 463/3, 619/3	60	40	0
Lu, M.	100%	ECEN 248/4	40	50	10
Mahapatra, R.	100%	CSCE 312/4, 617/3	60	30	10
Miller, S.L.	100%	ECEN 683/3	40	40	20
Narayanan, K.	100%	ECEN 661/3	60	30	10
Rauchwerger, L.	100%	CSCE 654/3	60	30	10
Reddy, N.	100%	Development Leave			100
Shakkottai, S.	100%	ECEN 248/4	60	40	0
Shell, D.	100%	CSCE 420/3	60	40	0
Shi, W.	100%	Development Leave			100
Song, D.	100%	CSCE 452/3, 643/3	60	30	10
Sprintson, A.	100%	ECEN 350/4	60	40	0
Taylor, V.	100%	Administration	10	20	70
Walker, D.	100%	CSCE 680/3	40	30	30
Watson, K..	100%	Administration			100

(continued)

Table VI.1: (continued)

Faculty Member (Name)	FT or PT (%)	Classes Taught (Course No. / Credit Hrs.) (Spring 2010)	Total Activity Distribution Teaching	Research	Other
Xiong, Z.	100%	Development Leave			100
Yurttas, S.	100%	CSCE 310/3, 438/3, 602/3, 603/3	80	10	10
Zhang, X	100%	ECEN 619/3, 621/3	60	30	10

More importantly, the reasonable teaching load insures that faculty will have adequate time to spend advising and instructing students. While formal advising is done in a centralized manner both in the CSE and the EEE Department (See Section I.C for a description of various faculty-initiated advising and mentoring activities), all faculty involved in teaching undergraduate courses must necessarily advise students, at least in an informal fashion. In addition, while formal teaching is primarily accomplished through a traditional lecture format, course section sizes are maintained at a low level to insure that students will be able to obtain individual attention from their instructors when necessary. It is through these one-on-one or small group interactions between students and faculty where much of the most important “learning” takes place. A number of faculty members are involved in various manners with the local student chapters of the ACM, IEEE and Eta Kappa Nu (HKN). It is also common for students taking the senior design course (ECEN 405 / CSCE 483) to seek out an informal faculty mentor to advise them throughout the course of their project. (See Section I.B for more information about faculty-student interaction and student mentoring.)

Other means applied at institution and department level to ensure and promote faculty teaching competence and professional growth (such as the Center for Teaching Excellence, post-tenure review, competitive Faculty Development Leave Program, support for attendance of professional society meetings, encouragement for scholarly activities in general) are described in the institution-level addendum to the Self-Study questionnaire.

Table VI.2: Faculty Analysis (Computer Engineering)

Name	Rank	FT or PT	Highest Degree	Institution from which Highest degree Earned & Year	Years of Experience: Govt./ Industry Practice	Years of Experience: Total Faculty	Years of Experience: This Institution	State in which Registered	Level of Activity: Professional Society (indicate Society)	Level of Activity: Research	Level of Activity: Consulting / Summer Work in Industry
Amato, N.	Prof	FT	Ph.D.	UIUC 1995	5	15	15	None	ACM-Low, IEEE-High, CRA-High	High	None
Bettati, R.	Prof	FT	Ph.D.	UIUC 1994	0	14	14	None	IEEE-High, ACM-Low	High	Low
Cantrell, P.E.	Asc Prof	FT	Ph.D.	GaTech 1981	4	28	28	None	IEEE-Low	None	None
Chai, J.	Asst Prof	FT	Ph.D.	CMU 2006	0	4	4	None	ACM-Med	High	None
Choi, G.	Asc Prof	FT	Ph.D.	UIUC 1994	7	16	16	None	IEEE-HKN-Low	High	None
Daugherity, W.	Sr. Lec	FT	Ed.D.	Harvard 1977	3	28	23	None	None	None	None
Dos Reis, G.	Asst Prof	FT	Ph.D.	Ec. Norm. Sup. de Cachan 2001	0	5	4	None	IEEE-med, ISO/IEC-high	High	Low
Dougherty, E.R.	Prof	FT	Ph.D.	Rutgers U. 1974	0	35	14	None	IEEE-SPIE-High	High	High
Gratz, P.	Asst Prof	FT	Ph.D.	UT 2008	0	2	2	None	ACM-IEEE-Low	High	None
Gutierrez, R.	Asc Prof	FT	Ph.D.	NC State 1998	0	12	8	None	IEEE-Low	High	None
Hammond, T.	Asst Prof	FT	Ph.D.	MIT 2007	4	11	4	None	ACM-Low	High	None
Hu, J.	Asst Prof	FT	Ph.D.	U. of MN 2001	5	8	8	None	ACM-IEEE-High	High	None
Huang, G.M.	Prof	FT	Ph.D.	Washington U. 1988	0	30	26	None	IEEE-Med	Med	None
Jang, A.	Asst Prof	FT	Ph.D.	CalTech 2004	0	5	5	None	ACM-IEEE-Low	High	None
Khatri, S.	Asst Prof	FT	Ph.D.	Berkeley 1999	0	10	6	None	IEEE-High	High	High
Kim, E.J.	Asc Prof	FT	Ph.D.	Penn State 2003	0	12	12	None	IEEE-Low	High	None
Kundur, D.	Asc Prof	FT	Ph.D.	Toronto 1999	0	10	7	None	IEEE-ACM-Med	High	Med
Leyk, T.	Sr. Lec	FT	Ph.D.	Austral Natl 1997	0	12	12	None	None	None	None
Li, P.	Asst Prof	FT	Ph.D.	CMU 2003	0	6	6	None	IEEE-High	High	Med
Liu, J.C.	Prof	FT	Ph.D.	U of Mich 1989	1	20	20	None	IEEE-Med	High	Low

(continue)

Faculty Analysis (continued)

Name	Rank	FT or PT	Highest Degree	Institution from which Highest degree Earned & Year	Years of Experience: Govt./ Industry Practice	Years of Experience: Total Faculty	Years of Experience: This Institution	State in which Registered	Level of Activity: Professional Society (indicate Society)	Level of Activity: Research	Level of Activity: Consulting / Summer Work in Industry
Lively, W.	Prof.	FT	Ph.D.	SMU 1971	2	37	37	TX	IEEE-Low	None	Low
Loguinov, D.	Asc Prof	FT	Ph.D.	City U of NY 2002	0	2	2	None	IEEE-Low	Med	None
Lu, M.	Prof.	FT	Ph.D.	Rice Univ 1987	6	16	16	TX	Med	High	None
Mahapatra, R.	Asc Prof	FT	Ph.D.	IIT 1992	0	19	8	None	IEEE-Med	Med	Low
Miller, S.L.	Prof.	FT	Ph.D.	UCSD 1988	1	15	5	None	IEEE-High	High	Low
Narayanan, K.	Asc Prof	FT	Ph.D.	GaTech 1998	0	13	12	None	IEEE-High	High	None
Rauchwerger, L.	Prof	FT	Ph.D.	UIUC 1995	3	14	13	None	None	High	None
Reddy, N.	Prof	FT	Ph.D.	UIUC 1990	5	14	14	None	IEEE-Med	High	Low
Shakkottai, S.	Asst Prof	FT	Ph.D.	UIUC 2007	0	3	2	None	IEEE-Low	High	None
Shell, D.	Asst Prof	FT	Ph.D.	USC 2008	0	2	2	None	IEEE-Low	High	None
Shi, W.	Prof	FT	Ph.D.	UIUC 1992	0	14	6	None	IEEE-Med	High	Low
Song, D.	Asc Prof	FT	Ph.D.	Berkeley 2003	0	7	7	None	IEEE-High	High	None
Sprintson, A.	Asst Prof	FT	Ph.D.	Technion 2003	1	5	5	None	IEEE-Med	High	None
Taylor, V.	Prof.	FT	Ph.D.	Berkeley 1991	1	11	0	None	ACM-Low, IEEE-Med, CRA-Med	High	None
Walker, D.	Prof	FT	Ph.D.	Carnegie M 1986	10	16	16	None	IEEE-High	High	Low
Watson, K.	Prof.	FT	Ph.D.	Texas Tech 1982	2	32	27	TX	IEE-ASEE-High	Low	None
Williams, G.	Prof.	FT	Ph.D.	TAMU 1965	3	34	34	TX	IEEE-High	None	Low
Xiong, Z.	Asc Prof	F	Ph.D.	UIUC 1996	0	6	4	None	IEEE-High	High	Med
Yurttas, S.	Sr. Lec	FT	Ph.D.	Ege U 1981	0	26	21	None	None	None	None
Zhang, X	Asc Prof	FT	Ph.D.	UMich 2001	0	8	8	None	IEEE-High	High	None

CRITERION VII: FACILITIES

The students and faculty in the CE Program at Texas A&M have direct access to world-class facilities. The laboratories, equipment, documentation, and support provide an excellent platform for the CE program to accomplish its objectives. Ample access to modern and well-maintained laboratory and computing equipment, excellent documentation, first-class access library resources (in paper, microfiche, and digital, and others) provide an atmosphere conducive to learning and that encourages professional development.

In the following, we will first give an overview of the available facilities and then illustrate in detail how these facilities are more than adequate to

- foster faculty-student interaction,
- create a climate that encourages professional development and professional activities,
- provide opportunities for students to learn the use of modern Computer Engineering tools, and
- support the scholarly activities of the students and faculty.

In the following, we elaborate on laboratories and computing facilities. Information about support of the facilities can be found in Section VIII..7.

VII.A Space

VII.A.1 Offices (Administrative, Faculty, Clerical, Teaching Assistants)

VII.A.1.1 Departmental Facilities (ECE)

The following table gives an overview of office space allocated to Administrative, Faculty, Clerical and Teaching Assistant categories:

Table VII.1: Office Space Distribution (CSE Department)

Type of Space	Square Footage
Administrative	436
Faculty	13,727
Clerical	11,923
Teaching Assistants	15,498

(continued)

Table VII.1: (continued)

Type of Space	Square Footage
Total space	**14,584**

VII.A.1.2 Departmental Facilities (CSE)

Sizes for faculty offices generally vary between 121 to 164 square feet. All faculty members have an individual office with window assigned. There are modern desks, chairs, and tables to facilitate work and meetings with various individuals. Offices contain a whiteboard, telephone (with long-distance capability), bookshelves and filing cabinets (if the faculty member desires them). Faculty computers are generally purchased by individual faculty, using various funding sources. Among the sources for funding are startup funds (for new faculty), annual department allocation (each faculty member currently is allocated $1000 each year by the department; this may be spent on equipment, supplies, or other things such as travel), research grants, and (perhaps most importantly) a university-wide program that supports upgrades of faculty office computers. This Faculty Workstation Program provides a 3:1 matching for funds (up to $1500 from the University) for purchase of a computer or laptop. Faculty with 4 or more years since last using workstation funds are given priority, although funds may also be given to those with 3 or more year old workstations. Note that the $500 needed to be contributed by the faculty member to receive the maximum matching falls well within the amount of annual allocation.

Overall, the space and equipment for faculty offices is adequate for faculty members to conduct their business.

VII.B Laboratory Facilities, Equipment, and Infrastructure

VII.B.1 Instructional Facilities

VII.B.1.1 Institutional Facilities

University-wide services are provided through a Computing & Information Services group (CIS). This group supports a number of services all across campus. While department labs and services are sufficient for the program-oriented instruction, and open lab access is provided by the department, students do often make use of CIS-supported facilities. Among the services offered by CIS are open-access labs in places across campus, wireless networking, printing, software for individual use, and a virtual lab.

CIS maintains six open access labs on campus, with a total of 1225 PC Workstations for student use. Of these, three of the labs are located within a short walk of the departments buildings: Blocker (173 Workstations), Wisenbaker (62 Workstations), and the Student Computing Center (556 Workstations). Printers and scanners are available at all labs. There is a very wide range of over 100 software products provided on these machines, including the full Adobe suite, Autodesk products, Microsoft Office and Visual Studio, Solidworks, Matlab, Maple, and many more.

All lab resources can also be accessed through the Virtual Open Access Lab (VOAL). VOAL allows students (or faculty) to set up a virtual computer from wherever they are, and to thus access all of the software facilities normally provided at on-site Open Access Labs.

CIS also manages a service for providing heavily discounted (essentially just the distribution cost) software to students, allowing students to have many high-end programs for their own use, at very cheap prices. This is typically software that has been licensed for university-wide use, and includes products such as all Microsoft, Adobe, and McAfee software.

VII.B.1.2 Departmental Facilities (CSE & ECE)

Classrooms Each department is allocated a set of classrooms on campus for which they have priority in assigning courses. This allocation is based on historical utilization. The engineering departments meet to trade priority classrooms before submitting their proposed semester schedules to the Registrars office. The Registrars office assigns any additional classrooms that are needed to fulfill each departments semester schedule. They try to assign a classroom as close as possible to the building of a departments priority classrooms. The table below shows a list of the classrooms for which the CSE and ECE departments departments have priority and which CSCE and ECEN courses also utilized in the 2009-2010 academic year.

Table VII.2: Classrooms used for CSCE and ECEN courses in Fall 2009-2010

Room	Priority	Seating Capacity
Zachry Engineering Building		
ZEC 103	ECEN	96
ZEC 128A	ECEN	30
ZEC 223A	ECEN	46
ZEC 223B	ECEN	64
ZEC 223C	ECEN	44
ZEC 223D	ECEN	47
ZEC 104A		39
ZEC 105A		28
ZEC 105B		54
ZEC 105D		30
ZEC 119A		37
ZEC 119C		40
ZEC 119D		36
ZEC 127A		39
ZEC 128D		30
ZEC 227A		56
ZEC 333A		29
H.R. Bright Building		
HRBB 104	CSCE	30
HRBB 113	CSCE	55
HRBB 124	CSCE	136
HRBB 126	CSCE	30

Instructional Laboratories Table VII.3 and Table VII.4 give a summary of the various laboratories used for undergraduates and some of the major equipment used in those labs. Also shown are the courses supported by each of these labs.

Table VII.3: Summary of Undergraduate Laboratory Facilities

Room	Purpose of Lab, Courses Taught	Stations	Area (sq. ft.)
ZEC 6	Gen. Purpose Computer Lab.	20	716
ZEC 12B	Teaching Lab., ECEN 448	24	737
ZEC 17B	Teaching Lab., ECEN 449	16	575
ZEC 17C	Teaching Lab., ECEN 459	16	950
ZEC 20	Teaching Lab., ECEN 338	3	719
ZEC 20A	Teaching Lab., ECEN 438, 441	3	349
ZEC 100LA	Gen. Purpose PC Lab.	10	402
ZEC 111A	Gen. Purpose PC Lab.	2	1220
ZEC 111B	Teaching Lab, ECEN 489	8	966
ZEC 111C	Teaching Lab., ECEN 326	8	772
ZEC 113C	Teaching Lab, ECEN 325	8	780
ZEC 113D	Teaching Lab, ECEN 214	8	825
ZEC 115C	Teaching Lab, ECEN 220, 248	16	726
ZEC 115D	Teaching Lab, ECEN 220, 248	16	759
ZEC 203	Teaching Lab, ENGR 215	26	1686
ZEC 213A	Teaching Lab, ECEN 467, 654	20	674
ZEC 213B	Gen. Purpose PC Lab	16	798
ZEC 213C	Teaching Lab, ECEN 455	10	606
ZEC 213E	Gen. Purpose SUN Lab.	12	338
ZEC 309A	Teaching Lab., ECEN 452	5	474
ZEC 317	Teaching Lab., ECEN 472	5	693
HRBB 203	PC Lab	22	739
HRBB 217	Microcomp. Arch. Lab CSCE 462	10	617
HRBB 218	Senior Design Lab, CSCE 483	14	709
RDMC 111A	General Teaching & Open Access	24	768
RDMC 111B	General Teaching & Open Access	21	539
RDMC 111C	General Teaching & Open Access	43	1056
RDMC 111H	General Teaching & Open Access	33	800[1]
RDMC 111J	General Teaching & Open Access	45	982

Table VII.4: Existing Laboratory Equipment and Instrumentation

Location	Principal Usage	Description
Laboratory Space in Zachry Engineering Building		

(continued)

[1] Approximate number.

Table VII.4: (continued)

Location	Principal Usage	Description
ZEC 6	ECEN 215,350	16 Computer stations equipped with Intel 1.3GHz computers, a 17 inch monitor, and associated software, an Sharp Notevision data display unit suspended from the ceiling for teaching and presentation purposes and an HP Laserjet 9050 DN Printer. The following equipment is located in a storage cabinet for use with the lab: twenty NI DAQ cards and one Fluke PM6303A RCL meter.
ZEC 12B	ECEN 448	10 Core2 Duo 6300 @ 1.86 GHz computers with 10 sets of the following equipment physically attached to the workbenches: Tektronix MSO2014 Oscilloscope, Instek GFG-8210 Function Generator, Fluke 8840A Multimeter, HP 5381A Counter, TMS320LF2407 DSP Board, TMS320C6713 DSP board and HP Laserjet Printer
ZEC 17B	ECEN 438, 441	4 stations consisting of 4 Celeron D 2.53GHz systems, 4 stations with the following equipment: Hampden H-R-SCR-2X Power Electronics Trainer, Hampden H-IE C-B4 Motor Drive, MPJA 9305-PS Dc Power Supply, Hampden RL-100-3 Resistance Load, Hampden IL-100A Inductance Load, Tektronix TDS3014B Oscilloscope, Hampden SM-100-3 Synchronous Motor, Hampden Digital Photo Tachometer, HP 6235A Triple Output Power Supply, Hampden DM-100A DC Machine, Hampden IM-100 Induction Motor, Hampden H-SCR-104 Four Quadrant Speed Controller, and One Laser Jet 2100TN printer is located in the lab.
ZEC 17C	ECEN 459, 460	12 stations consisting of 3 Core 2 Duo systems and 9 Pentium 4 3.4 GHz systems with 5 SEL 421 Protection Automation Control relays and 7 SEL 551C Overcurrent Relay Reclosing Relays. 6 stations with the following equipment: Hampden T-100-3A Three Phase Transformer, Hampden BPS-103A AC-DC Power Supply, Hampden RL-100-3 Resistance Load, HP 54600B Oscilloscope, Hampden IL-100-3 Inductance Load, Hampden SM-100-3 Synchronous Machine, Hampden DM-100A DC Machine, Hampden HPT-100A Digital Photo Tachometer, Hampden VT-100A Variac, and One Laser Jet Printer is located in the lab.
ZEC 20AB	ECEN 338	6 stations consisting of 5 Pentium 4 2.0GHz systems and one Pentium II 350MHz system, each with custom made software. Three stations have the following equipment, HP 6236B Power Supply, Wavetek 188 Function Generator, and various Hampden equipment such as motors, controllers, loads, frequency units, and AC-DC Power Supply. Four stations have Tektronix TDS 340A Scopes. Several hand held instruments, such as multimeters, current clamps, and high voltage probes.

(continued)

Table VII.4: (continued)

Location	Principal Usage	Description
ZEC 100LA	Open Lab	10 Computer stations equipped with Intel Core2 VPro computers, a 17-inch wide screen monitor, and associated software. An HP Laserjet 9050DN printer is in the lab.
ZEC 111A	Open Lab	Additional portable equipment is supplied and available for long-term checkout from the Instrument Room. An HP Laserjet 8150DN, two HP ScanJet 5200C scanners, two Pentium 4 2.0GHz computers with a CD Writer installed and 2 computers with Core 2 Duo processors, two Data Display units on carts, one 3M MP7740i and one Infocus LP755 and a 3M datadisplay unit in a carrying case for presentation purposes are in the lab.
ZEC 111B	ECEN 403,404,405	16 stations, each equipped with a Core 2 Dup computer with GPIB interface and technical software, and the following equipment attached physically to the work bench: Protek 3040T Triple DC Power Supply, Agilent E3630A Triple Output DC Power Supply, Instek GDM-8245 Dual Display Digital Multimeter, Tektronix TDS-2014B Oscilloscope, Agilent 33220A Function Generator, and an HP 4200N are also located in the lab. There are also 4 other stations with the following equipment: eight Weller WRS1002 De-Soldering Stations, and eight Weller WES51 Soldering Stations.
ZEC 111C	ECEN 403, 404, 405	8 stations, each equipped with a Celeron 2.53 GHz computer with GPIB interface and technical software, and the following equipment attached physically to the work bench: Protek 3040T Triple DC Power Supply, Agilent E3630A Triple Output DC Power Supply, HP 34401A Digital Multimeter, Tektronix TDS-2014B Oscilloscope, Agilent 33120A Function Generator, and an HP 4200N are also located in the lab.
ZEC 113C	ECEN 325, 326	8 stations, each equipped with a Celeron 2.53 GHz computer with GPIB interface and technical software, and the following equipment physically attached to the work bench, an HP 54600A Scope, HP 3630A Power Supply, HP 33120A Function Generator, HP 34401A Multimeter, NI Elvis II, and an HP 5381A Frequency Counter. A Tektronix 571 Curve Tracer, a Fluke PM6303A RCL Meter and an HP 4200N are also located in the lab.

(continued)

Table VII.4: (continued)

Location	Principal Usage	Description
ZEC 113D	ECEN 214	8 stations, each equipped with a Core2 Duo 3.0 GHz computer with GPIB interface and technical software, and the following equipment attached physically to the work bench, a Tektronic TDS-2014B Oscilloscope, Xantrex HPD 30-10 Power Supply, HP 3630A Power Supply, HP 34401A Multimeter, an HP 33120A Function Generator, a Chroma 63103 DC Electric Load, a Chroma 6312 Mainframe, a NI Elvis System, and a solar panel and wind generator. A Tektronix 571 Curve Tracer, a Fluke PM6303A RCL Meter and an HP 4200N are also located in the lab.
ZEC 115C	ECEN 248	16 stations, each equipped with a Core2 Duo computer with GPIB interface and technical software, and the following equipment attached physically to the work bench, an Tektronix TDS-2022B Oscilloscope, HP 6236B Power Supply, Spartan 3E FPGA Board and an HP 33120A Function Generator. A Tektronix 571 Curve Tracer, and an HP 2100TN printer are also located in the lab.
ZEC 115D	ECEN 449	8 stations, each equipped with a Pentium 4 2.8 GHz computer with GPIB interface and technical software, and the following equipment attached physically to the work bench, Agilent 54622D Oscilloscope, Agilent 1673G Logic Analyzer, Lorex SG6158 Color Day/Night Camera, Digilent Virtex Pro Development Board, Fluke 8840A Multimeter, mpja 14605PS DC Power Supply, and an Hp 4200N Printer is also located in the lab.
ZEC 103		45 stations, each with a 1.66 GHz Pentium laptop computer with technical software attached physically to the station.
ZEC 213A	ECEN 474, 475, 476	20 stations, each equipped with a Sun terminal workstation. The terminals are connected to a SUN Sunfire server that contains the technical software. This lab and server are on its own subnet for better network performance. An HP LaserJet 9050DN printer is in the lab.
ZEC 213B	Open Lab	20 Computer stations equipped with Intel Core2 VPro computers, a 17-inch wide screen monitor, and associated software. An HP Laserjet 9050DN printer is in the lab.
ZEC 213E	Open Lab	13 stations, each equipped with a Dell Precision workstation running RedHat Linux and technical software. An HP 9050 Laserjet is located in the lab.

(continued)

Table VII.4: (continued)

Location	Principal Usage	Description
ZEC 309A	ECEN 452	5 stations, each with microwave frequency signal generators, counters, power supplies, HP 415D & E SWR meters, model 5-542C microwave amplifiers, General Radio oscillators, and specialized equipment. A 486 computer, 2 Tektronix 922 Scopes, Stepper motor controller, HP 6642A DC Power Supply, HP 437B Power meter, and various Frequency meters, Directional couplers, Tuners, and Detector mounts are in the lab.
ZEC 317	ECEN 47, 6882	5 stations containing semiconductor-processing equipment including photo resist spinners, wet etcher, dry etcher, mask aligner, and equipment for process and electrical characterization.
ZEC 317A	ECEN 472, 688	6 SUN Ultra5 SPARC Workstations with Ssupreme software for processor design.
Laboratory Space in H.R. Bright Building		
HRBB 203	General teaching, open-access after class hours	22 HP dc7900 with 4 GB RAM, 160 GB HDD, 256 MB ATI video cards, and 19” displays. The lab includes whiteboards and a screen with a projector that can be driven from one ofthe classroom computers.
HRBB 217	CSCE 462	10 x Dell Optiplex 740 workstations, 2GHz (AMD AthlonX2 3600+), 2GB RAM, 80GB HDD , Agilent 100MHz 54622A oscilloscope , Agilent 20MHz 8111A function generator , 3 x Agilent 100MHz 54601A oscilloscopes , BK Precision 5MHz 4011A function generator , 30 Cypress PSoC kits, 20 Digilab 3S FPGA, 20 LCD unbuilt, 8 LCD built, 6 temperature-controlled soldering irons, 20 sets of hand tools, 18 power supplies, etc.
HRBB 218	CSCE 483	12 x Dell Optiplex 740 workstations, 2GHz (AMD AthlonX2 3600+), 2GB RAM, 80GB HDD , 2 x Agilent 200MHz DSO3202A oscilloscopes, multiple power supplies, soldering stations, etc.
HRBB 220	sketch-recognition classes	11 Gateway M285-E 14” Tablet PCs (Laptops) with 2GB RAM, 40GB HDD, CD-RW/DVD, 13 Centiq 21UX touch sensitive LCD monitors.
Laboratory Space in Reed-McDonald Building		
RDMC 111 A	General teaching, open-access after class hours	23 Dell Optiplex 620 with 3GB RAM, 160 GB HDD, onboard video, and 19” displays. The lab includes whiteboards and a screen with a projector that can be driven from one ofthe classroom computers.
RDMC 111 B	General teaching, open-access after class hours	21 HP dc7900 with 4 GB RAM, 160 GB HDD, 256 MB ATI video cards, and 19” displays. The lab includes whiteboards and a screen with a projector that can be driven from one ofthe classroom computers.

(continued)

Table VII.4: (continued)

Location	Principal Usage	Description
RDMC 111 C	General teaching, open-access after class hours	35 HP dc7900 with 4 GB RAM, 160 GB HDD, 256 MB ATI video cards, and 19” displays. The lab includes whiteboards and a screen with a projector that can be driven from one ofthe classroom computers.
RDMC 111 H	General teaching, open-access after class hours	28 Dell Optiplex 620 with 3GB RAM, 160 GB HDD, onboard video, and 19” displays. The lab includes whiteboards and a screen with a projector that can be driven from one ofthe classroom computers.
RDMC 111 J	General teaching, open-access after class hours	45 HP dc7900, with 4GB RAM, 160GB HDD, 256MB ATI Video card, and 22” widescreen LCD display each. The lab includes whiteboards and a screen with a projector that can be driven from one ofthe classroom computers.

One of the main benefits of an instruction at a leading research institution is the leveraging of advanced research resources for day-to-day teaching. Both in the CSE and the ECE departments, faculty who teach courses like to use their research lab equipment to supplement instruction in particular classes. As one example, Dr. Chai uses his Motion Capture Laboratory occasionally for assignments in his undergraduate graphics course (CSCE 441) to let students have a chance to use 3D motion capture equipment.

VII.C Resources and Support

VII.C.1 Computer Resources, Hardware and Software used for Instruction

VII.C.1.1 Institutional Facilities

Texas A&M provides first-class instructional computing facilities, with excellent access to computing and Internet resources, a large number of open-access laboratories, and a first-class supercomputing infrastructure that is available for teaching and research.

It must be noted that the CE Program is particularly fortunate, as it can count Dr. Pierce Cantrell, Associate Provost for Information Technology at Texas A&M, among its faculty. Indeed, Dr. Cantrell is on the Computer Engineering Coordination Committee, thus providing an ideal contact point for the Program's questions and concerns regarding institutional facilities.

Full access to computing and Internet resources - Students have full access to e-mail, personal web pages, and use of the Internet through **Computing and Information Services** (CIS, `http://cis.tamu.edu`). An **e-mail** server known as Neo provides a high-availability service supporting e-mail and directory service protocols (POP, IMAP4, Web access to e-mail, and LDAP). A dedicated web server supports personal web pages. Another server complex provides instructional web services including WebCT. For **personal web sites**, `people.tamu.edu` allows authorized Texas A&M users to publish a personal web page. All students and faculty can create a web page on `people.tamu.edu`. Network-accessible home directory space (40 MB/student) is provided for all students with dual access from either UNIX or microcomputers.

Open Access Computer Labs - Open Access Computer Labs (OAL) provides a wide range of computers, software, scanners and printing available up to 24 hours per day across campus. After activating their OAL account, students, faculty and staff can also access 1 GB of storage space to save files or create a web page. Staff access is determined by their department. Numerous supported labs are located across campus, including OAL computers in the University Libraries, to better serve the academic and instructional needs of the University. All lab resources can also be accessed off campus using the Virtual Open Access Lab (VOAL). Smart classrooms and video workstations are available in most labs.

Supercomputing - The Texas A&M University Supercomputing Facility (`http://sc.tamu.edu`, operated by CIS, is dedicated to providing the hardware, software, support, and related services needed by Texas A&M faculty and students for their research and educational needs. The hardware supported by the Supercomputing Facility includes a 324-node (2592 cores) IBM iDataplex Cluster with 120 TB disk storage, a 52-node (832 cores) IBM p5-575 cluster with 1,632 GB of memory and 20 TB of RAID storage, a Sun x4170 archive system with 28 TB (as of January 2010) of storage. Undergraduates have access to these machines upon request by a faculty member for either an entire class or individual projects.

VII.C.1.2 Departmental Facilities (CSE)

Most of the PCs in the teaching laboratories in HRBB and RDMC run Windows XP Professional 32bit SP3 with current patches. The installed software comprises 7zip, Active Python 2.5, Active TCL 8.5, Adobe Reader 9, Emacs 21.2.1, Eclipe SDK 3.4, Forefront Client Security (Anti-malware), Ghostscript 8.14/GSView 4.6, GLUT, Java JDK6, Notepad++ 5.4.5, Office 2007, PCSpim Version 7.2.1, PSPad 4.5.3, Putty 0.60, Thunderbird 2.0.0, TortoiseSVN 1.6.4, VIM, VirtualBox Version 2.1.2, Visual Studio 2008 (Team Edition), VLC Player 1.0.1, WinSCP 4.1.6, WinShell for TEX 2.2.1, and X-Win32 9.0.

The CSE department maintains several servers that students and faculty have remote access to. These include NetApp devices that provide storage (30 TB worth of usable disk space), 14 Dell PowerEdge servers (R710, R610, 1950, 2850, 2650), and 21 Sun servers (T2000, v440, v240, v210).

Every student is given 2GB of quota on a department file server. This data is backed up regularly, including hourly, nightly, and weekly snapshots. In addition, students are given access to 500GB of scratch space on the secondary departmental file server, and have limited use of lab hard drive space for scratch data.

The CSE department also has two special-purpose machines available for remote use: an 8-node linux cluster, and a recently added GPU-based computer (8 Intel cores, 12GB RAM, 8 GPUs providing 1024 GPU threads, 12GB video memory).

The servers are configured to support remote access for a variety of services. This includes an SVN server, web hosting, interactive Unix servers for both "low" and "high" CPU usage, scratch disk space, backed up disk space, and typical standard services (mail, VPN, printing, etc.). The Unix servers include a very large set of software, too extensive to list here, including all of the standard compilers and utilities often available for Unix/Linux systems. Among the additional software provided on the Unix machines is the Sun Studio suite, Mathematica, Adobe Acrobat, and Matlab.

Supported software for the linux cluster is Mathematica, Matlab, and Hspice.

Students also have free individual access (i.e. can download their own copies, free) of almost all Microsoft products, by virtue of the Departments participation in the Microsoft Developers Network Academic Alliance; all students enrolled in department courses have been added to the subscription. This includes important products that may be used for classes, including Visual Studio, SQL Server, Windows Server 2008, etc.

Printer support is provided, and student printing is paid for primarily by student fees. Printers are updated frequently (currently, all printers are new) and are located on every floor of HRBB and in the open access lab in RDMC.

VII.C.1.3 Departmental Facilities (ECE)

The Electrical and Computer Engineering Department has 198 Microsoft Windows based computers, 13 Linux machines, and 20 Sun Solaris based systems spread throughout 15 laboratories available for instruction. The software used on the Windows based machines include: Matlab, MS Office, National Instruments LabVIEW, Code Composer, PSim, PSSE, PSpice, Electronic Workbench, Agilent Waveform Editor, Altium DXP, Symantec Antivirus, SSH, HP Benchlink Suite, Xilinx, ETAP, Cygwin-x, Putty, Stateye, and Ghostview. The Windows based machines are on a Novell network where the students have home directories for their data. The PC labs are maintained using a REMBO server which re-images each PC every time it is rebooted, insuring the student has a properly functioning system every time they log on. There is a dedicated printer located in every teaching and open lab.

The PC labs utilize 4 Novell servers which include 2 clustered servers that hold their home directories for high availability.

The UNIX based machines use software that includes: Cadence, HSpice, Ssupreme, and Matlab. There is a dedicated printer located in each lab. There are 7 UNIX servers which handle authentication, printing, and data simulation.

VII.C.2 Equipment Planning, Acquisition and Maintenance

VII.C.2.1 Institutional Facilities

The university-wide resources are maintained by the University's Department for **Computer and Information Services** (CIS). CIS has a large organizational structure, consisting of an executive director, with seven associate directors in charge of individual aspects of CIS (e.g. one in charge of Open Access facilities, and another in charge of Networking and Information Security). CIS also supports several campus IT functions not directly related to instruction.

For the **Open Access Labs** (the primary portion of CIS used by our students, directly), budgeting is handled by a steering committee. The steering committee consists of representatives of students (graduate and undergraduate), faculty, and CIS members. The committee takes requests gathered by either committee members or submitted by students (or others) to CIS. It examines these requests yearly for capital purchases and sets the capital budget. The policy is for all PCs to be on a three-year refresh cycle, so one-third of all PCs are replaced yearly (though the specifications for the new PCs must be determined each year). There is also an operating budget set on a year-to-year basis as part of the overall university budget; there is less decision-making for this budget, but some input is provided by the steering committee.

All Texas A&M students pay a Computer Access Fee (currently $24.16 per semester hour), which is used exclusively to support "equipment and services for student access to computing, networking, and student administrative computing." These funds are used for purchasing instructional and lab computing equipment university-wide, as well as limited personnel support (e.g. for individuals maintaining the campus instructional equipment; not for teaching assistants or instructors). Besides maintaining existing computing equipment, proposals can be submitted and are reviewed competitively for the use of these funds to support purchase of additional instructional equipment. All Texas A&M students also pay a Software Licensing Fee (currently $1.25 per semester hour) that is used for the software licensing process that allows all students to obtain versions of many software products. There is an additional charge for the cost of distribution of physical media (CDs) containing the software (e.g. $20 for Microsoft Office). These sources pay for much of the general computing and instructional equipment available for students.

The Supercomputing Center has a steering committee that sets policy, reviews requests for use of the cluster machines, and plans hardware acquisition. The Immersive Visualization Center has a director who manages the resources contained there.

VII.C.2.2 Departmental Facilities (CSE)

Laboratory equipment for department labs is handled through the departments Computing Services Group. The process for planning, acquiring, and maintaining all systems is centered around the head of CSG. The head of CSG makes the final decision on these issues, based on input from faculty, students, and CSG staff.

Currently, departmental machines are targeted for a 3-year refresh cycle. Requests for particular software are generally submitted by faculty or CSG staff. Software is acquired on an as needed/requested basis, subject to the CSG head'sdetermination of adequate funding. Generally, all software with reasonable cost and with instructional value is purchased, following such requests. The CSG head likewise evaluates the adequacy of current hardware for existing instructional needs and in order to keep up with common computing practice. For instance, current lab systems are purchased with the intention of them being able to run the latest Microsoft OS well, while supporting Visual Studio and other IDEs. Recently, all student-accessible machines were upgraded to 64-bit hardware.

Lab machines are generally purchased via the CIS bulk purchase agreement with various vendors. This allows the department to leverage the buying power of the University, greatly reducing costs for lab purchases. Occasionally lab machines are obtained directly from CIS at no cost, when available. The budget for instructional equipment is obtained primarily through course fees. Students are charged up to $170 per class in fees. These fees can be used to cover teaching assistants, printing, presentation systems (projectors, screens, A/V equipment) in classrooms, lab PCs, open-access lab PCs, support staff, and all other hardware and software.

Servers and general CSG functions are funded through the department and fee accounts. The ratio of funds from each account depends on the ratio of student use and faculty/staff use. The department has also received generous equipment grants from various industry partners (e.g. a recent donation of several servers and GPU nodes from Chevron), which are incorporated into the department resources.

Faculty and students can submit requests and suggestions to CSG, either directly to staff or through a CSG-maintained wiki. Needs are assessed continuously by CSG, and it is the responsibility of the CSG head and staff to ensure that equipment is being obtained and maintained appropriately. The assessment of the performance of CSG is made by the department head as part of the annual staff review process. The existing procedures used for obtaining and maintaining department equipment have been adequate.

VII.C.2.3 Departmental Facilities (ECE)

The Electrical and Computer Engineering department has several schedules for replacement and maintenance of laboratory equipment, depending on expected equipment life and lab usage. Oscilloscopes, multimeters and other sensitive measurement equipments every five years, and standard items such as power supplies are replaced approximately every seven years. Each semester all students taking undergraduate labs are asked to fill out a lab evaluation questionnaire, which is used to determine which laboratory is in need of an equipment upgrade, and ensures that the existing equipment is adequate, to perform each specific laboratory experiments.

At this time we are in the process of replacing 8 HP 54600, 2-channel scopes in room 113C with new TDS 2024B 4-channel, color Tektronic scopes, adding 12 additional 177 Fluke meters in room 017C, replacing 96 chairs in all the open lab rooms, and replacing all the blackboards in our laboratories with white dry erase boards.

At the end of each semester, the Instrument room staff will go through each piece of electronic equipment, in every laboratory room, and verify it is operating correctly, and is within the manufactures calibration specifications.

VII.D Student Access

VII.D.1 Institutional Facilities

Open Access Computer Labs Lab hours at the CIS-run open access labs vary by lab and by schedule. During a normal week, the Student Computing Center is open 24 hours a day, the Wisenbaker lab from 7:30 a.m. to 10:00 p.m., and the Blocker lab from 7:30 a.m. to midnight. Hours at all labs are reduced on weekends and during breaks/holidays, and some labs have reduced hours in the summer.

CIS also offers its Virtual Open Access Lab (VOAL), discussed earlier, which allows students to remotely access the software and computing power that would be available within an open access lab.

Campus Network The campus network supports over 35,000 Ethernet connections in 140 buildings and is operated by CIS. All residence hall rooms have a network connection per resident (10,500 connection total), and all 222 centrally administered classrooms have also been equipped with a network connection since 1997. There is still a mix of 10 Mbps shared and 100 Mbps switched Ethernet connections. Wireless Internet access is also available all across campus.

Texas A&M is a member of Internet2 and is connected to its high-speed Abilene network via a second OC3 that connects to the Texas GigaPoP in Houston. This same circuit transports intranet traffic on a statewide backbone jointly operated by the UT and A&M Systems. Planning is underway to construct a statewide fiber optic network.

Off-campus access to the network is supported by VPN. For those wanting high-speed access, TAMU and Verizon provide Digital Subscriber Line services for additional cost to students, faculty and staff. A high-speed Network Access Point connects the university directly to the local cable modem provider, and Virtual Private Network hardware allows off-campus users with any internet service to have the same accessibility as on-campus users.

VII.D.2 Departmental Laboratories

As indicated above, the computing facilities and laboratory equipment utilized by the students in the program is housed in various laboratory rooms. To provide a summary of the accessibility of these facilities, the utilization and access policies of each of the laboratory rooms will be described below.

Open and General Laboratories (CSE) - Lab hours for those laboratories not requiring id card access are: Mon-Thu: 7 a.m. to Midnight, Fri: 7 a.m. to 6 p.m., Sat: 10 a.m. to 7 p.m., and Sun: Noon to Midnight. During these hours our Helpdesk is staffed with two lab operators who are responsible for helping our customers (faculty, staff, students). When the Helpdesk is not open, the Open Access labs and some of the general Teaching labs are accessible via ID card authentication. Network connectivity to Unix and Windows terminal services is available via VPN for off-campus students and via Ethernet for on-campus students (provided to the campus from the University's Computing and Information Services organization).

Specialty Laboratories (CSE)- Specialty laboratories (i.e., for CSCE 462 and 483) are open via numeric keypad access all hours 24/7. In the specialty laboratories, the network access situation is necessarily somewhat different, as there is specific hardware to be connected to the computers. In CSCE 462 and 483, the students can access the file server in the laboratory and compiler their programs on it from their dorms or off campus, but, for safety reasons, they cannot run their programs on the machines connected to external hardware without being in the laboratory.

Open Access Labs (ECE)- Lab hours for those laboratories not requiring id card access are:
Summer Semester: Monday thru Friday 8:00 AM - 5:00PM closed Saturday & Sunday
Spring & Fall Semesters: Monday thru. Friday 8:00 AM - 9:00 PM, Saturday 8:00AM - 5:00PM, Sunday Closed.

Open and General Laboratories(ECE)- Labs are open 24 hours 7 days each week and are accessed via a combination lock.

Specialty Laboratories(ECE)- Specialty laboratories (i.e., for ECEN 405) are open via numeric keypad access all hours 24/7.

VII.E Documentation

VII.E.1 Institutional Facilities

Students have easy access to support for computing issues. There are fully staffed help desks located in each of the Open Access Labs, and CIS Help Desk Central provides students with 24-hour a day telephone support. For students, training in the use of technology is often integrated into the syllabus of formal academic classes. In addition, Computing and Information Services offers a full slate of free non-credit short courses (`http://shortcourses.tamu.edu`) each semester. Topics include general microcomputer use (Word, Excel, PowerPoint, Access, Photoshop, EndNotes), SAS, UNIX, and web related tools (e.g. DreamWeaver, Flash). In addition, the Supercomputing Center offers a number of short courses related to the operation of the supercomputing infrastructure, such as Unix, operation of the SC clusters, Basic Code Profiling, Introduction to OpenMP and MPI, and others.

VII.E.2 Departmental Laboratories (CSE)

For the open and general purpose laboratories, documentation is available online (The helpdesk wiki `wiki.cse.tamu.edu` has over 130 entries) and at two helpdesks. The helpdesk are staffed with two lab operators each. The opening hours for the helpdesk in the H.R. Bright Building are Monday-Friday 7:30AM-6:00PM. The helpdesk in the Reed-McDonald Building is open Saturday and Sunday 2:00PM-6:00PM, Monday 7:30AM-12:00PM and 2:00PM-6:00PM, Tuesday 7:30AM-2:00PM and 4:00PM-6:00PM, Wednesday and Thursday 7:30AM-6:00PM, and Friday 7:30AM-11:00AM and 2:00PM-6:00PM.

For CSCE 462, most documentation is online, including the lab manual, lab assigments, etc., on the class Web site. There are also user manuals in the lab. Most all parts manuals, etc., are now online.

For CSCE 483, there is extensive documentation available, mostly online. Examples of such information include tutorials and assignments on floating point gate arrays, LabView software and tools, Specifications and pin configuration of ICs Discrete components, syllabus, laboratory rules, safety rules, and resources for programming in HDL, all of which are also available in the laboratory. Also in the laboratory are documents on Micro processor boards, in house developed Processor IP Core assembler and compiler, and previous project reports.

VII.E.3 Departmental Facilities (ECE)

All documentation for all software is located either online or locally on the computers in the lab.

VII.F Faculty Access

VII.F.1 Institutional Support

In addition, the **Instructional Technology Services** (ITS) group manages a number of technologies that can be used to augment teaching. These are available to all faculty who wish to incorporate them into their classroom setting, and support and training for all technologies as well as about instructional techniques is provided. Use of ITS services is at the choice of individual instructors. Among the technology supported by ITS are: eLearning, a university-wide management system for handling course material (including grades) in a hybrid or completely online manner; Wiki and Blog services; Plagiarism detection and citation services; a Second Life virtual campus; A/V capture, editing, and streaming; tools for building and offering online testing and instruction; a system for calibrated peer review for assessing student writing; tablets and smart boards; and student response systems (clickers for students to give feedback during large lectures).

The university has a workstation program in which faculty members can obtain partial funding for updating their office workstations every 3 - 4 years. Departments are expect to cost share this in some manner.

VII.F.2 Departmental Support (CSE)

Faculty have a mix of PC and Unix computers in their offices and are connected via 10/100/1000 Ethernet connections to the departmental computing resources. New computer systems are available every four years via a university-wide **Faculty Workstation Program**. Software for Microsoft Office, MSDN subscription and Adobe Acrobat are provided. Specialized software such as Rational Suite and Matlab are provided either on faculty office machines or through network accessible departmental machines.

For the specialty laboratories, faculty generally have to go to the laboratory to get access to the equipment, though in a couple of cases, some limited capability is available outside of the instructional laboratories.

In the case of 462, one of the faculty has duplicated most of the equipment in his research laboratory and can develop materials there.

VII.F.3 Departmental Support (ECE)

Faculty have a mix of PC and UNIX computers in their offices which are connected via 100MB/s Ethernet. New computer systems are available every 3 years via a university-wide Faculty Workstation program.

VII.G Support Personnel

VII.G.1 Institutional Facilities

The University's Computer and Information Services (CIS) provides extensive support staff to maintain the campus open computing labs, the supercomputer facilities and the campus network, along with their 24/7 helpdesk services. Overall, there are about 200 full-time CIS employees, supplemented by about 250 student workers. CIS staff is sufficient to handle existing CIS services.

VII.G.2 Departmental Laboratories (CSE)

The department is supported by the Computer Services Group (CSG, `http://www.cs.tamu.edu/department/groups/csg`). CSG consists of one IT manager (Aaron Palermo) and five full-time staff: one unix admin, one web/network administrator, one windows admininistrator, one helpdesk manager, and one facilities coordinator who also oversees shipping and receiving for the department. In addition, there are 10 student workers, working a maximum of 20 hours per week, who work with CSG in these areas.

The amount of computer support staff is sufficient to the task.

For the open and general purpose laboratories, the faculty are not expected to provide significant support or development. In the case of the specialty laboratories, however, the introduction of new experiments, equipment and software, is preceded by faculty involvement in the development. Often, GANT support is provided to support this.

VII.G.3 Departmental Laboratories (ECE)

There are two 100% budgeted support staff members and three graduate students available for maintenance of the computers in the teaching labs, open labs and servers. They consist of one Computer Systems Manager, one Senior Systems Administrator, and three GANTs. At times there is also one undergraduate student worker as needed.

Two full-time electronic technicians, with 45 years of combined experience in electronics troubleshooting, provide maintenance and service on all laboratory equipment. The technical work area is located adjacent to the labs in room ZEC 111A. An open atmosphere is encouraged between students and the technical staff, allowing students to freely talk and consult with the staff. Each of the technicians has their own personal phone and e-mail address to make it convenient for students to access them. An average of three Electrical Engineering students are employed each semester to aid in weekly laboratory experiment set-ups as required. The student workers also assist in component checkout, repair of test leads, and other testing accessories.

CRITERION VIII: INSTIT. SUPPORT AND FINANCIAL RESOURCES

Support to the program, in form of professional development, facilities, and support personnel is provided to the CE Program at departmental level, i.e., through the CSE Department and the ECE departments. Many aspects are handled uniformly across the departments. Wherever this is not the case, we will give the CSE- and ECE-specific information separately in the following description.

Whenever not further specified, the figures given in this section are for the home departments, and not limited to the CE program only. This is because partitioning some of the support figures for laboratories or courses would be artificial.

VIII..4 Budget Process (CSE and ECE)

The budget allocation to the departments is made by the Dean of Engineering. There are two components to the budget: salary funds and operational funds. The budget allocation is generally done on a historical basis and in an incremental form. When a faculty position is made available to the department, the college allocates to the department an additional amount of money proportional to the level of the position. When a faculty member leaves the department, the corresponding salary goes back to the college, which may reallocate the funds back to the department to hire a replacement at the department heads request. Any shortfall in allocated salary or operational funds is covered by research incentive funds obtained from research expenditures on externally funded projects and other sources, such as gift funds. Currently the department retains 54% of the overhead on funded projects (which at Texas A&M is 46.5% of eligible expenditures). Half of the overhead return funds are returned to the department monthly as they are generated through research expenditures and the other half is provided to the department in a lumped sum as a "base allocation" at the beginning of the next academic year in which they were collected. Base allocation funds are fringe bearing (the state pays fringe benefits) and are thus very suitable for salaries. As such they are used to cover any shortfalls or to hire additional staff and otherwise enhance the academic quality of our programs.

VIII..5 Institutional Support, Financial Resources and Constructive Leadership (CSE and ECE)

There is adequate institutional support and sufficient financial resources to achieve the objectives of the Computer Engineering program. The primary institutional support comes from the gold plate budget to support the salaries of faculty, staff, teaching assistants and general operation. This is augmented by the fees, Equipment Access Fee, Instructional Enhancement Fee and the Graduate Enhancement Fee (see Section VIII..7).

Another source of financial support is endowments in the form of chairs, professorships, fellowships and scholarships. The ECE department currently has 16 endowed positions with another to become available soon. The current market value of endowments for undergraduate scholarships is around $2.0 million, which would generate approximately $100,000 income for distribution to students. The income from endowed chairs and professorships is used to support the facultys educational, research and development activities. The CSE department has a very active **Industrial Affiliates Program** (IAP). In Year 09-10 the IAP counted has 21 corporate members, which contribute a total of $150,000 in membership fees per year. These funds are used to sponsor student scholarships (for a total of 52 $1,500 dollar scholarships in Year 09-10.) Another portion of these funds is made available to support student research activities (student travel to conferences is a common use) that might not have other sources of funding available. IAP funds are administered by a faculty committee.

The faculty holding endowments support graduate and undergraduate students enriching the educational experience of the program. In addition to the scholarships from endowments, one-time scholarships are also provided from the gift funds from the industry and the alumni. Using our gift funds, scholarships are also given every year to involve the undergraduate students in the research activities in the department so as to enrich their educational experience. Both departments have 3-year NSF REU Site grants that provide funding for students to engage in research activities during the summer.

Much attention is paid to recognition of scholarly activity. Faculty is encouraged to attend and to present papers at professional society meetings, symposiums and conferences, and to publish their research results in scientific journals and conference proceedings. The department makes a strong and consistent effort to nominate faculty members for teaching, research and service awards. The college and university provide numerous internal award programs for this type of recognition, and the department seeks out external award programs through professional societies and foundations as well. Nearly all of these awards carry generous stipends for use by the awardees.

Funds are also generated through external grants for laboratory and instructional development. An example is a current Texas Workforce Development grant, for which both departments have this grant. These grants typically enjoy significant cost sharing from the department and the College.

The leadership in both departments have tried to ensure that the resources are used constructively to support the instructional process. In particular, these resources have been used to accomplish the following objectives:

- Keep the teaching load of tenure track faculty to 3 courses per academic year and those of lecturers to 3 courses per semester. This is a reasonable course load that gives the faculty time for performing their instructional responsibilities as well as other professional development activities. In addition, adequate release time is provided for special assignments like the Associate Department Head, Graduate Advisor and ABET Coordinator.

- All efforts are made to keep class sizes less than 50. Some class sizes can become large because of demand in certain areas. In these situations, a graduate assistant is provided to provide additional help for the students. The additional 18 positions allocated to the department of electrical engineering will further help reduce the class size.

- Both departments have help desks operated by graduate students or senior undergraduate students has been introduced and found useful.

- Graduate student assistant support is provided to the faculty to develop new labs or substantially revise the labs.
- Reduced teaching load may be provided for substantial revision and coordination of certain classes like ENGR 111, ECEN 214 and ECEN 314 and ECEN 325.

VIII..6 Faculty Professional Development (CSE and ECE)

The College of Engineering and University strongly support a Faculty Development Leave program where faculty can apply for leave for one semester, or one academic year. They are allowed to retain 100% of their salary for a one-semester leave, and 50% of their salary for a two-semester leave. In addition some funds are provided for travel and incidental expenses. Generally we have been able to accommodate all who wish to pursue this opportunity in a given year. Texas A&M also offers a Faculty Abroad Program to all faculty members. Consulting and outside employment are also allowed, with prior permission from the Dean of Engineering, up to a maximum of one day per week.

In addition to this program, other sources of support are available to faculty which helps support their professional development. Twenty five percent of the indirect earned on projects is given back to the PIs. These are discretionary funds that can be used by the faculty for their professional development including such things as society membership fees, travel to conferences, etc.

For new hires, lighter teaching loads for first two years, research support for the first two summers and attractive start up packages are provided to help them get off to a productive start on their professional careers. The recent success of some of our younger faculty indicates that this level of support is adequate to allow new faculty to succeed.

The University provides support to faculty by providing teaching workshops through the Montague Center for Teaching Excellence. Faculty members are encouraged to attend these free sessions. A program for faculty is also offered through Computing and Information Services that provides free instruction on several software packages used for online instruction. In fall 2002, the university began offering grant writing workshop sessions to interested faculty.

VIII..7 Support of Facilities and Equipment

VIII..7.1 CSE Department

There are three faculty administrators in the department. Dr. Valerie Taylor serves as head of the department and is responsible for the overall administrative duties of the department. She holds a twelve-month appointment at 100% time, and the vast majority of this time is devoted to her administrative duties. Dr. Donald Friesen is associate head for academics and is responsible for assigning teaching schedules, tracking faculty loads, submission of current course information to the University, and handling advising and other student issues. He also substitutes for the head when she is absent. Dr. Friesen holds a twelve-month appointment at 100% time, and is required to teach two courses per year.

In addition to these three full-time faculty positions whose majority of time is dedicated to administration, there are three full-time staff members overseeing the administrative, accounting and computing areas. They provide administrative assistance to and in coordination with the administrative faculty. The cumulative efforts of these individuals provide more than adequate time for proper administration of the program.

In order to maintain laboratory facilities for our academic program, the university administers two types of fees to students: the Engineering Equipment Access Fee (EEAF); and the Instructional Enhancement Fee (IEF). The EEAF is a set fee of $70 per course, with a maximum charge of $210 per student, per semester. The IEF is course specific (up to $170 per course in 2009,) based on enhancements for that specific course, and determined at the department level. Both fees are administered to the department by the College of Engineering, and funds are utilized based on budget projections and essential needs. The EEAF provides general funds for laboratory facilities, while the IEF funds allow us to tailor the fee to the resources required. The department routinely supplements support personnel for laboratory maintenance and help desk assistance (undergraduate and graduate student personnel), and some donor funding has been received specifically for improvement and establishment of instructional and research laboratories. Any deficiencies in departmental laboratory facilities are brought to the attention of upper administration by the department head.

As previously described in Chapter VII (Facilities) the departmental facilities and resources consist of six PC labs with Windows 2000/XP, four of them are scheduled for teaching lower level courses, and two others are open access labs which are available for any Computer Science student. UNIX servers are accessed from PC labs or from other systems. There are also specialty labs used for computer engineering senior project courses, virtual network engineering. All of them except the virtual network lab are available to undergrads, and they are financed by the EEAF (Engineering Equipment Access Fee) and CAF (Computer Access Fee).Some teaching is also done in the virtual network engineering lab, but it is not financed by EEAF fee. All systems are connected by Ethernet to departmental servers (LAN), and via gateways to the campus backbone (WAN).

All lab computers are replaced on a 3 year cycle and all systems come with three year warranty included in the purchase price. Maintenance of an EEAF-purchased system for teaching is continued for its entire life. The older systems are often used for special class projects or for light-duty use such as DNS servers until they break.

The PC labs are adequate because they are supplemented by the University open labs. Students now are satisfied with printing quota and disk space on departmental computers. However, there is a trouble with providing appropriate support to junior and senior more specialized courses because there is no sufficient budget to buy required hardware and software. But donations from industry for these courses provide some help.

VIII..7.2 ECE Department

The Electrical Engineering department has several schedules for replacement and maintenance of laboratory equipment, depending on expected equipment life and lab usage. All proto-boards are replaced annually. Laboratory computers and data acquisition cards are replaced every three years. Oscilloscopes, multimeters and other sensitive measurement equipments every five years, and standard items such as power supplies are replaced approximately every seven years. Each semester all students taking undergraduate labs are asked to fill out a lab evaluation questionnaire. The question forms are collected and distributed to the staff and department administration. In subsequent meetings all complaints are investigated and adjustments are made to improve equipment maintenance and performance. The department views the software provided to the students as a part of the regular equipment inventory. All software, including for example Matlab and Cadence is updated annually. Any software requests are reviewed by at least two faculties with the goal of determining usability and value within the Electrical Engineering and Computer Engineering curriculum. Currently the department maintains approximately eight major software packages and numerous other special application packages, all of which are available in the department Unix and PC labs which are open to students 24 hours a day during the semester. Two staff and three half-time graduate students maintain department computer servers and lab based PC's. Three staff and three part time students are responsible for all other laboratory equipment maintenance, laboratory preparation, equipment checkout and supply, inventory and support facilities.

In addition to the budgeted funds for the permanent support personnel, there are a number of other sources of funds used to maintain and update facilities and equipment. The equipment access fee has been used almost solely for the purpose of acquiring and updating instructional laboratory facilities. The only exception is FY04 due to the budget cut of all departments when part of these funds have been used for support personnel. This has helped us to update and maintain the laboratory facilities.

Industry donations have been sought to update computational facilities and also some other labs. Grants are also obtained and used for updating laboratories. For example, a substantial part of the Texas Workforce Development grant has been used to update the ECEN 214 and ECEN 248 labs.

VIII..8 Adequacy of Support Personnel and Institutional Services

VIII..8.1 CSE Department

The CSE department has adequate staff to meet the needs of the faculty. Secretarial support is provided in the main office area by four staff members; accounting support is provided by four staff members; and advising support is provided by three staff members. Each area utilizes student workers as necessary to provide office coverage and additional support. Office equipment is updated frequently (approximately every three) in order to provide the most up-to-date software and hardware to promote efficiency. This group of staff supports the teaching and research faculty, graduate teaching assistants, graduate research assistants, and both graduate and undergraduate students. This is a large group to support, and the level of support varies greatly from group to group. However, every attempt is made so that services are provided in a timely and efficient manner.

VIII..8.2 ECE Department

There are two full time personnel managing departmental laboratory facilities and two that manage our computing and networking infrastructure. For the laboratories, we have an instrument room supervisor and a technician. Several student workers help our full time staff in running the academic laboratories. For the computer facilities, there is Computer Systems Manager and a Microcomputer Specialist. There are also 3 Graduate Assistants managing various functions and assisting the full time personnel. On the administrative side, there is a Senior Administrative Coordinator and an Academic Business Administrator.

There are three staff members in the front office, including the Assistant to the Department Head, and three in the accounting office. Each group in the Wisenbaker Engineering Research Center (WERC) building is provided with a support staff as they do not have easy access to the front office staff located in the Zachry building. The computer engineering group has an Administrative coordinator as the computer engineering is a shared degree program. In the undergraduate advising office, we also have two academic advising staff, in addition to a Senior Lecturer who also advises students.

VIII..8.3 Summary

Overall, staff support in the departments is adequate and allows faculty and students to perform without sacrifice in academic quality.

VIII..9 Continuity of Institutional Support

The university strives to provide adequate facilities for every program, as well as an atmosphere of "oneness" that is unique to the Aggie spirit. The Dean of Engineering provides support at the college level, and relays further program needs to the upper administration. The Dean of Faculties Office is accessible and provides guidance and advice on matters dealing with faculty members. Examples of consistent institutional support include the annual IEEF fee that is charged per course, with the course feed determined by the department. Further, the university provides opportunities for departments to write proposals to fund new specialty labs or upgrade existing labs. The College of Engineering offers similar opportunities. The department consistently writes proposals for such programs, for which we have been very successful with our proposals over the past few years.

Over the past several years, significant progress has been made in meeting the physical space needs of the Computer Science program, however the issue of sufficient operating budget continues to be a concern for the program, just as with all of the College of Engineering. Traditionally, engineering programs have augmented State appropriations for academic expenditures through the use of overhead return on externally funded research projects administered through the Texas Engineering Experiment Station (TEES). TEES Divisions/Departments, including the CSE and ECE, receive 54% of the F&A/overhead generated on externally funded research projects. Many of the engineering programs continue to use these funds to supplement the State appropriated academic funds in order to meet operating budget requirements.

While the State appropriations for academic expenditures saw slight increases during the past five years, there was a 2.5% reduction in State Appropriations for FY2010 and an additional 2.5% reduction in FY 2011. As a result of this budget reduction, there will be no merit raises for faculty and staff for FY 2011. In order to meet current and anticipated shortfalls in State revenues, the Texas Legislative Review Board (LRB) has directed all state agencies to submit a plan to reduce their budgets by 10% from current FY2011 levels, which have already been reduced by 5% as a result of the previous reduction. This means that the University and TEES must each reduce their state appropriations by an additional 5% for FY2012 and again 5% for FY2013. The University is in the process of planning for this mandated reduction and is also setting aside a merit raise pool for FY2012 and FY 2013, resulting in a total required reduction of $60M. The College's portion of this reduction amounts to $5.5M. The CSE Departments portion of this reduction is $583,869, while the ECE's portion is $792,787. The departments must provide the College with a plan to meet this reduction by July 8, and the College must provide the University with a plan to meet this reduction by July 15. Since TEES is a separate state agency, in order to meet the State's mandate, TEES must also reduce its TEES state appropriation by $2.959M. At this point, it is not known whether this plan will be carried out or whether some revised plan with lesser reductions will be required. The Department of Computer Science is strong and will remain strong. The program will continue to grow in quality and stature and we will not let this reduction stop our forward progress.

Criterion IX: Program Criteria

This section needs to be updated!!

In the following we describe how the ABET program criteria are satisfied by the Computer Engineering curriculum (with a comparison of the "Old Curriculum" and the "Curriculum-2008", and also how these criteria fit into the program outcomes and the assessment process described in Chapter III.

Program Criterion: The structure of the curriculum must provide breadth across the range of Computer Engineering topics.

Old Curriculum The CE curriculum is characterized by a large number of courses across all areas of the CE spectrum (circuits and logic design, architecture, systems, and software), which are complemented by a small number of technical electives. Technical electives can be selected from a "shopping menu" of junior and senior courses.

Curriculum-2008 In addition to a "core" portion of the curriculumn, primarily during the first two years, all students must take 15 hours of junior or senior level courses from at least 2 depth sequences with each sequence requiring at least 2 courses. Having two depth sequences ensures an adequate level of breadth.

Relevant Program Outcome: N/A.
Closing the Loop: Feedback from all constituencies identified no shortcomings with this Program Criterion.

Program Criterion: The structure of the curriculum must provide depth across the range of Computer Engineering topics.

Old Curriculum The CE curriculum is characterized by a large number of courses across all areas of the CE spectrum (circuits and logic design, architecture, systems, and software), which are complemented by a small number of technical electives. Technical electives can be selected from a "shopping menu" of junior and senior courses.

Curriculum-2008 In addition to a "core" portion of the curriculumn, primarily during the first two years, all students must take junior or senior level courses from at least 2 depth sequences with each sequence requiring at least 2 courses. Requring two courses in each depth sequence (in addition to any prerequisites that the student needs to satisfy) ensure an adequate level of depth.

Relevant Program Outcome: N/A.
Closing the Loop: Feedback from all constituencies identified no shortcomings with this Program Criterion.

Program Criterion: Graduates have knowledge of probability and statistics, with applications to Computer Engineering.

All Computer Engineering majors are required to take either STAT 211 "Principles of Statistics" or ECEN 303 "Random Signals and Systems" as a part of their curriculum. In addition, several core and certain elective courses within the Computer Engineering Program also afford the student the opportunity for additional study in probability and statistics.

Relevant Program Outcome: Outcome 1.
Closing the Loop: Some shortcomings were noted early on with regard to this program criterion, in particular with respect to "applications to Computer Engineering". See Section IV for a discussion of actions to correct these shortcomings.

Program Criterion: Graduates have knowledge of mathematics through differential and integral calculus.

Computer Engineering students are required to take a suite of Mathematics courses (see table below) that are designed to impart a detailed knowledge of Engineering Mathematics. Throughout the curriculum mathematical concepts are used in various courses and assignments including the Senior Design course.

Course No.	Course Name	Course Description
MATH 151	Engineering Math I	Rectangular coordinates, vectors, analytic geometry, functions, limits, derivatives of functions, applications, integration, computer algebra.
MATH 152	Engineering Math II	Differentiation and integration techniques and their applications, improper integrals, approximate integration, infinite series, power series, Taylor series.
MATH 251	Engineering Math III	Vector calculus, calculus of functions of several variables, partial derivatives, directional derivatives, gradient, multiple integration, line integrals, Stokes' theorems.
MATH 302	Discrete Mathematics	Formal structures for describing data, algorithms and computing devices; theory and application of sets, graphs and algebraic structures.
MATH 308	Differential Equations	Linear ordinary differential equations, solutions in series, solutions using Laplace transforms, systems of differential equations.
MATH 311	Topics in Applied Math. I	Matrices, determinants, systems of linear equations, eigenvalues, eigenvectors, diagonalization of symmetric matrices; vector analysis, including normal derivative, gradient, divergence, curl, line and surface integrals, Gauss', Green's and Stokes' theorems.

Relevant Program Outcome: Outcome 1.
Closing the Loop: Shortcomings were noted with regard to Complex Variables. We have made minor modifications to ECEN 314 "Linear Circuit Analysis" to enhance students' abilities to use complex numbers. See Chapter IV for a detailed discussion of actions to correct these shortcomings.

Program Criterion: Graduates have knowledge of basic sciences.

All CE students are required to take two semesters of Physics (PHYS 218 “Mechanics” and PHYS 208 “Electricity and Optics”) and one semester of Chemistry (CHEM 107 “Chemistry for Engineers”). These concepts are then reinforced through applications in many courses.

Relevant Program Outcome: Outcome 1.
Closing the Loop: In general, our assessment data indicates that our students do well with respect to this criterion. A problem was identified, however, that affects a small number of our students: Data collected in some upper-level ECEN courses indicates that students’ abilities in Physics might be weak. This may be caused by students not following the recommended curriculum. The EE Department is gaining first experience with an automated system for prerequisites monitoring and enforcement for both EE and CEEN students. Based on the experiences with this system, it may be introduced for CEPN students as well.

Program Criterion: Graduates have knowledge of computer science and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components.

Old Curriculum The engineering science aspects of Computer Engineering are taught with a balanced view of hardware and software. The software engineering science aspects are taught in the courses CSCE 111 “Introduction to Computer Science and Programming”, CSCE 211 “Data Structures and Implementation”, CSCE 311 “Analysis of Algorithms”, and CSCE 410 “Operating Systems”.

The hardware engineering science aspects of Computer Engineering are taught in the courses ECEN 214 “Electrical Circuit Theory”, ECEN 248 “Introduction to Digital System Design”, ECEN 314 “Linear Circuit Analysis”, ECEN 325 “Electronics”, CSCE 321/ECEN 350 “Computer Architecture” and CSCE 462/ECEN 449 “Microcomputer Systems”. Hardware/software tradeoffs are taught in the Computer Architecture and Microcomputer Systems courses. The Computer Engineering program has a capstone design course - CSCE 483 “Computer Systems Design” / ECEN 405 “Electrical Design Lab”. This course covers both software and hardware design. A hardware path to this course comes through the ECEN 248 “Intro Digital Systems Design”, CSCE 321 “Computer Architecture”, and CSCE 462 “Microcomputer Systems” courses, while a software path to this course comes through CSCE 111 “Introduction to Computer Science and Programming”, CSCE 211 “Data Structures and Implementation”, CSCE 410 “Operating Systems”, and CSCE 431 “Software Engineering”. Students work in teams to develop the total design for computer systems from requirements to specifications, to design, to implementation, to testing and documentation. (See Section V.B.2 for details on the culminating design experience.)

The Computer Engineering electives taught in the EE department are focused in the areas of hardware, hardware design and hardware-software tradeoffs. ECEN 454 “Digital Integrated Circuit Design”, ECEN 475 “VLSI Systems Design”, and ECEN 468 “Advanced Logic Design” all concentrate on hardware design. The laboratories associated with ECEN 475 and 468 require students to propose, design and simulate or test significant open-ended designs. Additional hardware design and hardware-software tradeoffs are examined in ECEN 450 Computer Interfacing and Communication. This course has a laboratory where open-ended design is over 66% of the laboratory experience.

Curriculum-2008 The engineering science aspects of Computer Engineering are taught with a balanced view of hardware and software. The software engineering science aspects are taught in the courses

ENGR 112B “Introduction to Programming and Software”, CSCE 113 “Integrated Programming and Design”, CSCE 221 “Data Structures and Algorithms”, CSCE 313 “Introduction to Computer Systems”, and CSCE 315 “Programming Studio”.

The hardware engineering science aspects of Computer Engineering are taught in the courses ECEN 214 “Electrical Circuit Theory”, ECEN 248 “Introduction to Digital System Design”, ECEN 314 “Linear Circuit Analysis”, ECEN 325 “Electronics”, CSCE/ECEN 350 “Computer Architecture” and CSCE 462/ECEN 449 “Microcomputer Systems”. Hardware/software tradeoffs are taught in the Computer Architecture and Microcomputer Systems courses. The Computer Engineering program has a capstone design course - CSCE 483 “Computer Systems Design” / ECEN 405 “Electrical Design Lab”. This course covers both software and hardware design. (A hardware path to this course comes through the ECEN 248 “Intro Digital Systems Design”, CSCE/ECEN 350 “Computer Architecture”, and CSCE 462 / ECEN 449 “Microcomputer Systems” courses, while a software path to this course comes through ENGR 112B “Introduction to Programming and Software”, CSCE 113 “Integrated Programming and Design”, CSCE 221 “Data Structures and Algorithms”, CSCE 313 “Introduction to Computer Systems”, and CSCE 315 “Programming Studio”.) Students work in teams to develop the total design for computer systems from requirements to specifications, to design, to implementation, to testing and documentation. (See Section V.B.2 for details on the culminating design experience.)

The Computer Engineering electives taught in the ECE department are focused in the areas of hardware, hardware design and hardware-software tradeoffs. ECEN 454 “Digital Integrated Circuit Design”, ECEN 475 “VLSI Systems Design”, and ECEN 468 “Advanced Logic Design” all concentrate on hardware design. The laboratories associated with ECEN 475 and 468 require students to propose, design and simulate or test significant open-ended designs. Additional hardware design and hardware-software tradeoffs are examined in ECEN 450 Computer Interfacing and Communication. This course has a laboratory where open-ended design is over 66% of the laboratory experience.

Relevant Outcomes: Outcomes 2, 3, 5, 11.
Closing the Loop: The Spring 2004 outcome assessment gave somewhat mixed indications. See Section III.F.2.1 for details and for actions taken. All current assessment data is satisfactory.

Program Criterion: Graduates have a knowledge of Discrete Mathematics.

Computer Engineering students are required to take MATH 302 “Discrete Mathematics” in the “Old Curriculum” and CSCE 222 “Discrete Structures for Computing” in the “Curriculum-2008”. In these two courses the students are exposed to theory and applications of sets, graphs, and algebraic structures. A number of courses (such as CSCE 311 “Analysis of Algorithms”, but also CSCE 410 “Operating Systems”, ECEN 248 “Digital Systems Design” and others) give students opportunity to apply the concepts acquired in this course.

Relevant Outcome: Outcome 1.
Closing the Loop: Formal assessment data indicates that student performance is adequate for this criterion. The faculty in the CSE department, however, felt that students have difficulty with this material. The new course CSCE 222 “Discrete Structures for Computing” therefore attempts to present the material within more of a computing context. The CECC supports this development, and graduates of “Curriculum-2008” are required to take CSCE 222 instead of MATH 302. We are still collecting evidence of whether this decision improves the knowledge of our graduates of Discrete Mathematics.

APPENDIX A: COURSE SYLLABI

A.A Engineering Courses

ENGR 111B Foundations of Engineering I (1-3)
Credit Hours: 2
Course Coordinator:

CURRENT CATALOG DESCRIPTION

(1-3) Credit 2 I, II, S Introduction to the engineering profession, ethics, and disciplines; development of skills in teamwork, problem solving and design; other topics included, depending on the major, are: emphasis on computer applications and programming; visualization and CAD tools; introduction to electrical circuits, semiconductor devices, digital logic, communications and their application in systems; Newton's laws, unit conversions, statistics, computers, Excel; basic graphics skills; visualization and orthographic drawings.

TEXTBOOK

White, Richard M. and Roger W. Doering. Electrical Engineering Uncovered, 2nd Ed. Upper Saddle River, NJ: Prentice Hall, 2001.

REFERENCES

Course material is available on E-Learning (http://elearning.tamu.edu)

COURSE OUTCOMES

1. Understand the foundations of engineering, engineering design, design methodologies, experimentation, measurement, design tradeoffs, etc.
2. Introduction to technical writing and presentations.
3. Understand the need for life-long learning as engineers.
4. Understand that engineers have to follow professional as well as humanitarian ethics.
5. Understand the basics of electrical and computer engineering principles.
6. Understand the basics of circuits. Concepts of Voltage current, resistance, capacitance, AC/DC, Power and energy. Able to solve simple DC circuit problems
7. Understand the basics of semiconductor devices, diodes and transistors.
8. Understand the basics of digital representation, binary logic, truth tables, realization of binary circuits, basics of logic equations.
9. Understand the differences of Analog versus digital representation and transmission of signals.
10. Understand the basics of computer elements such as processor, memory, and I/O. Understand the basics of hardware, software interaction.
11. Understand the different types of software, applications, OS, Compilers, etc.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVE	ASSESSMENT METHOD	ABET OUTCOME
Understand the engineering design process	Homework, tests, comp. exam	3 (C,D,E,H,J)
Understand the engineering ethics	Tests, in-class discussion	3 (f)
Technical writing and presentations	Homework, in-class exercises, tests, lab reports.	3 (G)
Understand the need for life-long learning	Tests	3 (I)
Understand the basics of electrical and computer engineering principles	Homework, tests, comp. exam	3 (A,C,E,K)
Understand the basics of circuits, voltage, current, resistance, capacitance	Homework, tests, labs, and comp. exam	3 (A,C,E,K)
Understand the basics of semiconductors, and devices: diodes and transistors.	Homework, tests, labs, and comp. exam	3 (A,C,E,K)
Understand binary representation, digital logic, gates, logic equations, truth tables	Homework, tests, labs, and comp. exam	3 (A,C,E,K)
Understand the basics of elements of a computer system	Homework, tests, labs, and comp. exam	3 (A,C,E,K)
Understand the different types of software	Tests, and comp. exam	3 (A,C,E,K)
Understand the difference between analog and digital representation and transmission	Homework, tests, labs, and comp. exam	3 (A,C,E,K)

PREREQUISITES BY TOPIC

Math 151 or registration therein and admission to the College of Engineering

MAJOR TOPICS COVERED IN THE COURSE

1. Emphasis on Engineering Design
2. Communications
3. Fundamental Electrical Engineering Concepts
4. Fundamental Computer Engineering Concepts

ASSESSMENT PLAN FOR THE COURSE

Homework	15%
Exam 1	15%
Exam 2	15%
Exam 3	25%
Lab Assignments	30%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

ENGR 112B Foundations of Engineering II (1-3)
Credit Hours: 2
Course Coordinator:

CURRENT CATALOG DESCRIPTION

(1-3) Credit 2 I, II, S Continuation of ENGR 111. Topics include, depending on the major: emphasis on computer applications and programming and solids modeling using CAD tools or other software; fundamentals of engineering science; advanced graphic skills. ENGR 111; MATH 151; approval of instructor may also be required.

TEXTBOOK

Stroustrup, Bjarne. Programming Principles and Practice Using C++. Reading, PA: Addison-Wesley, 2009.

REFERENCES

Textbook (PPP) C++ Style Guide, http://courses.cs.tamu.edu/ward/112.spr10/PPP-style-rev2.pdf

COURSE OUTCOMES

At the end of this course, students should be able to:

1. Understand computer program structure, design and development.
2. Use primitive data types and control structures in computer programs.
3. Understand and apply vectors, strings, and structs.
4. Declare and use functions in computer programs.
5. Understand object-oriented programming concepts: objects, classes, inheritance, polymorphism, and encapsulation.
6. Design and create simple graphic user interfaces.
7. Understand and apply file I/O in computer programs.
8. Understand and use basic algorithms for searching, sorting, lists, trees and maps.
9. Navigate and make use of class libraries.
10. Write simple computer programs in a high-level programming language, C++.
11. Complete a team design project using knowledge and principles from the course.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVE	ASSESSMENT METHOD	ABET OUTCOME
Understand computer program structure, design and development	**Homework, quizzes, exams**	**(a, e, k)**
Use primitive data types and control structures in computer programs	**Homework, quizzes, exams**	(a,e,k)
Understand and apply vectors, strings, and structs	**Homework, quizzes, exams**	**(a,e,k)**
Declare and use functions in computer programs	**Homework, quizzes, exams**	(a,e,k)
Understand object oriented programming concepts class, object, inheritance, and encapsulation	**Homework, quizzes, exams**	**(a,e,k)**
Design and create simple graphic user interfaces	**Homework, quizzes, exams**	(a,e,k)
Understand and apply file I/O in computer programs	**Homework, quizzes, exams**	**(a,e,k)**
Understand and use basic algorithms for searching, sorting, lists trees and maps	**Homework, quizzes, exams**	(a,e,k)
Navigate and make use of class libraries	**Homework, quizzes, exams**	**(a,e,k)**
Write simple computer programs in a high level programming language, C++	**Homework, quizzes, exams**	**(a,e,k)**
Complete a team design project requiring knowledge and use of principles gained in this course	**Evaluating student group programming projects and written reports**	**(a,d,e,g,k)**

PREREQUISITES BY TOPIC

ENGR 111; MATH 151; approval of instructor may also be required.

MAJOR TOPICS COVERED IN THE COURSE

1. Programming
2. Computation
3. Errors
4. Writing a Program
5. Completing a Program
6. Functions
7. I/O Streams
8. Customizing I/O
9. Graphics
10. Graphing Functions and Data
11. GUI
12. Vectors
13. Arrays
14. Templates and Exceptions
15. Containers

ASSESSMENT PLAN FOR THE COURSE

Labs, Quizzes, Papers	30%
*One Hour Exams	20%
Final Exam	25%
Projects	20%
Attendance/Class Participation	30%

Grading Scheme

90 - 100	**A**
80 - 89	**B**
70 - 79	**C**
60 - 69	**D**
< 60	**F**

ENGR 482 Ethics and Engineering

REQUIRED OR ELECTIVE: Required course

CATALOG DESCRIPTION: Credit 3 (2-2). Development of techniques of moral analysis and their application to ethical problems encountered by engineers, such as professional employee rights and whistle blowing; environmental issues; ethical aspects of safety, risk and liability and conflicts of interest; emphasis on developing the capacity for independent analysis of real and hypothetical cases. Cross-listed with PHIL 482.

PREREQUISITES: Junior classification

TEXTBOOK AND OTHER REQUIRED MATERIAL: *Engineering Ethics* by Harris, C.E., Jr., Pritchard, M.S., and Rabins M.J.; 4th ed., 2009, Wadsworth-Cengage Learning, Belmont, California

COURSE LEARNING OUTCOMES: At the end of this course, students should be able to:

1. Know some of the common methods for analyzing and resolving ethical issues;
2. Think analytically, critically, and creatively about ethical issues in engineering;
3. Know some of the classic ethical cases that have arisen in engineering;
4. Know typical ethical issues that arise in engineering;
5. Know contemporary ethical issues involving the environment and sustainability, race and gender, and globalism/internationalism.
6. Know typical professional issues, including those concerning professional licensure;
7. Know the standard, special expectations placed on an engineering professional;
8. Know common features of professional societies' codes of ethics;
9. Communicate in writing about non-technical ethical and professional issues.

TOPICS COVERED:

Week 1: Course introduction; introduction to professional ethics
Week 2: Professional responsibility; line drawing and creative middle way; factual, conceptual and moral issues
Week 3: Writing and communication
Week 4: Ethical theory; utilitarianism and respect for persons
Week 5: Contemporary social and value dimensions of technology; computer ethics
Week 6: Risk, liability and safety
Week 7: Classic ethical cases—*Challenger* and *Columbia* disasters; mid-term examination
Week 8: Risk assessment and management; professionalism and licensure; professional codes
Week 9: Reliability and trust
Week 10: Preventive and aspirational ethics; contemporary ethical issues
Week 11: Environmental ethics
Week 12: Classical ethical dilemmas
Week 13: Contemporary global/international professionalism and ethical considerations
Week 14: Contemporary race and gender issues; discrimination

CLASS/LABORATORY SCHEDULE: Two, 50 minute lecture sessions per week, and one weekly 110 minute discussion session led by a teaching assistant.

CONTRIBUTION TO MEETING REQUIREMENTS OF CRITERION 5:

Subject	Semester hrs	Subject	Semester hrs	Subject	Semester hrs
Mathematics		Engineering Science		General	3
Basic Science		Engineering Design			

RELATIONSHIP OF COURSE TO PROGRAM OUTCOMES:

	ABET Program Outcome		ABET Program Outcome
	a. ability to apply knowledge of mathematics, science and engineering	x	f. understanding of professional and ethical responsibility
	b. ability to design and construct experiments, as well as to analyze and interpret data	x	g. ability to communicate effectively
	c. ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	x	h. broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
	d. ability to function on multi-disciplinary teams		i. recognition of the need for, and an ability to engage in life-long learning
	e. ability to identify, formulate and solve engineering problems	x	j. a knowledge of contemporary issues
			k. ability to use the techniques, skills and modern engineering tools necessary for engineering practice

Prepared by Warren M. Heffington_ **Date** July 8, 2009

A.B Courses in CSE Department

CSCE 113 Intermediate Programming and Design (1-3)
Credit Hours: 2
Course Coordinator: Bjarne Stroustrup

CURRENT CATALOG DESCRIPTION

(1-3). Credit 2 Continuation of ENGR 112; programming and design with C++; topics include design and implementation of functions, classes, and class hierarchies; software development strategies; error handling and exceptions; testing and debugging; type safety; strings; templates and the STL, graphics and GUIs; mathematical computation; and principles of object-oriented programming.

TEXTBOOK

Stroustrup, Bjarne. **Programming: Principles and Practice Using C++**. Reading: Addison-Wesley Publishing Co., Inc., 2008.

REFERENCES

Eckel, Bruce. **Thinking in C++: Introduction to Standard C++, Volume One**. 2nd ed. Prentice-Hall, 2000, ISBN 0139798099. Free online at http://www.mindview.net/Books/TICPP/ThinkingInCPP2e.html#TheElectronicBook.

Lippman, S. B., Lajoie, J., and Moo, Barbara. **C++ Primer**. 4th ed. Reading: Addison-Wesley, 2005.

COURSE OUTCOMES

At the end of this course, students should be able to:

1. Understand computer program structure, design and development.
2. Use primitive data types and control structures in computer programs.
3. Understand and apply vectors, strings, and structs.
4. Declare and use functions in computer programs.
5. Understand object-oriented programming concepts: objects, classes, inheritance, polymorphism, and encapsulation.
6. Design and create simple graphic user interfaces.
7. Understand and apply file I/O in computer programs.
8. Understand and use basic algorithms for searching, sorting, lists, trees and maps.
9. Navigate and make use of class libraries.
10. Write simple computer programs in a high-level programming language, C++.
11. Complete a team design project using knowledge and principles from the course.

Relationship between Course Outcomes and Program Outcomes

Objective	Assessment Method	ABET Outcome
Understand Computer Program Structure, Design and Development	Homework, Quizzes and Exams	(A, E, K)
Use Primitive Data types and Control Structures	Homework, Quizzes and Exams	(A, E, K)
Understand and Apply Vectors, Strings, and Structs	Homework, Quizzes and Exams	(A, E, K)
Use Functions in Computer Programs	Homework, Quizzes and Exams	(A, E, K)
Understand Object-Oriented Programming Concepts	Homework, Quizzes and Exams	(A, E, K)
Design and Create Simple Graphic User Interfaces	Homework, Quizzes and Exams	(A, E, K)
Understand and Apply File I/O	Homework, Quizzes and Exams	(A, E, K)
Use Basic Algorithms for Searching, Sorting , Lists, Trees and Maps	Homework, Quizzes and Exams	(A, E, K)
Navigate and Make use of Class Libraries	Homework, Quizzes and Exams	(A, E, K)
Write Simple Computer Programs in a High-level Programming Language, C++	Homework, Quizzes and Exams	(A, E, K)
Complete a Team Design Project Using Knowledge and Principles from the Course	Evaluating Student Group Programming Projects and Written Reports	(A, E, K)

Prerequisites by Topic

Knowledge of C++ programming, class design, portable graphics, and parameterized types and their implementations.

Major Topics Covered in the Course

1. Computer Program Structure, Design and Development
2. Primitive Data Types and Control Structures in Computer Programs
3. Vectors, Strings, and Structs
4. Functions in Computer Programs
5. Object-oriented Programming Concepts
6. Graphic User Interfaces
7. File I/O in Computer Programs
8. Basic Algorithms for Searching , Sorting, Lists, Trees and Maps
9. Class Libraries
10. Simple Computer Programs in a High-level Programming Language C++

Assessment Plan for the Course

Lab Work (Labs, Quizzes, Papers)	30%
One-hour Exams (2) (10 pts each)	20%
Comprehensive Final Exam	25%
Project	20%
Attendance and Class Participation (Pop quizzes and lab quizzes)	5%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		
Data Structures	1		Concepts of Programming Languages	1	
Computer Organization and Architecture					

CSCE 121 Introduction to Program Design and Concepts (3-2)
Credit Hours: 4
Course Coordinator: Bjarne Stroustrup

Current Catalog Description

(3-2). Credit 4. Computer programming syntax for primitive types, control structures, vectors, strings, structs, classes, functions, file I/O, exceptions and other programming constructs, plus the use of class libraries; practice in solving problems with computers; includes the execution of student written programs in C++.

Textbook

Stroustrup, Bjarne. Programming: **Principles and Practice Using C++**. Reading: Addison-Wesley Publishing Co., Inc., 2008.

References

Eckel, Bruce. **Thinking in C++: Introduction to Standard C++, Volume One**. 2nd ed. Prentice-Hall, 2000, ISBN 0139798099. Free online at http://www.mindview.net/Books/TICPP/ThinkingInCPP2e.html#TheElectronicBook.

Lippman, S. B., Lajoie, J., and Moo, Barbara. **C++ Primer**. 4th ed. Reading: Addison-Wesley, 2005.

Course Outcomes

Learning Objectives: At the end of this course, under ABET outcomes a, e, and k, students should be able to:

12. Understand computer program structure, design and development.
13. Use primitive data types and control structures in computer programs.
14. Understand and apply vectors, strings, and structs.
15. Declare and use functions in computer programs.
16. Understand object-oriented programming concepts: objects, classes, inheritance, polymorphism, and encapsulation.
17. Design and create simple graphic user interfaces.
18. Understand and apply file I/O in computer programs.
19. Understand and use basic algorithms for searching, sorting, lists, trees and maps.
20. Navigate and make use of class libraries.
21. Write simple computer programs in a high-level programming language, C++.
22. Complete a team design project using knowledge and principles from the course.

Relationship between Course Outcomes and Program Outcomes

OBJECTIVE	ASSESSMENT METHOD	ABET OUTCOME
Understand Computer Program Structure, Design and Development	Homework, Quizzes and Exams	(A, E, K)
Use Primitive Data types and Control Structures	Homework, Quizzes and Exams	(A, E, K)
Understand and Apply Vectors, Strings, and Structs	Homework, Quizzes and Exams	(A, E, K)
Use Functions in Computer Programs	Homework, Quizzes and Exams	(A, E, K)
Understand Object-Oriented Programming Concepts	Homework, Quizzes and Exams	(A, E, K)
Design and Create Simple Graphic User Interfaces	Homework, Quizzes and Exams	(A, E, K)
Understand and Apply File I/O	Homework, Quizzes and Exams	(A, E, K)
Use Basic Algorithms for Searching, Sorting , Lists, Trees and Maps	Homework, Quizzes and Exams	(A, E, K)
Navigate and Make use of Class Libraries	Homework, Quizzes and Exams	(A, E, K)
Write Simple Computer Programs in a High-level Programming Language, C++	Homework, Quizzes and Exams	(A, E, K)
Complete a Team Design Project Using Knowledge and Principles from the Course	Evaluating Student Group Programming Projects and Written Reports	(A, E, K)

PREREQUISITES BY TOPIC

This course is for CPSL majors. CECL, CEEL, and ELEL majors who have taken ENGR 111 and MATH 151 should take ENGR 112 instead of this course.

MAJOR TOPICS COVERED IN THE COURSE

11. Computer Program Structure, Design and Development
12. Primitive Data Types and Control Structures in Computer Programs
13. Vectors, Strings, and Structs
14. Functions in Computer Programs
15. Object-oriented Programming Concepts
16. Graphic User Interfaces
17. File I/O in Computer Programs
18. Basic Algorithms for Searching , Sorting, Lists, Trees and Maps
19. Class Libraries
20. Simple Computer Programs in a High-level Programming Language C++

Assessment Plan for the Course

Lab Work (Labs, Quizzes, Papers)	30%
One-hour Exams (2) (10 pts each)	20%
Comprehensive Final Exam	25%
Project	20%
Attendance and Class Participation (Pop quizzes and lab quizzes)	5%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms	0.5		Software Design		
Data Structures	1.5		Concepts of Programming Languages	2	
Computer Organization and Architecture					

CSCE 181 Introduction to Computing (1-0)
Credit Hours: 1
Course Coordinator: Valerie Taylor

CURRENT CATALOG DESCRIPTION

(1-0). Credit 1. Introduce entering students to the broad field of computing; presentations from industry and academia about how computer science concepts are used in research and end products; includes a major writing component.

TEXTBOOK

Zobel, Justin. Writing for Computer Science. 2nd Ed. London: Springer-Verlag, 2004.

REFERENCES

1. *Thinking in C++: Introduction to Standard C++, Volume One*, 2nd ed., Bruce Eckel, Prentice-Hall, 2000, ISBN 0139798099. Free online at http://www.mindview.net/Books/TICPP/ThinkingInCPP2e.html#TheElectronicBook.

2. *C++ Primer*, 4th ed., Lippman, S. B., Lajoie, J., and Moo, Barbara, Addison-Wesley, 2005.

3. *Great Ideas in Computer Science*, Alan W. Bierman, MIT Press, 1990. Not so new but still has good general material.

4. *Computer Science, An Overview*, J. Glenn Brookshear, Addison Wesley, multiple editions.

5. *An Invitation to Computer Science*, G. Michael Schneider and Judith L. Gersting, Brooks/Cole, multiple editions.

6. *A Balanced Introduction to Computer Science*, David Reed, Prentice Hall, multiple editions.

COURSE OUTCOMES

1. Introduce students to the broad field of computing
2. Introduce students to technical writing

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVE	ASSESSMENT METHOD	ABET OUTCOME
Introduction to Broad Field of Computing	Class Participation, Written Reports	(F, I, J, H)
Introduction to Technical Writing	Written Reports	(F, G, I, J, H)

PREREQUISITES BY TOPIC

None.

MAJOR TOPICS COVERED IN THE COURSE
See Current Catalog Description Above

ASSESSMENT PLAN FOR THE COURSE
This course is graded on a pass/fail basis. To receive a satisfactory grade, the student must complete the following:

1. **Short Reports:** Complete six short written reports with a grade of 70% or higher.
2. **Long Report:** Complete this report with a grade of 70% or higher.
3. **Class Participation:** You are expected to ask questions of the speakers. State your name before asking the question so that the teaching assistant can record the information during class. You must ask at least two questions, in two different classes.
4. **Attendance:** Attendance will be taken, and is mandatory for the class. At most two unexcused absences will be allowed. Students with more than two unexcused absences will fail the course. An absence is considered excused with proper university-approved documentation. More information is available at http://student-rules.tamu.edu/rule07.

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture					

Note: This class explores different topics within the Computer Science and Computer Engineering spectrum. There is no set core or advanced content per se.

CSCE 221 Data Structures and Algorithms (3-2)
Credit Hours: 4
Course Coordinator: Nancy Amato/Teresa Leyk

CURRENT CATALOG DESCRIPTION

(3-2). Credit 4. Specification and implementation of basic abstract data types and their associated algorithms: stacks, queues, lists, sorting and selection, searching, graphs, and hashing; performance tradeoffs of different implementations and asymptotic analysis of running time and memory usage; includes the execution of student programs written in C++.

TEXTBOOK

Goodrich, Michael T., Roberto Tamassia, and David M. Mount. **Data Structures and Algorithms in C++**. Hoboken: John Wiley & Sons, Inc., 2004.

REFERENCES

None.

COURSE OUTCOMES

1. Apply the concept of basic data structures and algorithms for stacks, queues, lists, trees, graphs and hash tables in designing solutions to other problems.
2. Classify algorithms using Big-O asymptotic notation and compare trade-offs of their implementations in terms of running time and memory usage.
3. Improve C++ programming skills by implementing data structures and algorithms.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHOD	ABET OUTCOME
Apply Concepts of Basic Data Structures and Algorithms	Homework, Exams, Quizzes	(A, B, C, E, K)
Classify Algorithms using Big-O Asymptotic Notation	Homework, Exams, Quizzes	(A, B, C, E, K)
Improve C++ Programming Skills	Homework, Exams, Project	(A, B, C, E, K)
Enhance Technical Writing Skills, Oral Communication Skills and Gain Knowledge of Contemporary Issues	Culture Reports, Project	(G, H, I, J)

PREREQUISITES BY TOPIC

CPSC 121; co-requisite MATH 302.

MAJOR TOPICS COVERED IN THE COURSE

1. Review of C++ Programming Language (with emphasis on data structure implementation)
2. Introduction to Analysis of Algorithms

3. Stacks and Queues Vectors, Lists and Sequences
4. Trees and Search Trees Priority Queues. Heaps Dictionaries. Hashing.
5. Sorting, Sets and Selection
6. Graphs

ASSESSMENT PLAN FOR THE COURSE

Exams	45%
Quizzes	15%
Homework Assignments	30%
Participation	5%
CS Culture Assignments	5%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms	2		Software Design		
Data Structures	1.5		Concepts of Programming Languages	0.5	
Computer Organization and Architecture					

CSCE 222 Discrete Sstructures for Computing (3-0)
Credit Hours: 3
Course Coordinator: Jennifer Welch

CURRENT CATALOG DESCRIPTION

(3-0). Credit 3. Provide mathematical foundations from discrete mathematics for analyzing computer algorithms, for both correctness and performance; introduction to models of computation, including finite state machines and Turing machines.

TEXTBOOK

Rosen, Kenneth H. **Discrete Mathematics and Its Applications**. 6th Ed. New York: McGraw-Hill, 2006.

REFERENCES

None.

COURSE OUTCOMES

1. Provide mathematical foundations for analysis of algorithms
2. Provide an introduction to finite automata and Turing machines

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVE	ASSESSMENT METHOD	ABET OUTCOME
Understand Mathematical Foundations for Analysis of Algorithms	Homework, Mid-terms, Final	(A, E, K)
Introduction to Finite Automata and Turing Machines	Homework, Mid-terms, Final	(A, E, K)

PREREQUISITES BY TOPIC

Math 151, Cross-listed with ECEN 222

MAJOR TOPICS COVERED IN THE COURSE

1. Sets, Logic and Proofs.
2. Functions, Sequences and Sums.
3. Algorithms and Complexity.
4. Induction and Recursion.
5. Counting and Recurrences.
6. Relations.
7. Models of Computation.

ASSESSMENT PLAN FOR THE COURSE

Homework	30%
Two Midterms	40%
Final	30%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms	3		Software Design		
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture					

CSCE 310 Database Systems (3-0)
Credit Hours: 3
Course Coordinator: Rabi Mahapatra

CURRENT CATALOG DESCRIPTION

(3-0). Credit 3. I, II, S File structures and access methods; database modeling, design and user interface; components of database management systems; information storage and retrieval, query languages, high-level language interface with database systems.

TEXTBOOK

Garcia-Molina, Hector, Jeffrey D. Ullman, and Jennifer Widom. **Database Systems: The Complete Book**. Upper Saddle River: Prentice Hall, 2001.

REFERENCES

None.

COURSE OUTCOMES

1. Provide students with a comprehensive introduction to the area of computer databases: their historical origins, design and design structures and processes and some commercially available products.
2. Simultaneously provide the students with an introduction to the requirements of team work as it pertains to the design of computer-related database and to develop their personal communications and technical skills for coping with these requirements.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Understand Principles of Database Systems	Homework, Exams, Final, Project	(A, B, E, K, J)
Requirements of Team Work in the Design of Databases	Project	(A, C, D, E, G, I)

PREREQUISITES BY TOPIC

CPSC 211 or 221.

MAJOR TOPICS COVERED IN THE COURSE

1. Entity-Relationship Data Model
2. Relational Data Models
3. Relational Algebra, Tuple Relational Calculus, Domain Relational Calculus
4. Design Theory of Relational Databases
5. SQL, Constraints
6. Programming, Transactions
7. Database System Implementation, Secondary Storage Management

8. Index Structures
9. Query Processing and Compilation
10. Failure Recovery
11. Database Systems and the Internet

ASSESSMENT PLAN FOR THE COURSE

Homework	25%
Midterm 1	15%
Midterm 2	15%
Project	25%
Final Exam	20%

Grading Scheme

86 - 100	A
70 - 85	B
60 - 69	C
50 - 59	D
< 50	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms	1		Software Design		
Data Structures	2		Concepts of Programming Languages		
Computer Organization and Architecture					

CSCE 311 Analysis of Algorithms (3-0)
Credit Hours: 3
Course Coordinator: Nancy Amato

CURRENT CATALOG DESCRIPTION

(3-0) Credit 3 I, II, S Design of computer algorithms for numeric and non-numeric problems; relation of data structures to algorithms; analysis of time and space requirements of algorithms; complexity and correctness of algorithms.

TEXTBOOK

Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest and Clifford Stein. **Introduction to Algorithms**. 2nd Ed. Cambridge: MIT Press, 2001.

REFERENCES

1. Algorithms in the Real World, a course at CMU. Check out the links.
2. The Algorithmist
3. Top Coder, online programming competitions, including emphasis on algorithms
4. Lecture slides for algorithms course at Princeton: great graphics and lots of real-world applications. Check out files entitled 18UndirectedGraphs.pdf and 20DirectedGraphs.pdf, for instance.

COURSE OUTCOMES

1. Students will become familiar with fundamental algorithms and algorithmic techniques
2. Given a particular application, students will be able to decide which algorithm among a set of possible choices is best
3. Students will learn to prove correctness and analyze the running time of a given algorithm
4. Students will learn to design efficient algorithms for new situations using the techniques learned
5. Students will learn to prove a problem is NP-complete using reduction and understand the implications

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHOD	ABET OUTCOMES
Understand Fundamental Algorithms and Techniques	Homework, Exams, Quizzes	(A,E)
Understand Algorithmic Strategies and Design Efficient Algorithms to Solve Problems	Homework, Exams, Quizzes	(A, B, C, E, K)
Prove Correctness and Analyze Run Time of Algorithms	Homework, Exams, Quizzes	(A)
Using Reduction to Prove a Problem is NP-complete	Homework, Exams, Quizzes	(A, E, K)
Read,Write Reports on Some Aspect of Computer Science and Engineering Related to Algorithms	Cultural Reports	(A, G)

Prerequisites by Topic
Math 302; CSCE 211

Major Topics Covered in the Course

1. Introduction and Math Preliminaries
2. Sorting and Order Statistics
3. Implementations of Dictionary ADT
4. Dynamic Programming
5. Disjoint Sets
6. Graph Algorithms
7. NP-Completeness
8. String Matching

Assessment Plan for the Course

Homework	40%
Exams	45%
Quizzes	10%
Culture Reports	5%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		
Data Structures	0.5		Concepts of Programming Languages		
Computer Organization and Architecture	2.5				

CSCE 312 Computer Organization (3-2)
Credit Hours: 4
Course Coordinator: Rabi Mahapatra

CURRENT CATALOG DESCRIPTION

(3-2). Credit 4.Introduction to computer systems from programmer's perspective: simple logic design, data representation and processor architecture, programming of processors, memory, control flow, input/output, and performance measurements; hands-on lab assignments.

TEXTBOOK

Bryant, Randal E., and David R. O'Hallaron. Computer Systems: **A Programmer's Computer Systems: A Programmer's Perspective**. 3d Ed. Upper Saddle River:Prentice Hall, 2003.

REFERENCES

Vahid, Frank. **Digital Design**. Hoboken: Wiley, 2006.
The C Programming Language. 2nd Ed. (ANSI C version) or later, Kernighan & Ritchie, Prentice Hall.

COURSE OUTCOMES

1. Students will learn critical thinking.
2. Students will learn how to communicate technical concepts in the area of computer systems.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Learn Critical Thinking	Homework, Exams, Final Project	(A, E, K)
Learn to Communicate Technical Concepts in Computer Systems	Homework, Exams, Final Project	(A, G)

PREREQUISITES BY TOPIC

CSCE 221

MAJOR TOPICS COVERED IN THE COURSE

Computer Systems
Data Representation, Arithmetic, Logic Design
Machine Language
Processor Architecture
Memory Hierarchy
Virtual Memory
System Level I/O

Assessment Plan for the Course

Homework	40%
Exams	40%
Final Project	20%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture	4				

CSCE 313 Introduction to Computer Systems (3-2)
Credit Hours: 4
Course Coordinator: Ricardo Bettati

CURRENT CATALOG DESCRIPTION

(3-2) Credit 4 Introduction to system support for application programs, both on single node and over network: OS application interface, inter-process communication, introduction to system and network programming, and simple computer security concepts; hands-on lab assignments.

TEXTBOOK

Robbins, Kay A., and Steven Robbins. **Unix Systems Programming: Communication, Concurrency, and Threads**. Upper Saddle River: Pearson Education, Inc., 2003.

REFERENCES

Bryant, Randal E. and David R. O'Hallaron. **Computer Systems: A Programmer's Perspective**. 2nd ed. Addison Wesley, 2010.
Nutt, Gary. **Operating Systems, A Modern Perspective**. 2 Sub ed. Addison Wesley, 1999.
Tanenbaum, A.S. **Modern Operating Systems.** 4th ed. Pearson Custom Publishing, 2008.
Stevens, W. Richard. **Advanced Programming in the UNIX Environment**. Addison Wesley, 1992.

COURSE OUTCOMES

1. Execution of a program; function calls; interrupts.
2. Memory layout of a running program.
3. What is an operating system; what are its components; why system calls; etc.
4. The OS application interface; file system; memory control; process control; etc.
5. Run-time environments; interaction of compilers, linkers, loaders to run a program.
6. Concurrency, process synchronization, interprocess communication
7. Network Programming; Berkeley sockets; RPC; pitfalls in networks.
8. Security threats in centralized and distributed systems; authentication, authorization, confidentiality; security mechanisms.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Ability to Execute a Program and Memory Layout of a Running Program	Homework, Machine Problems	(A, B, C, E, K)
Understanding What an Operating System is and Its Components	Homework, Machine Problems, Exams	(A, B, C, E, K)
Understanding the OS Application Interface	Homework, Machine Problems	(A, B, C, E, K)
Understanding Run-time Environments	Homework, Machine Problems	(A, B, C, E, K)
Concurrency, Process, Synchronization, Interprocess Communication	Machine Problems	(A, B, C, E, K)
Learning Network Programming	Homework, Machine Problems, Exams	(A, B, C, E, K)
Understanding Security Threats in Centralized and Distributed Systems	Homework, Machine Problems, Exams	(A, B, C, E, F, K)

PREREQUISITES BY TOPIC

CPSC 312 or co-requisite CPSC 350

MAJOR TOPICS COVERED IN THE COURSE

1. History, Architecture-Level Support
2. OS Structures Processes/Threads
3. Processes/Threads CPV Scheduling
4. POSIX Threads Process Synchronization
5. Process Synchronization, Critical Sections/Semaphoresch
6. Unix I/O
7. Files and Directories, Unix Special Files
8. POSIX IPC
9. Case Study: Producer-Consumer Asynchronous Events
10. Network Programming: Intro
11. Sockets: The TCP/UDP/IP API
12. Server Design Security: Overview
13. Security: Introduction to Cryptography, Security, Authentication, Authorization

ASSESSMENT PLAN FOR THE COURSE

	Points
Homework	100
Exams	450
Machine Problems	400
Other	50

Grading Scheme

901 - 1000	A
801 - 900	B
701 - 800	C
601- 700	D
<600	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture	4				

CSCE 314 Programming Languages (3-0)
Credit Hours: 3
Course Coordinator: Jaakko Jarvi/Gabriel Dos Reis

CURRENT CATALOG DESCRIPTION
(3-0) Credit 3 Explores the design space of programming languages via an in-depth study of two programming languages, one subject-oriented (Java), one functional (Haskell); focuses on idiomatic uses of each language, and on features characteristic for each language.

TEXTBOOK
Arnold, Ken, James Gosling, and David Holmes. **Java™ Programming Language**, 4th Ed. Upper Saddle River: Prentice Hall PTR, 2005.

REFERENCES
Hutton, Graham. **Programming in Haskell**. New York: Cambridge University Press, 2007.

COURSE OUTCOMES
1. Provide students with an understanding of the use, efficiency considerations, and implementation approaches of common abstraction mechanisms and language constructs in modern programming languages.
2. Deepen understanding concerning concepts and features of programming languages, and how programming languages work.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Understand Use, Efficiency, and Implementation of Common Abstraction Mechanisms and Language Constructs in Modern Programming Languages	Assignments and Quizzes, Exams	(A, E, K)
Increase Understanding of Concepts, Features and How Programming Languages Work	Assignments and Quizzes, Exams	(A,E, I, K)

PREREQUISITES BY TOPIC
CPSC 221

MAJOR TOPICS COVERED IN THE COURSE
1. Types, Static Typing and Type Inference
2. Parametric Polymorphism
3. Higher-order Functions, Closures
4. Recursive Types and Functions
5. Algebraic Data Types
6. Abstract Data Types and Modules
7. Type Classes

8. Effects in a "Pure" Language
9. Grammars, Lexing and Parsing
10. Abstract Syntax, Internal Representations
11. Types and Type Checking
12. Interpretation, Optimization, Code Generation
13. Subtyping and Inheritance
14. Subtype Polymorphism, Exception Handling, Generics, Wildcards, reflection, Concurrency

ASSESSMENT PLAN FOR THE COURSE

Assignments and Quizzes	20%
Mid-term Exam	40%
Final Exam	40%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		
Data Structures			Concepts of Programming Languages	3	
Computer Organization and Architecture					

CSCE 315 Programming Studio (2-2)
Credit Hours: 3
Course Coordinator: John Keyser

Current Catalog Description

(2-2) Credit 3 Intensive programming experience that integrates core concepts in Computer Science and familiarizes students with a variety of programming/development tools and techniques; students work on 2 or 3 month-long projects each emphasizing a different specialization within Computer Science; focuses on programming techniques to ease code integration, reusability, and clarity.

Textbook

McConnell, Steve. **Code Complete: A Practical Handbook of Software Construction**. 2nd ed. Redmond: Microsoft Press, 2004.

References

Brian W. Kernighan and Rob Pike. **The Practice of Programming**. Addison Wesley, 1999.
Goodliffe, Pete. **# Code Craft**. No Starch, 2007. (Note: this book is available to read online for free through TAMU).

Course Outcomes

1. Familiarize students with a variety of programming/development tools and techniques that integrate core concepts in computer science.
2. Honing good programming techniques.
3. Students will emerge with strong programming skills with the ability to address individual and team programming challenges competently.

Relationship between Course Outcomes and Program Outcomes

Objectives	Assessment Methods	ABET Outcomes
Understand a Variety of Programming and Development Tools and Techniques to Integrate Core Concepts in Computer Science	Major Projects, Exercises, and Quizzes	(A, B, C, E, G, I, K)
Sharpening Good Programming Techniques	Major Projects, Exercises, and Quizzes	(A, B, C, E, G, I, K)
Emerge with Strong Programming Skills with the Ability to Address Individual and Team Programming Challenges Competently.	Major Projects, Exercises, and Quizzes	(A, B, C, D, E, G, K)

Prerequisites by Topic

CPSC 312 and 314; or CPSC 350; co-requisite CPSC 313

MAJOR TOPICS COVERED IN THE COURSE

1. Style Considerations in Writing Code
2. Design of Software Systems and APIs
3. Coding Beyond the Single Component
4. Basic Collaborative Software Coding Practices
5. Design for Portability, Performance, Testability
6. Specification and Documentation
7. Basic Software Tools and their Use
8. Subject-specific Topics Related to the Team Projects

ASSESSMENT PLAN FOR THE COURSE

Three Major Projects	84%
*Exercises,Quizzes,	16%

*Includes Course Survey Participation, and Evaluation of Class Participation

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design	3	
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture					

CSCE 350 Computer Architecture and Design (3-3)
Credit Hours: 4
Course Coordinator: Rabi Mahapatra

CURRENT CATALOG DESCRIPTION

(3-3) Credit 3 Intensive programming experience that integrates core concepts in Computer Science and familiarizes students with a variety of programming/development tools and techniques; students work on 2 or 3 month-long projects each emphasizing a different specialization within Computer Science; focuses on programming techniques to ease code integration, reusability, and clarity.

TEXTBOOK

Patterson, David A., and John L. Hennessy. **Computer Organization and Design**. 3rd ed. San Francisco: Morgan Kaufmann Publishers, 2005.

REFERENCES

Brown, Stephen and Zvonko Vranesic. **Fundamentals of Digital Logic with Verilog Design**. McGraw-Hill, 2003.
Publisher's URL: http://highered.mcgraw-hill.com/sites/0072823151/ This reference is strongly recommended.

Mano, M. Morris. **Digital Design**. 3rd ed. Prentice Hall, Upper-Saddle River, New Jersey, 2002.
Publisher's URL:http://vig.prenhall.com/catalog/academic/product/1,4096,0130621218,00.html

COURSE OUTCOMES

Students will be able to:

1. Integrate core concepts with a variety of programming and development tools and techniques
2. Implement concepts emphasizing different specializations in computer science
3. Develop programming techniques to ease code integration, reusability, and clarity

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Integrate Core Concepts with Programming and Development Tools and Techniques	Homework/Quizzes, Projects, Exams	(A, C, E, K)
Implement Concepts Emphasizing Different Specializations in Computer Science	Projects, Homework/Quizzes	(A, C, E, K)
Develop Programming Techniques to Ease Code Integration, Reusability, and Clarity	Projects	(A, C, E, K)

PREREQUISITES BY TOPIC

ECEN 248 Cross-listed with ECEN 350

Major Topics Covered in the Course

1. Five Components of a Computer
2. Performance, Technology and Delay Modeling
3. Instruction Set Architecture Design
4. Digital-Logic Design for Combinational Circuits
5. Introduction to Hardware Description Languages (Verilog)
6. Digital-Logic Design for Sequential Circuits
7. Single-Cycle Datapath and Control; Multi-cycle Datapath and Control
8. Introduction to Pipelining
9. Pipelining Hazards
10. Overview of SRAM and DRAM Design
11. Virtual Memory

Assessment Plan for the Course

Homework/Quizzes	20%
Mid-term Exam	25%
Final Exam	25%
Three Mini Projects	30%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture		4			

CSCE 410 Operating Systems (3-0)
Credit Hours: 3
Course Coordinator: Riccardo Bettati

CURRENT CATALOG DESCRIPTION

(3-0) Credit 3 I, II, S Hardware/software evolution leading to contemporary operating systems; basic operating systems concepts; methods of operating systems design and construction; algorithms for CPU scheduling, memory and general resource allocation; process coordination and management; case studies of several operating systems.

TEXTBOOK

Silberschatz, Abraham, Peter B. Galvin, and Greg Gagne. **Operating System Concepts**. 8th ed. Hoboken, NJ: John Wiley & Sons, Inc., 2008.

REFERENCES

1. Operating Systems
    a. (hands-on) *Operating Systems*, *Operating Systems, A Modern Perspective*, by Gary Nutt (Addison Wesley)
    b. (not-so hands-on) *Modern Operating Systems* A.S. Tanenbaum (Prentice Hall)
    c. (very hands-on) *Operating Systems, Design and Implementation* A.S. Tanenbaum, A. W. Woodhull (Prentice Hall)
2. OS Internals
    a. (Windows) *Inside Microsoft Windows 2000*, by D.A. Solomon and M.E. Russinovich (Microsoft Press).
    b. (Multiprocessor Unix) *UNIX Systems for Modern Architectures*, by Curt Schimmel, 1994 (Addison Wesley).
    c. (Unix V) *The Magic Garden Explained: The Internals of Unix System V Release 4* by B. Goodheart and J. Cox (Prentice Hall)
    d. (BSD Unix, easy reading) *The Design and Implementation of the 4.4 BSD Operating System*, by McKusick, K. Bostic, M.J. Karels, J.S. Quarterman (Addison Wesley).
    e. (build-your-own; old, but excellent) "Operating System Design - The XINU Approach", by D.E. Comer, 1984 (Prentice Hall).
3. Systems Programming
    a. (introductory) *Practical UNIX Programming: A Guide to Concurrency, Communication, and Multithreading*, Kay and Steven Robbins (Prentice Hall).
    b. (more advanced) *Advanced Programming in the UNIX Environment*, by W. Richard Stevens (Addison Wesley)
4. *The Practice of Programming* by Brian W. Kernighan and Rob Pike (Addison-Wesley Pub Co; ISBN: 020161586X)

Course Outcomes

1. Specific topics include design and trade-offs for the management of system resources: processes, memory, files, and peripheral devices.
2. To provide in-depth knowledge to computer science and computer engineering students on the design and implementation of contemporary operating systems.

Relationship between Course Outcomes and Program Outcomes

Objectives	Assessment Methods	ABET Outcomes
Understand Design and Trade-offs for Management of System Resources	Homework, Exams	(A, C, D, E, K)
Acquire In-depth Knowledge on Design and Implementation of Contemporary Operating Systems	Homework, Exams, Projects	(A, B, C, D, E, F, K)

Prerequisites by Topic

CPSC 315

Major Topics Covered in the Course

1. Memory: dynamic memory, virtual memory, caching for OS designers
2. Threading: Overview/Refresh, threading in practice, alternatives to threading
3. Synchronization: Overview/Refresh, atomic transactions, transactional memory
4. File Systems
5. IO Systems
6. Multiprocessors: Caching, Scheduling, Synchronization
7. Virtual Machines
8. Distributed Systems: Distributed Structures, Distributed Coordination, Distributed File Systems

Assessment Plan for the Course

Homework	150 points
Exam1	200 points
Exam 2	250 points
Projects	400 points

Grading Scheme

901 - 1000	**A**
801 - 900	**B**
701 - 800	**C**
601 - 700	**D**
< 600	**F**

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms		1	Software Design		
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture		2			

CSCE 411 Design and Analysis of Algorithms (3-0)
Credit Hours: 3
Course Coordinators: Jennifer Welch/Nancy Amato

CURRENT CATALOG DESCRIPTION

(3-0) Credit Study of computer algorithms for numeric and non-numeric problems; design paradigms; analysis of time and space requirements of algorithms; correctness of algorithms; NP-completeness and undecidability of problems.

TEXTBOOK

Cormen, Thomas, Charles Leiserson, Ronald Rivest, and Clifford Stein. **Introduction to Algorithms**. 2nd Ed. Cambridge: MIT Press, 2003.

REFERENCES

None

COURSE OUTCOMES

At the end of the semester, you should:

1. be familiar with fundamental algorithms and algorithmic techniques;
2. given a particular application, be able to decide which algorithm among a set of possible choices is best;
3. be able to prove correctness and analyze the running time and space complexity of a given algorithm;
4. be able to design efficient algorithms for new situations using the techniques learned;
5. be able to prove a problem is NP-complete using reduction and understand the implications;
6. be able to understand the notion of undecidability, know that some problems are undecidable and comprehend the implications.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Familiarize Students with Fundamental Algorithms and Techniques	Homework, Exams, Quizzes	(A, E)
Ability to Choose Best Algorithm for a Particular Application	Homework, Exams, Quizzes	(A, B, C, E,)
Prove Correctness, Analyze Running Time and Space Complexity of a Given Algorithm	Homework, Exams, Quizzes	(A)
Design Efficient Algorithms for New Situations Using the Techniques Learned	Homework, Exams, Quizzes	(A, E, K)
Ability to Prove a Problem is NP-complete using Reduction and Understand Implications	Homework, Exams, Quizzes	(A, E)
Understand Notion of Undecidability	Homework, Exams, Quizzes	(A, E)
Read and Write Reports on Some Aspect of Computer Science and Engineering Related to Algorithms	Cultural Reports	(A, G)

PREREQUISITES BY TOPIC

CPSC 221, 315; MATH 302

MAJOR TOPICS COVERED IN THE COURSE

1. Sorting Lower Bound
2. Divide and Conquer Algorithms
3. Greedy Algorithms
4. Dynamic Programming
5. Amortized Analysis
6. Graph Algorithms
7. Randomized Algorithms
8. NP-Completeness
9. Undecidability

ASSESSMENT PLAN FOR THE COURSE

Homework	35%
Quizzes	9%
Exams	45%
Culture Reports	5%
Class Participation	5%
ABET Post Test	1%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms		3	Software Design		
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture					

CSCE 420 Artificial Intelligence (3-0)
Credit Hours: 3
Course Coordinators: Thomas Ioerger/Yoonsuck Choe

CURRENT CATALOG DESCRIPTION

(3-0) Credit 3 I, II, S Fundamental concepts and techniques of intelligent systems; representation and interpretation of knowledge on a computer; search strategies and control; active research areas and applications such as notational systems, natural language understanding, vision systems, planning algorithms, intelligent agents and expert systems.

TEXTBOOK

Russell, Stuart, and Peter Norvig. **Artificial Intelligence: A Modern Approach**. 2nd ed. Upper Saddle River: Prentice Hall, 2002.

REFERENCES

None

COURSE OUTCOMES

1. List the basic techniques for creating intelligent programs. This will be measured by quizzes, homework and tests.
2. Create a successful program illustrating the operation of one of these methods. This will be measured by the final project.
3. Apply the right programming language or technique to the right problem. This will be measured by exercises.
4. Be able to evaluate a proposed AI application for likelihood of success. This will be measured by the inclusion of case studies on homework and tests.
5. Be able to discern sensationalism from science on the possible impact of AI on society. This will be measured by the final.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVE	ASSESSMENT METHOD	ABET OUTCOME
Creating Intelligent Programs	Quizzes, Homework, Tests	(A, B, C, D)
Create Successful Programs	Final Project, Programming Exercises	(A, B, C, D)
Apply Right Programming Language, Technique to Correct Problem	Exercises, Programming Exercises	(A, B, C, D)
Evaluate Proposed AI Application for Likely Success	Case Studies on Homework, and Tests	(A, B, C, D)
Discern Sensationalism from Science on Possible Impact of AI on Society	Final Exam	(F, H, J)

PREREQUISITES BY TOPIC

CPSC 411 Design and Analysis of Algorithms (which has CPSC 221 Data Structures and Algorithms and CPSC 315 Programming Studio as perquisites). CPSC 311 may be substituted for CPSC 411 if the student has taken CPSC 221 and 315.

MAJOR TOPICS COVERED IN THE COURSE

1. Introduction to Intelligent Agents
2. Search
3. Constraint Satisfaction
4. Knowledge Representations
5. Logic & Inference
6. Fuzzy Logic
7. Planning
8. Learning
9. Neural Networks
10. Natural Language Processing
11. Affective Computing, Ethics

ASSESSMENT PLAN FOR THE COURSE

*Weekly Homework	10%
*Daily Quizzes	10%
Three Exams	30%
4 Small Programming Exercises	5%
Final Project	15%
Take Home Final	15%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

*Lowest Daily Quiz and Lowest Weekly Homework will be dropped.

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms		1.5	Software Design		0.5
Data Structures		0.5	Concepts of Programming Languages		0.5
Computer Organization and Architecture					

CSCE 431 (2-2)
Credit Hours: 3
Course Coordinator: William Lively

CURRENT CATALOG DESCRIPTION

(2-2) Credit 3 I, II, S Application of engineering approach to computer software design and development; life cycle models, software requirements and specification; conceptual model design; detailed design; validation and verification; design quality assurance; software design/development environments and project management.

TEXTBOOK

Somerville, Ian. Software Engineering. 8th ed. Boston: Addison-Wesley, 2006.

REFERENCES

1. Roger S. Pressman. Software Engineering: A Practitioner's Approach. McGraw-Hill 7e, 2005
2. Stephen R. Schach. Object-Oriented Classical Software Engineering. McGraw-Hill, 7e, 2007
3. Craig Larman. Applying UML and Patterns: Introduction of OO Analysis and Design and Iterative Development. Prentice Hall, 3e, 2005
4. Eric Freeman, et al. Head First Design Patterns. O'Reilly, 2004
5. Craig Larman. Agile & Iterative Development: A Manager's Guide. Addison-Wesley, 2004
6. Irene Polikoff et al. Capability Cases: A Solution Envisioning Approach. Addison-Wesley, 2006

COURSE OUTCOMES

1. This course will provide computer science and computer engineering students with the skills to design and develop software systems,
2. Give students an understanding of the complexity and sophistication of large complex software systems, and
3. It will also provide understanding of how large complex software systems must be built with teams of software engineers working together.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Develop Skills to Design and Develop Software Systems	Short Quizzes, Exams, Final Project	(A, B, C, E, K)
Understand Complexity of Large Complex Software Systems	Short Quizzes, Exams	(A, B, C, E, K)
Implement Large Complex Software Systems Built with Teams of Software Engineers	Final Project, Class Participation	(A, B, C,D, E, K)
Understand Management Issues-staffing, Planning, Estimating, Resource Allocation, Reviewing	Final Project	(D, F, I, J)

PREREQUISITES BY TOPIC

CPSC 315 or approval of instructor

MAJOR TOPICS COVERED IN THE COURSE

1. Introduction
2. Socio-technical Systems
3. Critical Systems
4. Software Processes
5. Project Management
6. Software Requirements
7. Requirement Engineering Process
8. System Models
9. Critical Systems Specification
10. Formal Specification
11. Architectural Design
12. Distributed System Architectures
13. Application Architectures
14. Object Oriented Design
15. Real-time Software Design
16. User Interface Design
17. Rapid Software Development
18. Software Reuse
19. Component-based Software Engineering
20. Critical Systems Development
21. Software Evolution
22. Verification and Validation
23. Software Testing
24. Critical Systems Validation
25. Managing People
26. Software Cost Estimation
27. Quality Management
28. Process Improvement

29. Configuration Management
30. Software Engineering Ethics

<u>ASSESSMENT PLAN FOR THE COURSE</u>

Short Quizzes	30%
Exams	25%
Class Participation	10%
Final Project	35%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

<u>Estimate Curriculum Category content (Semester Hours)</u>

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		3
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture					

CSCE 433 Formal Languages and Automata (3-0)
Credit Hours: 3
Course Coordinators: Jianer Chen

CURRENT CATALOG DESCRIPTION

(3-0) Credit 3 I Basic types of abstract languages and their acceptors; the Chomsky hierarchy; solvability and recursive function theory; application of theoretical results to practical problems.

TEXTBOOK

Hopcroft J.E., Motwani R. and Ullman J.D. ***Introduction to Automata Theory, Languages and Computation.*** 3rd Ed. Reading: Addison-Wesley, 2006.

REFERENCES

None

COURSE OUTCOMES

To provide computer science and engineering students with formal methods and foundations of computer science including formal languages, machines, decidability, solvability, and computability.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Understand Formal Methods and Foundations of Formal Languages, Machines, Decidability, Solvability, and Computability	Homework, Mid-term and Final Exams	(A, B, K)

PREREQUISITES BY TOPIC

CPSC 315 or approval of instructor

MAJOR TOPICS COVERED IN THE COURSE

1. Finite automata and regular expressions: deterministic finite automata, nondeterministic finite automata, regular expressions, equivalence, closure properties, pumping lemma.
2. Context-free grammar and pushdown automata: context-free grammar, pushdown automata, equivalence, closure properties, Chomsky normal form, pumping lemma.
3. Turing machines: Turing machines, variants, nondeterministic Turing machines, decidability and undecidability, *NP*-completeness.

ASSESSMENT PLAN FOR THE COURSE

Homework	30%
Two Mid-term Exams	40%
Final Exam	30%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms		1	Software Design		1
Data Structures			Concepts of Programming Languages		1
Computer Organization and Architecture					

CSCE 434 Compiler Design (3-0)
Credit Hours: 3
Course Coordinator: Lawrence Rauchwerger

CURRENT CATALOG DESCRIPTION

(3-0) Credit 3 II Programming language translation: functions and general organization of compiler design and interpreters; theoretical and implementation aspects of lexical scanners; parsing of context free languages; code generation and optimization; error recovery.

TEXTBOOK

A. Aho, R. Sethi, J. Ullman, M. Lam Compilers: Principles, Techniques and Tools 2nd Edition, Addison-Wesley Publishing Company, New York, New York, 2006.

REFERENCES

COURSE OUTCOMES

At the end of the course the students should be able to understand:

1. Lexical Analysis
2. Parsing techniques (recursive descent, LL91), LR(1)
3. Context-sensitive analysis
4. Intermediate representations
5. The procedure abstraction and how to implement it
6. Heap management
7. Simple code generation
8. Instruction selection
9. Register allocation
10. Code improvement techniques

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVE	ASSESSMENT METHOD	ABET OUTCOME
Understand Lexical Analysis		(C, E, K)
Understand Parsing Techniques		(A, C, E, K)
Understand Context-sensitive Analysis		(A,C, E, K)
Understand Intermediate Representations		(A, C, E, K)
Understand Procedure Abstraction and How to Implement it		(A, B, C, E, K)
Understand Heap Management		(C, E, K)
Understand Simple Code Generation		(C, E, K)
Understand Instruction Selection		(C, E, K)
Understand Register Allocation		(C, E, K)
Understand Code Improvement Techniques		(C, E, K)

PREREQUISITES BY TOPIC

CPSC 315 or approval of instructor (C++ programming experience highly recommended)

MAJOR TOPICS COVERED IN THE COURSE

1. Lexical analysis (scanning, scanner generation)
2. Parsing (recursive descent, LL(1), LR(1))
3. Context-sensitive analysis (ad hoc techniques and attribute grammars or syntax-directed translation)
4. Intermediate representations
5. The procedure abstraction
6. Heap management
7. Simple code generation
8. Instruction selection (better code generation)
9. Register allocation (better code generation)
10. Code improvement techniques (data-flow analysis, dependence analysis, simple transformations)

ASSESSMENT PLAN FOR THE COURSE

Mid-term I	25%
Mid-term II	25%
Projects	50%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		
Data Structures		2	Concepts of Programming Languages		1
Computer Organization and Architecture					

CSCE 436 Computer Human Interaction (3-0)
Credit Hours: 3
Course Coordinator: Richard Furuta

CURRENT CATALOG DESCRIPTION

(3-0) Credit 3 Comprehensive study of the Computer-Human Interaction (CHI) area; includes history and importance of CHI; CHI design theories; modeling of computer users and interfaces; empirical techniques for task analysis and interface design; styles of interaction and future directions of CHI including hypermedia and computer-supported collaborative work.

TEXTBOOK

None

REFERENCES

Reeves, Byron and Clifford Nass. **The Media Equation: How People Treat Computers, Television, and New Media Like Real People and Places**. Cambridge University Press, 1996.

Norman, Donald A. **Design of Everyday Things**. Basic Books, 2002.

Sears, Andrew and Julie A. Jacko. **Human-Computer Interaction Handbook**. 2nd ed. CRC Press, 2007.

Toth, Jennifer. **Mole People: Life in the Tunnels Beneath New York City.** Chicago Review Press, 1995

Briggs, Jean L. **Never in Anger: Portrait of an Eskimo Family**. Harvard University Press, 1971.

Norman, Donald A. **Emotional Design: Why We Love (or Hate) Everyday Things**. 4th ed. Basic Books, 2005.

Norman, Donald A. **Design of Future Things**. 7th ed. Basic Books, 2007.

Blass, Thomas. **The Man Who Shocked the World: The Life and Legacy of Stanley Milgram**. New ed. Basic Books, 2009.

Cooper, Alan. **The Inmates are Running the Asylum: Why High Tech Products Drive Us Crazy and How to Restore the Sanity**. Sams-Pearson Education, 2004.

COURSE OUTCOMES

1. Understanding and conceptualizing interaction
2. Designing for collaboration and communication
3. Understanding how interfaces affect users
4. The process of interaction design
5. Identifying needs and establishing requirements
6. Design, prototyping and construction, introducing evaluation
7. Team design problem seeking and storytelling

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Understanding and Conceptualizing Interaction	Quizzes, Exams	(A, J)
Designing for Collaboration and Communication	Blog, Participation, Final Project	(C,E,K)
Understanding How Interfaces Affect Users	Quizzes, Exams, Blog, Participation, Final Project	(A, H, J)
The Process of Interaction Design	Blog, Participation, Final Project	(C,E,K)
Identifying Needs and Establishing Requirements	Assignments, Blog, Participation, Final Project	(B, C,E,K)
Design, Prototyping and Construction, Introducing Evaluation	Blog, Participation, Final Project	(C,E,J, K)
Team Design Problem Seeking and Storytelling	Blog, Participation, Final Project	(D, G)

PREREQUISITES BY TOPIC

(CPSC 315 or approval of instructor) Students need to be proficient at object oriented programming in either Java or C++. Students should have taken some higher level computer science courses. Possible courses include artificial intelligence, user interfaces, or software engineering.

MAJOR TOPICS COVERED IN THE COURSE

1. Interaction Design
2. Conceptualizing Interaction
3. Collaboration and Communication
4. Interaction Design Process
5. Needs and Requirements of Users
6. Design, Prototyping and Construction
7. Evaluation Framework
8. Observing Users
9. Consulting Users and Experts
10. Team Design Project
11. Communicators and Advisory Systems

ASSESSMENT PLAN FOR THE COURSE

Final Project	30%
Final Exam	20%
Mid-Term Exam	10%
Assignments	20%
Quizzes	10%
Blog	5%
Participation	5%

Grading Scheme

90 - 100	A
75 - 89	B
60 - 74	C
50 - 59	D
< 50	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		3
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture					

CSCE 438 Distributed Objects Programming (3-0)
Credit Hours: 3
Course Coordinators: William Lively/Salih Yurttas

Current Catalog Description

(3-0) Credit 3 Principles of distributed computing and programming with current paradigms, protocols, and application programming interfaces including Sockets, RMI, CORBA, IDL, Servlets, Web Services; security issues with public/private keys, digital signatures, forms and GUI based applications with multi-tier components, database connectivity and storing/streaming data structured using XML.

Textbook

Spaanjaars, Imar. **Beginning ASP.Net 3.5: In C# and VB (Programmer to Programmer)**. Indianapolis: Wiley Publishing, 2008.

References

None

Course Outcomes

Students will learn:

1. to develop scale-up software systems as distributed objects technology based application and to apply and solve a relevant problem with specific technologies; and
2. to investigate and locate the availability of specific technology related concepts and software layers with applications.

Relationship between Course Outcomes and Program Outcomes

Objective	Assessment Method	ABET Outcomes
Develop Scale-up Software Systems as Distributed Objects Technology Based Application	Homework, Final Project	(A, C, D, E, K)
Apply and Solve Relevant Problems with Specific Technology	Homework, Final Project	(A, C, D, E, K)
Investigate and Locate Availability of Specific Technology Related Concepts and Software Layers with Applications	Homework, Final Project	(A, C, D, E, K)

Prerequisites by Topic

CPSC 315 or approval of instructor

Major Topics Covered in the Course

1. dot for e-commerce: applications, clients, servers. j2ee, .net framework, visual studio.net, netbeans ide, eclipse

2. structuring documents,languages for documents: html, dhtml, javascript, css, xhtml, dom, xml, xsl, xslt, sax,ajax, unicode(internationalization).
3. programming objects for networking: sockets, streams, urls.
4. distributed object technologies: java rmi, corba, idl, servlets, web services, remoting.
5. jdbc – ado data persistence, serialization, ui, jsp, asp.net,xml.
6. Concurrency: threads.
7. Security: keys: public, private, and secret. Digital signatures. Data encryption.

Assessment Plan for the Course

Homework	60%
Final Project	40%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		2
Data Structures			Concepts of Programming Languages		1
Computer Organization and Architecture					

CSCE 440 Quantum Algorithms (3-0)
Credit Hours:
Course Coordinator: Andreas Klappinecker

CURRENT CATALOG DESCRIPTION

(3-0) Credit 3 Introduction to the design and analysis of quantum algorithms; basic principles of the quantum circuit model; gives a gentle introduction to basic quantum algorithms; review recent results in quantum information processing.

TEXTBOOK

M. Nielsen and I. Chuang: Quantum Computation and Quantum Information, Cambridge University Press, 2000.

REFERENCES

None

COURSE OUTCOMES

1. The approach is algorithmic (after 2-3 weeks you will know the basics of the computing model).
2. You will complete a simulator of a quantum computer (a surprisingly simple task, since I provide a comprehensive framework).
3. You will get a comprehensive overview of many quantum algorithms and protocols.
4. We will dispel the myths that a quantum computer cannot be built.
5. The course has been revised to include recent developments.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Objectives	Assessment Methods	ABET Outcomes
Learn Basics of Computer Model	Assignments, Final Project	(A, E, K)
Complete a Simulator of a Quantum Computer	Final Project	(A, B, C, D, E, K)
Learn Quantum Algorithms and Protocols	Assignments, Mid-term Exam	(A, E, K)
Dispel the Myths that a Quantum Computer Cannot be Built	Final Project	(A, B, C, E, G, J, K)

PREREQUISITES BY TOPIC

CPSC 315 or approval of instructor

MAJOR TOPICS COVERED IN THE COURSE

1. Prolegomena
2. Quantum Circuits
    a. Quantum States
    b. A Single Quantum Bit
    c. Quantum Gates

    d. Measurements
    e. Examples
3. Algorithmic Appetizers
    a. Teleportation
    b. Deutsch's Problem
    c. Hidden Subgroup Problems
    d. A Small Search Algorithm

<u>ASSESSMENT PLAN FOR THE COURSE</u>

Mid-term Exam	25%
Final Project	25%
Assignments	45%
Culture Reports	5%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

<u>Estimate Curriculum Category content (Semester Hours)</u>

Area	Core	Advanced	Area	Core	Advanced
Algorithms		3	Software Design		
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture					

CSCE 441 Computer Graphics (3-0)
Credit Hours: 3
Course Coordinator: John Keyser

CURRENT CATALOG DESCRIPTION

(3-0) Credit 3 I, II, S Principles of interactive computer graphics; 2-D and 3-D rendering pipelines, including geometric object and view transformations, projections, hidden surface removal, and rasterization; lighting models for local and global illumination; hierarchical models of 3-D objects, systems and libraries supporting display and user interaction.

TEXTBOOK

McConnell, Steve. **Code Complete: A Practical Handbook of Software Construction**. 2nd ed. Redmond: Microsoft Press, 2004.

REFERENCES

Foley, Van Dam, Feiner, Hughes. **Computer Graphics: Principles and Practice.** 2nd ed in C. Addison-Wesley, 1996.

Rick Parent. **Computer Animation: Algorithm & Techniques**. Morgan Kaumann. 2nd ed.

COURSE OUTCOMES

1. Become familiar with basic 2D rendering concepts and algorithms such as line drawing, line and polygon clipping, polygon filling, and antialiasing.
2. Understand 3D rendering techniques including hierarchical model structures, geometric transformations, projections, and hidden surface removal.
3. Understand basic lighting and shading techniques.
4. Understand the basics of color models as they relate to computer graphics.
5. Become familiar with basic aspects of geometric and solid modeling.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Understand Basic Concepts and Principles of Computer Graphics	Mid-term, Projects, Final	(A, B, C, E, K)
Understand Graphics Systems Organizations	Projects, Mid-term, Final	(A, B, C, E, K)
Understand Device Technologies for Raster and Vector Graphics Displays	Projects, Mid-term, Final	(A, B, C, E, K)
Be Able to Develop Two and Three Dimensional Scene Models	Projects, Mid-term, Final	(A, B, C, E, K)
Be Able to Segment, Clip and View Scenes	Projects, Mid-term, Final	(A, B, C, E, K)
Be Able to Perform Two and Three Dimensional Geometric Transformations and Projections	Projects	(A, B, C, E, K)
Be Able to Develop Basic Hierarchical Data Structures for Graphics Modeling	Projects, Mid-term, Final	(A, B, C, E, K)
Be Able to Develop Basic Graphics Animations	Projects, Mid-term, Final	(A, B, C, E, K)

Prerequisites by Topic

CPSC 211 or 221 or approval of instructor

Major Topics Covered in the Course

1. Overview of Graphics
2. 2D Primitive Drawing
3. 3D Geometric Transformations
4. Specification of View Frusta and Projections
5. Hidden-surface Removal and Z-buffering
6. Color Models
7. Basic Illumination and Shading
8. Texture Mapping
9. Hierarchical 3D Model Specification
10. Ray-tracing Basics
11. Key frame Interpolation and Rotation Representation
12. Animation with Mocap
13. Image Processing

Assessment Plan for the Course

Projects	60%
Mid-term	15%
Final	25%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms		2	Software Design		1
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture					

CSCE 442 Scientific Programming (3-0)
Credit Hours: 3
Course Coordinator: Vivek Sarin

CURRENT CATALOG DESCRIPTION

(3-0) Credit 3 II Introduction to numerical algorithms fundamental to scientific and engineering applications of computers; elementary discussion of error; algorithms, efficiency; polynomial approximations, quadrature and systems of algebraic and differential equations.

TEXTBOOK

Heath/Michael. **Scientific Computing: An Introductory Survey**. 2nd ed., McGraw-Hill. 2002.

REFERENCES

None

COURSE OUTCOMES

1. Introduction to numerical algorithms fundamental to engineering applications of computers
2. Elementary discussion of Errors
3. Algorithms Efficiency

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVE	ASSESSMENT METHOD	ABET OUTCOME
Understand Numerical Algorithms Fundamental to Engineering Applications of Computers	Homework, Final Project	(A, B, C, D, E, K)
Develop Algorithm Efficiency	Homework, Final Project	(A)

PREREQUISITES BY TOPIC

Knowledge of Fortran, C, or C++; MATH 304 or MATH 308 or concurrent enrollment in one of these

MAJOR TOPICS COVERED IN THE COURSE

1. **Introduction and Floating Pt. Arithmetic and Error**
2. **Iterative Algorithms and Solution of Equations**
3. **Solution of Linear Systems**
4. **Interpolation and Splines**
5. **Numerical Differentation and Integration**
6. **Numerical Solution of IVP and BVP**
7. **Eigenvalue Problem**
8. **Approximation Theory and FFT**

ASSESSMENT PLAN FOR THE COURSE

Homework	60 points
Final Project	40 points

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms		3	Software Design		
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture					

CSCE 444 Structures of Interactive Information (3-0)
Credit Hours: 3
Course Coordinator: Andruid Kerne

CURRENT CATALOG DESCRIPTION

(3-0) Credit 3 A systems approach to the programming, design, authoring and theory of hypermedia; object-oriented visual and interactive programming; visual design, including color, space, text and layering; the reference as a metadisciplinary structure; collecting and sampling; ontologies, maps and navigation as means of structuring information; create dynamic hypermedia that is expressive and interpretive.

TEXTBOOK

Chris Sells, Ian Griffiths. **Programming WPF**. 2nd ed. Reilly and Associates. 2007. On-line at safari (less usable than paper).
Jesse Liberty, Donald Xie. **Programming C# 3.0**. 5th ed. Reilly and Associates. 2007. On-line at safari
Don Norman. **The {Design, Psychology, Psychopathology} of Everyday Things**. New York: Basic Books, 1988. (All variant titles are the same.)
Edward Tufte. **Envisioning Information**. Chesire, CT: Graphics Press, 1990.
David Turnbull. **Maps are Territories: Science is an Atlas**. Chicago: University of Chicago Press, 1989.

REFERENCES

Johannes Itten. **The Art of Color**. -or- **The Elements of Color**. New York: Wiley, 1997.
Judith Bishop. **C# 3.0 Design Patterns**. Reilly and Associates, 2007. On-line at safari

COURSE OUTCOMES

This course develops an ecosystems approach to structures of interactive information. These structures are semantic and technical. They are cultural and creative. We will explore programming, design, authoring, and theory. We will work conceptually, visually, and algorithmically.

1. Interactive information as a form of communication.
2. Visual design, including color theory, space, and foreground/background relationships.
3. Visual and conceptual layering.
4. Practices of collecting from Duchamp to Vaneevar Bush to Borges to DJ Spooky are investigated.
5. The problem of how to represent large collections in ways that promote cognition and communication.
6. Ontologies, maps, navigation, and information visualization as functional semiotic means for structuring interactive information.
7. The design of dynamic navigation as an approach addressing the *large collections problem*.

I ask you to create hypermedia projects that are expressive and interpretive.
You will learn to specify problems, as well as to solve them. By performing the assignments, you will build yourself a web-accessible interactive portfolio.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Understand Interactive Information as a Form of Communication	Quizzes, Class Participation	(A, G, H, J)
Learn Components of Visual Design	Quizzes, Projects, Journaling	(A, C, E, K)
Learn How to Represent Large Collections that Promote Cognition and Communication	Quizzes, Projects, Journaling	(A, B, C, E, K)
Ontologies, Maps and Information Visualization as Functional Semiotic Means for Structuring Interactive Information	Projects, Journaling	(A, B, C, E, K)
Design of Dynamic Navigation to address the Large Collections Problem	Projects, Journaling	(A, B, C, D, E, F, G, K)
Practices of collecting from Duchamp to Vaneevar Bush to Borges to DJ Spooky are investigated.	Projects, Journaling	(A, B, C, E, K)

PREREQUISITES BY TOPIC

CPSC 315 or approval of instructor

MAJOR TOPICS COVERED IN THE COURSE

1. Interactive information as a form of communication.
2. Visual design, including color theory, space, and foreground/background relationships.
3. Visual and conceptual layering.
4. The reference as a metadisciplinary structure.
5. Practices of collecting from Duchamp to Vaneevar Bush to Borges to DJ Spooky are investigated.
6. The problem of how to represent large collections in ways that promote cognition and communication.
7. Ontologies, maps, navigation, and information visualization as functional semiotic means for structuring interactive information.
8. The design of dynamic navigation as an approach addressing the *large collections problem*.

ASSESSMENT PLAN FOR THE COURSE

Journaling	10%
Mid-term Project	25%
Final Project	35%
Smaller Projects	20%
Quizzes	?
Class Participation	10%

Grading Scheme

90 - 100	**A**
80 - 89	**B**
70 - 79	**C**
60 - 69	**D**
< 60	**F**

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		3
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture					

CSCE 452 Robotics and Spatial Intelligence (3-0)
Credit Hours: 3
Course Coordinator: Dezhen Song

CURRENT CATALOG DESCRIPTION

(3-0) Credit 3 II Algorithms for executing spatial tasks; path planning and obstacle avoidance in two- and three-dimensional robots--configuration space, potential field, free-space decomposition methods; stable grasping and manipulation; dealing with uncertainty; knowledge representation for planning--geometric and symbolic models of the environment; task-level programming; learning.

RECOMMENDED TEXTBOOK

John J. Craig. Introduction to Robotics: Mechanics and Control (3rd Edition). Prentice Hall: August 6, 2004.

Ronald C. Arkin. **Springer Handbook of Robotics**. Springer Berlin Heidelberg, [Online access] Behavior-Based Robotics, MIT press, 1998.

REFERENCES

Microsoft Robotics Developer Center- http://msdn.microsoft.com/en-us/robotics/default.aspx

COURSE OUTCOMES

It is expected that successful participation in the course will allow the student to demonstrate:

1. An understanding of basic timing mechanisms in different operating systems,
2. An understanding of the basic kinematics and dynamics of robot manipulators and provide hands on experience in programming real robots.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Understand Basic Timing Mechanisms in Different Operating Systems	Quizzes, Mid-terms, Projects	(A, E)
Understanding of the Basic Kinematics and Dynamics of Robot Manipulators and Provide Hand's on Experience in Programming Real Robots.	Quizzes, Mid-terms, Projects	(A, B, C, D, E, F, G, J, K)

PREREQUISITES BY TOPIC

CPSC 315 or approval of instructor

MAJOR TOPICS COVERED IN THE COURSE

1. Introduction to Homogeneous Transformations and Coordinate Frames
2. Homogeneous Transformations and Coordinate Frames

3. Forward Kinematics
4. Inverse Kinematics
5. Tele-operation and Networked Robots
6. Introduction to Mobile Robots
7. Motors and Sensors
8. Robot Motion Planning

Assessment Plan for the Course

Quizzes	5%
Class attendance	5%
2 Mid-terms	45%
5 Projects	45%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms		3	Software Design		
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture					

CSCE 462 Microcomputer Systems (2-2)
Credit Hours: 3
Course Coordinator:

CURRENT CATALOG DESCRIPTION

(2-2) Credit 3 II Microcomputers as components of systems; VLSI processor and co-processor architectures, addressing and instruction sets; I/O interfaces and supervisory control; VLSI architectures for signal processing; integrating special purpose processors into a system.

TEXTBOOK

None

REFERENCES

1. Class web site: http://rtds.cs.tamu.edu/web_462/
2. All the major technical materials are drawn from the vendor datasheets and web pages.
3. Lab manual – will be distributed with lab assignments, and available in lab and on the class Web site.

COURSE OUTCOMES

At the end of the course students should be able to:

1. Analyze and choose microcomputer technologies to build a small computer system;
2. Use FGPA design tools to create and test logic designs;
3. Use the compiler to cross compile application codes into a single board computer;
4. Interface between microcontroller and FPGA;
5. Properly document program code;
6. Plan an open project: secure parts, budget and execute the implementation of a target "system" of the student's choosing, and be able to make a live demonstration of the prototype.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Analyze and Choose Microcomputer Technologies to Build a Small Computer System	Labs, Open Project	(A, B, C, E, F, J, K)
Use FGPA Design Tools to Create and Test Logic Designs	Labs, Open Project	(A, B, K)
Use Compiler to Cross Compile Application Codes into a Single Board Computer	Labs, Open Project	(A, E, K)
Interface between Microcontroller and FPGA	Labs, Open Project, Exams	(A, E, K)
Learn to Properly Document Program Code	Exams, Labs	(A, F, G, H, J)
Plan, Budget, Secure Parts Implement a Target System and Make a Prototype	Labs, Exams, Open Project	A, B, C, D, E, F, G, K)

Prerequisites by Topic

CSCE 313; digital design, computer architecture, programming operating systems

Major Topics Covered in the Course

FPGA Basics
Static RAM
Address Decoding
I/O Fundamentals
USB
Design Tools
Microcomputer Systems
Memory Read and Write Cycles
Interrupts and Exceptions
Parallel and Serial I/O
MMlite
Instruments (Scope, Logic Analyzer)

Assessment Plan for the Course

Mid-term Exam	20%
Open Project	40%
Labs	20%
Final Exam	20%

Grading Scheme

85 - 100	A
70 - 84	B
60 - 69	C
50 - 59	D
< 49	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms		1	Software Design		
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture		2			

CSCE 463 Networks and Distributed Processing (3-0)
Credit Hours: 3
Course Coordinator: Dmitri Loguinov

CURRENT CATALOG DESCRIPTION

(3-0) Credit 3 I, II Basic hardware/software, architectural components for computer communications; computer networks, switching, routing, protocols and security; multiprocessing and distributed processing; interfacing operating systems and networks; case studies of existing networks and network architectures.

TEXTBOOK

Kurose, James F., and Keith W. Ross. Computer Networking: A Top-Down Approach. 5th Ed. Reading: Addison Wesley, 2009.

REFERENCES

http://irl.cse.tamu.edu/courses/463-500

COURSE OUTCOMES

To provide Computer Science and Engineering students with knowledge of basic hardware, software and architectural components for computer communications; computer networks, switching, routing, protocols and security; distributed processing and network applications; and case studies of existing networks and network architecture. Provide students with experience in designing networks and/or network applications according to real world requirements.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Provide Knowledge of Basic Hardware, Software and Architectural Components for Computer Communications.	Quizzes, Mid-term Exams	(A, B, C, E, F, H, K)
Provide Experience in Designing Networks and/or Network Applications According to Real World Requirements.	Programming Assignments	(A, B, C, D, E, F, G, K)

PREREQUISITES BY TOPIC

CPSC 315 or approval of instructor

MAJOR TOPICS COVERED IN THE COURSE

a. **Preliminaries**
    a. **Sockets/threads, net concepts**
    b. **Gnutella**
b. **Application Layer**
    a. **HTTP**
    b. **FTP**

        c. **SMTP/POP3**
        d. **P2P**
    c. **Transport Layer**
        a. **TCP**
        b. **UDP**
    d. **Network Layer**
        a. **Switching**
        b. **Routing**
    e. **Data-link Layer**
        a. **CSMA/Ethernet**
    f. **Security**
        a. **Encryption, Authentication**

ASSESSMENT PLAN FOR THE COURSE

Homework 40%

1. 4 Programming Assignments

Exams

1. 3 Quizzes 15%
2. 3 Mid-terms 45%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms		1	Software Design		
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture		2			

CSCE 470 Information Storage and Retrieval (3-0)
Credit Hours: 3
Course Coordinator: Frank Shipman, III

CURRENT CATALOG DESCRIPTION

(3-0) Credit 3 Representation of, storage of and access to very large multimedia document collections; fundamental data structures and algorithms of current information storage and retrieval systems and relates various techniques to design and evaluation of complete retrieval systems.

TEXTBOOK

Manning, Christopher D., Prabhakar Raghavan, and Hinrich Schutze. **Introduction to Information Retrieval**. New York: Cambridge University Press, 2008.

REFERENCES

Ricardo Baeza-Yates and Berthier Ribeiro-Neto. **Modern Information Retrieval**. Addison Wesly and ACM Press.

COURSE OUTCOMES

By the end of the semester the student should be able to:

1. Define and explain the key concepts and models relevant to information storage and retrieval, including efficient text indexing and compression, Boolean, and vector space retrieval models, relevance feedback, document clustering and text categorization, Web search, including crawling, indexing, and link-based algorithms like PageRank, and so on.
2. Design, implement, and evaluate the core algorithms underlying a fully functional IR system, including the indexing, retrieval, and ranking components, as well as advanced algorithms like document clustering and text categorization.
3. Distinguish between the traditional IR problem domain (its underlying assumptions, approaches, and techniques) and the Web IR problem domain.
4. Identify the salient features and apply recent research results information storage and retrieval, including collaborative filtering, adversarial information retrieval, question answering, and social information management.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Define and Explain Key Concepts and Models Relevant to Information Storage and Retrieval	Homework, Exams, Class Participation	(A, B, C, G, K)
Design, Implement, and Evaluate the Core Algorithms Underlying a Fully Functional IR System	Project, Homework, Class Participation,	(A, B, C, I, K)
Distinguish Between Traditional IR Problem Domain and Web IR Problem Domain	Homework, Exams	(A, E, K)
Identify Salient Features and Apply Recent Research Results in Information Storage and Retrieval	Homework, Project	(A, B, C, E, H, J, K)

Prerequisites by Topic

CPSC 315 or approval of instructor, students should be able to design and develop large JAVA programs and learn new software libraries on their own.

Major Topics Covered in the Course

1. Overview of Information Retrieval Tasks,
2. Evaluation of Information Retrieval Systems,
3. Collections and Content Types,
4. Query Languages and IR Models,
5. Relevance Feedback and Clustering,
6. Text Processing and Compression,
7. Interfaces for Information Retrieval,
8. Searching the Web.

Assessment Plan for the Course

Class Participation	10%
Exams	45%
Homework	20%
Project	25%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms		0.5	Software Design		2
Data Structures		0.5	Concepts of Programming Languages		
Computer Organization and Architecture					

CSCE 481 Seminar (0-2)
Credit Hours: 1
Course Coordinators: Valerie Taylor/Riccardo Bettati

CURRENT CATALOG DESCRIPTION

(0-2) Credit 1 I, II, S Investigation and report by students on topics of current interest in computer science.

TEXTBOOK

Zobel, Justin. **Writing for Computer Science**, Second Ed. Springer, 2004.

REFERENCES

None

COURSE OUTCOMES

The goal of this course is to expose students to a variety of topics of current interest in computer science. This will include several practical issues related to career-oriented topics, such as finding a job, job environment, and graduate school. This course is being taught in a way consistent with W course requirements.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Learn About Current Topics of Technical, Career-oriented, and Graduate School Interests in Computer Science	Class Participation, Written Reports	(F, I, J, H)
Develop Technical Writing Skills	Writing Assignments	(F, G, I, J, H)

PREREQUISITES BY TOPIC

Junior or senior classification

MAJOR TOPICS COVERED IN THE COURSE

The course will cover a variety of topics in class, in addition to research topics that students will be exposed to through attending research seminars outside of class. The in class topics will include material on:

1. Career opportunities and pathways for those with undergraduate and/or graduate degrees in computer science and engineering
2. Job topics, including job searching, interviewing, and negotiating
3. Company work environments
4. Computer Science/Engineering research, including undergraduate research
5. Graduate school

In addition, in-class instruction will be provided on writing for computer science.

ASSESSMENT PLAN FOR THE COURSE

Pass/Fail
All of the following must be completed to pass:
Seminar Reports- 13
Short Written Assignments
  Resume
  3 Culture Assignments, reports based on research oriented presentations in the dept.
  1 Company Report, drawn from career fair
  1 report to be determined latter
Longer Written Assignment, 4-6 pages

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture					

Note: This class explores different topics within the Computer Science and Computer Engineering spectrum. There is no set core or advanced content per se.

CSCE 482 Senior Capstone Design (1-6)
Credit Hours: 3
Course Coordinator: Ricardo Gutierrez-Osuna

CURRENT CATALOG DESCRIPTION

(1-6) Credit 3 Project-based course to develop system integration skills for solving real-world problems in computer science; significant team software project that integrates advanced concepts across computer science specializations; projects require design, implementation, documentation and demonstration, as well as design methodology, management process and teamwork.

TEXTBOOK

None

REFERENCES

Kerne, A., Toups, Z., Dworaczyk, B., Khandelwal, M., A Concise XML Binding Framework Facilitates Practical Object-Oriented Document Engineering, *Proc ACM Document Engineering 2008*.

Kerne, A., Toups, Z.O., Dworaczyk, B., Khandelwal, M. Expressive, Efficient, Embedded, and Component-based XML-Java Data Binding Framework, *Interface Ecology Lab Technical Report 08-06*, 2008.

Toups, Z.O., Kerne, A., Webb, A. A lightweight object-oriented distributed semantic services framework. Submitted to the International Conference on Software Engineering, 2008.

COURSE OUTCOMES

1. Students will collaborate to develop exciting projects using state-of-the-art computing technologies, such as multi-touch, the iPhone, web information semantics, and GPU visualization. Senior Capstone Design emphasizes problem formation, as well as the development of solutions.
2. You will develop research-level ideas. Projects require demonstration of methods and techniques, while providing space for you to express yourself creatively.
3. You will build sophisticated and reliable integrated systems of software and hardware components, through iterative design processes that take into account human needs, requirements, and imagination, as well technological characteristics and scientific methods.

Relationship between Course Outcomes and Program Outcomes

Objectives	Assessment Methods	ABET Outcomes
Develop System Integration Skills	Project	(A, E, K)
Integrate Various System Components from the Hardware Layer to the Application Layer	Project	(A, B, C, E, F, J, K)
Implement Project Accomplishment, Design Methodology, Management Process and Team Work	Project	(A, B, C, D, E, F, G, H, J, K)
Learn Documentation and Demonstration of a Computing System with Hardware and Software Designs	Project	(A, B, C, D, E, F, G, H, J, K)

Prerequisites by Topic

Senior classification; at least two CPSC courses from one track including 411

Major Topics Covered in the Course

1. Integrating Algorithms
2. Software
3. Intelligence
4. Systems
5. Graphs
6. Information
7. Human Centered Perspective

Assessment Plan for the Course

Project:

Project Proposals	7.5%
Project Plan	15%
Research Notebook	7.5%
Video	15%
Final Presentation	7.5%
Final Report	15%
*Other Deliverables	20%
Participation	5%
Peer Review	7.5%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		3
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture					

CSCE 483 Computer Systems Design (1-6)
Credit Hours: 3
Course Coordinator: Ricardo Gutierrez-Osuna

CURRENT CATALOG DESCRIPTION

(1-6) Credit 3 Engineering design; working as a design-team member, conceptual design methodology, design evaluations, total project planning and management techniques, design optimization, systems manufacturing costs considerations; emphasis placed upon students' activities as design professionals.

TEXTBOOK

Patrick M. Lencioni. **The Five Dysfunctions of a Team: a Leadership Fable**. (Jossey-Bass, 2002).

REFERENCES

1. Ralph Ford and Chris Coulston. **Design for Electrical and Computer Engineers**. (McGraw-Hill Science, 2007).
2. Barry Hyman. **Fundamentals of Engineering Design**. 2nd Ed. (Prentice Hall, 2003).
3. Jon R. Katzenbach and Douglas K. Smith. **The Wisdom of Teams: Creating the High-Performance Organization**. Collins. (2003). Available on-line at TAMU Libraries.
4. Jon R. Katzenbach and Douglas K. Smith. **Organization**. Collins. (2003). Available on-line at TAMU Libraries.
5. Technical material from the literature, manufacturer's datasheets and user manuals.

COURSE OUTCOMES

1. Prepare students for engineering practice with a major design experience based on the knowledge and skills acquired in earlier course work and incorporating engineering standards and realistic constraints that include most of the following considerations: economic, environmental, sustainability, manufacturability, ethical, health and safety, social and political.

RELATIONSHIP BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

OBJECTIVES	ASSESSMENT METHODS	ABET OUTCOMES
Develop System Integration Skills	Project	(A, E, K)
Integrate Various System Components from the Hardware Layer to the Application Layer	Project	(A, B, C, E, F, J, K)
Implement Project Accomplishment, Design Methodology, Management Process and Team Work	Project	(A, B, C, D, E, F, G, H, J, K)
Learn Documentation and Demonstration of a Computing System with Hardware and Software Designs	Project	(A, B, C, D, E, F, G, H, J, K)

PREREQUISITES BY TOPIC

CPSC 315 and 462; senior classification, knowledge of basic software engineering skills, foundation in personal communications skills, foundation in basic sciences & mathematics, knowledge of computer systems & languages

MAJOR TOPICS COVERED IN THE COURSE

1. Introduction and Project Management
2. User Requirements/ Problem Statement
3. Introduction to Design/ Stages of Design
4. Innovation, Creativity & Search for Solutions
5. RFP's and Contracts
6. Proposal Organization/Planning
7. Project Development Plan
8. Project Staffing/Scheduling/Costing
9. Project Test Plan
10. Project Documentation/Reports
11. Design Review/Rationalization
12. Abstracts/ Professional Papers
13. Design Presentations

ASSESSMENT PLAN FOR THE COURSE

Project:

Project Proposal	15%
Weekly Progress	10%
Critical Design Review	10%
Final Communication	10%
Project Grade	20%
Team Work	5%
Individual Performance	30%

Grading Scheme

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Estimate Curriculum Category content (Semester Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software Design		3
Data Structures			Concepts of Programming Languages		
Computer Organization and Architecture					

A.C Courses in ECEE Department

Course Name: ECEN 214
Course Title: Electrical Circuit Theory

Catalog Description:
214. Electrical Circuit Theory. (3-3). Credit 4. Resistive circuits: circuit laws, Network reduction, nodal analysis, mash analysis; energy storage elements; sinusoidal steady state ; AC energy systems; magnetically coupled circuits; the ideal transformer; resonance; introduction to computer applications in circuit analysis.

Course Designation: Required

Prerequisite(s): CPSC 110 or equivalent.

Required Text(s): J. W. Nilsson**,** Electric Circuits, 6^{th} ed., Prentice-Hall 2002.

Course Objectives: At the end of this course, students should:

1. Understand three basic electrical quantities: charge, current and voltage and the conversion of their reference directions. Investigate power and energy and demonstrate that these quantities are conserved.

2. Define independent and dependent sources that act as energy or signal generators in a circuit. Define and utilize the fundamental laws of circuit theory; Ohm's law and Kirchhoff's laws. Investigate the power dissipation as heat in a resistor.

3. Explore series and parallel resistive circuits, delta-wye transformation, voltage and current division principles. Explore the equivalent resistance, voltages, currents and power in series parallel connection of resistors. Illustrate how the above laws and techniques can be applied to design of resistive circuits.

4. Understand two systematic techniques of circuit analysis: nodal and mesh analysis. Introduce methods of simplifying circuits: source transformation, superposition, Thevenin and Norton equivalent circuits. Understand the concept of equivalent circuit and learn a variety of techniques for finding the Thevenin equivalent circuit. Investigate the maximum power transfer to a resistive load.

5. Understand operational amplifiers, its circuit model and v-i characteristics. Define the ideal op amp and its terminal voltages and currents. Analyze various circuits containing op amps. Analyze some popular op amp circuits: inverting, non-inverting, summing and difference amplifier circuits.

6. Understand capacitors and inductors as two energy storage components. Investigate properties of capacitors and inductors, and their v-i relationships. Introduce parallel and series combination of capacitors and inductors.

7. Understand the exponential response of first order RL and RC circuits without and with constant excitation sources present. Derive the exponential solution that characterizes the voltage and current response of RL and RC circuits. Analyze the integrating and differentiating amplifiers.
8. Explore the parallel and series RLC circuits. Derive the differential equations and develop a systematic method for finding the voltage and current response in RLC circuits. Define and understand the significance of underdamped, overdamped and critically damped responses.

9. Review the basic arithmetic of complex numbers. Introduce the concept of phasor for representing sinusoidal voltages and currents. Define the concepts of impedance and a generalized ohm's law.

Utilize the circuit analysis techniques and the network theorems, to analyze ac circuits by phasor methods.

10. Understand the concept of rms and average value of a periodic voltage or current. Define the average power, reactive power, apparent power and complex power and discuss their significance. Introduce the concept of power factor and describe a method and reasons for improving the power factor associated with the load. Derive the maximum power transfer theorem for ac circuits.

11. Introduce three-phase ac systems for transmitting power. Learn basic methods for analyzing three-phase circuits with different configurations. Derive the formulas for power calculation in three-phase systems.

Course Topics and Hours

Unit	Hours
1. Circuit variables	2
2. Circuit Elements	2
3. Resistive Circuits	3
4. Techniques of circuit analysis	5
5. Operational Amplifiers	4
6. Capacitors and Inductors	3
7. First Order Circuits	4
8. Second order Circuits	5
9. Sinusoidal Steady State Analysis	4
10. AC Power Analysis	4
11. Three phase Circuits	4
review lectures	2

Total Hours 42

Lecture Schedule – 3 meetings per week, 50 minutes each.
Laboratory Schedule – 1 meeting per week, 110 minutes each.

Student Evaluation

Homework & quiz	15%
lab	15%
Midterm Exams(3)	45%
Final Exam	25%
Total	100%

Contributions to Professional Component:

Engineering science	4 credit hours
Engineering design	0 credit hours

Relationship to Program Outcomes:

OBJECTIVE	ASSESSMENT METHOD	ABET OUTCOME
• Introduce three basic electrical quantities: charge, current and voltage and the conversion of their reference directions. • Investigate power and energy and demonstrate that these quantities are conserved.	Homework, Quiz, Exams, Prelabs, Lab reports and lab quizzes, Design studio assignments.	3(a), 3(b), 3(d), 3 (e), 3 (k)
• Define independent and dependent sources that act as energy or signal generators in a circuit. • Define and utilize the fundamental laws of circuit theory; Ohm's law and Kirchhoff's laws. • Investigate the power dissipation as heat in a resistor.	Homework, Quiz, Exams, Prelabs, Lab reports and lab quizzes, Design studio assignments.	3(a), 3(b), 3(d), 3 (e), 3 (k)
• Introduce series and parallel resistive circuits, delta-wye transformation, voltage and current division principles. • Explore the equivalent resistance, voltages, currents and power in series parallel connection of resistors. • Illustrate how the above laws and techniques can be applied to design of resistive circuits.	Homework, Quiz, Exams, Prelabs, Lab reports and lab quizzes, Design studio assignments.	3(a), 3(b), 3(d), 3 (e), 3 (k)
• Introduce two systematic techniques of circuit analysis: nodal and mesh analysis. • Introduce methods of simplifying circuits: source transformation, superposition, Thevenin and Norton equivalent circuits. • Understand the concept of equivalent circuit and learn a variety of techniques for finding the Thevenin equivalent circuit. • Investigate the maximum power transfer to a resistive load.	Homework, Quiz, Exams, Prelabs, Lab reports and lab quizzes, Design studio assignments.	3(a), 3(b), 3(d), 3 (e), 3 (k)
• Introduce operational amplifiers, its circuit model and v-i characteristics. • Define the ideal op amp and its terminal voltages and currents.	Homework, Quiz, Exams, Prelabs, Lab reports and lab quizzes, Design studio assignments.	3(a), 3(b), 3(d), 3 (e), 3 (k)

• Analyze various circuits containing op amps. • Analyze some popular op amp circuits: inverting, non-inverting, summing and difference amplifier circuits.		
• Introduce capacitors and inductors as two energy storage components. • Investigate properties of capacitors and inductors, and their v-i relationships. • Introduce parallel and series combination of capacitors and inductors.	Homework, Quiz, Exams, Prelabs, Lab reports and lab quizzes, Design studio assignments.	3(a), 3(b), 3(d), 3 (e), 3 (k)
• Introduce the exponential response of first order RL and RC circuits without and with constant excitation sources present. • Derive the exponential solution that characterizes the voltage and current response of RL and RC circuits. • Analyze the integrating and differentiating amplifiers.	Homework, Quiz, Exams, Prelabs, Lab reports and lab quizzes, Design studio assignments	3(a), 3(b), 3(d), 3 (e), 3 (k)
• Explore the parallel and series RLC circuits. • Derive the differential equations and develop a systematic method for finding the voltage and current response in RLC circuits. • Define and understand the significance of underdamped, overdamped and critically damped responses.	Homework, Quiz, Exams, Prelabs, Lab reports and lab quizzes, Design studio assignments	3(a), 3(b), 3(d), 3 (e), 3 (k)
• Review the basic arithmetic of complex numbers. • Introduce the concept of phasor for representing sinusoidal voltages and currents. • Define the concepts of impedance and a generalized ohm's law. • Utilize the circuit analysis	Homework, Quiz, Exams, Prelabs, Lab reports and lab quizzes, Design studio assignments.	3(a), 3(b), 3(d), 3 (e), 3 (k)

techniques and the network theorems, to analyze ac circuits by phasor methods.		
• Understand the concept of rms and average value of a periodic voltage or current. • Define the average power, reactive power, apparent power and complex power and discuss their significance. • Introduce the concept of power factor and describe a method and reasons for improving the power factor associated with the load. • Derive the maximum power transfer theorem for ac circuits.	Homework, Quiz, Exams, Prelabs, Lab reports and lab quizzes, Design studio assignments.	3(a), 3(b), 3(d), 3 (e), 3 (k)
• Introduce three-phase ac systems for transmitting power. • Learn basic methods for analyzing three-phase circuits with different configurations. • Derive the formulas for power calculation in three-phase systems.	Homework, Quiz, Exams, Prelabs, Lab reports and lab quizzes, Design studio assignments.	3(a), 3(b), 3(d), 3 (e), 3 (k)

Prepared by: Mina M. Rahimian & Prasad Enjeti. Last revised 5/28/2010

Course Name: ECEN 248
Course Title: Introduction to Digital Systems Design

Catalog Description:

248. Introduction to Digital Systems Design. (3-3). Credit 4. Combinational and sequential digital system design techniques; design of practical digital systems.

Course Designation: Required

Prerequisite(s): ECEN 214 – or equivalent, or registration therein.

Required Text(s): Stephen Brown and Zvonko Vranesic**,** Fundamentals of Digital Logic with VHDL Design, McGraw-Hill 2000.

Course Objectives: At the end of this course, students should:

1. Understand the fundamental differences between analog and digital circuits.
2. Understand the difference between combinational and sequential digital logic.
3. Understand the fundamental concepts of Boolean Algebra and their application to the analysis and synthesis of digital circuits – including the minimization of two-level AND-OR combinational circuit realizations.
4. Be familiar with Karnaugh Maps for up to six variables and understand the relationships between operations performed using these tools and equivalent Boolean algebraic manipulations.
5. Have a mastery of digital numerical representations including unsigned and signed integer representations, Binary-Coded-Decimals, and Floating Point formats for rational numbers; be able to convert between these representation formats.
6. Be able to analyze and design standard arithmetic circuits that involve signed addition, subtraction, multiplication, and Binary-Coded-Decimal data representations.
7. Be familiar with typical multi-level logic primitives such as multiplexers, ROMs, PLAs, and PALS and one-out-of 2**N decoders.
8. Be able to use and understand standard synchronous sequential logic primitives such as latches, flip-flops, registers, and counters.
9. Be capable of the synthesis and analysis of synchronous sequential circuits in both Mealy and Moore design styles.
10. Understand the fundamentals of clocking logic and how to avoid the adverse affects of logic hazards.
11. Have been introduced to MOS-based logic gates and understand the simpler implications of the analog circuit characteristics of a particular IC fabrication technology upon the performance of digital circuits based on that IC fabrication technology.
12. Understand DeMorgan's Theorem and its applications with respect to inversion-based logic primitives – such as the conversion from AND-OR to NAND-NAND logic.
13. Understand the difference in static and dynamic logic analysis and be able to make simplified determinations of worst case timing delay through combinational logic circuits.
14. Based upon their laboratory experience, they should be able to design, implement, and debug simple combinational and sequential logic circuits using standard SSI integrated circuits, and they should be capable of moderately sized logic circuit designs using simple Computer Aided Design tools in conjunction with programmable logic.

Course Topics and Hours

Unit	Hours
12. Logic gates and Boolean Algebra	4
13. Combinational logic design and analysis	6
14. Arithmetic circuits	5
15. Common MSI logic primitives and their utilization	3
16. Synchronous sequential circuit design	8
17. Latches, flip-flops, registers, counters and their applications	5
18. NMOS and CMOS-based logic gates and latches	3
Exams	8
Total Hours 42	

Lecture Schedule – 3 meetings / week, 50 minutes each or 2 meetings / week 75 minutes each
Laboratory Schedule – 1 session of 170 minutes / week,

Student Evaluation:

Homework	15%
Laboratory	15%
Midterm Exams(2)	40%
Final Exam	30%
Total	100%

Contributions to Professional Component:

Engineering science	2 credit hours
Engineering design	2 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of Boolean Algebra to the analysis and synthesis of digital circuits	Homework problems and exam questions	5	3(a), 9
Laboratory work to design, debug, and analyze logic circuits	Laboratory grade	6	3(k), 9
Final laboratory project	Laboratory grade	7, 8	3(c), 3(e), 9

Prepared by: M. Ray Mercer, last revised 5/28/2010

Course Name: ECEN 303
Course Title: Random Signals and Systems

Catalog Description:
303. Electrical Circuit Theory. (3-1). Credit 3. Concepts of probability and random variables necessary for study of signals and systems involving uncertainty; applications to elementary problems in detection, signal processing and communication.

Course Designation : Required

Prerequisite(s): ECEN 214, MATH 308 or registration therein.

Required Text(s): S. L. Miller and D. G. Childers, PRP: Probability and Random Processes, Elsevier, 2004.

Course Objectives: By the end of this course, students should:

1. Review basic notions of set theory and simple operations such as unions, intersections, differences and De Morgan's laws. Discuss cartesian products and simple combinatorics. Go over the counting principle, permutations, combinations and partitions.
2. Introduce sample spaces, probability laws and random variables. Distinguish between events and outcomes, and illustrate how to compute their probabilities.
3. Present the concepts of independence and conditional probabilities. Study the total probability theorem and Bayes' rule. Provide examples of these important results applied to tangible engineering problems.
4. Understand mathematical descriptions of random variables including probability mass functions, cumulative distribution functions and probability density functions. Become familiar with commonly encountered random variables, in particular the Gaussian random variable.
5. Introduce the notions of expectations and moments, including means and variances. Calculate moments of common random variables. Characterize the distributions of functions of random variables.
6. Explore the properties of multiple random variables using joint probability mass functions and joint probability density functions. Understand correlation, covariance and the correlation coefficient. Discuss how these quantities relate to the independence of random variables.
7. Gain the ability to compute the sample mean and standard deviation of a random variable from a series of independent observations. Estimate the cumulative distribution function from a collection of independent observations. Study the law of large numbers and the central limit theorem, and illustrate how these two theorems can be employed to model random phenomena.
8. Explain the concept of confidence intervals associated with sample means. Calculate confidence intervals and use this statistical tool to interpret engineering data.
9. Engage the student in active learning through problem solving and real-world examples. Encourage the student to become an independent learner and increase his/her awareness of available resources.

Course Topics and Hours

Unit	**Hours**
1. Introduction and Mathematicla Review	1.5
2. Basica Concepts of Probability	4.5
3. Conditional Proability	4.5
4. Outcomes and Combinatorics	3
5. Discrete Random Variables	3
6. Discrete Expectations	4.5
7. Random Vectors	4.5
8. Continuous Random Variables	4.5
9. Functions and Derived Distributions	4.5
10. General Expectations and Bounds	3
11. Empirical Distributions	3
12. Real-World Applications	1.5

Total Hours 42

Lecture Schedule – 3 meetings per week, 50 minutes each.
Recitation Schedule – 1 meeting per week, 50 minutes each.

Student Evaluation

Homework Assignments	20%
Tests (3)	70%
Quizzes & Recitation	5%
Class Pariticipation	5%
Total	100%

Contributions to Professional Component:

Engineering science	3 credit hours
Engineering design	0 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Introduction to basic concepts of probability theory and statistics.	Homework problems, quizzes and test questions	1 (probability and statistics)	9
Solution and analysis of engineering problems involving probability and statistics	Homework problems, quizzes and test questions	5	3(a)
Introduction to real-world applications and case studies using probability theory	Homework problems, quizzes and test questions	7	3(e)

Prepared by: Last revised 5/28/2010

Course Name: ECEN 314
Course Title: Linear Circuit Analysis

Catalog Description:
314. Linear Circuit Analysis. (3-1). Credit 3. Continuous-time and discrete time signals and systems, linear time invariant systems, linear constant coefficient differential equations and Laplace transform, continuous-time Fourier series and transform, MATLAB simulation.

Course Designation: Required

Prerequisite(s): ECEN 214 – Electrical Circuit Theory, MATH 308 – Differential Equations.

Required Text(s): M. J. Roberts**,** Signals and Systems: Analysis Using Transform Methods and MATLAB, McGraw Hill, 2003.

Course Objectives: At the end of this course, students should:
1. Develop basic problem solving skills and using linear analysis techniques.
2. Have an appreciation of the use of basic mathematics including calculus, complex variables, and algebra for the analysis and design of linear time invariant (LTI) systems used in engineering practice.
3. Understand the similarities and differences between continuous-time and discrete-time signals and systems, and be familiar with engineering applications for each class.
4. Be able to use singularity functions such as the unit step and unit impulse functions, and periodic functions such as sinusoids and complex exponentials in linear system analysis.
5. Understand various system properties such as linearity, time invariance, memorylessness, causality, bounded-input bounded-output stability, and invertibility, how to determine whether a given system exhibits one or more of these characteristics, and implications for practical engineering systems.
6. Understand the process of convolution between two signals and its implications for LTI system analysis.
7. Be able to characterize an LTI system using the impulse response, frequency response, and (if possible) a linear constant coefficient differential equation (LCCDE).
8. Be able to solve a LCCDE using Laplace Transform methods.
9. Understand the intuitive meaning of the “frequency domain” for continuous-time periodic and aperiodic signals, and appreciate its use.
10. Be able to compute the Fourier Series (FS) or Fourier Transform (FT) of a set of well-defined continuous-time signals from first principles using the Fourier pair.
11. Be able to determine the FS or FT of a broader class of signals using relevant tables and properties.
12. Understand the application of Fourier analysis to ideal filtering (through the FT convolution property), amplitude modulation (through the FT modulation property), sampling (through the FT multiplication property) for continuous-time signals and systems.
13. Have a facility with MATLAB programming to solve basic linear system and signal problems.
14. Be familiar with formulating a mathematical problem from a general problem statement.

Course Topics and Hours

Unit	**Hours**
1. Importance of signals and systems in engineering analysis and design	1
2. Review of important mathematical concepts and functions	3
3. Basic system properties and classifications	3
4. LTI system analysis: convolution	7
5. Linear constant coefficient differential equations and the Laplace Transform	2
6. The Fourier Series	5
7. The Fourier Transform	7
8. Fourier Transform analysis of signals and systems	7
9. Exams and review lectures	7
Total Hours 42	

Lecture Schedule – 3 meetings per week, 50 minutes each.
Recitation Schedule – 1 meeting per week, 50 minutes each.

Student Evaluation:

Homework	15%
Project	10%
Midterm Exams(3)	45%
Final Exam	30%
Total	100%

Contributions to Professional Component:

Engineering science	3 credit hours
Engineering design	0 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Mathematical introduction to the basics of complex variables	Homework problems and test questions	1 (complex only)	9
Solution and analysis of linear circuit and general system problems	Homework problems and test questions	5	3(a), 3(e), 9
Use of MATLAB for time and frequency signal analysis and design	Homework problems and final project	4, 6	9

Prepared by: Deepa Kundur, last revised 5/28/10

Course Name: ECEN 322
Course Tite: Electric and Magnetic Fields

Catalog Description:
322. Electric and Magnetic Fields (3-1). Credit 3. Vector Analysis, Maxwell's Equations,Wave Propagation in unbounded regions, reflection and refraction of waves, transmission line theory; introduction to waveguides and antennas.

Course Designation: Required

Prerequisite(s): ECEN 214 Linear Circuit Analysis; MATH 311 or registration therein Topics in Applied Mathematics; PHYS 208 Electricity and Optics

Required Text(s): F. T. Ulaby, Fundamental of Applied Electromagnetics, 5th ed, Prentice-Hall, 2006.

Course Objectives: At the end of this course, students should:

1. Be able to obtain the integral forms from the differential forms of Maxwell's equations using Stokes and divergence theorems.
2. Know the point and integral forms of Maxwell's equations in the time and frequency domains and Ohm's law and how to derive Helmholtz equation from Maxwell's equaltions.
3. Know the names of the fields, currents and charges in Maxwell's equations and their dimensions.
4. Use vector operations - addition, subtraction, curl, gradient, divergence, dot and cross products.
5. Be able to change an expression from the time to the frequency domain and from the frequency to the time domain.
6. Be able to calculate displacement current, conduction current, skin depth and loss tangent.
7. Given an expression for a plane wave show how to obtain the equation for the phase velocity and determine the direction of travel of the wave.
8. Know the definitions of homogeneous, linear, and isotropic mediums and the definition of a uniform plane wave.
9. Given a uniform plane wave expression be able to determine or calculate its amplitude, polarization, phase velocity, propagation constant, attenuation constant, intrinsic impedance, and wavelength. Conversely, be able to construct a uniform plane wave given some of the above information.
10. Given an expression for either E or H in the time (or frequency) domain, be able to find the corresponding H or E in the frequency (or time) domain.
11. Given the field (electric or magnetic) on one side of a boundary be able to find the field on the other side using the boundary conditions.
12. Be able to derive Snell's law.
13. Be able to calculate time average power density, and attenuation in dB.
14. Given the angle of incidence, the field magnitude, and the frequency, be able to find the other fields (time or frequency domain) for either parallel or perpendicular polarization. Or, given one field expression, be able to calculate the others.
15. Calculate critical angle, Brewster angle, attenuation and penetration depth.
16. Find the characteristic impedance and propagation constant of a transmission line given R, L, G, and C.
17. Design a quarter-wave transformer and determine complete design dimensions for a microstrip circuit.
18. Calculate the input impedance, input voltage and power delivered to the load and incident and reflected power at a load of a transmission line.
19. Find the equivalent capacitance or inductance of an open or shorted transmission line.
20. Calculate the standing wave ratio and reflection coefficient on a transmission line.

21. Use a Smith chart to:Find transmission line impedance, standing wave ratio, and reflection coefficient and design a stub tuner to impedance match a transmission line load.

Course Topics and Hours

Unit	Hours
1. Wave properties	1
2. Complex numbers and phasors	1
3. General properties and analysis for transmission lines	1
4. Transmission line propagation, reflection and power flow	1
5. Standing waves	1
6. Introduction to matrix methods for 2-port networks	2
7. Lossless lines and special cases	2
8. The Smith Chart	3
9. Impedance matching	2
10. Time-harmonic fields and Maxwell's equations	1.5
11. Wave equation and solutions	1.5
12. Lossy materials	1
13. Uniform plane-waves	1
14. Power, density, polarization and wave properties	1
15. Transmission line modeling for 2-port networks	1.5
16. Normal and oblique incidence	1.5
17. Snell's Law and Brewster Angle	1
18. Dispersion	1
19. Transverse electric and transverse magnetic modes	3
20. Cut-off frequency	1
21. Phase and group velocities	1
22. Energy, power and Q-factor	4
23. Retarded potentials	1
24. Hertizian, half-wave and arbitrary-length dipoles	2
25. Antenna patterns, directivity and gain	1
26. Friis transmission formula	1
27. Exams and review lectures	3

Total Hours 42

Lecture Schedule – 3 meetings per week, 50 minutes each.
Recitation Schedule – 1 meeting per week, 50 minutes each.

Student Evaluation:

Tests (3)	60%
Homework, Quizzes and Recitation Attendance	15%
Final Exam	25%
Total	100%

Contributions to Professional Component:

Engineering science	3 credit hours
Engineering design	0 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of vector analysis to the transport of communication information.	Homework problems and exam questions	1, 5	3(a), 9
Application of complex variables to modeling field degradation and signal reception	Homework problems and exam questions	1, 5	3(a), 9
Use of MathCad to simulate wave propagation and behavior in microwave circuits	Homework problems	4, 5, 6	3(a), 3(k), 9
Use of concepts from basic physics to model microwave signal propagation and interaction with materials	Homework problems and exam questions	2, 5	3(a), 9

Prepared by: Robert Nevels, last revised 5/28/10

Course Name: ECEN 325
Course Title: Electronics

Catalog Description:
325. Electronics. (3-4). Credit 4. Introduction to electronic systems; linear circuits; operational amplifiers and applications; diodes, field effect transistors, bipolar transistors; amplifiers and nonlinear circuits.

Course Designation: Required

Prerequisite(s): ECEN 314 – Signals and Systems or registration therein.

Required Text(s): A.S. Sedra and K.C. Smith**,** Microelectronic Circuits, 6th ed., Oxford University Press, 2010.

Course Objectives: At the end of this course, students should:
1. Appreciate the role of analog electronics in our modern world.
2. Develop basic problem solving skills with analog electronic circuits, including the analysis of circuits using basic principles (Ohm's Law, Kirchoff's Laws, superposition, Thevenin's Theorem) and the design of simple amplifiers from basic specifications.
3. Understand how engineering mathematics (calculus, frequency-domain methods, etc.) can be used in the analysis and design of practical analog circuits.
4. Be able to derive analytically the expressions for input impedance, output impedance and gain for linear circuits with dependent sources.
5. Be able to derive the transfer function and Bode plot for a given electronic circuit.
6. Understand the basic operation of semiconductor devices.
7. Be able to derive a linear circuit description from circuits containing (nonlinear) semiconductors.
8. Understand the principles of good amplifier design.
9. Have direct experience in the design of analog circuits (e.g., amplifiers).

Course Topics and Hours

Unit	Hours
1. Kirchoffs voltage and current laws, linear network analysis, Bode plots	5
2. Operational amplifiers: principles, applications, frequency and slew rate	5
3. Diodes: operation, large-signal models, rectifiers, small-signal model	4
4. Bipolar junction transistor: device characteristics, DC biasing	7
5. Bipolar junction transistor: small-signal model, amplifier analysis & design	7
6. MOS field-effect transistor: device structure and characteristics, DC biasing	7
7. MOS field-effect transistor: small-signal model, amplifier analysis & design	7
8. Kirchoffs current	
Total Hours 42	

Lecture Schedule – 2 meetings per week, 75 minutes each.
Laboratory Schedule – 1 meeting per week, 170 minutes each.
Recitation Schedule – 1 meeting per week, 50 minutes each.

Student Evaluation:

Homework	15%
Labs	20%
Midterm Exams (2)	40%
Recitation Attendance	5%

Final Exam	20%
Total	100%

Contributions to Professional Component:

Engineering science	2.5 credit hours
Engineering design	0.5 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Linear system (ODE, transfer function) and circuit analysis for time- and frequency-domain descriptions	Homework grades, lab work and test grades (on specific problems/tasks)	5	3 (a)
Lab work involving software tools such as SPICE and use of test equipment (oscilloscopes, function generators, power supplies, etc.)	Lab work evaluation	6	3 (k)
Design of passive networks to meet frequency response criteria, design of amplifiers to meet specifications	Homework grades, lab work and test grades (on specific problems/tasks)	8	3 (c), 3 (a)
Proper use of lab equipment to characterize original circuits designed by the student	Lab work evaluation	9	3 (b)

Prepared by: Takis Zourntos, last revised 5/28/10.

Course Name: ECEN 326
Course Title: Electronic Circuits

Catalog Description:
326. Electronic Circuits. (3-3). Credit 4. I, II Basic circuits used in Electronic systems; differential and multistage amplifiers; current mirrors, active loads and references; output stages; frequency response of integrated circuits; feedback; stability; frequency response and stability of feedback amplifiers.

Course Designation: Elective

Prerequisite(s): ECEN 314 – Linear Circuit Analysis and ECEN 325 – Electronics

Required Text(s): P. R. Gray, P. J. Hurst, S. H. Lewis and R. G. Meyer**,** Analysis and Design of Analog Integrated Circuits, 4th ed., John Wiley & Sons, Inc., 2001.

Course Objectives: At the end of this course, students should:
1. Understand the operation of bipolar junction transistors (BJTs) and MOS transistors.
2. Understand the concepts of amplifier gain, input impedance, output impedance, DC equivalent circuit, small-signal analysis, loading effect.
3. Understand the three basic amplifier configurations: Common emitter (source), common base (gate), and common collector (drain). Be able to design single-stage and multiple-stage amplifiers with given specifications.
4. Understand the concepts of common-mode and differential mode operation.
5. Understand the device mismatch effects in differential amplifiers.
6. Understand the characteristics of current mirrors and active loads, and be able to choose an appropriate topology for the given design specifications.
7. Understand how to generate voltage and current references in an integrated circuit.
8. Understand the difference between small-signal and large-signal models.
9. Understand the characteristics and the operation of class-A, class-B and class-AB output stages.
10. Understand the concept of frequency response and be able to calculate the frequency-dependent transfer function of single-stage and multiple-stage amplifiers.
11. Be able to predict the frequency response using zero-value time constant analysis.
12. Understand the concept of feedback, practical feedback configurations and the effect of loading.
13. Understand the relation between gain and bandwidth in feedback amplifiers, and the concept of stability.
14. Understand the concept of compensation. Be able to use an appropriate method of compensation to stabilize a feedback amplifier.
15. Be able to use SPICE circuit simulator in the design process.
16. Be able to design, implement and characterize electrical circuits to meet the desired specifications.

Course Topics and Hours

Unit		Hours
1.	Overview of bipolar and MOS transistor operation	3
2.	Differential and multistage amplifiers	6
3.	Current mirrors, active loads and references	6
4.	Output stages	4
5.	Frequency response of integrated circuits	8
6.	Feedback	6
7.	Frequency response and stability of feedback amplifiers	6
	Exams and review lectures	3
Total Hours	42	

Lecture Schedule – 3 meetings per week, 50 minutes each.
Laboratory Schedule – 1 meeting per week, 3 hours.

Student Evaluation:

Homework	15%
Laboratory	20%
Quizzes	5%
Midterm Exams(2)	40%
Final Exam	20%
Total	100%

Contributions to Professional Component:

Engineering science	3 credit hours
Engineering design	1 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of electricity and mathematics knowledge to design of amplifier circuits.	Homework problems and exam questions	2, 5	3(a), 9
Application of complex variables to analyze stability of feedback amplifiers.	Homework problems and exam questions	1, 5	3(a), 9
Use of a circuit simulator (SPICE) to analyze and design electrical circuits.	Homework problems and laboratory	2, 5, 6	3(a), 9
Design, implementation and characterization of single and multiple-stage transistor amplifiers.	Laboratory	6, 8, 9	3(b), 3(c), 3(k)

Prepared by: Aydin I. Karsilayan, last revised 5/28/2010

Course Name: ECEN 350
Course Title: Computer Architecture and Design

Catalog Description:
350. Computer Architecture and Design (3-3). Credit 4. Computer architecture and design; use of register transfer languages and simulation tools to describe and simulate computer operation; central processing unit organization, microprogramming, input/output and memory system architectures.

Course Designation: Required

Prerequisite(s): ECEN 248 – Introduction to Digital Systems Design

Required Text(s): David Patterson and John Hennessy, Computer Organization and Design: The hardware/software interface, 3rd edition, 2002.

Course Objectives: At the end of this course, students should:
1. Understand the organization of a computer system including the CPU datapath, CPU control, memory systems and I/O systems.
2. Understand the impact of semiconductor technology on computer design and architecture.
3. Understand the basics and principles of instruction set design.
4. Be familiar with simple programming using an assembly level language.
5. Understand the impact of instruction sets on hardware design.
6. Understand the basics of computer arithmetic, number representation, logic operations.
7. Be familiar with designing datapaths for a processor.
8. Understand the implications of branch instructions on program flow and hardware design.
9. Understand the performance implications of various factors such as clock speed, average clock cycles per instruction and number of instructions.
10. Understand the role of compilers and high-level languages in programming.
11. Be familiar with designing control circuitry for a basic processor.
12. Understand the differences in single-cycle/multicycle design of processors.
13. Be familiar with processor pipelining.
14. Understand the implications of pipelining on memory design, instruction set design, compiling, performance.
15. Understand the implications of branch instructions on pipelining.
16. Be familiar with microprogramming.
17. Understand basics of memory technology, registers, SRAM, DRAM.
18. Understand the performance issue of various memory technologies.
19. Be familiar with the notion of locality.
20. Understand the memory architectures including cache architectures.
21. Be familiar with cache architectures: direct-mapped, set-associative, wide/narrow block size.
22. Understand the concepts of virtual memory.
23. Be familiar with the need for address translation.
24. Understand the impact of address translation on cache/memory accesses.
25. Be familiar with hardware designs of various cache architectures.
26. Understand the basics of Input/Output.
27. Be familiar with magnetic disk drives and different components of accessing data from a disk drive.
28. Be familiar with interrupt driven/ polling-driven I/O.
29. Be familiar with basics of keyboard I/O, network I/O and graphics
30. Be familiar with various components of a computer.

Course Topics and Hours

Unit	Hours
1. Overview of Computer Architecture and Performance	3
2. Basics of Instruction set, MIPS instruction set	4
3. Basics of Computer Arithmetic, Integer and Floating Point	4
4. Datapath design	3
5. Design of datapath control, singlecycle, multicycle design	6
6. Memory Technology, architectures, caches	6
7. Virtual memory, disks	4
8. I/O, interrupts, OS	3
9. Pipelining	3
Exams and review lectures	6

Total Hours 42

Lecture Schedule – 2 meetings per week, 75 minutes each.
Laboratory Schedule – 1 meeting per week, 170 minutes

Student Evaluation:

Homework	25%
Midterm Exams(2)	50%
Final Exam	25%
Total	100%

Contributions to Professional Component:

Engineering science	1 credit hours
Engineering design	2 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Introduction to computer architecture and impact of technology	Homework problems and exam questions	13, 14,15	3(h), 3(i), 3(j)
Design of CPU datapath, and control	Homework problems and exam questions	7, 8	3(a), 3(b), 3(c), 3(e)
Design of Memory systems, caches	Homework problems and exam questions	7,8	3(a), 3(b), 3(c), 3(e)
Assembly level programming – relation to high level languages	Homework problems and exam questions	4	3(a), 3(b), 3(c), 3(e), 3(k)
Understanding of performance issues and tradeoffs in design	Homework problems and exam questions	7,8,9	3(c), 3(e), 3(g), 3(h), 3(i), 3(j)

Prepared by: A. L. Narasimha Reddy, last revised 5/28/2010

Course Name: ECEN 351
Course Title: Applied Electromagnetic Theory

Catalog Description:
351. Applied Electromagnetic Theory. (3-0). Credit 3. I, II Guided waves; applications of Maxwell's equations and electromagnetic wave phenomena to radiation, antenna design and optics; numerical techniques in electromagnetics.

Course Designation: Elective

Prerequisite(s): ECEN 322 – Electric and Magnetic Fields

Required Text(s): K. R. Demarest**,** Engineering Electromagnetics, Prentice-Hall 1998.

Course Objectives: At the end of this course, students should:

1. Understand the concept of plane wave propagation and plane wave reflection and transmission at planar interfaces between dissimilar media.
2. Understand the concept of guided waves in metallic waveguides and in dielectric slabs and optical fibers.
3. Understand the concept of cavity resonators and quality factor.
4. Understand the concepts of Hertzian dipole, antenna parameters, wire and aperture antennas, antenna arrays, and radar.
5. Understand the concept of discretization and numerical solution of simple integral and partial differential equations of electromagnetics.

Course Topics and Hours

Unit	**Hours**
1. Review of Maxwell's equations and boundary conditions	1
2. Plane waves	5
3. Guided waves	10
4. Cavity resonators	2
5. Radiation and antennas	14
6. Numerical techniques in electromagnetics	5
Exams and review lectures	5
Total Hours 42	

Lecture Schedule – 2 meetings per week, 1 hour 15 minutes each.
Laboratory Schedule – N/A

Student Evaluation:

Homework	10%
Project	10%
Midterm Exams(2)	50%
Final Exam	30%
Total	100%

Contributions to Professional Component:

Engineering science	3 credit hours
Engineering design	0 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Solution of source-free Maxwell's equations in free space and in the presence of simple boundaries; application of the method of separation of variables.	Homework problems and exam questions	1, 5	3(a), 9
Solution of Maxwell's equation including sources with application to antennas and antenna arrays.	Homework problems and exam questions	1, 5	3(a), 9
Use of MATLAB, C, or FORTRAN to solve a simple boundary-value problem of electromagnetics.	Homework problems	4, 5, 6	3(a), 3(k), 9
Written term project (report) on topic of students choosing related to applied electromagnetics	Project	11, 13, 14, 15	3(g), 3(h), 3(i), 3(j)

Prepared by: K. A. Michalski, last revised 5/28/2010

Course Name: ECEN 370
Course Title: Electronic Properties of Materials

Catalog Description:
370. Electronic Properties of Materials. (3-1). Credit 3. Introduction to basic physical properties of solid state materials; some solid state physics employed, but major emphasis is on engineering applications based on semiconducting, magnetic, dielectric and superconducting phenomena.

Course Designation: Required

Prerequisite(s): PHYS – 222

Required Text(s): L. Solymar and D. Walsh, , Electrical Properties of Materials, 7th ed., Oxford University Press 2004.

Course Objectives: At the end of this course, students should:
1. Have knowledge of basic concepts and tools behind quantum theory, such as the wave-particle duality concept and Schrodinger equation. Solution of Schrodinger equation for the particle-in-a-box problem for understanding the concept of discreteness in energy level. Solution of Schrodinger equation for the Kronig-Penney model for understanding the concept of the energy band and the effective mass in solids.
2. Be familiar with the density of states of energy bands and the Fermi-Dirac distribution. Be familiar with the concept of the Fermi level and the work function. Be able to apply the above quantities for calculating the electron density in metals and the electron-hole density in semiconductors. Be able to apply the above quantities for understanding the physical properties and effects of materials such as the specific heat, thermionic emission, the Schottky effect, and the photoelectric effect.
3. Understand the ionic lattice structure of materials, the meaning of thermal velocity of particles in materials, the meaning of the mean free time and the mean free path of particles. Understand the concept of drift velocity and mobility of electrons and holes in semiconductors and their relationship to semiconductor's resistivity. Be familiar with Hall's measurements for determination of electron/holes concentrations.
4. Understand the basis of electromagnetic wave propagation in solids. Understand the meaning of complex wave number and how it describes the absorption and transmission characteristics of materials. Understand how the electron density affects the free-carrier absorption coefficient in semiconductors.
5. Understand the concept of doping in semiconductor. Understand how a pn junction works. Understand the relationship of forward voltage, device capacitance with dopant concentration.
6. Have knowledge of III-V compound materials and their applications for fabricating optical devices such as semiconductor lasers and photodetectors. Have a general knowledge of optoelectronics including devices, optical fibers and materials for optical modulators and switches.
7. Have a general knowledge of crystal growth methods and of how devices are fabricated.

Course Topics and Hours

Unit	Hours
1. The electron as particle and waves	6
2. The Schrodinger equation electron in a potential well, and the Kronig-Penney model	5
3. The free electron theory of metals	6
4. Band theory of solids	3
5. Semiconductors, crystal growth and fabrication	2

6. Principles of semiconductor devices 6
7. Dielectric materials, ferroelectrics and optical fibers 4
8. Semiconductor lasers, detectors, integrated optics 6
9. Exams and reviews 4

Total Hours 42

Lecture Schedule – 2 meetings per week, 75 minutes each.
Recitation Schedule – 1 meeting per week, 50 minutes each

Student Evaluation:

Homework	10%
Recitation Attendance	5%
Midterm Exams(2)	52%
Final Exam	33%
Total	100%

Contributions to Professional Component:

Engineering science	3 credit hours
Engineering design	0 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Wave-particle duality concept, solution of Schrodinger equation, application of density of states and Fermi-Dirac statistics to describe physical quantities and effects.	Homework problems and exam questions	2,1,4	3(a), 3(e), 9
Study of thermal velocity, drift velocity, mobility, and resistivity.	Homework problems and exam questions	2	3(a), 9
Electromagnetic propagation in solids, the meaning of complex wave number.	Homework problems	2,1	3(a), 9
Device physics, how a pn junction works, forward voltage and capacitance of a pn junction.	Homework problems and exam questions	2	3(a), 9
Study of crystal growth of thin epitaxial layers and device fabrications.	Homework problems and exam questions	2,3	3(j)

Prepared by: Chin B. Su, last revised 5/28/2010

Course Name: ECEN 403
Course Title: Electrical Design Laboratory I

Catalog Description:
403. Electrical Engineering Design Laboratory I. (2-2). Credit 3. Application of design process and project engineering as practiced in industry; team approach to the design process; develop a project proposal; proposed project implemented in ECEN 404.

Prerequisite(s): ECEN 214, 314, 325; Technical Writing (select from ENGL 301, 210, 241; COMM 203, 205); senior classification.

Required Text(s):

1. J. E. Salt and R. Rothery, Design for Electrical and Computer Engineers, Wiley, 2001.
2. M. Alley, The Craft of Scientific Writing, 3rd ed., Springer, 1996.
3. Design for Electrical and Computer Engineers, by J. Eric Salt and Robert Rothery. Published by John Wiley & Sons.

Course Objectives: At the end of this course, students should be able to demonstrate skills in the categories below:

1. Design Methodology
   a. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
   b. Describe the activities that occur during each stage of a design process, and distinguish among the products of each stage
   c. Develop a functional representation of a design solution based on design requirements
   d. Analyze project needs in order to produce quantitative design requirements
   e. Apply prescribed innovation methods to generate conceptual design solutions
   f. Evaluate concepts and select the most viable
   g. Record all project-related activities in a design notebook
2. Societal Impact
   a. Recognize the ever-present role of design in human activity
   b. Identify the visceral, behavioral, and reflective aesthetic components of designs
   c. Analyze and address risks associated with a concept
   d. Formulate methods to improve the predicted reliability of a concept
3. Project Management
   a. Design a suitable work breakdown structure for completing a project
   b. Assess risk in a project and assign appropriate contingency
   c. Assess project performance through a project tracking method.
   d. Communicate and justify design choices through written and oral assignments
   e. Learn how to function in a team

Lecture Course Topics and Hours

Unit	Topic	Hours
1	Course Introduction	1.5
2	Team Dynamics	1.5
3	Project Selection and Ideas	1.5
4	Designing Practical Systems	1.5
5	Design Process Overview	1.5
6	Problem Formulation	1.5

7	Problem Definition	1.5
8	Project Management I	1.5
9	Project Management II	1.5
10	System Design	1.5
11	Conceptual Design	1.5
12	Microcontrollers	1.5
13	Analog Design	1.5
14	Technical Writing	1.5
15	Oral Presentations	1.5
16	Initial Design Review	1.5
17	Guest Lecture – Patents	1
18	Safety and Ethics	2
19	Prototyping	2
20	Career Options	2
21	Guest Lecture – Graduate School	2
22	Final Design Review	2
	Total Hours	35

Lecture Schedule – 2 meetings /week, 125 minutes total/week.
Laboratory Schedule – 1 meeting/week, 110 minutes each.
Student Evaluation:

Design Proposal	20%
Status Reports	15%
Design Reviews	15%
Lab/Attendance	10%
Final Report	40%
Total	100%

Contributions to Professional Component:

Engineering science	0 credit hours
Engineering design	3 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Use of Engineering Design Method in a formal proposal of a project idea	Report #2	6	3(k)
Oral Presentation of project proposal	Presentation #1	7	3(e)
Oral Presentation of project solution ideas through a preliminary design review	Presentation #2	8	3(c)
Weekly group meeting with instructor	Group Dynamics score determined through one-on-one group interaction	10	3(d)
Formulation of design requirements and potential solutions in written and	Reports and Presentations	11	3(g)

oral formats			
Weekly group meeting with intstructor	Determined through one-on-one group interaction	12, 15	3(f), 3(j)
Oral Presentations of project proposal and solution	Questions during oral presentations	13	3(h)
Generating technical documentation of final solutions sufficient to reproduce project	Citatations in written work	14	3(i)

Last revised 5/28/2010

Course Name: ECEN 404
Course Title: Electrical Design Laboratory II

Catalog Description:
404. Electrical Engineering Design Laboratory II. (2-3). Credit 3. Continuation of ECEN 403; application of the design process and project engineering as practiced in industry; team approach to the design process; complete a project based on proposal from ECEN 403; includes testing, evaluation and report writing.

Prerequisite(s): ECEN 403, senior classification and project approval.

Required Text(s):

4. J. E. Salt and R. Rothery, Design for Electrical and Computer Engineers, Wiley, 2001.
5. M. Alley, The Craft of Scientific Writing, 3rd ed., Springer, 1996.
6. Design for Electrical and Computer Engineers, by J. Eric Salt and Robert Rothery. Published by John Wiley & Sons.

Course Objectives: At the end of this course, students should:
1. Understand the Engineering Design Method.
2. Be able to utilize the Engineering Design Method to generate potential solutions to a specific design challenge.
3. Understand the basic of Project Management including: statements of work, work break-down structures, critical path identification, distribution of tasks, project tracking and status reporting.
4. Be able to generate status reports.
5. Understand professional communication methods and techniques including formal reports and presentations.
6. Be able to clearly communicate ideas, status and test results through written reports.
7. Be able to clearly communicate through oral presentations.
8. Be familiar with methods to rigorously define design requirements for potential solutions.
9. Be familiar with the implementation of senior level course material in a design project.

Lecture Course Topics and Hours

Unit	Topic	Hours
1	Project Design Process (Problem Motivation, Needs Analysis, Functional Decomposition)	2
2	Project Design Process (Conceptual Design, Prototyping, Testing)	2
3	Planning/Project Management (Budget, Gantt Chart, Responsibility Matrix)	1
4	PIC Programming	1
5	Analog and Digital Circuits	3
6	Prototyping (procurement and fabrication)	2
7	Testing and Verification	2
8	Technical Writing	3
9	Engineering Ethics	1
10	Career Paths from Electrical Engineering and Life Lessons	1
11	Project Presentation	4
12	Guest Lectures (9 speakers from industry, government agencies, academia)	13
	Total Hours	35

Lecture Schedule – 2 meetings /week, 125 minutes total/week.
Laboratory Schedule – 1 meeting/week, 170 minutes each.

Student Evaluation:

Status Reports 10% (65% technical content, 30% writing quality, 5% organization)
Oral Presentation 10% (presentation slides will count as writing assignment)
Final Report 20% (65% technical content, 30% writing quality, 5% organization)
Final Project Demonstration 50% (max score determined by technical merit/difficulty)
Lab/Attendance 10%
Total 100%

Contributions to Professional Component:

Engineering science	0 credit hours
Engineering design	3 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Use of Project Management techniques to plan and track progress of a project	Status Reports	10,11,12,15	3(d), 3(e), 3(f), 3(g), 3(k), 4
Oral presentation of final project solution through a critical design review	Critical Design Review and Project Presentation	10, 11, 12, 13, 14, 15	3(d), 3(e), 3(f), 3(g), 3(h), 3(i), 3(j), 3(k), 4
Generating technical documentation of final solutions sufficient to reproduce project	Project Report	10, 11, 12, 13, 14, 15	3(d), 3(e), 3(f), 3(g), 3(h), 3(i), 3(j), 3(k), 4
Applying upper-level electrical engineering course work to a design project	Project/Check—completed technical merit	1, 5, 9, 10	3(a), 3(d), 3(e), 3(k), 4
Sharing work between team members	Student Surveys	10	3(d), 4

Last revised 5/28/2010

Course Name: ECEN 405
Course Title: Electrical Design Laboratory

Catalog Description:
405. Electrical Design Laboratory. (1-6). Credit 3. Introduction to the design process and project engineering as practiced in industry; student teams apply the design process by developing a project from proposal through test and evaluation.

Prerequisite(s): ENGL 210 or 301, completion of selected major field courses, senior classification and project approval.

Required Text(s):
Design for Electrical and Computer Engineers, by J. Eric Salt and Robert Rothery. Published by John Wiley & Sons. ISBN: 0-471-39146-8

Course Objectives: At the end of this course, students should:
1. Understand the Engineering Design Method.
2. Be able to utilize the Engineering Design Method to generate potential solutions to a specified design challenge.
3. Understand the basics of Project Management including: statements of work, work break-down structures, critical path identification, distribution of tasks, project tracking and status reporting
4. Be able to generate status reports.
5. Understand professional communication methods and techniques including formal reports and presentations.
6. Be able to clearly communicate ideas, status and test results through written reports
7. Be able to clearly communicate through oral presentations.
8. Be familiar with methods to rigorously define design requirements for potential solutions.
9. Be familiar with the implementation of senior level course material in a design project.

Course Topics and Hours

Unit	Topic	Hours
1	Selecting a Team	1
2	Selecting a Project	1.5
3	Requirements Analysis and Specification	1
4	Designing Practical Systems	1.5
5	Prototyping	1
6	Programming	1
7	Analog and Digital Circuits	1
8	Active and Passive Filters	1
9	Technical Writing	1
10	Professionalism and Ethics	1
11	Guest Lectures	11
12	Oral Presentations	4
13	Demo Day	1.5
	Total Hours	27.5

Lecture Schedule – 2 meetings / week, 125 minutes total
Laboratory Schedule – 1 session of 170 minutes / week
Student Evaluation:
Project Requirements:
To pass this course, you must demonstrate a working, technically meritorious project.

Design Proposal ** Execution Plan ** Status Reports **	20%	Evaluated on the basis of: technical content, spelling and grammar.
Lab Performance	10%	Based on your notebook, lab assignments, lab attendance, etc.
Final Report **	20%	This report must be high-quality (see link).
Final Completed Project and Professionalism *	50%	This grade indicates the **technical merit** of the final implemented solution. At the proposal phase of the course, the instructor indicated the maximum grade achievable based on the technical merit of the proposed project. If your team executed your proposal, then your team *has access* to the maximum grade. If your team fell short of the proposal *but still executed a technically meritorious project* then the instructor will give you access to a lesser grade that is consistent with the resulting merit. If you were unable to execute a technically meritorious project, you will fail the course. The grade you *have access to* (as specified preciously) will be tempered by your professionalism. **Professionalism** encompasses your: • *Attitude* in the lectures and the labs • *Appearance* at design review meetings with the instructor • *Attendance* (you must attend all lectures and all group meetings with your mentor; attendance will be taken!) • *Contribution* to the project as ascertained from peer evaluations • *academic honesty* (plagiarism and other forms of academic misconduct will not be tolerated)
TOTAL POINTS	**100%**	

* Peer evaluations will be conducted throughout the course (at the time of the design review meetings and at the end of the course), to aid the instructor in determining the level of contribution of group members. It is *your* responsibility to ensure that you contribute to your project! You must be aware of and be present at all group meetings, contribute to and sign off on all reports. To ensure delivery, all e-mails to group members must be sent (or copied) to their NEO accounts.

** These reports must be professional produced, typed and bound. The documents should reflect the techniques presented in *Technical Writing* (ENGL 301). Any content in your report that is derived from a source other than your group members must include reference. Any instances of plagiarism (no matter how seemingly minor) will result in the report being rejected for grading (i.e., the associated report component of *your group's* grade will be set to 0%) and referral of your group to the Aggie Honor Office.

Contributions to Professional Component:

Engineering science	0 credit hours
Engineering design	3 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Formulation of Design Requirements for potential solutions	Request for Proposal <report>	7, 10, 11	3(e), 3(g), 3(h), 3(k), 4
Use of Engineering Design Method in a formal proposal of a project idea	Project Proposal <report>	5, 6, 7, 8, 10, 11, 12, 13, 15	3(b), 3(c), 3(d), 3(e), 3(f), 3(g), 3(h), 3(j), 4
Use of Project Management techniques to plan and track progress of a project	Status Reports	10, 11, 12, 15	3(d), 3(e), 3(f), 3(g), 3(k), 4
Oral Presentation of project solution ideas through a preliminary design review	Preliminary Design Review	10, 11, 12, 13, 14, 15	3(d), 3(e), 3(f), 3(g), 3(h), 3(i), 3(j), 3(k), 4
Oral Presentation of final project solution through a critical design review	Critical Design Review	10, 11, 12, 13, 14, 15	3(d), 3(e), 3(f), 3(g), 3(h), 3(i), 3(j), 3(k), 4
Generating technical documentation of final solutions sufficient to reproduce project	Project Report	10, 11, 12, 13, 14, 15	3(d), 3(e), 3(f), 3(g), 3(h), 3(i), 3(j), 3(k), 4
Applying upper-level electrical engineering course work to a design project	Project/Check – completed technical merit	1, 5, 9, 10	3(a), 3(d), 3(e), 3(k), 4
Sharing work between team members	Student Surveys	10	3(d), 4

Last revised 5/28/2010

Course Name: ECEN 410
Course Title: Introduction to Medical Imaging

Catalog Description:
410. Introduction to Medical Imaging. (3-0). Credit 3. Introduction to the physics and the engineering principles of medical imaging systems; focus on magnetic resonance imaging, x-ray computer tomography, ultrasonography, optical imaging and nuclear medicine; includes system structure, source generation, energy tissues interaction, image formation and clinical examples..

Course Designation: Elective

Prerequisite(s): MATH 222 or 251 or 253; junior or senior classification.

Required Text(s): Andrew Webb, Introduction to Biomedical Imaging, Wiley-IEEE Press, 2002.

Other References:
Shung, K. Kirk Ed. Principles of Medical Imaging
Cho, Jones, and Singh, Foundations of Medical Imaging, Wiley & Sons
Guy and Ffytche, An Introduction to the Principles of Medical Imaging, Imperial College Press

Course Objectives: At the end of this course, students should:
1. Describe the instrumentation and structure of MRI, CT, UltraSound, SPECT/PET, and optical imaging.
2. Explain the physical principles of the imaging modalities.
3. Know how the data are acquired and how the images are reconstructed in each modality.
4. Understand the characteristics of each imaging modality and major applications of each imaging modality.

Course Topics and Hours

Unit	Topic	Hours
1	Overview of medical imaging technologies and applications	1
2	Review of some basic math and physics	2
3	Principle of tomographic imaging	3
4	Magnetic Resonance Imaging	9
5	X-ray Computer Tomography (CT)	6
6	Ultrasound Imaging	6
7	Nuclear Imaging	6
8	Optical Imaging	4
9	Evaluation of quality: resolution, SNR, contrast and speed	2
10	Literature review project presentation	2
11	Course review	2
	Total Hours	43

Lecture Schedule – 2 meetings/week, 150 minutes total/week.
Laboratory Schedule – N/A

Student Evaluation:

Tests and Exams	50%
Homework and Projects	50%
Total	100%

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Introduction to mathematical and physical principles of medical imaging systems	Home work and exam problems	1,2	9
Use linear algebra and Matlab for simple tomographic reconstructions	Home work and Quiz problems	7	3(e)
Project of presenting a critical review on a new biomedical imaging technology	Project presentation and report	11	3(g)
Lectures on advantages/disadvantages and impacts of different medical imaging modalities	Quiz and exam problems	13,15	3(h)

Prepared by Jim Ji, last revised 6/23/2010

Course Name: ECEN 412
Course Title: Ultrasound Imaging

Catalog Description:
412. Ultrasound Imaging. (3-0). Credit 3. Mathematical analysis of wave propagation, scattering of ultrasound in biological tissues, electronic transducer arrays for the beam forming, models of the received signals and signal processing methods for medical ultrasound imaging of tissues; includes discussions of research related to fundamental ultrasound imaging concepts.

Course Designation: Elective

Prerequisite(s): ECEN314 – Signals and Systems or approval from instructor; junior or senior classification.

Required Text(s): D. Christensen, Ultrasonic Bioinstrumentation, Wiley, 1988.

Course Objectives: At the end of this course, students should:
1. Explain the underlying physical principles behind ultrasound imaging.
2. Develop basic problem solving skills and using of wave physics, mechanics and optics.
3. Be familiar with fundamental concepts of apertures, radiation patterns and antenna theories.
4. Understand fundamental image quality factors in ultrasound imaging as they pertain to near field, far field or focal regions.
5. Be able to solve problems that relate to linear array and phased array instruments.
6. Understand fundamental concepts of pulse-echo and Doppler instrumentation.
7. Understand the image formation process leading to an ultrasound image.
8. Be able to analyze and design ultrasound instruments with predefined specifications.
9. Be able to recognize artifacts in ultrasound images as they relate to fundamental physical concepts.
10. Be able to analyze a state-of-the art ultrasound technique - its advantages, limitations, potentials and current research.
11. Understand methods for characterizing and analyzing ultrasound imaging systems.
12. Have an appreciation for the capabilities and advantages of ultrasound imaging as a non-invasive medical imaging modality.

Course Topics and Hours

Unit	**Topic**	**Hours**
1	Fundamentals of Ultrasound	6
2	Piezoelectric Transducers	3
3	Aperture Fundamentals	7
4	Ultrasound Fields	4
5	Array Transducers	3
6	Pulse-Echo Ultrasound Instrumentation	3
7	Doppler Imaging Principles	4
8	Image Artifacts	3
9	Current Developments	4
10	Project Presentation	5
	Total Hours	42

Lecture Schedule – 2 meetings/week, 150 minutes total/week.
Laboratory Schedule – N/A

Student Evaluation:

Midterm Exam	20%
Final Exam	30%
Homework	20%
Project	20%
Class Participation	10%
Total	100%

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Introduction and application of basic physics of mechanics and optics including wave physics, aperture fundamentals, radiation pattern and array theory	Homework problems and test questions	2	9
Analysis of pulse-echo ultrasound instrumentation and design of instruments (phased array and Doppler) with predefined specifications	Homework problems and test questions	8	3(c)
Introduction to state-of-the art ultrasound-based techniques and contemporary issues related to ultrasound imaging techniques	Test question and final project	15	3(j)

Prepared by: Raffaella Righetti, last revised 5/28/2010

Course Name: ECEN 419
Course Title: Genomic Signal Processing

Catalog Description:
419. Genomic Signal processing. (3-0). Credit 3. Introduction to molecular biology, application of engineering principles to system biology, unearthing intergene relationships, carrying out gene based classification of disease, modeling genetic regulatory networks, altering dynamic behavior.

Course Designation: Elective

Prerequisite(s): ECEN 314 – Signals and Systems or approval by instructor.

Required Text(s):
1. A. Datta and E. R. Dougherty, Introduction to Genomic Signal Processing with Control, Taylor & Francis, 2007.
2. B. Alberts, D. Bray, A. Johnson, J. Lewis, M. Raff, K. Roberts and P. Walter, Essential Cell Biology, 3rd ed., Garland Publishing Inc., 2009.

Course Objectives: At the end of this course, students should:
1. Be exposed to fascinating ways in which electrical engineering approaches are being used in the area of system biology.
2. Develop a basic understanding of molecular biology
3. Gain an appreciation of how problems arising in systems biology can be formulated and solved using engineering tools.

Course Topics and Hours

Unit	Hours
1. Introduction	1
2. Organic chemistry review	2
3. Energy considerations in biochemical reactions	3
4. Proteins	3
5. DNA, trascription and translation	3
6. Chromosomes, gene regulation and gentic variation	3
7. DNA technology	3
8. Cell division	3
9. Cell cycle control, cell death and cancer	3
10. Expression microarrays	3
11. Classification	3
12. Clustering	3
13. Genetic regulatory networks	3
14. Intervention	3
15. Intervention based on control theory	3
Total Hours	42

Lecture Schedule – 3 meetings per week, 50 minutes each.
Recitation Schedule – N/A

Student Evaluation:

Tests (2)	50%
Computer Assignments	50%

Total	100%

Contributions to Professional Component:

Engineering science	3 credit hours
Engineering design	0 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Class projects based on application of electrical engineering concepts to genomic signal processing	Computer assignment reports	4	
Introduction to application of control theory to genomics	Tests	6	

Last revised 5/28/10

Course Name: ECEN 420
Course Title: Linear Control Systems

Catalog Description:
420. Linear Control Systems. (3-0) Credit 3. I, II Application of state variable and frequency domain techniques to modeling, analysis and synthesis of single input, single output linear control systems.

Course Designation: Elective

Prerequisite(s): ECEN 314; MATH 308

Required Text(s): Franklin, Powell and Emani-Naeini, Feedback Control of Dynamic Systems, 5th edition, Prentice Hall, 2006.

Course Objectives: At the end of this course, students should:
1. Be able to derive transfer function and state space models of electrical, mechanical and electromechanical systems.
2. Be able to compute, both analytically and using MATLAB, the response of dynamic systems to steps, ramps, sinusoids and other common signals.
3. Understand the concept of stability of systems and be able to analyze and predict the stability of control systems using the characteristic equation, Rooth Herwite criterion and root locus methods.
4. Understand the basic mechanism by which a feedback control system can track reference signals, reject disturbances and provide stability despite large uncertainties.
5. Understand basic frequency response methods, the Nyquist criterion, Bode plots and their role in control system designs.
6. Carry out the design of robust control systems using classical design criteria, namely gain margin, phase margin and time-delay tolerance.
7. Understand the rudiments of operation of digital control systems and their analysis using Z-transforms.

Course Topics and Hours:

Unit	Topic	Hours
1	Laplace transforms, transfer-functions and time response	6
2	Signal flow graphs, block diagrams open and closed loop systems	6
3	Stability analysis using the Reoth criteria and root loci	6
4	Tracking, disturbance rejection and stabilization	6
5	Frequency response, Nyquist criterion, Bode plots	6
6	Classical control design using gain and phase margins	6
7	Digital control systems fundamentals	6
	Total Hours	42

Lecture Schedule – 3 meetings / week, 50 minutes each
Laboratory Schedule – N/A

Student Evaluation:

Tests and Final Exam	70%
MATLAB Assignments	30%
Total	100%

* Best 7 of all test and exam grades are computed; the final exam counts as two tests and is optional.

Contributions to Professional Component

Engineering Science	3 credit hrs

Engineering Design 0 credit hrs

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criterion
Apply Laplace transforms, blackdiagrams and transfer functions to determine the time of response systems	Homework and exam problems	1,5	3(a), 9
Stability analysis using Routh criterion, root loci and characteristic equations	Homework and exam problems	1,5	3(a), 9
Using the Hyquist criterion and Bode plots in classical control designs	Homework and exam problems	1,5	3(a),9, 3(c)
Use Matlab Control System Toolbox functions for analysis and design	Homework problems	1,4,5,6	3(a), 3(c), 3(e)

Last revised: 5/28/2010

Course Name: ECEN 421
Course Title: Digital Control Systems

Catalog Description:
421. Digital Control Systems. (3-0) Credit 3. Feedback systems in which a digital computer is used to implement the control law; Z-transform and time domain methods serve as a biss for control systems design. Effects of computer word length and sampling rate.

Course Designation: Elective

Prerequisite: EE 420 – Linear Control Systems

Required Text: B. C. Kuo, Digital Control Systems, 2nd ed., Oxford University Press, 1995.

Course Objectives: At the end of this course students should be able to:
1. Derive transfer function and state space models of discrete time systems.
2. Understand A/D and D/A conversion of signals and the discretization of continuous time systems.]
3. Compute the responses of discrete time systems, both analytically as well as using MATLAB, to standard test inputs.
4. Determine the stability of a control system containing a digital computer.
5. Understand how tracking, disturbance rejection and stabilization can be accomplished in a digital control system.
6. Apply classical control design techniques using the Nyquist criterion and Bode plots to design digital controllers.
7. Determine the digital equivalent of a continuous time controller.

Course Topics and Hours

Unit	**Hours**
1. Sampling of continuous time signals, A/D and D/A conversion Nyquist rate, aliasing.	6
2. Z-transforms and their application to determining the response of discrete Time systems.	6
3. State space models of discrete time systems, block diagrams and signal flow graphs.	6
4. Stability analysis of discrete time control systems using the characteristic equations, Juyr's test and root loci.	6
5. Tracking, disturbance rejection and stabilization in discrete time systems. Digital PID controllers.	6
6. Frequency response of discrete time systems, Nyquist and Bode designs.	6
6. Digital equivalents of continuous time controllers using Tustir's method, pole-zero and step response equivalents.	6
Total Hours	42

Lecture Schedule – 3 meetings / week, 50 minutes each
Laboratory Schedule – N/A

Student Evaluation:

Tests and Final Exam	70%
MATLAB Assignments	30%

Total 100%

* Best 7 of all test and exam grades are computed; the final exam counts as two tests and is optional.

Contributions to Professional Component

Engineering Science 3 credit hrs

Engineering Design 0 credit hrs

Relationship to Program Outcomes:

Course Activity	Assessment	EE Outcome	ABET Criteria
A/D, D/A conversion, discrete time systems, difference equations	Homework and exam problems	1,5	3(a), 9
Z-transforms and state space models	Homework and exam problems	1,5	3(a), 9
Digital Controller design for tracking, disturbance rejection and stabilization	Homework, exams	1,5	3(a), 3(c), 9
Use Matlab toolboxes for analysis and design	Homework problems	1,4,5,6	3(a), 3(c) 3(e)

Prepared by: S. P. Bhattacharyya, last revised 5/28/2010

Course Name: ECEN 422
Course Title: Control Engineering and Design Methodology

Catalog Description:
422. Control Engineering and Design Methodology. (2-3). Credit 3. Modeling, specifications, rating and operating principles of sensors, actuators and other control system components; experiments on conceptual design, simulation and physical implementation of control systems.

Course Designation: Elective

Prerequisite(s): ECEN 420 - Linear Control Systems or equivalent.

Required Text(s): Lab manual.

Course Objectives: At the end of this course, students should:
1. Be able to identify inputs, outputs of a system, analyze the dynamic characteristics of the system and model it in transfer function or state-space equations.
2. Be familiar with MATLAB. Know how to use functions in Control Toolbox to analyze control systems, including their stability, frequency response, time response, etc..
3. Be familiar with Simulink. Know how to construct a Simulink model for a system. Use that to compare and evaluate different control strategies for a given plant or to simulate a given controller applied on different plants.
4. Understand PID controllers and the functions of its three terms. Be able to tune PID controllers according to Zeigler-Nichols Tuning Method. Be able to fine-tune the three parameters of PID according to the system response.
5. Understand LQ control problems and know how to compute the feedback gains.
6. Understand the different requirements on process control systems and servo systems.
7. Know the difference between regulation problems and tracking problems.
8. Be familiar with Process Control Trainer used in this course. Understand the functions of its components. Know how to calibrate this instrument. Be able to apply different control methods on the system, record and analyze the results.
9. Be familiar with Digital Servo used in this course. Understand the working of A/D, D/A converters, Pulse Width Modulations (PWM). Understand the working of analog and digital position sensors and speed sensors.
10. Be familiar with Digital Pendulum used in this course. Know how to get its mathematical model and design the controllers based on this model. Be able to apply the chosen control methods and analyze the results.

Course Topics and Hours

Unit	**Lecture Hours**
1. Introduction of MATLAB and Simulink	3
2. Modeling	2
3. PID controllers	3
4. Other control methods	3
5. Overview and review of experiments	15
Exams and review lectures	2
Total Hours for Lectures	**28**

Lecture Schedule – 2 meetings per week, 50 minutes each.
Laboratory Schedule – 1 meeting per week, 3 hours each.

Students Evaluation:

Experiments (9)	90%
Final Exam	10%
Total	100%

Each of above experiments will be evaluated according to:

Knowledge of the Theory	20%(Quiz, Questions, Oral Exams)
Work in the Lab	40%
Lab Report	40%

Contributions to Professional Component:

Engineering science	2 credit hours
Engineering design	1 credit hours

Relationship to Program Outcomes:

Course Activity	**Assessment Method**	**EE Outcome**	**ABET Criteria**
Apply Laplace transforms and state-space techniques to get models of electrical and mechanical systems.	Lab reports and exam	1, 2, 5, 7	3(a), 3(e), 9
Design controllers based on transfer function models and state-space models	Lab reports and exam	1, 5, 6, 7, 8	3(a), 3(c), 3(e), 9
Use MATLAB and Simulink to analyze and simulate control systems.	Lab reports and exam	4, 5, 6	3(a), 3(i), 3(k), 89
Conduct experiments to physically implement designed control systems and write lab reports to analyze the results.	Lab reports	2, 4, 5, 6, 7, 8, 9, 10, 11	3(a), 3(b), 3(c), 3(d), 3(e), 3(g), 3(k)

Prepared by: Hao Xu, last revised 5/28/2010

Course Name: ECEN 438
Course Title: Power Electronics

Catalog Description:
438. Power Electronics. (3-3). Credit 4. Electric power conditioning and control; characteristics of solid state power switches; analysis and experiments with ac power controllers, controlled rectifiers, dc choppers and dc-ac converters; applications to power supplies, airborne and spaceborne power systems.

Course Designation: Elective

Prerequisite(s): Junior or senior classification in electrical engineering or approval of instructor.

Required Text(s): Power Electronics, Circuits, Devices, and Applications, 3rd edition, by Muhammad H. Rashid, Prentice Hall 2004

Course Objectives: At the end of this course, students should:
1. Understand the major aspects of power electronics.
2. Understand basic theoretical methods of calculation and design of important power electronic circuits such as ac voltage controllers, ac to dc uncontrolled and controlled rectifiers, dc to dc choppers, dc to ac inverters and power supplies.
3. Use power electronics software such as Psim to simulate the behavior of different topologies.

Course Topics and Hours:

Unit	Topic	Hours
1	Introduction to power electronics	2
2	Power Semiconductor Diodes	6
3	Diode circuits and Rectifiers	5
4	Thyristors, Controlled Rectifiers	5
5	AC Voltage Controllers	4
6	Thyristors Communication Techniques	4
7	Power Transistors	4
8	DC Choppers	4
9	Pulse-Width-Modulated Inverters	4
10	Resonant Pulse Converters	4
	Total Hours	42

Lecture Schedule – 2 meetings / week, 150 minutes total

Laboratory Schedule – 1 session of 170 minutes / week

Student Evaluation:

Homework	10%
Lab	20%
Exam #1	20%
Exam #2	20%
Final Exam	30%
TOTAL POINTS	**100%**

Contributions to Professional Component:

Engineering science	3 credit hours

Engineering design 1 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Power computation including sing-phase and three-phase power in the presence of harmonics	Homework problems and exam questions	1, 2, 5, 6	3(a),
Rectifiers including single-phase and three-phase	Homework problems and exam questions plus lab report	1, 2, 5, 6, 7	3(a), 3(b), 3(c), 3(g)
AC voltage controllers	Homework problems and exam questions plus lab report	4, 5, 6	3(a), 3(b), 3(c), 3(k), 3(g) 9
DC-DC converters including buck, boost, and buck-boost converters	Homework problems and exam questions plus lab reports	4, 5, 6, 7	3(a), 3(b), 3(c), 3(g)
Single-phase and three-phase inverters	Homework problems and exam questions plus lab reports	4, 5, 6, 7	3(g), 3(b), 3 (c) 3(h), 3(i), 3(j), 3(g)

Last revised 5/28/10

Course Name: ECEN 440
Course Title: Introduction to Thin Film Science and Technology

Catalog Description:
440. Introduction to Thin Film Science and Technology. (3-0). Credit 3. This undergraduate course is designed as an introductory class for those students who are interested in thin film fundamentals and processing for various industrial applications. Thin film science and technology have gone through a thorough development which results in numerous new devices (e.g., Light Emitting Diodes (LED), fuel cell and solar cell) and new materials with fundamentally new properties. Thin film research shares the knowledge from multi-disciplines (e.g., materials science, chemistry, solid state physics, mechanics and etc.) A newly developed model called "***The Art of Laying Apples***" will be used throughout the course for explaining thin film concepts. Topics include, but are not limited to, fundamentals on crystal structures and defects in thin films, the basic nucleation and growth mechanisms of thin films (growth models, lattice matching epitaxy and domain matching epitaxy), thin film processing techniques (CVD, MOCVD, MBE, PLD, Laser-MBE, sputtering, and evaporation etc.), thin film growth instrumentation aspect (energy source, chamber configurations, vacuum systems and growth controllers), and several advanced topics related to electrical and optical devices. Lab or tour session(s) will be provided to promote teaching and learning.

Course Designation: Elective

Prerequisite(s): Junior or senior classification; admission to upper level in College of Engineering.

Reference Materials:
Professor will use multiple books and reference material, a partial list follows:
1. Electronic Thin Film Science for Electrical Engineers and Materials Scientists, by K-N Tu, J. W. Mayer and L. C. Feldman, 1992
2. Materials Science of Thin Films: Deposition and Structure, by M. Ohring, 2002
3. Elements of X-ray Diffraction, 2nd edition, by B.C. Cullity, 1978
4. Introduction to Dislocations, by D. Hull and D.J. Bacon, 4th edition, 2001

Course Objectives: At the end of this course, students should:
1. Understand newly developed model called "The Art of Laying Apples"
2. Understand the fundamentals of crystal structures and defects in thin films.
3. Understand the basic nucleation and growth mechanisms of thin films
4. Understand vacuum and vacuum techniques
5. Understand thin films processing techniques
6. Understand thin film grown instrumentation aspect.
7. Be familiar with several advanced topics related to electrical and optical devices.

Course Topics and Hours:

Unit	Topic	Hours
1	Overview of thin film technology	3
	Introduction to the Apple Model	
2	Crystal structures of thin films	3
3	Defects in thin films (vacancies and interstitials, dislocations, grain boundaries etc.)	3
	Nanocrystalline, polycrystalline and epitaxial thin films	
4	Thermal dynamics, Interface and surface of thin films	3

5	Thin film nucleation and growth models (2D, 3D, and 2D-3D combination)	3
6	Epitaxy Homoepitaxy and heteroepitaxy; Lattice matching epitaxy and domain matching epitaxy; Superlattice structures and quantum wells	3
7	Vacuum systems	2
8	Thin film growth techniques (Physical Vapor Deposition-Sputtering, MBE, Laser MBE, PLD and E-bean evaporation)	3
	Thin Film Lab Sessions (thin film deposition and property measurements)	3
9	Thin film growth techniques (Chemical Vapor Deposition-CVD, PECVD, MOCVD)	3
10	Special topics in thin films for electrical and optical devices (LED), Solid Oxide Fuel Cells, Solar Cells and other applications	6
11	Presentation	4
12	Exams	3
	Total Hours	42

Lecture Schedule – 2 meetings / week, 140 minutes total

Student Evaluation:

Midterm Exam	25%
In-class quizzes	20%
Term Paper	20%
Final Exam	35%
TOTAL POINTS	**100%**

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Mathematical calculation on thin film growth rate, defects density, crystal structure, nucleation and lattice matching relations, etc.	Homework assignments, quizzes and exams	2, 5	3(a), 9

Think film lab tours and in-class demonstration	Project report on lab sessions	9, 10	3(b), 3(d)
Presentation and term paper on thin film characterization techniques and post-deposition processing tools	Term paper presentation and term paper	11	3(g)

Prepared by Haiyan Wang, last revised 5/28/10

Course Name: ECEN 441
Course Title: Electronic Motor Drives

Catalog Description:
441. Electronic Motor Drives. (3-3). Credit 4. Application of semiconductor switching power converters to adjustable speed DC and AC motor drives; steady state theory and analysis of electronic motion control in industrial, robotic and traction system; laboratory experiments in power electronics, motor drives and their control.

Course Designation: Elective

Prerequisite(s): Junior or Senior standing in Electrical and Computer Engineering.

Required Text(s): Ned Mohan, Electronic Drives: An Integrative Approach, Mnpere, 2003.

Course Objectives: At the end of this course, students should:
1. Be familiarized with the basic motor drives and their application to modern life.
2. Be familiarized with the various motors, their control methods and the power and signal electronic means of controlling the torque and speed of these motors.
3. Apply and specify this essential technology in a vat array of job applications from computer industry to automotive, to consumer products, to military, to energy industry, to aerospace and others.

Course Topics and Hours:

Unit	Topic	Hours
1	Introduction, Overview of Variable Speed Drive Systems	3
2	Basic Mechanical Systems in Motor Drives	3
3	Basic Electric and Magnetic Circuits	3
4	Basic Switching Power Converters for Motor Drives	3
5	Principles of Electro-Mechanical Energy Conversion	3
6	Quiz #1	2
7	DC Motor Drives and Brushless DC Motor Drives	3
8	Feedback Control of Motor Drives	3
9	Introduction to AC Machines	3
10	Permanent Magnet Synchronous Motor/Generator Drives	3
11	Introduction to Induction Motors	3
12	Adjustable Speed Induction Motor Drives	3
13	Quiz #2	2
14	Advanced Motor Drives	3
15	Advanced Topics/Term Project Assignment	2
	Total Hours	42

Lecture Schedule – 3 meetings/week, 150 minutes total/week.

Laboratory Schedule – 1 meeting/week of 180 minutes.

Student Evaluation:

Homework	15%
Quiz #1	20%
Quiz #2	20%
Lab	20%
Final Exam	25%

TOTAL 100%

Contributions to Professional Component:

Engineering science 3 credit hours

Engineering design 1 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Impact of motor drives technology on industry, life and economy	Homework problems and exam questions	1, 5	3(a), 9
The nature of electric motors and drives	Homework problems and exam questions	1, 5	3(a), 9
Control of electric motors and their power electronic implementation	Homework problems	4, 5, 6	3(a), 3(k), 9
Application of motor drives in various industries, case studies and design exercises	Homework problems and exam questions	2, 5	3(a), 9
Term design project and class demo and examples, future and broader trends in industry.	Project	11, 13, 14, 15	3(g), 3(h), 3(i), 3(j)

Last revised 5/28/10

Course Name: ECEN 442
Course Title: DSP Based Electromechanical Motion Control

Catalog Description:
442. DSP Based Electromechanical Motion Control. (2-3). Credit 3. Overview of energy conversion and basic concepts on electromechanical motion devices; different control strategies including the solid-sate drive topologies; for every electromechanical motion device, its DSP control implementation discussed and implemented in the lab.

Prerequisite(s): ECEN 314 or approval of instructor; Junior or Senior classification.

Reference Material: H.A. Toliyat, and S. Campbell, DSP-Based Electromechanical Motion Control, CRC Press, September 2003.

Course Objectives: At the end of this course, students should:
1. Be familiarized with student with DSP applications as related to various electromechanical motion devices.
2. Understand the concept of energy conversion and basic concepts on electromechanical motion devices.
3. Understand different control strategies including the solid-state drive topologies.
4. Be familiar with every electromechanical motion device, and its DSP control implementation.

Course Topics and Hours:

Unit	Topic	Hours
1	Introduction to the TMSLF2407 DSP Controller	1
2	Chapter 2	2
3	Chapter 5	2
4	Chapter 6	2
5	Stepper Motors	1
6	Chapter 3	2
7	Chapter 4	1
8	DC, Synchronous Motors and AC Induction Motors	5
9	Motor Control	4
10	Advanced Motor Control Algorithms	4
11	Advanced Motor Control Applications	4
	Total Hours	28

Lecture Schedule – 2 meetings / week, 100 minutes total/week.

Laboratory Schedule – 1 session of 170 minutes / week

Student Evaluation:

Lab:	40%
Homework & Quiz:	20%
Exam #1:	20%
Exam #2:	20%
TOTAL	100%

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Become proficient in TMSLF2407 Programming	Labs	4	9
Become familiar with AC and DC Motors	Homework, quizzes and exams	5, 6, 8	3(a), 3(c), 3(k)
Become familiar with DSP concepts as related to electromechanical motion.	Homework, quizzes and exams	1, 5, 6	9, 3(a), 3(k)

Last revised 5/28/10

Course Name: ECEN 444
Course Title: Digital Signal Processing

Catalog Description:
444. Digital Signal Processing. (3-0). Credit 3. Digital signal processing; discrete-time signals and systems, linear shift-invariant systems, the discrete Fourier transform and the fast Fourier transform algorithm, and design of finite impulse response and infinite impulse response digital filters.

Course Designation: Elective

Prerequisite(s): ECEN 314, or equivalent course on continuous-time signal and system analysis.

Required Text(s): John G. Proakis and Dimitris G. Manolakis, Digital Signal Processing: Principles, Algorithms, and Applications, 4th ed., Prentice-Hall, 2007.

Course Objectives: At the end of this course, students should:
1. Know the basic analysis and design of linear shift-invariant discrete-time systems.
2. Learn the properties of digital signal and systems, Z-transforms and discrete Fourier transform, spectrum analysis and how to design digital filters to manipulate signals in the time and frequency domains.

Course Topics and Hours:

Unit	Topic	Hours
1	Overview of DSP	1
2	Signals, systems, and frequency domain analysis	2
3	Fourier series and Fourier transform	3
4	Sampling of continuous-time signals and sampling theorem	2
5	Discrete-time systems: difference equation and properties	4
6	Z-transform and transfer function	2
7	Frequency response of discrete-time systems	4
8	DFT (Discrete Fourier Transform) and FFT (Fast Fourier Transform)	2
9	Basic filter structure and theory	2
10	IIR (Infinite Impulse Response) filter design	3
11	FIR (Finite Impulse Response) filter design	4
12	Multirate signal processing	3
13	Introduction to Wavelets	2
14	Two-dimensional signal processing	2
15	A/D, D/A and hardware implementation	2
16	Applications of DSP	2
17	Course Reviews	2
	Total Hours	42

Lecture Schedule – 3 meetings / week, 150 minutes total
Laboratory Schedule – N/A

Student Evaluation:

Tests	35%	Midterm 15%; final 20%
Quiz	10%	

Homework	30%	
Matlab Projects	25%	5 mini projects assigned throughout the semester (8 for honor students)
TOTAL POINTS	**100%**	

Contributions to Professional Component:

Engineering science	3 credit hours
Engineering design	0 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of algebra, calculus, and discrete mathematics to evaluate the transient and steady-state responses, and to check stability of an LTI system	Homework problems and exam questions	1, 5	3(a), 9
Application of complex variables and differential calculus to evaluate the frequency, phase and group delay responses	Homework problems and exam questions	1, 5, 6	3(a), 9
Use of MATLAB to design, implement and test digital signal processing systems	Homework problems	4, 5, 6	3(a), 3(b),3(k), 9
Use of concepts from integral calculus and complex analysis to evaluate the inverse of the following transforms: DTFT, DFT, FFT and z-transform.	Homework problems and exam questions	1, 5	3(a), 9
Written term project (report) on topic of students choosing related to digital signal processing	Project	1, 2, 4, 5, 7, 8, 11, 13, 14, 15	3(d),3(e), 3(g), 3(h), 3(i), 3(j)

Last revised 5/28/10

Course Name: ECEN 447
Course Title: Digital Image Processing

Course Description:
447. Digital Image Processing. (3,3). Credit 4. Improvement of pictorial information using spatial and frequency domain techniques; two-dimensional discrete Fourier transform; image filtering, enhancement, restoration, compression; image processing project.

Course Designation: Elective

Prerequisite(s): ECEN 314; Familiarity with MATLAB; ECEN 444 useful but not requirement.

Required Text(s): Gonzalez and Woods, Digital Image Processing, 3rd Edition, Prentice-Hall, 2007.

Course Objectives: At the end of this course, students should:
1. Be able to understand image formation, processing, and analysis.
2. Be able to design linear and nonlinear imaging filters for practical applications.

Course Topics and Hours:

Unit	Topic	Hours
1	Introduction	2
2	Mathematics Review	4
3	Basic Imaging Concepts	2
4	Spatial Filters	5
5	Frequency-Domain Filters	7
6	Problem Session	1.5
7	Midterm Exam	1
8	Image Restoration	4
9	Mathematical Morphology	8
10	Image Segmentation and Description	6
11	Problem Session	1.5
	Total Hours	42

Lecture Schedule – 2 meetings / week, 150 minutes total
Laboratory Schedule – 1 session of 150 minutes / week

Student Evaluation:

Homework	25%
Exams	50%
Lab	25%
TOTAL POINTS	**100%**

Contributions to Professional Component:

Engineering science	3 credit hours
Engineering design	1 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of probability and random processes to model digital images for applications such as segmentation and compression.	Homework problems and Lab assignments	1, 5	3(a), 9
Application of complex variables to Fourier transforms of images (reconstruction of images based on the phase information)	Homework problems and exam questions	1, 5	3(a), 9
Use of MATLAB to perform image processing applications	Homework problems and Lab assignments	4, 5, 6	3(a), 3(k), 9
Use of concepts from basic physics (optics) to model imaging systems	Homework problems and Lab assignments	2, 5	3(a), 9
Lab report on each assignment	Lab reports	11, 13, 14, 15	3(g), 3(h), 3(i), 3(j)

Last revised 5/28/10

Course Name: ECEN 448
Course Title: Real Time Signal Processing

Catalog Description: 448. Real-Time Digital Signal Processing. (2-3). Credit 3. Features and architectures of digital signal processing chips; assembly language programming; software development tools; real-time implementation of FIR filters, IIR filters, and the FFT algorithms; signal processing project.

Course Designation : Elective

Prerequisite(s): ECEN 444, basic knowledge of C programming.

Required Text(s): None. Class notes and lab documents provided.

Course Objectives: At the end of this course, students should:

1. Understand the basic architectural elements of digital signal processing (DSP) hardware
2. Be able to program DSP hardware to do signal processing tasks using MATLAB/Simulink
3. Gain an appreciation for the trade-offs in algorithm design for real-time DSP implementation

Course Topics and Hours:

Unit	Topic	Hours
1	Analog-to-Digital Conversion	2
2	Computational Accuracy in DSP Implementations	2
3	Architectures for Programmable DSP devices	4
4	Discrete-time System and Signals Concepts	4
5	Digital Filters: design and implementation	2
6	Amplitude Quantization	2
7	Practical frequency-selective digital filters	4
8	Real-time filtering	4
9	Real-time Audio rocessing	4
	Total Hours	28

Lecture Schedule – 2 meetings per week, 50 minutes each.
Laboratory Schedule – 1 meeting per week, 170 minutes each.

Student Evaluation

Lab Assignments	50%
Tests (2)	30%
Final Project	20%
Total	100%

Contributions to Professional Component:

Engineering science	2 credit hours
Engineering design	1 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Become proficient in the MATLAB/Simulink programming of C6713 DSP	Laboratory Assignements	4, 6	3(k), 9
Become familiar with signal processing algorithms and their applications.	Tests	4,5,6,9	3(a), 3(b), 3(c), 3(k), 9
Become familiar with the design and DSP implementation of FIR and IIR filters and their applications. Become familiar with the programming and use of FFT algorithms on the C6713	Laboratory Assignements, Tests, Final Project	4,5,6,7,9	3(a), 3(b), 3(c), 3(e), 3(k), 9
Based on design specification, design a signal processing solution. Test and perfect the signal processing algorithm. Present the design solution both written and orally	Final Project	4,5,6,7, 11	3(a), 3(c), 3(e), 3(k), 3(g)

Last revised: 5/28/2010

Course Name: ECEN 449
Course Title: Microprocessor System Design

Catalog Description: 449. Microprocessor System Design. (3-3). Credit 4. Introduction to microprocessors; 16/32 bit single board computer hardware and software designs; chip select equations for memory board design, serial and parallel I/O interfacing; ROM, static and dynamic RAM circuits for no wait-state design; assembly language programming, stack models, subroutines and I/O processing .

Course Designation: Elective

Prerequisite(s): ECEN 248 -Introduction to Digital System Design

Required Text(s): Barry B. Brey, The Intel Microprocessors, 6th ed., Prentice-Hall 2003.

Course Objectives: At the end of this course, students should:
1. Understand the basic principle and operation of microprocessor architecture, data representation.
2. Understand the concepts of programming models, addressing models, and assembly languages, and how to apply them in programming.
3. Understand the principles of stack programming modes, data movement instructions, and their applications.
4. Understand the principles of Stack programming modes, data movement instructions and how to use them.
5. Understand the principles of Data moving instructions, string and data transfers, assembler directives.
6. Understand the principles of Data moving instructions, string data transfers, assembler directives.
7. Understand the principles of hardware specifications, bus timing, minimum and maximum mode, and why we need them.
8. Understand the principles of Arithmetic and logic instructions, and how to apply them in programming.
9. Understand the principles of the program control instructions and how to apply them in programming.
10. Understand the definitions and principles of procedures, modular programming, and disk files.
11. Understand the definitions and principles of Interrupt hook, memory interfaces and how to use them.
12. Understand the definitions and principles of dynamic RAM, static RAM, EDO, SDRM, I/O interfaces.
13. Understand the definitions and principles of Programmable peripheral Interface, PIT, UART, and their applications.
14. Understand the definitions and principles of A/D, D/A, Interrupts processing, expending interrupt structure.
15. Understand the definitions and principles of Programmable interrupt controller, DMA, DMA controlled I/O, and how to apply them in real engineering problems.

Course Topics and Hours

Unit	Hours
1. Overview of micro-computer/microprocessor and their applications	1
2. Microprocessor architecture and data representations	1
3. Programming techniques and methodologies	2
4. Hardware specifications, bus timing control, minimum/maximum modes	2
5. Data moving instructions, string data transfer, assembler directives	5
6. Arithmetic and logic instructions programming	5
7. Program flow control instructions and programming	5
8. Procedure, modular programming, disk files	3

9. Interrupt structure and hook, memory interfaces 5
10. Dynamic RAM, static RAM, EDO, SDRM, I/O interface 4
11. A/D, D/A, Expending Interrupt structure 3
12. Programmable interrupt controller, DMA, DMA controlled I/O 2
    Exams/quizzes and review lectures 4

Total Hours 42

Lecture Schedule – 2 meetings per week, 75 minutes each.
Laboratory Schedule – 1 meeting per week, 170 minutes each.

Student Evaluation:

Labs:	20%
Homework:	15%
Quizzes:	5%
Exam 1:	20%
Exam 2:	20%
Exam 3:	20%
Total	**100%**

Contributions to Professional Component:

Engineering science	2 credit hours
Engineering design	2 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of knowledge of microcomputer/microprocessors to engineering problems.	Homework problems/Labs and exam/quizzes questions	7, 8, 9	3(a), 7,9
Application of modular techniques to programs .	Homework/Labs problems questions	5, 6	3(a), 9
Designing and constructing a prototype Industry Standard Architecture (ISA) interface card containing DIP switches, LEDs, LCD Display, and A/D converter.	Homework/Labs problems	7, 8, 9, 11	3(a), 3(k), 9
Writing assembly language programs and developing trouble shooting skills using a logic analyzer and oscilloscope.	Homework problems and Labs questions	7, 8	3(a), 9
Written Labs team-project report on topics assigned by the Labs students choosing related to wireless communications	Projects and Experiments	11, 14, 15	3(g), 3(h), 3(i), 3(k)

Prepared by: Xi Zhang, last revised 5/28/2010

Course Name: ECEN 451
Course Title: Antenna Engineering

Catalog Description:
451. Antenna Engineering. (3-0). Credit 3.

Introduction to antenna theory and design; includes antenna performance parameters, analysis of radiation from sources using Maxwell's equations, theory and design of wire antennas, arrays and frequency independent antennas; computer methods for antenna design. Prerequisite: ECEN 322.

Course Designation: Elective

Prerequisite(s): ECEN 322 – Introduction to Electromagnetics

Required Text(s): W. Stutzman ang G. Thiele, Antenna Theory and Design, 2^{nd}. Ed., John Wiley & Sons, 1997, ISBN 0471025909

Course Objectives: At the end of this course, students should:

1. Understand the terminology and parameters used to characterize antenna performance.
2. Understand the concept of a point source radiator, including the derivation of the point source radiator fields from Maxwell's equations.
3. Be able to explain how to use a point source radiator to derive the far-field radiation patterns of an antenna with a known current distribution.
4. Be able to explain the concept of an electrically short antenna, and the basic principles that govern electrically short antenna.
5. Understand dipole, loop and monopole antennas for mobile and low-frequency applications.
6. Understand the concept of a resonant length antenna. Be familiar with the performance of a dipole antenna.
7. Understand and be able to quantify mutual impedance between dipole antenna elements.
8. Be familiar with and be able to analyze and design Yagi-Uda directional antennas.
9. Have a basic understanding of the operation of simple Balun elements and matching networks.
10. Understand the basic principles of solution of integral equations for the current on a wire antenna using the "Method of Moments".
11. Be able to use a method-of-moments based computer code to analyze a directional wire antenna.
12. Understand how to measure a far-field antenna pattern.
13. Understand the concept of building an array of radiators to enhance and control the directive properties of an antenna.
14. Be familiar with several basic antenna array types, such as uniform, bionomial, Tchebyscheff, and Woodward-Lawson arrays.
15. Understand the principles behind simple signal-processing antennas for target tracking.
16. Be able to describe a "broadband antenna" and describe at least two methods for creating a broadband antenna, and what a broadband antenna.

Course Topics and Hours

Unit	**Hours**
1. Antenna Parameters	6
2. Electrically Small Antennas	6
3. Resonant Length Antennas	8
4. Wire Antenna Analysis	6
5. Antenna Arrays	9
6. Broadband and Frequency Independent Antennas	3

Exams and review lectures 4
Total Hours 42

Lecture Schedule – 2 meetings per week, 75 minutes each.
Laboratory Schedule – N/A.

Student Evaluation:

Homework	15%
Project	25%
Midterm Exams(2)	30%
Final Exam	30%
Total	100%

Contributions to Professional Component:

Engineering science	2.5 credit hours
Engineering design	0.5 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Derivation of fields of current distributions to analyze antenna characteristics.	Homework problems and exam questions	1, 5	3(a)
Analysis of antennas using the method of moments. Modification of an example computer code for improved performance.	Homework problems, exam questions and course project.	1, 4, 5, 6	3(a), 3(j)
Analysis of antennas using various analytical methods, including array analysis.	Homework problems and exam questions.	2, 5, 6	3(a), 3(k)
Design, analysis and construction of an antenna to meet a set of specifications.	Course Project	2, 5, 8, 9, 10	3(a), 3(c), 3(k)
Written term project (report) on the antenna design project.	Course Project	11	3(g)

Prepared by: Steve Wright, last revised 5/28/2010

Course Name: ECEN 452
Course Title: Ultra High Frequency Techniques

Catalog Description:
452. Ultra High Frequency Techniques (2-3). Credit 3. Introduction to theory and practice of ultra high Frequency radio wave generation transmission and radiation; applications of Maxwell's equations, theory and design of wire antennas, arrays and frequency independent antennas; computer methods for antenna design.

Course Designation: Elective

Prerequisite(s): Prerequsite: ECEN322; ECEN 351 or registration therein.

Required Text(s): D. Pozar, Microwave Engineering, 3rd ed., Wiley, 2004.

Reference Texts: (on reserve in Library):
T.C. Edwards, Foundations for Microstrip Circuit Design, John Wiley & Sons, 1984.
R.E. Collin, Foundations for Microwave Engineering, McGraw-Hill Book Co., 1966.
S.Y. Liao, Microwave Devices and Circuits, Prentice-Hall, 1980.

Course Objectives: At the end of this course, students should be able to:
1. Use a Smith Chart to find an unknown load given measurement data.
2. Use a Smith Chart to design a single stub tuner or quarter wave transformer given a load.
3. Know the *R*, *L*, *G*, *C* model for a transmission line. Why is it necessary?
4. Calculate impedance, reflection coefficient and *VSWR* for a transmission line.
6. Find the current, voltage and input power given a transmission line circuit.
7. dB conversion from a ratio (*dB*, *dBm* and *dBW*).
8. Rectangular waveguide operating in the dominant TE_{10} mode (know the formulas for b , l_g, l_c, and f_c).
9. Given transmission line *R*, *L*, *G* and *C*, find Z_0 and b .
10. Theory of the slotted line - why does a longitudinal slot not interfere with the current flow?
11. Mathematics of operation of crystal detectors and mixers.
12. Microwave cavity, definition of *Q* and how it can be measured.
13. How could characteristic impedance be measured?
14. Mathematical theory and operation of microwave devices; attenuator, directional coupler, quarter-wavelength impedance transformer, isolator, gunn diode, sliding short.
20. Determine *S*-parameters for microwave devices.
21. Understanding of lab experiments, theory and practice.
22. Basic design equations for microstrip line, including impedance and wavelength equations.
23. Be able to find input impedance, insertion or return loss, and S-parameters of microstrip devices.
24. Design analysis or general questions on:
    (a) microstrip inductors and capacitors
    (b) low pass filter
    (c) ring and strip resonators
    (d) hybrid ring (and branch line coupler)
    (e) microstrip discontinuities
    (f) microstrip directional coupler
    (g) Wilkerson power divider

Course Topics and Hours

Unit	Hours
1. Transmission line analysis review	2
2. Transmission line devices; detectors, mixers, etc	4

3.	Tuning Stubs, Impedance Matching Techniques	2
4.	Rectangular Waveguide analysis review	2
5.	Sources, Tubes (Klystron, Magnetron), Solid-State (IMPATT, Gunn)	2
6.	Waveguides devices; attenuators, couplers, frequency meter, etc.	5
7.	Antenna Review	3
8.	S-parameters	2
9.	Microstrip devices; capacitors, inductors, filters, etc.	6
10.	Exams and review lectures	2
	Total Hours 30	

Laboratory Experiments:

1.	Measurement of Standing Waves	3
2.	Impedance Measurement in Coaxial System	3
3.	Impedance Matching	3
4.	Gunn Diode Characteristics	3
5.	Waveguide Standing Waves	3
6.	Measurement of Microwave Power and S-Parameters	3
7.	Antenna Pattern Measurement	3
8.	LIBRA Computer Microstrip Analysis	3
9.-13	Microwave or Antenna Design Project	12
	Total Hours 36	

Lecture Schedule – 2 meetings per week, 50 minutes each.
Laboratory Schedule – 1 meeting per week, 3 Hrs.

Student Evaluation:

Homework	10%
Term Exam (1)	30%
Final Exam	30%
Lab Reports/Participation	20%
Project and Report	10%
Total	100%

Contributions to Professional Component:

Engineering science	2 1/2 credit hours
Engineering design	1/2 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of vector and phasor analysis to operation of microwave devices and systems	Homework problems and exam questions	1, 5	3(a), 9
Application of complex variables to modeling device operation	Homework problems and exam questions	1, 5	3(a), 9
Use of LIBRA to simulate behavior in microwave circuits	Homework problems	4, 5, 6	3(a), 3(k), 9
Use of concepts from basic physics to model generation and propagation of microwave signals and interaction with materials.	Homework problems and exam questions	2, 5	3(a), 9
Written term project report and lab experiments	Project report	11,13,14,15	3(g), 3(h), 3(i), 3(j)
Design project	Report and faculty assessment	8,9,10,11,14	3(a), 3(b), 3(c), 3(d), 3(e)

Prepared by: Robert Nevels, last revised 5/28/10

Course Name: ECEN 453
Course Title: Microwave Solid-state Circuits and Systems

Catalog Description:
453. Microwave Solid-state Circuits and Systems. (3-0). Credit 3. Microwave solid-state devices and circuits; theory and design of various types of active circuits; applications of these devices and circuits in radar, communications and surveillance systems.

Course Designation: Elective

Prerequisite(s): ECEN 322

Required Text(s): K. Chang, Microwave Solid-state Circuits and Applications, Wiley, 1994.

Course Objectives: At the end of this course, students should:
1. Understand the basic theory and operation of transmission lines and wave guiding systems.
2. Understand the concepts of scattering parameters and their applications. Be able to represent circuits in ABCD, S, Y, and Z matrices.
3. Understand the operating principles of varactor devices and their circuit and system applications. Be able to learn the use of varactors for frequency-tuned oscillators and filters, frequency multipliers, and other circuits.
4. Understand the operating principles of detector and mixers. Learn to design microwave single-end and balanced mixers.
5. Be able to learn the design of a PIN diode and its applications to switching, phase shifter, and modulator circuits.
6. Be able to understand the operating theory of Gunn and IMPATT devices. Learn their applications as microwave power generators.
7. Learn various three-terminal transistor devices. Use these devices to design oscillators, amplifiers, mixers, and switches.
8. Be able to simulate receivers and transmitters using the above microwave solid-state devices.
9. Learn various design parameters for microwave receivers. Be familiar with the evaluation of dynamic range, noise figure, 1 dB compression point, third-order intercept point, intermodulation, etc.
10. Learn various design parameters for microwave transmitters. Be familiar with the evaluation of output power, efficiency, noise figure, 1 dB compression point, stability, AM noise, FM noise, tuning range, etc.

Course Topics and Hours:

Unit	Topic	Hours
1	Transmission lines and waveguides	6
2	S-Parameters and circuit representations	4
3	Varactor devices and circuit applications	3
4	Detectors and mixers	6
5	Receivers	3
6	Exam	2
7	PIN diodes, switches, and phase shifters	2
8	Amplifier and oscillator design using two-terminal devices	2
9	Gunn oscillators	2
10	IMPATT oscillators and amplifiers	2
11	Transistor amplifiers	6
12	Transistor oscillators, mixers and switches	4

Total Hours 42

Lecture Schedule – 2 meetings / week, 125 minutes total
Laboratory Schedule – N/A

Student Evaluation:

Exam 1	25%
Exam 2	25%
Final Exam	40%
Homework	10%
TOTAL POINTS	**100%**

Contributions to Professional Component:

Engineering science	2 credit hours
Engineering design	1 credit hour

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of electromagnetics and circuit theory and transmission lines and high frequency circuit modeling	Homework problems and exam questions	1, 2, 5	3(a), 3(c), 3(e), 3(k), 9
Application of solid-state device and circuit theory to design various microwave devices and circuits.	Homework problems and exam questions	1, 2,5,7,8	3(a), 3(c), 3(e), 3(k), 9
Use of MATLAB to perform circuit analysis and system simulations.	Homework problems	4, 5, 6	3(a), 3(k), 9
Discussion of receiver and transmitter system design.	Homework problems and exam questions	5, 7, 8	3(a), 3(c), 3(e), 3(k), 9

Last revised 5/28/10

Course Name: ECEN 454
Course Title: Digital Integrated Circuit Design

Catalog Description:
454. Digital Integrated Circuit Design. (3-0). Credit 3. Analysis and design of digital devices and integrated circuits using MOS and bipolar technologies and computer aided simulation.

Course Designation: Elective

Prerequisite(s): ECEN 248 and ECEN 325.

Required Text(s): CMOS Digital Integrated Circuits, Analysis and Design, 3ed edition, Sung-Mo Kang and Yusuf Leblebici, McGraw Hill, 2003

Reference Material: Digital Integrated Circuits: A Design Perspective, by Jan Rabaey, Prentice Hall, 1996

Course Objectives: At the end of this course, students should:
1. Understand CMOS design flow and fabrication steps
2. Understand the structure and operation of MOS transistors, geometric effects and capacitance
3. Understand SPICE modeling
4. Understand CMOS logic design styles
5. Understand Delay, signal integrity and power issues
6. Be familiar with ASIC design methodologies

Course Topics and Hours:

Unit	Topic	Hours
1	Introduction	2
2	IC Fabrication I	2
3	IC Fabrication II and layout design rule	2
4	MOS Transistor I	2
5	MOS Transistor II	2
6	SPICE modeling	1.5
7	Inverter characteristics I	2
8	Inverter characteristics II	2
9	CMOS inverter delay	2
10	Interconnect and power model	2
11	Combinational logic I	4
12	Combinational logic II	1
13	Sequential logic	3
14	Dynamic logic	2
15	Memory	3
16	Low power design and design for manufacturability	1.5
	Total Hours	34

Lecture Schedule – 2 meetings / week, 125 minutes total

Student Evaluation:

Homework	20%
Midterm I	25%
Midterm II	25%

Final	30%
TOTAL POINTS	**100%**

Contributions to Professional Component:

Engineering science	2 credit hours
Engineering design	1 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Use of SPICE for circuit simulation	Homework problems	6	3(k), 9
Use of state-of-the-art industrial device parameters and layout rules	Homework problems and exam questions	6	3(k), 9
Emphasis on electrical and physical design of digital circuits	Homework problems and exam questions	8	3(c), 9
Emphasis on diagnostic design problems	Homework problems and exam questions	7	3(e), 9

Last revised 5/28/10

Course Name: ECEN 455
Course Title: Digital Communications

Course Description:
455. Digital Communications. (3-3). Credit 4. Digital transmission of information through stochastic channels; analog-to-dialog conversion, entropy and information, Huffman coding; signal detection, the matched0filter receiver, probability of error; baseband and pass band modulation, signal space representation of signal, PAM, QAM, PSK, FSK; block coding; synchronization; communication through fading channels; spread-spectrum signaling; simulation of digital communication systems.

Course Designation: Elective

Prerequisite(s): ECEN 314

Required Text(s): Bernard Sklar, Digital Communications: Fundamentals and Applications, 2nd ed., Prentice-Hall, 2001.

Course Objectives: At the end of this course, students should be able to:
1. Identify the various components of a digital communication system. Discuss the purpose of source coding, channel coding, modulation, and equalization. Become familiar with commonly encountered digital communication systems, and discuss how these systems can be decomposed into the same abstract constituent parts.
2. Discuss the purpose of information theory and calculate the entropy of simple information sources. Understand practical methods of compression such as Huffman and Lempel-Ziv codes.
3. Describe the process of analog to digital conversion and the relationship between bandwidth, sampling rate, and aliasing. Compute the amount quantization noise introduced by uniform and non-uniform quantization.
4. Understand the notion of error correcting codes. Encode and decode simple linear block codes. Compute the probability of decoding failure for simple codes.
5. Derive simple modulation schemes, signal waveforms, and their vector space representations. Characterize the structure of optimal receivers, and compute the probabilities of symbol and bit errors at the output of the demodulator.
6. Discuss the properties of band limited channels. Study the causes and implications of intersymbol interference, and understand the Nyquist criterion for ISI-free signaling.

Course Topics and Hours:

Unit	Topic	Hours
1	Probability Review 1: Discrete Random Variables	3
2	Source Coding	6
3	Analog to Digital Conversion	6
4	Channel Coding	6
5	Probability Review 2: Continuous Random Variables	3
6	Basic Modulation Techniques	4.5
7	New Probability: Random Processes	4.5
8	Advanced Modulation and Detection	4.5
9	Band limited Signaling and Intersymbol Interference	4.5
	Total Hours	42

Lecture Schedule – 2 meetings / week, 125 minutes total

Laboratory Schedule – 1 session of 170 minutes / week

Student Evaluation:

Participation	5%	Class and lab attendance and discussion
Homework	15%	6-8 assignments throughout the semester
Midterms	40%	Two equally weighted midterm exams
Lab Reports	15%	6 two-week lab projects and reports
Final Exam	25%	Comprehensive final
TOTAL POINTS	**100%**	

Contributions to Professional Component:

Engineering science	2.75 credit hours
Engineering design	0.25 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of probability and random processes to the performance evaluation of digital communication systems.	Homework problems and exam questions	1, 5	3(a), 9
Application of complex variables to modeling of two-dimensional constellations schemes	Homework problems and exam questions	1, 5	3(a), 9
Use of MATLAB to evaluate the performance of or simulate digital communication systems.	Project, homework	4, 5, 6	3(a), 3(k), 9
Written term project (report) on a given topic.	Project	11, 13, 14, 15	3(g), 3(h), 3(i), 3(j)

Last revised: 5/28/10

Course Name: ECEN 457
Course Title: Operational Amplifiers

Catalog Description:
457. Operational Amplifiers. (3-3). Credit 4. Analysis of basic operational amplifier and operational transconductance amplifier (OTA) circuits; noise analysis in Op amp and OTA circuits; nonlinear OTA and Op amp circuits; instrumentation amplifiers; transducer circuits; function generators; oscillators and D/A converters and basics of switched capacitor circuits.

Course Designation: Elective

Prerequisite(s): ELEN 326

Required Text(s): Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, 3rd ed., McGraw-Hill, 2001.

Reference Material(s):
E.J. Kennedy, "Operational Amplifier Circuits Theory, and Applications," Hold, Rienhart and Winston, Inc. 1988.
K.L. Ashley, "Analog Electronics with LabVIEW", Prentice hall PTR, 2003

Course Objectives: At the end of this course, students should:
1. Understand OP Amp and OP Transconductance Amp practical circuits and applications
2. Develop OP Amp circuit design expertise through quick approximation circuit analysis and reinforced through more precise circuit simulation.

Course Topics and Hours:

1	Ideal IP Amp (OA) and Macro-model	3
2	Basic Building Blocks	3
3	OTA Fundamental Properties	2
4	Non-Ideal Properties and Macro-Models	4
5	Noise Analysis in Op Amp Circuits	4
6	Active Filters	8
7	Multipliers and Nonlinear Applications	4
8	Waveform Generators	4
9	Oscillators	4
10	Switched-Capacitor Techniques	2
11	D/A Converters and ADCs	2
12	Functional Circuits, PLLs	2
	Total Hours	42

Lecture Schedule – 2 meetings / week, 125 minutes total
Laboratory Schedule – 1 session of 170 minutes / week

Project Requirements:
a) Design, simulation and realization of a small system.
b) Special hardware projects chosen by you, ideas from *Popular Electronics Magazine* or similar are acceptable. You will need to include the theoretical aspects of the design, that justification of the design is mandatory. Experimental vs. theoretical results are needed, including a prototype with a printed circuit is required.

Student Evaluation:

6 Laboratories	25%
Two Midterm Exams	40%
Final Exam or Project*	15%
Homework Assignments	15%
Weekly Quizzes	5%
TOTAL POINTS	**100%**

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
1. Apply knowledge of basic mathematics and science to solve electrical engineering problems	Midterm Exam#1 (problems 1, 2)	5	3(a)
2. Use the techniques, skills, and modern engineering tools necessary for engineering practice	Homework #4 (problems1,3)	6	3(k)
3. Ability to identify, formulation and solve engineering problems	Midterm Exam #2	7	3(c)
4. Design a system, component , or process to meet specified needs	Lab #5	8	3(c)
5. Design and conduct experiments, as well as analyze and interpret data	Lab #6	9	3(b)
6. Ability to collaborate with other engineers with differing skill sets to solve engineering problems	Final Project	10	3(d)
7. Ability to communicate both orally and in writing	Final Porject Presentation and Report	11	3(g)

Last Revised: 5/28/10

Course Name: ECEN 458
Course Title: Active Filter Analysis and Design

Catalog Description:
458. Active Filter Analysis and Design. (3-3) Credit 4. Systematic analysis and design for active RC filters; continous-time; switched-capacitor circuits; filter approximations; synthesis techniques; sensitivity; practical considerations for monolithic integrated filters; experimental and computer-simulation verification.

Course Designation: Elective

Prerequisite(s): ECEN 325

Required Text(s):
[1] Notes (see webpage under: http://amemsp02.tamu.edu/~sanchez)
[2] Active and Passive Analog Filter Design: An Introduction, L.P. Helsman, McGraw Hill, 1993, ISBN 0-07-030860

References:
[1] Analog Integrated Circuit Design, David A. Johns, and Ken Martin, John Wiley & Cons, Inc., New York, 1997. Chapters 10 & 15
[2] Design with Operational Amplifiers and Analog Integrated Circuits, S. Franco, McGraw Hill, New York, 1988
[3] Analog Filter Design, M.E. van Valkenburg, Holt, Rinehart and Winston, Inc. (Saunders College Publishing), 1982
[4] Design of Analog Filters Passive, Active RC, and Switched Capacitor, R. Schaumann, M.S. Ghausi, and K. R. Laker, Prentice Hall, New Jersey, 1990

Course Objectives: At the end of this course, students should:
1. Analyze and design active-filters.
2. Emphasize the design of practical filters for a host of applications.
3. Blend theory and practice.
4. Complete a prototype.
5. Conduct system level design and simulation of active filters based on basic block diagrams.
6. Estimate frequency and time response at the system level of analog filters.
7. Understand how to map a basic blocks diagram into a circuit implementation based on Op Amp or Transconductance Amplifier.
8. Synthesize into a mathematical expression the filter frequency response specifications.
9. Understand the practical design trade-offs of Continuous-Time and Discrete-Time (Switched-Capacitor) filters.

Course Topics and Hours:

Unit	Topic	Hours
1	Introduction	2
2	Basic Block and Systems	6
3	Systems Fundamentals	6
4	Approximation	4
5	Biquad Circuits	4
6	RC-Active Filters	4
7	RC-Oscillators	4
8	OTA-C Filters	4

9	Switched-Capacitor Concepts	4
10	Switched Capacitor Filters	2
11	Presentations	2
	Total Hours	42

Lecture Schedule – 2 meetings/week, 125 minutes total
Laboratory Schedule – 1 meeting/week, 170 minutes total

Student Evaluation:

Partial Exam 1	20%
Partial Exam 2	15%
Partial Exam 3	15%
Laboratory	20%
Final Project	15%
Homework	10%
Quizzes	5%
TOTAL POINTS	**100%**

Contributions to Professional Component:

Engineering science	3 credit hours
Engineering design	1 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Use of engineering tools (MATLAB, SPICE, FIESTA and SWITCAP) for the simulation and verification of integrated circuits.	Homework problems, laboratories and exam questions	5, 6	3(a), 3(k), 9
Use of fundamentals for the solution of electronic circuits not discussed in class	Homework problems and project	5, 7	3(a), 3(k), 9
Have the ability to formulate and solve engineering problems. The circuits are simulated and some of them are experimentally verified.	Homework problems, laboratories, project and exam questions	8,9, 10,11	3(a), 9
Written term project (report) on related topic. Final Project consists of: a) Design, simulation and realization of a small system. b) Hardware projects chosen by student.	Report includes the theoretical aspects of the design, justification of the design is mandatory. Experimental vs. Theoretical results are needed, including a prototype.	8,9,10,11	3(g), 3(h), 3(i), 3(j)

Last Revised: 5/28/10

Course Name: ECEN 459
Course Title: Power System Fault Analysis and Protection

Catalog Description:
459. Power System Fault Analysis and Protection. (3-2). Credit 4. General considerations in transmission and distribution of electrical energy as related to power systems; calculation of electric transmission line constants; general theory of symmetrical components and application to analysis of power systems during fault conditions.

Course Designation: Elective

Prerequisite(s): ECEN 215 or ECEN 314

Required Text(s): J. Glover, M. Sarma, and t. Overbye, Power System Analysis and Design, 4th edition, Thomson Publishing, 2008.

Supplemental Text(s):
[1] Power Systems Analysis, A. Bergen and V. Vittal, Prentice Hall, 2nd Edition, 2000
[2] Power Systems Analysis, J. Grainger and W. Stevenson, McGraw Hill, 1994

Course Objectives: At the end of this course, students should:
1. Be able to apply the basic concepts in phasors, instantaneous power, complex power, network equations to compute three phase power, voltage and currents in balanced three-phase circuits.
2. Be able to apply basic transformer theory (single-phase two-winding, three-phase two-winding, and three-phase three winding transformers) and compute equivalent circuit parameters for practical transformers operating under steady-state conditions
3. Be able to set up a power systems in per-unit system representation and use it to perform simple power system analysis
4. Be able to explain the concepts of four basic transmission-line parameters: series resistance, series inductance and shunt capacitance and apply to overhead lines. Be able to explain the concepts of transmission line electric and magnetic fields
5. Using ABCD parameter and equivalent π circuit for long, medium, and short-length line approximations, be able to analyze the performance of single-phase and balanced three-phase transmission lines under normal steady-state conditions.
6. Be able to compute line loading limits
7. Using line compensation techniques, be able to improve voltage regulation and increase line loadings.
8. Be able to compute ac (sub-transient, transient, and steady-state currents) and dc components of fault current and power system three-phase short circuit currents
9. Be able to explain the concepts of unbalanced system operation including the type of fault causing it, such as single line-to-ground, line-to-line, and double line-to-ground
10. Be able to apply the symmetrical component transform to the analysis of unbalanced power system operation
11. Be able to determine the bus impedance matrix
12. Be able to develop and sequence network for loads, series impedances, transmission lines, rotating machines and transformers
13. Be able to compute the sequence networks for single line-to-ground, line-to-line, and double line-to-ground faults and analyze the short circuit current
14. Be able to explain the basic concepts of power system protection including the basic protection criteria for over-current, distance, and current differential.

15. Be able to use the protection relaying principles when protecting transmission/distribution lines, power transformer, buses, machines, etc.
16. Be able to analyze three-phase networks under normal and unbalanced conditions

Course Topics and Hours:

Unit	Topic	Hours
1	Basic Concepts	3
2	Admittance Model and Network Calculations	3
3	Power-flow Solutions	4
4	Economic Operation of Power Systems	2
5	Impedance Model and Network Calculations	3
6	Symmetrical Faults	3
7	Symmetrical Components and Sequence Networks	3
8	Asymmetrical Faults	6
9	Power System Stability	9
10	Fundamental of Power System Protection	3
11	Exams	3
	Total Hours	42

Lecture Schedule – 2 meetings / week, 125 minutes total
Laboratory Schedule – 1 session of 170 minutes / week

Student Evaluation:

Homework	15%
Laboratory	20%
In-class exercises	5%
Exam 1	20%
Exam 2	20%
Exam 3	20%
TOTAL POINTS	**100%**

Contributions to Professional Component:

Engineering science 3 credit hours

Engineering design 1 credit hour

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Use of differential equations in representing voltages and currents on the transmission line and power transformers	Homework problems and exam questions	1, 5	3 (a), 9
Use of complex variables in representing complex power and analyzing voltages and currents in ac circuits	Homework problems and exam questions	1, 5	3 (a), 89

Use of linear algebra and matrix computations in applying symmetrical component transform to analysis of unbalanced power system operation	Homework problems and exam questions	1, 5	3 (a), 9
Use of MATLAB for solving engineering problems and designing simple protection systems	Lab exercises	1, 5, 6, 7, 8, 14	3 (a), 3(c), 3 (e), 3 (k), 9
Lab reports on projects aimed at modeling power systems and measuring parameters of physical power system components	Lab exercises	5, 9,	3 (b), 3(e)

Last Revised: 5/28/10

Course Name: ECEN 460
Course Title: Power System Operation and Control

Catalog Description:
460. Power System Operation and Control. (2-1). Credit 3. Load flow studies; power system transient stability studies; economic system loading and automatic load flow control.

Course Designation: Elective

Prerequisite(s): ECEN 314 – Linear Circuit Analysis or ENG 215.

Required Text(s): A. Bergen and V. Vittal, Power System Analysis, 2nd ed., Prentice-Hall 2002.

Course Objectives: At the end of this course, students should:

1. Understand the basic operation of electric power systems during normal and emergency conditions.
2. Understand the analysis of three phase circuits.
3. Understand the concepts of power, power factor and per unit system.
4. Understand the models associated with the transmission lines, transformers, generators, loads and shunt elements.
5. Be able to build network matrices by inspection.
6. Understand the power flow problem and be able to formulate it for large interconnected power systems.
7. Understand the three methods of solving power flow problem: (1) Gauss-Seidel method, (2) Coupled Newton-Raphson method, and (3) Fast Decoupled Load Flow method and be able to implement them using MATLAB.
8. Understand the concepts of automatic generation control, area control error and frequency bias.
9. Understand the concept of available transfer capability and be able to determine the total transfer capability by using a power flow program.
10. Understand the problem of transient stability of a power system.
11. Understand the methods used to analyze power system stability: (1) small signal stability methods, (2) transient stability analysis methods.
12. Be able to derive Swing equations and solve them using a numerical integration method.

Course Topics and Hours

Unit	**Hours**
1. Overview of power system operation	2
2. Review of power calculations in three phase circuits	2
3. Network matrices and solution of network equations	5
4. Power flow problem, formulation and solution	12
5. Automatic Generation Control and Energy Markets	8
6. Power system stability analysis	8
Exams and review lectures	5

Total Hours 42

Lecture Schedule – 3 meetings per week, 50 minutes each.
Laboratory Schedule – N/A

Student Evaluation:

Homework	5%

Project	15%
Midterm Exams(3)	60%
Final Exam	20%
Total	100%

Contributions to Professional Component:

Engineering science	2 1/2 credit hours
Engineering design	1/2 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of complex variables to modeling and analysis of power networks.	Homework problems and exam questions	1, 5	3(a), 9
Use of MATLAB to solve power flow and transient stability problems.	Homework problems and exam questions	4,5,6	3(a), 3(k), 9
Use of basic concepts from physics to model electrical machines for stability analysis	Homework problems and exam questions	2, 5	3(a), 9
Computer assignment on obtaining available transfer capability for a power system.	Computer assignment	4,5,6	3(e),3(k), 9
Written term project (report) on power system design for a specified set of contingencies.	Project	4, 5, 8, 11, 13, 14, 15	3(c),3(g), 3(h), 3(i), 3(j)

Prepared by: Ali Abur, last revised 5/28/2010

Course Name: ECEN 462
Course Title: Optical Communication Systems

Course Description:

462. Optical Communication Systems. (3-0). Credit 3. Principles of optical communication systems; characteristics of optical fibers, lasers and photodetectors for use in communication systems; design of fiber-optic digital systems and other optical communication systems.

Course Designation: Elective

Prerequisite(s): ECEN 322 and ECEN 370.

Required Text(s): J.C. Palias, Fiber Optic Communications, 5th edition, Pearson Prentice Hall, 2005.

Course Objectives: At the end of this course, students should:
1. Understand the basic principles of fiber optic communication systems and criteria that influence the design and operation of such systems.
2. Be familiar with direct modulation techniques of laser diodes and light emitting diodes.
3. Be acquainted with optical direct detection and heterodyne detection.
4. Be able to characterize the performance of an optical receiver, perform signal-to-noise ratio and bit-error rate calculations.
5. Have a basic knowledge of optical distribution network types, design bi-directional linear bus network, and know the basic principles of Wavelength Division Multiplexing.

Course Topics and Hours:

Unit	Topic	Hours
1	Overview and Optics primer	2
2	Lightwave propagation in dielectric slab waveguides and optical fibers	5
3	Modes; Dispersion; Distortion	4
4	Light sources: Laser diodes; Light emitting diodes	3
5	Light detectors: PIN and Avalanche photodiodes	3
6	Modulation formats and techniques	3
7	Noise and detection	5
8	Analog and digital optical systems; Power budget and rise time analysis	5
9	Distribution networks and fiber components	3
10	Analysis of linear bus networks	4
11	Wavelength Division Multiplexing	2
	Exams	3
	Total Hours	42

Student Evaluation:

Homework	19%	Will be assigned weekly. Solutions available at Copy Center, 221
Exams	81%	(3 Exams)
TOTAL POINTS	**100%**	

Contributions to Professional Components:

Engineering science	2.5 credit hours
Engineering Design	0.5 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of solutions of differential equations for determining propagation in optical fibers.	Homework problems and exam questions.	1, 5	3(a)
Laplace transform and frequency domain analysis for rise time and bandwidth evaluations.	Homework problems	5, 6	3(a), 3(k)
Use of principles from applied physics (E&M and solid state materials) to model the response and performance of various component parts in system	Homework problems and exam questions	2, 8	3(a), 3(c), 3(e)

Last revised: 5/28/10

Course Name: ECEN 464
Course Title: Optical Engineering

Catalog Description:
464. Optical Engineering. (3-0). Credit 3. Ray optics; wave optics; propagation, reflection, refraction and diffraction of light; passive optical components, polarization, optical modulators, interferometers and lasers.

Course Designation: Elective

Prerequisite(s): ECEN 322 – Electric and Magnetic Fields; ECEN 370 – Electronic Properties of Materials

Required Text(s): Eugene Hecht, Optics, 4th ed., Addison Wesley, 2002.

Course Objectives: At the end of this course, students should:

1. Be familiar with the fundamental concepts of geometrical optics and wave optics and their application in problem solving.
2. Understand the operation of commonly used optical components and instruments.
3. Have an appreciation of applications of electrooptics and of some current research and development topics.

Course Topics and Hours

Unit		**Hours**
1.	Geometrical optics	9
2.	Wave equation	2
3.	Gaussian beams	5
4.	Diffraction	6
5.	Interference	3
6.	Diffraction gratings	3
7.	Reflection at dielectric interface	2
8.	Polarized light	5
9.	Interference in thin dielectric films	3
10.	Interferometers	4
11.	Lasers	3
	Total Hours	**45**

Lecture Schedule – 2 meetings per week, 75 minutes each.
Laboratory Schedule – N/A

Student Evaluation:

Homework	12.5%
Midterm Exams(2)	50.0%
Final Exam	37.5%
Total	100.0%

Contributions to Professional Component:

Engineering science	3 credit hours
Engineering design	0 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of basic physics concepts (electricity and magnetism) in the understanding of light propagation, diffraction, and interference.	Homework problems and exam questions	2, 5	3(a), 9
Application of basic mathematical concepts (differential and integral calculus, complex variables) in the analysis of optical phenomena and systems	Homework problems and exam questions	1, 5	3(a), 9
Use of computer programs to solve diffraction and interference problems.	Homework problems	4, 5, 6	3(a), 3(k), 9

Prepared by: Henry Taylor, last revised 5/28/2010

Course Name: ECEN 468
Course Title: Advanced Logic Design

Catalog Description:
468. Advanced Logic Design. (3-3). Credit 4. Introduction to the design, modeling and verification of complex digital systems; modern design methodologies for logic design; development of tools for the design and testing of digital systems.

Course Designation: Elective

Prerequisite(s): ECEN 248

Required Text(s): Michael D. Ciletti**,** Modeling, Synthesis, and Rapid Prototyping with the Verilog™ HDL, Prentice-Hall 1999.

Course Objectives: At the end of this course, students should:

4. Understand the *Verilog* hardware description language and its applications on VLSI chip design, simulation and verification.
5. Learn modern ASIC design techniques, methodologies and the usage of CAD software tools such as Synopsys *DesignCompiler* and *PrimeTime*.

Course Topics and Hours:

Unit	Topic	Hours
1	Introduction	1
2	Hardware Modeling	2
3	Simulation and Testbench	1
4	Data Types and Operators	2
5	User-Defined Primitives	1
6	Delay Models	2
7	System Tasks, Functions, Syntax, and Behavioral Modeling 1-4	2
8	Behavioral Modeling 1-4	4
9	Switch-Level Models	2
10	Synthesis of Combinational Logic 1-2	3
11	Synthesis of Sequential Logic	2
12	Synthesis of Language Constructs 1-2	3
13	MIPS Processor	1
14	VHDL	2
15	FPGA	1
16	HDL Coding Styles	2
17	Timing Verification	1
18	Testing	1
19	Design for Testability	1
20	Built-in Self-Test	1
	Total Hours	35

Lecture Schedule – 2 meetings / week, 125 minutes total
Laboratory Schedule – 1 session of 170 minutes / week

Student Evaluation:

Homework	10%
Midterm 1	20%

Midterm 2	20%
Labs	50%
TOTAL POINTS	**100%**

Contributions to Professional Component:

Engineering science	0.5 credit hours
Engineering design	3.5 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Learn typical IC design flow and methodologies	Homework problems and exam questions	15	3(j)
Use of concepts of delay modeling, timing verification, combinational and sequential circuit in design	Homework problems, exam questions and lab	5, 8	3(a), 3(c)
Use of Verilog HDL to design, model and verify integrated circuit	Lab	4, 6, 8	3(c), 3(k), 9

Last revised: 5/28/10

Course Name: ECEN 469
Course Title: Advanced Computer Architecture

Catalog Description:
469. Advanced Computer Architecture. (3-0). Credit 3. Introduction to advanced computer architectures including memory designs, pipeline techniques, and parallel structures such as vector computers and multiprocessors.

Course Designation: Elective

Prerequisite(s): ECEN 350 or CPSC 321.

Required Text(s): H. S. Stone**,** High-Performance Computer Architecture, 3rd ed., Addison Wesley 1993.

Course Objectives: At the end of this course, students should:
1. Understand basic memory structures including cache and virtual memory, and how the memory hierarchy works.
2. Understand replacement policies and their impact on cache performance, as well as the footprints behavior in cache.
3. Understand virtual-memory mapping, and the program locality.
4. Understand the pipeline concept, and the principles of pipeline design.
5. Be able to evaluate the performance of pipelines.
6. Understand the concept of collision vector and be able to design the pipeline control.
7. Be able to characterize numerical problems and provide parallel solutions.
8. Understand the data structure for vector computers.
9. Be able to evaluate multiprocessor performance in terms of run time and communication time.
10. Be familiar with Multiprocessor interconnections including bus, ring, crossbar, and MINs.

Course Topics and Hours

Unit	**Hours**
1. Introduction to Computer Architectures	2
2. Memory-Systems	
Cache Memory	4
Virtual Memory	4
3. Pipeline Techniques	
principle of pipeline design	3
performance of pipeline computers	3
control of pipeline states	4
4. Vector Computers	7
5. Multiprocessors	
multiprocessor performance	6
multiprocessor interconnections	6
6. Real Machine Examples	3
Total Hours 42	

Lecture Schedule – 3 meetings per week, 50 minutes each.
Laboratory Schedule – N/A

Student Evaluation:

Homework	25%
Test 1	25%
Test 2	25%
Final Exam	25%
Total	100%

Contributions to Professional Component:

Engineering science	3 credit hours
Engineering design	0 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of probability and statistics to the performance evaluation of memory and multiprocessor systems.	Homework problems and exam questions	1, 5	3(a), 9
Written algorithms for solving numerical problems in scientific computing.	Homework problems	4, 8	3(c), 9
Identified methodologies in formulating and resolving engineering problems.	Homework problems	7, 8	3(c), 3(e)

Prepared by: Mi Lu, last revised 5/28/2010

Course Name: ECEN 472
Course Title: Microelectronic Circuit Fabrication

Catalog Description:
472. Microelectronic Circuit Fabrication. (3-3). Credit 4. Fundamentals of MOS and bipolar microelectronic circuit fabrication; theory and practice of diffusion, oxidation, ion implantation, photolithography, etch; yield and reliability considerations; statistical process control; integrated process design, simulation and characterization.

Course Designation: Elective

Prerequisite(s): ECEN 325 and 370

Required Text(s):
1. Stephen A. Campbell, The Science and Engineering of Microelectronic Fabrication, 2nd ed., Oxford University Press, 2001.
2. ECEN 472 Laboratory Manual.

Course Objectives: At the end of this course, students should:
1. Know who invented the transistor and IC, understand the role Moore's Law has played in the continued development of the integrated circuit technology, and appreciate the continual need for improvement in semiconductor processing.
2. Be familiar with the basic unit process operations used to build semiconductor devices and apply these operations to fabricate simple device structures in the laboratory.
3. Know the fundamental crystallographic nomenclature used to describe semiconductor crystals and which elements are ordinarily used to dope silicon n- and p-type.
4. Have a rudimentary understanding of the principal methods used to grow single crystals and prepare wafers.
5. Understand the principles of diffusion in semiconductors and the limitations of diffusion as a method of introducing impurities into semiconductor material.
6. Be familiar with the use of SSuprem III to model diffusion and oxidation in semiconductors.
7. Understand the Deal-Grove model for oxidation in silicon.
8. Be able to describe the basic steps in the fabrication process for bipolar and MOS transistors.
9. Understand the use and limitation of ion implantation for the introduction of impurities, and have a basic knowledge of range-energy relationships in ion implantation.
10. Be familiar with the processes (optical, x-ray, electron beam) used for lithography and the limitations and benefits of each.
11. Have a rudimentary understanding of photoresists (types, chemistry, and process).
12. Be familiar with the kinetic theory of gasses, vacuum systems and plasma generation mechanisms.
13. Know the two principal methods of pattern etching, wet and dry, and be able to explain the advantages, limitations, and methods of implementing each process.
14. Understand the methods of physical deposition (evaporation and sputtering) used for building semiconductor devices
15. Know the advantages of CVD (chemical vapor deposition) over physical deposition and understand the use of atmospheric, low pressure and plasma-enhanced CVD.
16. Be familiar with epitaxial growth of semiconductor layers.
17. Have an understanding of the importance of yield in semiconductor manufacturing processes.
18. Understand the role of and need for SPC methods in the continuing monitoring and improvement of semiconductor processing.
19. Be able to characterize the simple devices made in the lab.

Course Topics and Hours:

Unit	Topic	Hours
1	Preface, 1 & 2 Overview, Introduction, Substrates (Wafers)	3
2	Oxidation	3
3	Diffusion	3
4	Ion Implantation	3
5	Rapid Thermal Processing	2
6	Test 1	2
7	Optical Lithography	3
8	Protoresists, Non-Optical Lithography	3
9	Etching, Wet and Dry	3
10	Test 2	2
11	Physical Vapor Deposition (PVD)	3
12	Chemical Vapor Deposition	3
13	Expitaxy, Planarization and Chemical Mechanical Polish	2
14	Test 3	2
15	Manufacturing…Yields, Statistical Methods	2
16	Planarization and Chemical Mechanical Polish	3
	Total Hours	42

Lecture Schedule – 2 meetings / week, 125 minutes total
Laboratory Schedule – 1 session of 170 minutes / week

Student Evaluation:

Homework	25%
Test 1	15%
Test 2	15%
Test 3	15%
Labs	25%
In Class Quizzes	5%
TOTAL POINTS	**100%**

Academic Integrity: *"Texas A&M University encourages Academic Integrity and strictly enforces policies against any form of scholastic dishonesty. Please review the Student Rules at http://student-rules.tamu.edu for more information regarding these policies."*
…Student Conflict Resolution Services

Contributions to Professional Component:

Engineering science	4 credit hours
Engineering design	0 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Building and characterizing	Lab prework and reports.	1, 2, 3,5, 6,9	3(a),3(b),3(e),

simple silicon device structures in the lab.			3(k), 9
Application of calculus, differential equations to understanding and solving problems in semiconductor processing.	Homework problems and exam questions	1, 5	3(a), 9
Use of SSUPREM III to solve simple problems in the design and understanding of silicon processing.	Homework problems	5, 6, 7	3(a), 3(c), 9

Last revised: 5/28/10

Course Name: ECEN 473
Course Title: Microelectronic Device Design

Course Description:
473.Microelectronic Device Design. (3-0). Credit 3. General processes for the fabrication of microelectronic devices and integrated circuits; a review of the electronic properties of semiconductors and carrier transport and recombination; analysis and characterization of p-n junctions, bipolar transistors, and MOS capacitors and transistors; design considerations for achieving optimum performance and practical structures are discussed.

Course Designation: Elective

Prerequisite(s): ECEN 325 and ECEN 370

Required Text(s): H. Craig Casey, Jr., Devices for Integrated Circuits, John Wiley & Sons, Inc., 1999.

Course Objectives: At the end of this course, students should:
1. Know who invented the transistor and IC and understand the role Moore's Law has played in the continued development of the integrated circuit technology.
2. Know which elements are ordinarily used to dope silicon n- and p-type.
3. Have a rudimentary understanding of the band theory of solids &d the importance of the forbidden gap in semiconductors.
4. Understand the role of electrons and holes in semiconductors and the difference between extrinsic and intrinsic doping.
5. Be familiar with the transport phenomena that occur in semiconductors because of the motion of charge carriers and be able to distinguish the difference between carrier diffusion and drift, as well as know how they are related through the Einstein relationship.
6. Understand carrier generation, recombination, and lifetime; know the differences among the Auger, radiative, and Shockley-Hall-Read recombination processes.
7. Be able to describe the basic steps in the fabrication process for bipolar and MOS transistors.
8. Be able to describe the variation of impurity distribution, electric field and electrostatic potential across the space charge region in a p-n junction at equilibrium and under bias.
9. Understand how the depletion region width varies with impurity concentration and bias voltage.
10. Be able to draw energy band diagrams for a variety of doping and bias levels.
11. Understand the importance of minority carriers in the p-n junction and be able to describe the variation of minority carrier concentration in the vicinity of the metallurgical junction.
12. Understand the I-V characteristics of and ideal junction and how space charge recombination, surface combination and high current affect the I-V relationship.
13. Have a familiarity with avalanche breakdown, tunneling and capacitance in p-n junctions.
14. Understand the basic operation of a bipolar transistor and be able to draw energy band diagrams for n-p-n and p-n-p transistors under equilibrium and biased conditions.
15. Be able to describe the current components in a bipolar transistor and show how these currents relate to the carrier concentrations, bias voltage, and physical dimensions of the device.
16. Be familiar with bipolar transistor operation in the common emitter and common base modes.
17. Be familiar with the energy band diagram and I-V characteristics of Schottky barrier devices.
18. Be able to draw energy band diagrams for MOS capacitors under equilibrium and biased conditions.
19. Understand the threshold voltage (VT) and how it is influenced by doping and the 4 charges that give rise to non-ideal conditions.
20. Understand MOS capacitor C-V characteristics under ideal and non-ideal conditions.

21. Be familiar with the I-V characteristics of MOS transistors for the basic MOSFET model (small ID), the Schichman-Hodges model (SPICE level I), and the variable depletion charge model (SPICE level 2).
22. Understand how the drain current varies in the saturation and sub-threshold regions.
23. Understand the impact of substrate bias on the I-V characteristics of the MOSFET.
24. Know the difference between the long channel and short channel MOSFET. Understand short channel effects and how to overcome them.
25. Understand the drivers for MOSFET miniaturization and how the device behavior is affected by scaling and other miniaturization efforts.

Course Topics and Hours

Unit	Topic	Hours
1	Overview, Introduction, Electrons in Solids	3
2	Carrier Transport and Recombination	3
3	p-n Junctions: I-V Behavior	6
4	p-n Junctions: Reverse Breakdown and Junction Capacitance	3
5	Bipolar Transistors	5
6	Schottky-Barrier Devices	3
7	MOS Capacitors	5
8	MOS Field Effect Transistors	10
9	Exams	4
	Total Hours	42

Lecture Schedule – 2 meetings / week, 125 minutes total

Laboratory Schedule – N/A

Student Evaluation:

Homework	10%
Midterm Exams(3)	45%
Project	45%
TOTAL POINTS	**100%**

Contributions to Professional Component:

Engineering science	3 credit hours
Engineering design	0 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of differential and integral calculus and differential equations in band theory and I-V characteristics of diodes .	Homework problems and exam questions	1, 5	3(a), 9
Understanding of the role of	Homework problems and	1, 5	3(a), 3(c) 9

minority and minority carriers in diodes and transistors.	exam questions		
Understanding of I-V characteristics of p-n diodes, Schottky diodes, bipolar transistors, and MOS devices.	Homework problems and exam questions	5, 6	3(a), 3(c), 9

Last revised: 5/28/10

Course Name: ECEN 474
Course Title: VLSI Circuit Design

Catalog Description:
474. VLSI Circuit Design. (3-3). Credit 4. Analysis and design of monolithic analog and digital integrated circuits using CMOS technologies; physics and device modeling; CAD tools and computer aided design; properties of fundamental IC blocks and design methodologies for VLSI scale circuits; layout rules, chip planning and layout verification; test and evaluation of integrated circuits.

Course Designation: Elective

Prerequisite(s): ECEN 326

Required Text(s): Lecture notes available on website

Recommended Books:
[1] Analog Integrated Circuit Design, D. A. Johns and K. W. Martin, John Wiley & Sons, 1997.
[2] Design of Analog CMOS Integrated Circuits, B. Razavi, Mc-Graw-Hill, New York 2001.
[3] Analysis and Design for Analog Integrated Circuits, Paul Gray, Robert Meyer and Paul Hurst and S. Lewis, John Wiley and Sons, fourth edition, 2003
[4] CMOS Circuit Design, Layout, and Simulation, R. J. Baker, H. W. Li, D. E. Boyce, IEEE Press, 1998
[5]Selected Journal Papers.

Course Objectives: At the end of this course, students should:
1. To discuss basic transistor models and layout techniques for the design of analog integrated circuits, and to characterize them.
2. To study the most important building blocks in CMOS technologies and understand their limitations.
3. To design analog IC circuits considering practical design parameters.
4. To use the IC design tools, especially Cadence, Spectre, Spice, and Matlab. WE expect to fabricate and test some basic CMOS ICs.

Course Topics and Hours:

1	Introduction and MOS Models	6
2	CMOS technologies and Layouts	6
3	Review Session	0.5
4	Midterm 1	1
5	Current Mirrors and differential pair	5
6	Voltage references and differential pairs	5
7	OTA design Part I	4
8	Review Session	0.5
9	Midterm 2	1
10	OTA design Part 2	5
11	Design of a Miller OPAMP	4
12	Advanced Techniques and fully-differential circuits	5
13	Review Session	0.5
14	Midterm 3	1
15	Project Presentation	0.5
	Total Hours	45

Lecture Schedule – 2 meetings / week, 125 minutes total

Laboratory Schedule – 1 session of 170 minutes / week

Student Evaluation:

Laboratory	25%
Exams	50%
Homework	15%
Final Project	10%
TOTAL POINTS	**100%**

Contributions to Professional Component:

Engineering science	2 credit hours
Engineering design	2 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Use of engineering tools (MATLAB, SPICE and CADENCE) for the simulation and verification of integrated circuits.	Homework problems, laboratories and exam questions	5, 6	3(a), 3(k)
Use of differential equations, linear algebra, complex variables and laplace transforms for the solution of complex circuits.	Homework problems	2,5	3(a), 9
Use of fundamentals for the solution of electronic circuits not discussed in class	Homework problems and project	5, 7	3(a), 3(e)
Written term project (report) on related topic. Report includes analysis of the problem, justification of the solution, and computer simulations	Project report includes description of the problem, justification of the proposed solution, theoretical and simulated results.	8,9,10,11	3(b), 3(c), 3(d), 3(g)

Last revised: 5/28/10

Course Name: ECEN 475
Course Title: Introduction to VLSI System Design

Catalog Description:
475. Introduction to VLSI System Design (3-3). Credit 4. Introduction to design and fabrication of microelectronic circuits; emphasis on very large scale integration (VLSI) digital systems; use of state-of-the-art design methodologies and tools; design of small to medium scale integrated circuits.

Course Designation: Elective

Prerequisite(s): ECEN 248 and ECEN 325

Required Text(s): Neil Weste and David Harris, CMOS VLSI Design: A Circuits and Systems Perspective, 3rd edition, Addison Wesley, 2005.

Course Objectives: At the end of this course, students should:
1. Be aware the technology trend and fabrication process
2. Be aware major steps in a typical IC design flow and common methodologies of modern IC design.
3. Be aware different IC design styles including custom design, standard cell, FPGA (Field Programmable Gate Array), their advantages and weakness.
4. Understand the models of MOS transistors.
5. Understand design rules and know how to use them in design.
6. Be able to design schematic of CMOS transistors and draw layout of CMOS circuits.
7. Understand delay evaluation methods including RC delay, Elmore delay, and effective capacitance delay
8. Be able to model gate delay, wire delay and path delay. Know how to handle the delay characteristics in simulations.
9. Understand parasitic resistance, capacitance and inductance, and their extraction methods
10. Understand timing verification, including static timing analysis, fault path
11. Understand the power analysis of CMOS circuits and techniques to minimize power consumption, such as clock gating and power gating
12. Understand the impact of process variation and its models, the concept of yield and parametric yield
13. Understand flip-flop and latch based design, their advantages and disadvantages
14. Understand clocking schemes, clock skew, setup and hold time violation, and their solutions
15. Understand the basic concepts of fault model, including stuck-at-fault, open fault, bridge fault, and delay fault
16. Understand the techniques for testing, including scan design, built-in self test (BIST) and automatic test pattern generation (ATPG), including the D-algorithm
17. Understand the importance of interconnect in modern technology, and techniques to reduce interconnect delay, including routing, buffering, gate sizing and wire sizing
18. Be aware the signal integrity issue in modern circuit, including captive and inductive coupling, power/ground noise.
19. Be aware of common FPGA architectures, their strength and weakness.
20. Be able to design, model and verify integrated circuits using layout tools.

Course Topics and Hours:

Unit	Topic	Hours
1	Introduction	1
2	CMOS Circuit overview	1
3	Design flow and HDL	2

4	Fabrication and layout	2
5	MOS transistor IV characteristics and parasitics	2
6	MOSDC and transient characteristics	2
7	Delay and Power Estimation	1.5
8	Logic effort and gate sizing	2
9	Interconnect	2
10	SPICE simulation	1
11	Combinational circuits	1.5
12	Dynamic circuits	2
13	Sequential circuits	2
14	Design methodology	2
15	Datapath	3
16	Clock distribution	1.5
17	Memory I	2
18	Memory II	1.5
19	Package, power, I/O	1.5
20	Low Power Design	1.5
	Total Hours	35

Lecture Schedule – 2 meetings / week, 125 minutes total
Laboratory Schedule – 1 session of 170 minutes / week

Student Evaluation:

Quiz	5%
Mid-term	30%
Final Exam	35%
Labs	30%
TOTAL POINTS	**100%**

Contributions to Professional Component:

Engineering science 1.0 credit hours

Engineering design 2.0 credit hours

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Learn parasitic capacitance and inductance, and their computation	Quiz, homework and exam questions	2, 5	3(a)
Learn device modeling, delay modeling and timing verification	Quiz, homework and exam questions, and lab	7	3(e)
Learn to build empirical models for delay evaluation	Quiz, homework and exam questions, and lab	9	3(b)

Last revised: 5/28/10

Course Name: ECEN 476
Course Title: Neural Networks and Implementations

Catalog Description:
476. Neural Networks and Implementations. (3-3) Credit 4. Analysis of neural network architectures; underlying principles, circuit implementations, and the application of neural networks to practical problems.

Course Designation: Elective

Prerequisite(s): Senior Classification

Required Text(s): L. V. Fausett, Fundamentals of Neural Networks, Prentice Hall, 1994.

Course Objectives: At the end of this course, students should:

Course Topics and Hours:

Unit	**Topic**	**Hours**
1	Introduction to Neural Networks	2
2	Simple Neural Networks for Pattern Classification	5
3	Pattern Association	8
4	Exam 1	1
5	Neural Networks Based on Competition	7
6	Adaptive Resonance Theory	8
7	Exam 2	1
8	Backpropagation Neural Net	8
9	Final Exam	2
	Total Hours	42

Lecture Schedule – 3 meetings/week, 50 minutes each.
Laboratory Schedule – 1 meeting/week, 170 minutes each.

Student Evaluation:

Project Requirements:
To pass this course, you must demonstrate a working, technically meritorious project.

Exam 1	25%
Exam 2	25%
Final Exam	20%
Homework	10%
Computer Lab	20%
TOTAL POINTS	**100%**

* Peer evaluations will be conducted throughout the course (at the time of the design review meetings and at the end of the course), to aid the instructor in determining the level of contribution of group members. It is *your* responsibility to ensure that you contribute to your project! You must be aware of and be present at all group meetings, contribute to and sign off on all reports. To ensure delivery, all e-mails to group members must be sent (or copied) to their NEO accounts.

** These reports must be professional produced, typed and bound. The documents should reflect the techniques presented in *Technical Writing* (ENGL 301). Any content in your report that is derived from a source other than your group members must include reference. **Any instances of plagiarism** (no matter how seemingly minor) **will result in the report being rejected for grading** (i.e., the associated report component of *your group's* grade will be set to 0%) **and referral of your group to the Aggie Honor Office.**

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Use of MATLAB to perform neural network simulations.	Simulation Projects	4	9
Application of mathematics to analyze and design neural networks.	Homework problems and exams	5	3(a)

Last revised: 5/28/10

Course Name: ECEN 478
Course Title: Wireless Communications

Catalog Description:
478. Wireless Communications. (3-0). Credit 3. Overview of wireless applications, models for wireless communication channels, modulation formats for wireless communications, multiple access techniques, wireless standards.

Course Designation: Elective

Prerequisite(s): ECEN 455; junior or senior classification

Required Text(s): Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2005.

Course Objectives: At the end of this course, students should:
1. Understand various topics in wireless communications for vice, data and multimedia.
2. Understand the characteristics of the wireless channel, including path loss for different environments, random log-normal shadowing due to signal attenuation, and the flat and frequency-selective properties of multipath fading.
3. Understand the fundamental capacity limits of wireless channels and the characteristics of the capacity-achieving transmission strategies.
4. Understand the practical digital modulation techniques and their performance under wireless channel impairments.
5. Understand the techniques to improve the speed and performance of wireless links, which includes the design and performance analysis of adaptive modulation and diversity techniques to compensate for flat-fading.
6. Understand the three techniques to combat frequency-selective fading: adaptive equalization, multicarrier modulation, and spread spectrum.
7. Understand the concept of multiple antenna systems.
8. Understand the various practical multiple access schemes in wireless systems

Course Topics and Hours:

Unit	Topic	Hours
1	Overview of Wireless Communications	4
2	Wireless Channel Modeling	12
3	Digital Modulation and its Performance	8
4	Diversity in Fading channels	7
5	Capacity of Wireless Channels	5
6	Multiple Antenna and Space-time Communications	3
7	Multiple Access Schemes	3
	Total Hours	42

Lecture Schedule – 2 meetings / week, 125 minutes total

Student Evaluation:

Homework	20%
Quizzes & Class Participation	10%
Midterm	25%
Final	45%
TOTAL POINTS	**100%**

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of probability and random processes to the performance evaluation of wireless communication systems.	Homework problems and exam questions	1, 5	3(a), 9
Application of complex variables to modeling of RF modulation formats	Homework problems and exam questions	1, 5	3(a), 9
Use of MATLAB to perform wireless communication system simulations.	Homework problems	4, 5, 6	3(a), 3(k), 9
Use of concepts from basic physics (E&M and optics) to model RF signal propagation	Homework problems and exam questions	2, 5	3(a), 9
Written term project (report) on topic of students choosing related to wireless communications	Project	11, 13, 14, 15	3(g), 3(h), 3(i), 3(j)

Prepared by: Scott L. Miller, last revised 5/28/10

Course Name: ECEN 480
Course Title: RF and Microwave Wireless Systems

Catalog Description:
480. RF and Microwave Wireless Systems. (3-0). Credit 3. Introduction to various RF and microwave system parameters, architectures and applications; theory, implementation, and design of RF and microwave systems for communications, radar, sensor, surveillance, navigation, medical and optical applications.

Course Designation: Elective

Prerequisite(s): ECEN 322

Required Text(s): K. Chang, RF and Microwave Wireless Systems, Wiley, 2000.

Course Objectives: At the end of this course, students should:
1. Understand the basic operation of typical wireless communication and radar systems.
2. Understand the concepts of transmission lines and wave propagation in free space.
3. Learn various antenna parameters. Be able to design antennas of various types including dipoles, monopoles, horns, dishes, and patch antennas.
4. Understand the operating principles of various microwave components including oscillators, amplifiers, couplers, filters, switches, mixers, phase shifters, modulators, etc.
5. Be able to learn the radar equation and its application to radar systems.
6. Be able to evaluate CW and pulse radar systems and learn various target tracking techniques.
7. Learn the Friis transmission equation, link budget calculation, and evaluation of wireless communication systems.
8. Understand modulation techniques and FDMA, TDMA, and CDMA multiple access techniques.
9. Learn various wireless communication systems including cellular phones, satellite communications, local area networks, etc.
10. Understand other wireless applications such as RFID, automobiles, GPS navigation system, sensors, direct broadcast systems, surveillance systems and microwave-optical systems

Course Topics and Hours:

Unit	Topic	Hrs
1	Introduction and Applications	2
2	Transmissions Lines and Waves	4
3	Antennas and Propagation	4
4	Various Components, Devices and Circuits	3
5	Receiver Parameters	3
6	Transmitter Parameters	3
7	Radar Equations and Radar Cross Section	2
8	CW and Pulse Radar Systems	3
9	Tracking, Direction Finding and SAR	2
10	Communications Systems and Link Budget (wireless, cellular, mobile, personal and satellite	5
11	Modulation and Multiple Access Techniques	2
12	Automobile Applications	2
13	Navigation Systems (GPS), Direct Broadcast System (DBS)	2
14	Remote Sensing, RFID and Sensor Systems	2
15	Surveillance Systems	2
16	Optical-Microwave Systems	1
	Total Hours	42

Lecture Schedule – 3 meetings / week, 150 minutes total

Student Evaluation:

Homework	15%
First Exam	25%
Second Exam	25%
Final Exam	35%
TOTAL POINTS	**100%**

Relationship to Program Outcomes:

Course Activity	Assessment Method	EE Outcome	ABET Criteria
Application of electromagnetics, circuit theory and transmission lines and high frequency circuit modeling	Homework problems and exam questions	1, 2, 5	3(a), 3(c), 3(e), 3(k), 9
Application of propagation, communications and radar theory to design radar systems.	Homework problems and exam questions	1, 2,5,7,8	3(a), 3(c), 3(e), 3(k), 9
Use of MATLAB to perform wireless system simulations.	Homework problems	4, 5, 6	3(a), 3(k), 9
Discussion of transceiver and sensing system design.	Homework problems and exam questions	5, 7, 8	3(a), 3(c), 3(e), 3(k), 9

Last revised: 5/28/10

A.D Support Courses

MATH 151 Engineering Mathematics I

REQUIRED OR ELECTIVE: Required Course

DESCRIPTION: Credit 4 (3-2). Rectangular coordinates, vectors, analytic geometry, functions, limits, derivatives of functions, applications, integration, computer algebra (MatLab).

PREREQUISITES: MATH 150 or equivalent.

TEXTBOOK AND OTHER REQUIRED MATERIAL: *Calculus with Early Vectors*, James Stewart, Cengage Learning
Matlab: An Introduction with Applications, Amos, Wiley

COORDINATOR: David Manuel, Department of Mathematics

COURSE LEARNING OUTCOMES: At the completion of MATH 151, students will be able to:

Represent and manipulate 2-D vectors, including polar form
Determine limits
Calculate explicit and implicit derivatives of analytic functions
Determine tangents to curves
Determine the roots of functions using the Newton method
Use trigonometric, exponential, and logarithmic functions
Find stationary values of functions using first and second derivatives
Determine antiderivatives,
Determine definite integrals of simple analytic functions
Understand the Fundamental Theorem of Calculus
Understand the substitution rule
Use symbolic software, Maple and/or MatLab, to:
- Assign variables, factor, simplify and plot
- Use functions and expressions
- Determine explicit and implicit derivatives
- Apply Newton's method
- Perform single variable integration
- Solve applied problems, including ones for which hand computation is cumbersome.

TOPICS COVERED: Week, Topic

1. Introduction, trigonometry review, two-dimensional vectors
2. Dot product, parameterized curves, (qualitative) definition of limit
3. Calculation of limits, limits at infinity, continuity.
4. Velocity, differentiation
5. Rates of change. Derivatives of the trigonometric functions. Exam 1
6. Chain Rule, implicit differentiation, derivatives of vector-valued functions.
7. Higher derivatives, tangents of parameterized curves
8. Differentials and approximation, exponential and inverse functions.
9. Logarithmic function, derivatives of logarithms. Exam 2.
10. Exponential growth and decay, inverse trigonometric functions, L'Hospitals Rule
11. Graphical interpretation of the derivative, first and second derivative tests.
13. Area and the definite integral.
14. The Fundamental Theorem of Calculus. Exam 3.
15. Review for Final Exam.

WEEKLY SCHEDULE: Three lectures for 50 minutes each, 1 laboratory session for 110 minutes.

STUDENT EVALUATION:	Exams 1, 2 and 3	50%
	Lab Grade	25%
	Final Exam	25%
	Total	100%

ESTIMATED ABET CATEGORY CONTENT: Mathematics: 4 credits

CONTRIBUTION OF COURSE TO MEETING THE REQUIREMENTS OF CRITERION 5:

Math 151 directly addresses ABET Criteria 3(a) and 3(k).

Criterion 3(a): Math 151 provides the knowledge to apply vector analysis, differentiation and elementary integration to the solution of engineering problems.

Criterion 3(k): Math 151 provides the knowledge to use symbolic software and computer programming tools to the analysis and solution of engineering problems.

RELATIONSHIP OF COURSE TO PROGRAM OUTCOMES:

Course Activity	Assessment Method	ABET Criterion 3 Outcome
Vectors, parameterized curves, calculation of limits, velocity, differentiation, rates of change, derivatives of trigonometric functions	Laboratory work, homework, Exam 1, Final Exam	a, k
Chain Rule, implicit differentiation, derivatives of vector-valued functions, higher derivatives, tangents of curves, differentials and approximation, exponentil and inverse functions, logarithmic functions, derivatives of logarithms	Laboratory work, homework, Exam 2, Final Exam	a, k
Exponential growth and decay, inverse trigonometric functions, L’Hospitals Rule, graphical interpretation of the derivative, first and second derivatives tests, definite integrals, Fundamental Theorem of Calculus	Laboratory work, homework, Exam 3, Final Exam	a, k

Prepared by _____David Manuel / Walter Haisler__________________ Date: ___4/15/2010___________

MATH 152 Engineering Mathematics II

REQUIRED OR ELECTIVE: Required Course

DESCRIPTION: Credit 4 (3-2). Differentiation and integration techniques and their applications (area, volumes, work), improper integrals, approximate integration, analytic geometry, vectors, infinite series, power series, Taylor series, computer algebra (MatLab).

PREREQUISITES: MATH 151 or equivalent.

TEXTBOOK AND OTHER REQUIRED MATERIAL: *Calculus with Early Vectors*, James Stewart, Cengage Learning
Matlab: An Introduction with Applications, Amos, Wiley

COORDINATOR: David Manuel, Department of Mathematics

COURSE LEARNING OUTCOMES: At the completion of MATH 152, students will be able to:
Determine areas and volumes by integration
Perform integration using integration by parts and trigonometric substitutions
Evaluate improper integrals
Understand and be able to apply various types of series including power series, Taylor and Maclaurin series.
Understand and determine convergence of series
Understand and be able to apply vector operations including dot product and cross product

TOPICS COVERED: Week, Topic

1. Review of Fundamental Theorem of Calculus, integration by substitution, area
2. Area, volumes by slicing, disks, washers
3. Volume by cylindrical shells
4. Average value, integration by parts, trigonometric integrals
5. Trigonometric substitution, partial fractions. Exam 1
6. Improper integrals, arc length, surface area of revolution
7. Sequences
8. Series, convergence tests
9. Power series. Exam 2
10. Representing functions as power series, Taylor and Maclaurin series
11. Applications of Taylor series, 3D coordinates
12. Dot product, cross product
13. Polar Coordinates
14. Review. Exam 3
15. Review for Final Exam.

WEEKLY SCHEDULE: Three lectures for 50 minutes each, 1 lab for 110 minutes.

STUDENT EVALUATION:

Exams 1, 2 and 3	50%
Lab Grade	25%
Final Exam	25%
Total	100%

ESTIMATED ABET CATEGORY CONTENT: Mathematics: 4 credits

CONTRIBUTION OF COURSE TO MEETING THE REQUIREMENTS OF CRITERION 5:

Math 152 directly addresses ABET Criteria 3(a) and 3(k).

Criterion 3(a): Math 152 provides the knowledge to apply vector analysis, differentiation, integration and series methods to the solution of engineering problems.

Criterion 3(k): Math 152 provides the knowledge to use symbolic software and computer programming tools (MatLab) to the analysis and solution of engineering problems.

RELATIONSHIP OF COURSE TO PROGRAM OUTCOMES:

Course Activity/Topic	Assessment Method	ABET Criterion 3 Outcome
Review of Fundamental Theorem of Calculus, integration by substitution, areas and volumes by slicing, disks, washers; volume by cylindrical shells; average value, integration by parts, trigonometric integrals; trigonometric substitution, partial fractions.	Laboratory work, homework, Exam 1	a, k
Improper integrals, arc length, surface area of revolution; Sequences; Series, convergence tests; Power series.	Laboratory work, homework, Exam 2	a, k
Representing functions as power series, Taylor and Maclaurin series; Applications of Taylor series, 3D coordinates; Dot product, cross product; Polar Coordinates	Laboratory work, homework, Exam 3	a, k

Prepared by _____David Manuel / Walter Haisler_________________ Date: ___4/15/2010___________

MATH 251 Engineering Mathematics III

REQUIRED OR ELECTIVE: Required Course

DESCRIPTION: Credit 3 (3-0). Vector algebra, calculus of functions of several variables, partial derivatives, directional derivatives, gradient, multiple integration, line and surface integrals, Green's and Stokes' theorems.

PREREQUISITES: MATH 152 or equivalent.

TEXTBOOK: *Calculus with Early Vectors*, James Stewart, Cengage Learning

COORDINATOR: David Manuel, Department of Mathematics

COURSE LEARNING OUTCOMES: At the completion of MATH 251, students will be able to:

1. Understand and be able to apply vector mechanics in 3D including curl and divergence; understand vector fields and their engineering applications.
2. Understand and be able to apply double and triple integration to engineering and mathematics problems in various coordinate systems (Cartesian, polar, cylindrical and spherical).
3. Understand and be able to apply principles for functions of several variables, limits and continuity, partial derivatives; chain rule; directional derivatives, gradients, and max/min concepts and applications.
4. Understand and be able to apply theorems for line and surface integrals (Green's and Stokes' theorems) to engineering and mathematics problems.

TOPICS COVERED: Week, Topic

16. 3D vectors, dot and cross product, lines and planes
17. Quadric surfaces, vector functions and space curves, arc length, motion in space
18. Functions of several variables, limits and continuity, partial derivatives, tangent planes, differentials
19. Chain rule, directional derivatives, gradients, man/min problems
20. Lagrange multipliers. Exam I.
21. Double integrals, iterated integrals, double integrals over general regions.
22. Polar coordinates, integrals in polar coordinates, applications of double integrals and triple integrals
23. Cylindrical and spherical coordinates, integrals in cylindrical and spherical coordinates, change of variables in multiple integrals
24. Vector fields, line integrals. Exam II
25. Fundamental theorem for line line integrals, Green's Theorem
26. Curl and divergence, parametric surfaces and their areas.
27. Surface integrals, Stokes' Theorem
28. Divergence Theorem
29. Review. Exam III
30. Review for Final Exam.

WEEKLY SCHEDULE: Three lectures for 50 minutes each.

STUDENT EVALUATION:	Exams 1, 2 and 3	75%
	Final Exam	25%
	Total	100%

ESTIMATED ABET CATEGORY CONTENT: Mathematics: 3 credits

CONTRIBUTION OF COURSE TO MEETING THE REQUIREMENTS OF CRITERION 5:

Math 251 directly addresses ABET Criteria 3(a).

Criterion 3(a): Math 251 provides the knowledge to apply vector analysis, differentiation, integration and mathematical theorems to the solution of engineering problems with emphasis on functions of several variables.

RELATIONSHIP OF COURSE TO PROGRAM OUTCOMES:

Course Activity/Topic	Assessment Method	ABET Criterion 3 Outcome
3D vectors, dot and cross product, lines and planes; quadric surfaces, vector functions and space curves, arc length, motion in space; functions of several variables, limits and continuity, partial derivatives, tangent planes, differentials; chain rule, directional derivatives, gradients, man/min problems; Lagrange multipliers.	homework, Exam 1	a
Double integrals, iterated integrals, double integrals over general regions. Polar coordinates, integrals in polar coordinates, applications of double integrals and triple integrals. Cylindrical and spherical coordinates, integrals in cylindrical and spherical coordinates, change of variables in multiple integrals. Vector fields, line integrals	homework, Exam 2	a
Fundamental theorem for line line integrals, Green's Theorem. Curl and divergence, parametric surfaces and their areas. Surface integrals, Stokes' and Divergence Theorem	homework, Exam 3	a

Prepared by David Manuel / Walter Haisler Date: 4/15/2010

MATH 308 Differential Equations

REQUIRED OR ELECTIVE: Required Course

DESCRIPTION: Credit 3 (3-0). Ordinary differential equations, solutions in series, solutions using Laplace transforms, systems of differential equations.

PREREQUISITES: MATH 251 or equivalent; knowledge of computer algebra system

TEXTBOOK: *Differential Equations: An Introduction to Modern Methods and Applications*, Brannan/Boyce, John Wiley

COURSE LEARNING OUTCOMES: At the completion of MATH 308, students will be able to:

1. Solve first-order separable and linear differential equations,
2. Solve higher-order constant-coefficient linear differential equations and systems of differential equations,
3. Understand and be able to solve these differential equations by a variety of approaches including integrating factors, separation of variables, method of undetermined coefficients, variation of parameters and Laplace transforms,
4. Solve homogeneous and non-homogeneous second order ordinary differential equations,
5. Find Laplace transforms and inverse transforms, and apply these to solve differential equations, and
6. Apply computer solution techniques (MatLab) to solve differential equations.

TOPICS COVERED:

- Chapter 1: 2 days (1 day = 50 minute lecture)
    1. Section 1.1. Some Basic Mathematical Models; Direction Fields
    2. Section 1.2. Solutions of Some Differential Equations
- Chapter 2: 5 days
    1. Section 2.1. Linear Equations; Method of Integrating Factors - one day
    2. Section 2.2. Seperable Equations - one day
    3. Section 2.3. Modeling with First Order Equations - one day
    4. Section 2.4. Differences Between Linear and Nonlinear Equations
    5. Section 2.5. Autonomous Equations and Population Dynamics
    6. Section 2.6. Exact Equations and Integrating Factors
    7. Do 2.4, 2.5 and 2.6 in two days, doing only one representative example from 2.5
- Chapter 3: 5 days
    1. Section 3.1. Systems of Two Linear Algebraic Equations - one day
    2. Section 3.2. Systems of Two First Order Linear Differential Equations - one day
    3. Section 3.3. Homogeneous Linear Systems with Constant Coefficients - one day
    4. Section 3.4. Complex Eigenvalues - one day
    5. Section 3.6. A Brief Introduction to Nonlinear Systems - one day
- Chapter 7: 4 days
    1. Section 7.1. Autonomous Systems and Stability - one day
    2. Section 7.2. Almost Linear Systems - one day
    3. Section 7.3. Competing Species - one day
    4. Section 7.4. Predator-Prey Equations - one day
- Chapter 4: 5 days
    1. Section 4.1. Definitions and Examples
    2. Section 4.2. Theory of Second Order Linear Homogeneous Equations (Cover 4.1 and 4.2 in one day)
    3. Section 4.3. Linear Homogeneous Equations with Constant Coefficients - one day
    4. Section 4.4. Characteristic Equations with Complex Roots - one day
    5. Section 4.6. Nonhomogeneous Equations: Method of Undetermined Coefficients - one day
    6. Section 4.8. Variation of Parameters - one day
- Chapter 5: 8 days
    1. Section 5.1. Definition of the Laplace Transform - one day

2. Section 5.2. Properties of the Laplace Transform - one day
3. Section 5.3. The Inverse Laplace Transform - one day
4. Section 5.4. Solving Differential Equations with Laplace Transforms - one day
5. Section 5.5. Discontinuous Functions with Laplace Transforms - one day
6. Section 5.6. Differential Equations with Discontinuous Forcing Functions - one day
7. Section 5.7. Impulse Functions - one day
8. Section 5.8. Convolution Integrals and Their Applications - one day

- Chapter A (Appendix A): 4 days
  1. Section A.1. Matrices
  2. Section A.2. Systems of Linear Algebraic Equations, Linear Independence, and Rank
  3. Section A.3. Determinants and Inverses
  4. Section A.4. the Eigenvalue Problem
- Chapter 6: 6 days
  1. Section 6.1. Definitiions and Examples
  2. Section 6.2. Basic Theory of First order Linear Systems
  3. Section 6.3. Homogeneous Linear systems with Constant Coefficients
  4. Section 6.4. Complex Eigenvalues
  5. Section 6.5. Fundamental Matrices and the Exponential of a Matrix
  6. Section 6.6. Nonhomogeneous Linear Systems
- Exams: 3 days

WEEKLY SCHEDULE: Three lectures for 50 minutes each.

STUDENT EVALUATION:	Exams 1, 2 and 3	75%
	Final Exam	25%
	Total	100%

ESTIMATED ABET CATEGORY CONTENT: Mathematics: 3 credits

CONTRIBUTION OF COURSE TO MEETING THE REQUIREMENTS OF CRITERION 5:
Math 308 directly addresses ABET Criteria 3(a) and 3(k). Math 308 provides the knowledge to apply a variety of mathematical techniques to solve applied mathematics and engineering problems that are characterized by ordinary differential equations. Math 308 provides the knowledge to use symbolic software and computer programming tools (MatLab) to the analysis and solution of engineering problems.

RELATIONSHIP OF COURSE TO PROGRAM OUTCOMES:

Course Activity/Topic	Assessment Method	ABET Criterion 3 Outcome
Solution of first-order separable and linear differential equations	Homework, major examinations	a
Solution of higher-order constant-coefficient linear differential equations and systems of differential equations	Homework, major examinations	a
Solution of differential equations by a variety of approaches including integrating factors, separation of variables, method of undetermined coefficients, variation of parameters and Laplace transforms	Homework, major examinations	a
Solution of homogeneous and non-homogeneous second order ordinary differential equations,	Homework, major examinations	a
Determination of Laplace transforms and inverse transforms, and application of these to solve differential equations	Homework, major examinations	a
Solution of differential equations with computer software (MatLab)	Homework	k

Prepared by Walter Haisler Date: May 2010

PHYS 208 Electricity and Optics

REQUIRED OR ELECTIVE: Required course

CATALOG DESCRIPTION: Credit 4 (3-3). Continuation of PHYS 218. Electricity, magnetism and optics. Primarily for engineering students. *Physics 208 Lab Manual*, 8th Edition (Ramirez).

PREREQUISITES: PHYS 218; MATH 152 or 172 or registration therein.

TEXTBOOK AND OTHER REQUIRED MATERIAL: *University Physics*, Young and Freedman 12th edition.

COURSE LEARNING OUTCOMES: At the end of this course, students should be able to:

1) Calculate forces between point charges and between distributions of charges.
2) Understand and be able to calculate the electric field produced by collections of point charges as well as continuous distributions of charge.
3) Calculate the electric potential for distributions of point charges and continuous distributions of charge.
4) Evaluate the capacitance of various configurations of conductors, to add capacitances in series and parallel, and to calculate the energy stored in a capacitor.
5) Evaluate the resistance of various configurations of conducting material, to add resistors in series and parallel, and to calculate the power dissipated by a resistor in a circuit.
6) Using Kirchoff's Rules, be able to setup and find the currents flowing in any multi-loop DC circuit.
7) Understand and be able to calculate the force of a magnetic field on either moving charges or current carrying wires.
8) Calculate the magnetic field produced by any current carrying configuration.
9) Analyze and calculate the "induced" electric fields produced in circuits due to time changing magnetic fields.
10) Calculate mutual and self inductance for various configurations of wire loops and circuits.
11) Understand and be able to analyze the behavior of circuits containing either RC, RL, LC and RLC circuit elements.
12) Use the laws of reflection and refraction to model the propagation of light through various media.
13) Understand the fundamental principles governing the behavior of thin lenses and be able to use these to calculate the properties of combinations of lenses used in optical instruments.
14) Understand the fundamental principles governing interference and diffraction of light and be able to use these to calculate the resulting interference patterns which may emerge from light scattering off/through various objects.

TOPICS COVERED:

Week	Topics
1	Mechanics review and Coulombs Law
2	Electric Forces and Fields
3	Electric Potentials
4	Gauss Derivation
5	Exam I. Applications of Gauss and Capacitors
6	Current and Ohm's Law
7	Simple Circuits
8	Magnetic Fields
9	Exam II. Magnetic Fields
10	Ampere's Law
11	Induced EMF and Inductance
12	Inductance and Time Dependent Circuits
13	Exam 3, Time Dependent Circuits

14	Maxwell's Equations, Waves
15	Review, Final Exam

CLASS/LABORATORY SCHEDULE: Three 50-minute lecture sessions per week, and one weekly 150 minute Laboratory session.

CONTRIBUTION TO MEETING REQUIREMENTS OF CRITERION 5:

Subject	Semester hrs	Subject	Semester hrs	Subject	Semester hrs
Mathematics	0	Engineering Science	0	General	0
Basic Science	4	Engineering Design	0		

RELATIONSHIP OF COURSE TO PROGRAM OUTCOMES:

	ABET Program Outcome		ABET Program Outcome
x	a. ability to apply knowledge of mathematics, science and engineering		f. understanding of professional and ethical responsibility
x	b. ability to design and construct experiments, as well as to analyze and interpret data	x	g. ability to communicate effectively
	c. ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability		h. broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
	d. ability to function on multi-disciplinary teams		i. recognition of the need for, and an ability to engage in life-long learning
x	e. ability to identify, formulate and solve engineering problems		j. a knowledge of contemporary issues
			k. ability to use the techniques, skills and modern engineering tools necessary for engineering practice

Prepared by __Dr. W.H. Bassichis / Walter Haisler____ **Date** _Spring 2010___

PHYS 218 Mechanics

REQUIRED OR ELECTIVE: Required course

CATALOG DESCRIPTION: Credit 4 (3-3). Mechanics for students in science and engineering.

PREREQUISITES: MATH 151 or registration therein.

TEXTBOOK AND OTHER REQUIRED MATERIAL: *University Physics*, Young and Freedman 12th edition. *Laboratory Experiments for Physics 218,* 9th Ed, Ramirez & Hiebert, published by Hayden McNeil.

COURSE LEARNING OUTCOMES: At the end of this course, students should be able to:
1. Translate a problem from plain English into physics language
2. Write the equations of motion in linear coordinates and in polar coordinates for linear and circular motion
3. Solve equations (and systems of equations) of motion for 1-step and multiple-step problems
4. Recognize and state initial (and final) conditions
5. Draw free body diagrams
6. Write the Newton's laws
7. Find the work done on a body and work done by a force, and distinguish them
8. Understand and use the work-energy theorem
9. Write energy conservation equations
10. Distinguish when and what energy is conserved
11. Write momentum conservation equations
12. Write and solve equations for torques. (rotational analogue of Newton's law)
13. Find the center of mass and solve problems using it.
14. Write two equilibrium conditions (for forces and torques)
15. Write equations of harmonic motion; recognize the initial conditions.

TOPICS COVERED:

Week	Topics
1	Introduction, physical quantities, units, vectors, and vector algebra
2	Motion along a straight line
3	Motion in two and three dimensions
4	Newton's laws of motion
5	Applications of Newton's laws
6	Work, kinetic energy, work-energy theorem, and power
7	Force and energy; momentum
8	Momentum and collisions
9	Rotation of rigid bodies, torque
10	Dynamics of rotational motion
11	Static equilibrium gravitation
12	Periodic motion
13	Mechanical Waves
14	Review

CLASS/LABORATORY SCHEDULE: Three 50-minute lecture sessions per week, and one weekly 150 minute Laboratory session.

CONTRIBUTION TO MEETING REQUIREMENTS OF CRITERION 5:

Subject	Semester hrs	Subject	Semester hrs	Subject	Semester hrs
Mathematics	0	Engineering Science	0	General	0
Basic Science	4	Engineering Design	0		

RELATIONSHIP OF COURSE TO PROGRAM OUTCOMES:

	ABET Program Outcome		ABET Program Outcome
x	a. ability to apply knowledge of mathematics, science and engineering		f. understanding of professional and ethical responsibility
x	b. ability to design and construct experiments, as well as to analyze and interpret data	x	g. ability to communicate effectively
	c. ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability		h. broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
	d. ability to function on multi-disciplinary teams		i. recognition of the need for, and an ability to engage in life-long learning
x	e. ability to identify, formulate and solve engineering problems		j. a knowledge of contemporary issues
			k. ability to use the techniques, skills and modern engineering tools necessary for engineering practice

Prepared by Dr. Igor V. Roshchin / Walter Haisler **Date** Fall 2009

CHEM 107 General Chemistry for Engineering Students

REQUIRED OR ELECTIVE: Required course

CATALOG DESCRIPTION: Credit 3 (3-0). Introduction to important concepts and principles of chemistry; emphasis on areas considered most relevant in an engineering context; practical applications of chemical principles in engineering and technology.

PREREQUISITES: None

TEXTBOOK AND OTHER REQUIRED MATERIAL: *Chemistry for Engineering Students,* Lawrence Brown and Thomas Holme (Brooks/Cole-Thomson Publishing, 2006, ISBN #0-534-38974-0).

COURSE LEARNING OUTCOMES: At the end of this course, students should be able to:

1. explain the relevance of molecular structure and properties to a wide variety of real technological problems;
2. explain the relationship between theory and experiment in science in general and chemistry in particular;
3. perform unit conversions as needed to solve quantitative problems;
4. recognize and identify chemical compounds from formulas, line structures, or structural models;
5. perform stoichiometric calculations to determine the amounts of products formed or reactants consumed in a chemical reaction in terms of mass, moles, or other appropriate units;
6. identify the major species present in aqueous solutions, including acids and bases;
7. describe the properties of gases on the molecular and macroscopic scales in terms of the kinetic theory of gases;
8. perform various calculations using the ideal gas law;
9. recognize the conditions under which gases may not behave ideally, and identify alternative models (van der Waals equation of state, etc.) that may be suitable for such conditions;
10. identify physical situations in which the wave or particle model of light are most useful;
11. relate observable properties of light to wavelength, frequency, photon energy, etc.;
12. describe the modern model of atomic structure and its origins in quantum mechanics;
13. predict or explain properties of elements (atomic size, ionization energy, chemical reactivity, etc.) in terms of electron configurations;
14. write Lewis electron structures for chemical compounds and use them to predict molecular geometry;
15. describe chemical bonding in solids in terms of the interaction of atomic orbitals and band theory;
16. describe the connection between chemical bonding and material properties like electrical conductivity;
17. use commonly tabulated thermodynamic data to calculate the changes in energy, enthalpy, entropy, or free energy for a chemical reaction;
18. apply the concepts of thermodynamics to evaluate compounds as fuels or energy sources;
19. describe chemical equilibrium as a dynamic process;
20. perform numerical calculations to determine the equilibrium composition of a reacting system;

TOPICS COVERED:

Week 1: Particulate Nature of Matter
Week 2: Reactions and Stoichiometry
Week 3: Reagents, Solutions, Solution Stoichiometry
Week 4: Gases
Week 5: Ideal Gas Law, Interaction of Light and Matter
Week 6: Quantum Mechanics and Atomic Structure
Week 7: Atomic Structure and Periodic Properties

Week 8: Introduction to Chemical Bonding
Week 9: Molecular Structure & Geometry
Week 10: Chemical Bonding in Solids
Week 11: Chemical Energetics and Calorimetry,
Week 12: Chemical Thermodynamics
Week 13: Chemical Kinetics
Week 14: Chemical Equilibrium
Week 15: Review and Final Exams

CLASS/LABORATORY SCHEDULE: Three 50-minute lecture sessions per week

CONTRIBUTION TO MEETING REQUIREMENTS OF CRITERION 5:

Subject	Semester hrs	Subject	Semester hrs	Subject	Semester hrs
Mathematics	0	Engineering Science	0	General	0
Basic Science	3	Engineering Design	0		

RELATIONSHIP OF COURSE TO PROGRAM OUTCOMES:

	ABET Program Outcome		ABET Program Outcome
x	a. ability to apply knowledge of mathematics, science and engineering. Students acquire basic knowledge of chemistry they will need in many engineering problems. Students develop appreciation for connections between chemistry, mathematics, and physics.		f. understanding of professional and ethical responsibility
	b. ability to design and construct experiments, as well as to analyze and interpret data	x	g. ability to communicate effectively Students write ten lab reports over the course of the semester, in which they discuss their results in both qualitative and quantitative terms. These reports include numerous tables and graphs to present data.
	c. ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability		h. broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
	d. ability to function on multi-disciplinary teams		i. recognition of the need for, and an ability to engage in life-long learning
x	e. ability to identify, formulate and solve engineering problems The completion of assignments requires students to locate or select data from appropriate reference sources.		j. a knowledge of contemporary issues
			k. ability to use the techniques, skills and modern engineering tools necessary for engineering practice

Prepared by __Larry Brown / Walter Haisler_   **Date** __Spring 2010____________

CHEM 117 General Chemistry for Engineering Students Laboratory

REQUIRED OR ELECTIVE: Required course

CATALOG DESCRIPTION:. Credit 1 (0-3).Introduction to important concepts and principles of chemistry in the laboratory; emphasis on areas considered most relevant in an engineering context; practical applications of chemical principles in engineering and technology.

PREREQUISITES: CHEM 107 or registration therein

TEXTBOOK AND OTHER REQUIRED MATERIAL: *Chemistry for Engineering Students*, Lawrence Brown and Thomas Holme (Brooks/Cole-Thomson Publishing, 2006, ISBN #0-534-38974-0). *Chemistry 117 Laboratory Manual*, Lawrence S. Brown, 2009, Hayden-McNeil, Plymouth, MI.

COURSE LEARNING OUTCOMES: At the end of this course, students should be able to:
1. perform laboratory experiments to measure a range of physical properties, such as temperature, pressure, mass, volume, with precision and accuracy;
2. use appropriate software to fit mathematical functions to experimental data and assess the quality of the fit;
3. present experimental data in graphs and tables to facilitate easy interpretation;
4. evaluate the quality of experimental data in both qualitative and quantitative terms, and
5. present the results of experiments in written form.

TOPICS COVERED (Laboratory assignments are related to the topics covered in CHEM 107)**:**
Week 1: Particulate Nature of Matter
Week 2: Reactions and Stoichiometry
Week 3: Reagents, Solutions, Solution Stoichiometry
Week 4: Gases
Week 5: Ideal Gas Law, Interaction of Light and Matter
Week 6: Quantum Mechanics and Atomic Structure
Week 7: Atomic Structure and Periodic Properties
Week 8: Introduction to Chemical Bonding
Week 9: Molecular Structure & Geometry
Week 10: Chemical Bonding in Solids
Week 11: Chemical Energetics and Calorimetry,
Week 12: Chemical Thermodynamics
Week 13: Chemical Kinetics
Week 14: Chemical Equilibrium
Week 15: Review and Final Exams

CLASS/LABORATORY SCHEDULE: One 150-minute laboratory period.

CONTRIBUTION TO MEETING REQUIREMENTS OF CRITERION 5:

Subject	Semester hrs	Subject	Semester hrs	Subject	Semester hrs
Mathematics	0	Engineering Science	0	General	0
Basic Science	1	Engineering Design	0		

RELATIONSHIP OF COURSE TO PROGRAM OUTCOMES:

	ABET Program Outcome		ABET Program Outcome
x	a. ability to apply knowledge of mathematics, science and engineering. Students acquire basic knowledge of chemistry they will need in many engineering problems. Students develop appreciation for connections between chemistry, mathematics, and physics.		f. understanding of professional and ethical responsibility
x	b. ability to design and construct experiments, as well as to analyze and interpret data Students carry out experiments in the laboratory, and make limited decisions on some experimental procedures. Students prepare graphs and compare data from most experiments with appropriate mathematical models.	x	g. ability to communicate effectively Students write ten lab reports over the course of the semester, in which they discuss their results in both qualitative and quantitative terms. These reports include numerous tables and graphs to present data.
	c. ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability		h. broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
x	d. ability to function on multi-disciplinary teams Students work in teams to carry out lab experiments, but the teams are not multidisciplinary.		i. recognition of the need for, and an ability to engage in life-long learning
x	e. ability to identify, formulate and solve engineering problems The completion of assignments requires students to locate or select data from appropriate reference sources.		j. a knowledge of contemporary issues
			k. ability to use the techniques, skills and modern engineering tools necessary for engineering practice

Prepared by __Larry Brown / Walter Haisler_ **Date** ____Spring 2010__________

ENGL 104 Composition and Rhetoric

REQUIRED OR ELECTIVE: Required course

CATALOG DESCRIPTION: Credit 3 (3-0). Focus on referential and persuasive researched essays through the development of analytical reading ability, critical thinking and library research skills.

PREREQUISITES: None

TEXTBOOK AND OTHER REQUIRED MATERIAL: (1) Blakesley, David, and Jeffrey L. Hoogeveen. Writing: A Manual for the Digital Age. New York: Cengage. 2009. (2) Levitt, Steven D., and Stephen J. Dubner. Freakonomics: A Rogue Economist Explores the Hidden Side of Everything. Revised and Expanded ed. New York: William Morrow—Harper Collins, 2005. (3) Seyler, Dorothy U. Read, Reason, Write: An Argument Text and Reader. 9th ed. Boston: McGraw Hill, 2009.

COURSE LEARNING OUTCOMES:
During the semester, students will learn how

- writers consider purpose, audience analysis, voice and tone in various genres and rhetorical situations;
- the conventions of written discourse govern format, usage, and style in various rhetorical situations and genres;
- audience and culture shape discourse; and
- sources can be synthesized effectively.

Students will also learn how to

- analyze rhetorical situations;
- identify academic sources;
- identify persuasive appeals in written and visual texts;
- paraphrase and summarize accurately the ideas of others;
- develop a thesis and construct a convincing written argument for a specific audience;
- use electronic resources to support library research;
- synthesize three or more sources, using MLA style for internal documentation and works cited;
- analyze and revise your own writing and the writing of others; and
- practice scholastic honesty, academic integrity, and the ethics of communication.

TOPICS COVERED:
Week 1: Course introduction; introduction to professional ethics
Week 2: Professional responsibility; line drawing and creative middle way; factual, conceptual and moral issues
Week 3: Writing and communication; line drawing and creative middle way
Week 4: Ethical theory; utilitarianism and respect for persons
Week 5: Contemporary social and value dimensions of technology; computer ethics
Week 6: Risk, liability and safety
Week 7: Classic ethical cases—*Challenger* and *Columbia* disasters; mid-term examination
Week 8: Risk assessment and management; professionalism and licensure; professional codes
Week 9: Reliability and trust
Week 10: Preventive and aspirational ethics; contemporary ethical issues
Week 11: Environmental ethics
Week 12: Classical ethical dilemmas
Week 13: Contemporary global/international professionalism and ethical considerations
Week 14: Contemporary race and gender issues; discrimination

CLASS/LABORATORY SCHEDULE: Three 50-minute lecture sessions per week.

CONTRIBUTION TO MEETING REQUIREMENTS OF CRITERION 5:

Subject	Semester hrs	Subject	Semester hrs	Subject	Semester hrs
Mathematics		Engineering Science		General	3
Basic Science		Engineering Design			

RELATIONSHIP OF COURSE TO PROGRAM OUTCOMES:

	ABET Program Outcome		ABET Progrm Outcome
	a. ability to apply knowledge of mathematics, science and engineering		f. understanding of professional and ethical responsibility
	b. ability to design and construct experiments, as well as to analyze and interpret data	x	g. ability to communicate effectively
	c. ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	x	h. broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
	d. ability to function on multi-disciplinary teams		i. recognition of the need for, and an ability to engage in life-long learning
	e. ability to identify, formulate and solve engineering problems	x	j. a knowledge of contemporary issues
			k. ability to use the techniques, skills and modern engineering tools necessary for engineering practice

Prepared by ____Walter Haisler____ **Date** ___Spring 2010____

ENGL 203 Introduction to Literature

REQUIRED OR ELECTIVE: Elective course

CATALOG DESCRIPTION: Credit 3 (3-0). Exploration of literature by genre and/or theme; literary analysis and interpretation; intensive writing about literature.

PREREQUISITES: ENGL 104

TEXTBOOK AND OTHER REQUIRED MATERIAL:
Required texts:
- DiYanni, Robert, ed. Literature: Approaches to Fiction, Poetry, and Drama. 2nd edition. McGraw-Hill, 2008.
- Alexi, Sherman. The Absolutely True Diary of a Part-Time Indian. Little, Brown. 2007.)
- Alexi, Sherman. Flight: A Novel. Grove Press. 2007

Recommended support texts:
A writing handbook and a standard college-level dictionary such as
- The Aggie Writer's Harbrace Handbook, Cheryl Glen et al.
- The New American Webster Handy College Dictionary

COURSE LEARNING OUTCOMES: During the semester, students will learn how:
- read and interpret literature critically and analytically;
- recognize major literary genres;
- identify the conventions of literary discourse that govern how readers construct literary meaning;
- identify, synthesize, and document primary and secondary sources;
- develop written arguments that build upon research relating to and interpretation of literary texts;
- demonstrate competency in grammar, diction, and usage; and
- practice scholastic honesty, academic integrity, and the ethics of communication.

TOPICS COVERED:

Day	Topic	Day	Topic
Jan 21	Course Orientation	Mar 23	A Raisin in the Sun & Project #3
Jan 23	Intro to Fiction & Overview Project	Mar 25	M~ Butterfly
Jan 26	Elements of Fiction, Pt I	Mar 27	The Importance of Being Earnest
Jan 28	Elements of Fiction, Pt II	Mar 30	The Cuban Swimmer & Tender
Jan 30	Writers in Context: Poe	Apr 1	Intro to Poetry & Types of
Feb 2	Writers in Context: O'Connor	Apr 3	Elements of Poetry, Pt I
Feb 4	Selected Short Stories	Apr 6	Elements of Poetry, Pt II
Feb 6	Selected Short Stories	Apr 8	Project #3 Workshop
Feb 9	Contemporary Fiction	Apr 10	Reading Day—No Class Meeting
Feb 11	Project #1 Workshop	Apr 13	Elements of Poetry, Pt III
Feb 13	Library Visit & Overview Project #2	Apr 15	Transformations
Feb 16	Absolutely True Diary of a Part-Time	Apr 17	Envisioning Poetry
Feb 18	Absolutely True Diary of a Part-Time	Apr 20	Poets in Context: Gwendolyn
Feb 20	Absolutely True Diary of a Part-Time	Apr 22	Poets in Context: Robert Frost
Feb 23	Flight	Apr 24	Poets in Context: Langston
Feb 25	Flight	Apr 27	Contemporary Poetry
Feb 27	Flight	Apr 29	World Poetry
Mar 2	Critical Analysis Practice	May 1	Project #4 Workshop
Mar 4	Intro to Drama & Literary Terms	May 4	No Class Meeting

Mar 6	Elements & Sophocles in Context		
Mar 9	Ibsen in Context		
Mar 11	Project #2 Workshop		
Mar 13	Library Day		

CLASS/LABORATORY SCHEDULE: Three 50-minute lecture sessions per week.

CONTRIBUTION TO MEETING REQUIREMENTS OF CRITERION 5:

Subject	Semester hrs	Subject	Semester hrs	Subject	Semester hrs
Mathematics		Engineering Science		General	3
Basic Science		Engineering Design			

RELATIONSHIP OF COURSE TO PROGRAM OUTCOMES:

	ABET Program Outcome		ABET Progrm Outcome
	a. ability to apply knowledge of mathematics, science and engineering		f. understanding of professional and ethical responsibility
	b. ability to design and construct experiments, as well as to analyze and interpret data	x	g. ability to communicate effectively
	c. ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	x	h. broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
	d. ability to function on multi-disciplinary teams		i. recognition of the need for, and an ability to engage in life-long learning
	e. ability to identify, formulate and solve engineering problems	x	j. a knowledge of contemporary issues
			k. ability to use the techniques, skills and modern engineering tools necessary for engineering practice

Prepared by____Nancy Small / Walter Haisler______ **Date** __Spring 2009______

ENGL 301 Technical Writing

REQUIRED OR ELECTIVE: Elective course

CATALOG DESCRIPTION: Credit 3 (3-0). Processes of developing field-specific technical information related to the major, including researching, drafting, editing, revising, and designing technical reports, proposals, manuals, resumes, and professional correspondence for specific audiences.

PREREQUISITES: ENGL 104

TEXTBOOK AND OTHER REQUIRED MATERIAL: Technical Communication Today, 3rd Edition, Richard Johnson-Sheehan, Pearson/Longman, 2007.

COURSE LEARNING OUTCOMES: By the end of the course, students should be able to:

- understand writing as a process (from invention to editing) and learn how to use that process appropriately and efficiently for various writing tasks;
- analyze audience and learn how to adapt writing (style, tone, graphics, page design) for that audience;
- become familiar with and learn to produce the types of writing most frequently used in scientific, technical, and professional fields;
- discover ways in which collaboration can support the writing process;
- become familiar with and learn to produce documents that reflect appropriate and effective style, graphics, and document design;
- understand and apply course concepts when writing other documents related to their discipline; and
- use a variety of technology tools to support online communication.

TOPICS COVERED:

- production of a variety of document types (such as reports, memos, instructions, etc.)
- effective collaboration;
- consideration of audience within the context of a particular purpose;
- engagement with various ethical issues;
- effective writing style, tone, graphics, and document design;
- technology use to support communication;
- effective research practices, project management practices, information management practices; and
- development of a credible argument.

CLASS/LABORATORY SCHEDULE: Three 50-minute lecture sessions per week.

CONTRIBUTION TO MEETING REQUIREMENTS OF CRITERION 5:

Subject	Semester hrs	Subject	Semester hrs	Subject	Semester hrs
Mathematics		Engineering Science		General	3
Basic Science		Engineering Design			

RELATIONSHIP OF COURSE TO PROGRAM OUTCOMES:

	ABET Program Outcome		ABET Progrm Outcome
	a. ability to apply knowledge of mathematics, science and engineering		f. understanding of professional and ethical responsibility
	b. ability to design and construct experiments, as well as to analyze and interpret data	x	g. ability to communicate effectively
	c. ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	x	h. broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
	d. ability to function on multi-disciplinary teams		i. recognition of the need for, and an ability to engage in life-long learning
	e. ability to identify, formulate and solve engineering problems	x	j. a knowledge of contemporary issues
			k. ability to use the techniques, skills and modern engineering tools necessary for engineering practice

Prepared by____Nancy Small / Walter Haisler______ **Date** __Spring 2008______

COMM 205 Communication for the Technical Professions

REQUIRED OR ELECTIVE: Elective course in most programs, required in petroleum engineering

CATALOG DESCRIPTION: Credit 3 (3-0). Design and presentation of oral reports for technical professions; incorporation of visual and graphic materials into presentation required; written reports required.

PREREQUISITES: ENGL 104

TEXTBOOK AND OTHER REQUIRED MATERIAL: O'Hair, Rubenstein, & Stewart, *A Pocket Guide to Public Speaking*, 2nd ed; and Nancy J. Street Packet for Technical Public Speaking (available online at elearning.tamu.edu).

COURSE LEARNING OBJECTIVES: This course will

- Provide experience in delivering technical speeches for a variety of audiences
- Build confidence in presenting materials
- Enhance knowledge of developing and delivering various speeches
- Increase versatility and marketability as a technical professional

TOPICS COVERED:

- Design and presentation of oral reports for technical professions
- Oral and written communication skills
- incorporation of visual and graphic materials into presentations
- Creation of a Wiki page
- Group presentation skills
- Projects (Job or career, Issue or process relevant to student's field, Point-Counterpoint, Persuasive extemporaneous presentation)
- In-class presentations (related to 4 projects above)

CLASS/LABORATORY SCHEDULE: Three 50-minute lecture sessions per week.

CONTRIBUTION TO MEETING REQUIREMENTS OF CRITERION 5:

Subject	Semester hrs	Subject	Semester hrs	Subject	Semester hrs
Mathematics		Engineering Science		General	3
Basic Science		Engineering Design			

RELATIONSHIP OF COURSE TO PROGRAM OUTCOMES:

	ABET Program Outcome		ABET Progrm Outcome
	a. ability to apply knowledge of mathematics, science and engineering		f. understanding of professional and ethical responsibility
	b. ability to design and construct experiments, as well as to analyze and interpret data	X	g. ability to communicate effectively
	c. ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability		h. broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
X	d. ability to function on multi-disciplinary teams		i. recognition of the need for, and an ability to engage in life-long learning
	e. ability to identify, formulate and solve engineering problems	X	j. a knowledge of contemporary issues
			k. ability to use the techniques, skills and modern engineering tools necessary for engineering practice

Prepared by____Lucas Logan / Walter Haisler______ **Date** __Spring 2010______

APPENDIX B: FACULTYRESUMES

Nancy Amato, Professor, Tenured

Experience, Department of Computer Science and Engineering, Texas A&M University
Hired, Assistant Professor, Tenure-track, July 1995
Promoted, Associate Professor with Tenure, September 2000; Promoted, Professor, September 2004

Degree	Field	Institution	Date
Ph.D.	Computer Science	University of Illinois @Urbana-Champaign	1995
M.S.	Computer Science	University of California@Berkeley	1988
B.S.	Mathematical Sciences	Stanford University	1986
A.B.	Economics	Stanford University	1986

Conferences, Workshops, and Professional Development (Last Five Years)

General Chair

ACM International Conference on Computing Frontiers (CF), Bertinoro, Italy, 2010

Steering Committee Member, Intern

Workshop on the Algorithmic Foundations of Robotics, 2009-present
Grace Hopper Celebration of Women in Computing: Scholarship Committee Co-Chair, 2007-2008; Member of Academic Advisory Committee, 2006

Registration Chair and Web Chair

Parallel Architectures and Compilation techniques (PACT), 2007

Program Committee Area Chair,

Robotics: Science and Systems, 2006, 2007

Conference Co-Chair

(WAFR): Intern. Workshop on Algorithmic Foundations of Robotics, 2006
Organizing Committee Member, SIAM Conference on Parallel Processing for Scientific Computing (PP), 2006

Program Committee Chair

4th IEEE International workshop on High Performance Computational Biology (HiCOMB) 2005,

Program Committee Member

International Conf. on Computer Animation and Social Agents (CASA), 2008, 2010.
2nd International Frontiers of Algorithmics Workshop (FAW), 2008, 2010
ACM SIGPLAN Symp. on Principles and Practices of Parallel Programming (PPoPP), 2009
IEEE International Workshop on High Performance Computational Biology, 2009
Robotics: Systems and Science (RSS), 2005, 2006, 2007, 2008, 2009

Other Related Computing Experience

International Computer Science Institute, University of California, Berkeley
Visiting Scientist (Fall 1994)
AT&T Bell Laboratories, Murray Hill, NJ
Visiting Scientist (Summer 1994)
U.S. Army Corps of Engineers, CERL, Champaign, IL
Research Assistant (1991-1993)
University of Illinois at Urbana-Champaign, IL
Research/Teaching Assistant (1988–1991)
Bell Communications Research, Piscataway, NJ
Member of Technical Staff (1986–1988)

Consulting- None

Department Committee Service 2009-2010
• **Advisory Committee (elected)** • **Graduate Assistantship & Scholarship Selection Committee** • **AWICS Student Organization Advisor**
College of Engineering Service 2009-2010
• **Promotion and Tenure Committee** • **Engineering Faculty Advisory Committee, Vice Chair**
University Committee Service 2009-2010
• **Alliance for Bioinformatics, Computational biology & Systems Biology** • **Council of Principal Investigators, Chair**

Department Committee Service 2005-2009
• **Advisory Committee (elected), 2005-2009** • **Faculty Search Systems Biology Sub Committee, Chair, 2005-2007** • **Graduate Advisory Committee, 2005-2006** • **Graduate Assistantship & Scholarship Selection Committee, 2005-2009** • **Promotion and Tenure Committee, 2005-1009** • **AWICS Student Organization Advisor, 2005-2009** • **Web Advisory Committee, 2006-2007** • **Faculty Search Senior Hire Sub Committee, 2007-2008**
College of Engineering Service 2005-2009
• **Graduate Instruction Committee, 2005-2006** • **Engineering Faculty Advisory Committee, 2007-2009**
University Committee Service 2005-2009
• **Alliance for Bioinformatics, Computational Biology & Systems Biology, 2007-2009**

Principle Publications †Undergraduate student author, ‡Graduate and PostDoc authors

Refereed Journals and Conferences

Computational Biology

Xinyu Tang‡, Shawna Thomas‡, Lydia Tapia‡, David P. Giedroc, and **Nancy M. Amato**, "Simulating RNA Folding Kinetics on Approximated Energy Landscapes," Journal of Molecular Biology, 3811(4), 2008, pp. 1055-1067.

Xinyu Tang‡, Shawna Thomas‡, Lydia Tapia‡, and **Nancy M. Amato**, "Tools for Simulating and Analyzing RNA Folding Kinetics," Proc. the 11th International Conference on Computational Molecular Biology (RECOMB), April 2007, pp. 268–282.

Xinyu Tang‡, Bonnie Kirkpatrick†, Shawna Thomas‡, Guang Song‡, and **Nancy M. Amato**, "Using Motion Planning to Study RNA Folding Kinetics," special issue of selected papers from RECOMB 2004, Journal of Computational Biology, 12(6), 2005, pp. 862–881.

Robotics (Motion Planning, Animation, Mobile & Reconfigurable Robots, Virtual/Augmented Reality)

Lydia Tapia‡, Shawna Thomas‡, Bryan Boyd‡, and **Nancy M. Amato**, "An Unsupervised Adaptive Strategy for Constructing Probabilistic Roadmaps," Proc. of the 2009 IEEE International Conference on Robotics and Automation (ICRA), Kobe, Japan, May 2009, pp. 4037-4044.

Roger Pearce‡, Marco Morales‡, and **Nancy M. Amato**, "Structural Improvement Filtering Strategy for PRM," Proc. of Robotics: Science and Systems (RSS), 2008, pp. 167–174.

High-Performance Computing (Algorithms, Modeling, Task Scheduling, Applications)

Lawrence Rauchwerger and **Nancy Amato**, "SmartApps: Middle-ware for Adaptive Applications on Reconfigurable Platforms", ACM SIGOPS Operating Systems Reviews, Special Issue on Operating and Runtime Systems for High-End Computing Systems, 40(2), 2006, pp. 73–82.

Geometric Computing

Jyh-Ming Lien‡ and **Nancy M. Amato**, "Approximate Convex Decomposition of Polyhedra and

Its Applications," Computer Aided Geometric Design (CAGD), 25(7), October 2008, pp. 503–522.

Jyh-Ming Lien‡, John Keyser and **Nancy M. Amato**, "Simultaneous Shape Decomposition and Skeletonization," Proc. of the ACM Solid and Physical Modeling Symposium (SPM), June 2006, pp. 219-228.

Other Scholarly Activities

Grants

"*RI: Small: Scalable Roadmap-Based Methods for Simulating and Controlling Behaviors of Interacting Groups: from Robot Swarms to Crowd Control*," The National Science Foundation, **PI: N. Amato**, co-PI: L. Rauchwerger, $450,000, 09/01/09–08/31/12.

"*DC: Small: Collaborative Research: Shape Representation of Large Geometries via Convex Approximation,"* The National Science Foundation, **PIs: N. Amato (lead),** J.-M. Lien (George Mason U.), **$500,000** (**$200,000** TAMU), 09/01/09–08/31/12.

"*Motion Planning Based Techniques for Modeling & Simulating Molecular Motions,"* The National Science Foundation, **PI: N. Amato,** co-PI: L. Rauchwerger, **$386,000**, 09/15/08–09/14/11.

"*A Compositional Approach to Scalable Parallel Software,"* The National Science Foundation (HECURA Program), PI: L. Rauchwerger, **co-PIs: N. Amato**, B. Stroustrup, **$1,232,000**, 09/01/08–08/31/11.

"*Support of Stockpile Stewardship Program,"* Lawrence Livermore National Security, PI: J. Morel, **co-PIs:** M. Adams, **N. Amato**, R. Arroyave, A. Benzerga, T. Cagin, J.-L. Guermond, Y. Jin, B. Mallick, B. Popov, L. Rauchwerger, $2,936,677, 09/09/08–06/30/11.

"*Institute for Applied Mathematics and Computational Science (IAMCS),"* King Abdullah University of Science and Technology (KAUST), PI: J. Calvin, **co-PIs:** M. Adams, G. Almes, **N. Amato**, P. Balbuena, W. Bangerth, R. Carroll, C. Douglas, C. Economides, Y. Efendiev, M. Genton, J.-L. Guermond, C. Hansen, J. Hendler, J. Huang, T. Ioerger, C. Johnson, M. Jun, G. Kanschat, P. Kuchment, R. Lazarov, F. Liang, B. Mallick, J. Pasciak, G. Petrova, B. Popov, L. Rauchwerger, H. Sang, G. Qin, W. Rundell, V. Sarin, B. Stroustrup, V. Taylor, J. Walton, W. Zhao. **$25,000,000**, 06/01/08–05/31/13.

"*Center for Radiative Shock Hydrodynamics (CRASH),"* The Department of Energy, PSAAP Program, PI: P. Drake (Michigan); **co-PIs:** K. Powell (Michigan), J. Holloway (Michigan), Q. Stout (Michigan), M. Adams (Nuclear Engineering, TAMU), **N. Amato (CSE, TAMU),** T. Gombosi (Michigan), S. Karni (Michigan), E. Larsen (Michigan), B. van Leer (Michigan), B. Mallick (Statistics, TAMU), W. Martin (Michigan), J. Morel (Nuclear Engineering, TAMU), P. Roe (Michigan), L. Rauchwerger (CSE, TAMU). I. Sokolov (Michigan), K. Thornton (Michigan), G. Toth (Michigan). **$17,000,000** (Texas A&M portion **$1,850,000**), 04/15/08–03/31/13.

"*ARI-LA: A Framework for Developing Novel Detection Systems Focused on Interdicting Shielded HEU*," The National Science Foundation (DNDO-NSF Academic Research Initiative), PI: W. S. Charlton, **co-PIs:** M. Adams, **N. Amato**, W. Bangerth, D. R. Boyle, S. G. Choi, Y. Ding, G. M. Gaukler, J.-L. Guermond, G. Kanschat, P. Kuchment, Y. Kuo, S. P. Khatri, E. W. Lindquist, W. F. Miller, Jr., J. C. Ragusa, L. Rauchwerger, C. Sprecher, A. Vedlitz, **$1,440,000**, 9/1/07–8/31/10.

"*Nutrition, Biostatistics and Bioinformatics Training Grant,"* The National Institutes of Health PI: R. J. Carroll (Statistics), **Amato's role: investigator and mentor**, **$490,000** (direct costs), 07/1/06–06/30/11.

Term/Year	Course Number	Course Title	Semester Hour	Class Size
Fall 2009	CSCE 620	Computational Geometry	3.0	19
Spring 2009	CPSC 221H	Data Structures and Algorithms Honors	4.0	10
Spring 2009	CPSC 681	Graduate Seminar	1.0	35
Fall 2008	CPSC 481	Undergraduate Seminar	0.2	67
Fall 2008	CPSC 626	Parallel Algorithm Design and Analysis	3.0	26
Spring 2008	CPSC 221H	Data Structures and Algorithms Honors	4.0	4
Fall 2007	CPSC 221H	Data Structures and Algorithms Honors	4.0	2
Fall 2007	CPSC 620	Computational Geometry	3.0	12
Spring 2007	CPSC 289	Special Topics in Data Structures and Algorithms	4.0	23
Fall 2006	CPSC 481	Undergraduate Seminar	0.2	63
Fall 2006	CPSC 681	Graduate Seminar	1.0	30
Spring 2006	CPSC 481	Undergraduate Seminar	0.2	52
Spring 2006	CPSC 681	Graduate Seminar	1.0	40
Fall 2005	CPSC 481	Undergraduate Seminar	0.2	58
Fall 2005	CPSC 681	Graduate Seminar	1.0	76
Spring 2005	CPSC 626	Parallel Algorithm Design and Analysis	3.0	28

Percentage of time devoted to scholarly and/or research activities: **100%**

Please give a brief description of your major research and scholarly activities: Dr. Amato's research interests are Motion Planning, Computational Biology, Robotics, Computational Geometry, Animation, Parallel and Distributed Computing, Parallel Algorithms, Performance Modeling, and Optimization.

Riccardo Bettati, Professor, Tenured

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, Tenure-track, July 1995

Promoted, Associate Professor with Tenure, September 2001; Promoted, Professor, September 2007

Degree	Field	Institution	Date
Ph.D.	Computer Science	University of Illinois, Champaign-Urbana	1994
Dipl.	Informatics Engineering	Swiss Federal Institute of Technology, Zurich	1988

Conferences, Workshops, and Professional Development (Last Five Years)

Program Committee Member

IEEE Real-Time Systems Symposium (RTTS), Washington, DC, 2009; Tucson, Arizona, 2007; Rio de Janeiro, Brazil, 2006

The Second International workshop of Real-Time Service-Oriented Architecture and Applications (RTSOAA), Seattle, WA, 2009

IEEE International Conference on Communications (ICC), Communication and Information Systems Security (CISS) Symposium, Dresden, Germany, 2009: Information and Network Security Symposium (INSS), Beijing, China, 2008

ACM Symposium on Applied Computing (SAC), Honolulu, HI, 2009

IEEE International Conference on Communications and Mobile Computing, Computer and Network Security Symposium, Kunming, China, 2009

Second International Workshop on Cyber-Physical Systems (WCPS), Montreal, Canada, 2009

IFIP International Conference on Network and System Security (NSS), Gold Coast, Australia, 2009; Shanghai, China, 2008; Dalian, China, 2007

International Symposium on Stabilization, Safety, and Security of Distributed Systems (SSS), Lyon, France, 2009

IEEE International Conference on Computer Communications and Networks (ICCCN), St. Thomas, Virgin Island, USA, 2008

International Conference on Parallel and Distributed Systems (ICPADS), Hsinchu, Taiwan, 2007

IEEE International Conference on Systems, Man and Cybernetics (SMC), Montreal, Canada, 2007

Workshop on Generative Programming and Component Engineering for QoS Provisioning in Distributed Systems, Portland, OR, 2006 (appointed)

IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), San Jose, CA, 2006 (appointed)

International Conference on Architecture of Computing Systems (ARCS), Frankfurt/Main, Germany, 2006 (appointed)

Other Related Computing Experience

University of California, Berkeley

Visiting Post-Doctoral Research Engineer, Electronics Research Laboratory, 1994-95

Post Doctoral Research Fellow, International Computer Science Institute, Berkeley, 1993-94

University of Illinois, Urbana-Champaign

Research Assistant, 1989-1993

Swiss Federal Institute of Technology, Zurich (ETH), Switzerland

Research Assistant, March-May 1988

Consulting

Wilmer Hale, Boston, MA; Litigation Consulting and Expert Witness, 2009
Rubin/Anders Scientific, Inc., Brookline, MA; Litigation Consulting, 2007
Sidley Austin LLP, Chicago, IL; Litigation Consulting, 2007
Winstead, Sechrest & Minick, Dallas, TX; Litigation Consulting and Expert Witness, 2005

Departmental Committee Service 2009-2010	College of Engineering Committee Service 2009-2010
• Advisory Committee (elected) • Computer Engineering Curriculum Coordination • Undergraduate Curriculum and ABET • Faculty Search Security Sub Committee, Chair • Promotion and Tenure • TACS Student Organization Advisor	• ABET Accreditation Coordinator, Computer Engineering Program

Departmental Committee Service 2005-2009	College of Engineering Committee Service 2005-2009
• Advisory Committee (elected), 2005-2006 • Computer Engineering Curriculum Coordination, 2005 • Undergraduate Curriculum and ABET, 2005-2009 • Faculty Search Software Sub Committee, 2005-2006 • Faculty Search Systems or Systems Software Sub Committee, 2006-2007 • Faculty Search Robotics Committee, 2008-2009 • Faculty Search Security Sub Committee, Chair, 2007-2008 • Promotion and Tenure, 2008-2009 • TACS Student Organization Advisor, 2008-2009	• Quality Enhancement Plan Committee, 2005-2009 • ABET Accreditation Coordinator, Computer Engineering Program, 2005-2009

Principle Publications *Indicates student author

Refereed Journals

Ye Zhu* and **R. Bettati**. 2009. Information Leakage as a Model for Quality of Anonymity Networks. *IEEE Trans. Parallel Distrib. Syst.* Vol. 20(4) (Apr. 2009), pp. 540-552.

I. Cardei, A. Pavan, **R. Bettati**, "Quality of Service guarantees and fault-tolerant TCP services in mobile wireless optical networks," Special Issue on System Aspects of Wireless Networks" of the International Journal of Ad Hoc and Ubiquitous Computing (IJAHUC), 2008, Vol. 3, No.3, pp. 146 - 158.

S. Wang* and **R. Bettati**, "Reactive Speed Control in Temperature-Constrained Real-Time Systems," *Journal of Real-Time Systems*, Volume 39, Numbers 1-3, August 2008, pp. 73-95.

Refereed Conference Publications

Highly Selective Conferences

Wei Yu*, Nan Zhang (former student), Xinwen Fu (former student), **Riccardo Bettati** and Wei Zhao, "On Localization Attacks to Internet Threat Monitors: An Information-Theoretic Framework", *Proceedings of the 38th Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN 2008),* Anchorage, Alaska, June 2008. (Acceptance rate 25%).

Y. Zhu* and **R. Bettati**, "Compromising Condentiality in Wireless Network using Sensors with Limited Information," *Proceedings of the 27th IEEE International Conference on Distributed Computing Systems (ICDCS 2007),* Toronto, CANADA, June 2007. (Acceptance rate 13%).

S. Wang* and **R. Bettati**, "Reactive Speed Control in Temperature-Constrained Real-Time Systems," *Proceedings of the 2006 EuroMicro Conference on Real-Time Systems, (ECRTS-2006),* Dresden, Germany, July 2006. (Acceptance rate 24%) **Best Paper Award**.

Selective Conferences with High Visibility

Y. Ahn*, I. Yeo (former student at TAMU), and **R. Bettati**, "Efficient Calibration of Thermal Models based on Application Behavior", *Proceedings of the 27th IEEE International Conference on Computer Design (ICCD 2009),* Lake Tahoe, CA, Oct. 2009. (Acceptance rate: 34%)

S. Cho (former student) and **R. Bettati**, "Adaptive Aggregated Aggressiveness Control on Parallel TCP Flows Using Competition Detection," *Proceedings of the 15th International Conference on Computer Communications and Networks (ICCCN-06),* Arlington, VA, October 2006. (Acceptance rate: 32%)

B. W. Graham*, Y. Zhu*, X. Fu*, and **R. Bettati**, "Using Covert Channels to Evaluate the Effectiveness of Flow Confidentiality Measures." *Proceedings of the 11th IEEE International Conference on Parallel and Distributed Systems (ICPADS 2005)*, Fukuoka, Japan, June 2005. (acceptance rate: 38%)

Other Scholarly Activities

Grants

"Expanding Cyber Situational Learning to CAE Institution," Department of Defense Information Assurance Scholarship Program Grant Solicitation, **PI: R. Bettati**, **$34,123.74**, 9/1/ 2009-8/31/ 2010.

"CI-TEAM: Virtual Tools for Expanding the Cyber Horizon (VTECH)," National Science Foundation Oce of Cyberinfrastructure in response to CI-TEAM solicitation. PI L. Cifuentes (1/3), **co-PIs R. Bettati (1/3),** Guy Almes (1/6), Willis Marti (1/6), with collaborators in TEEX and DelMar University, Corpus Christi, **$999,382**, 1/1,/2008 – 12/31/ 2009.

"Power-Aware Resource Management in Densely Packaged Distributed Real-Time Embedded Systems," National Science Foundation, **Co-PIs** R. Mahapatra and **R. Bettati**, (Mahapatra 50%, Bettati 50%), **$205,000** over 2 years, September 2005- 8/ 2007.

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Fall 2009	CSCE 663	Real-Time Systems	3.0	24
Fall 2009	CSCE 313	Introduction to Computer Systems	4.0	74
Spring 2009	CSCE 410	Operating Systems	3.0	25
Spring 2009	CSCE 611	Operating Systems and Applications	3.0	15
Fall 2008	CSCE 313	Introduction to Computer Systems	4.0	18
Fall 2008	CSCE 410	Operating Systems	3.0	30
Fall 2008	CSCE 611	Operating Systems and Applications	3.0	4
Spring 2008	CSCE 313	Introduction to Computer Systems	4.0	13
Fall 2007	CSCE 663	Real-Time Systems	3.0	24
Spring 2007	CSCE 662	Distributed Processing Systems	3.0	11
Fall 2006	CSCE 663	Real-Time Systems	3.0	20
Fall 2006	CSCE 410	Operating Systems	3.0	
Summer 2006	CSCE 410	Operating Systems	3.0	27
Summer 2006	CSCE 611	Operating Systems and Applications	3.0	3
Spring 2006	CSCE 410	Operating Systems	3.0	62
Spring 2006	CSCE 611	Operating Systems and Applications	3.0	2
Spring 2006	CSCE 662	Distributed Processing Systems	3.0	8
Fall 2005	CSCE 410	Operating Systems	3.0	45
Fall 2005	CSCE 611	Operating Systems and Applications	3.0	3
Spring 2005	CSCE 410	Operating Systems	3.0	55
Spring 2005	CSCE 611	Operating Systems and Applications	3.0	3
Spring 2005	CSCE 662	Distributed Processing Systems	3.0	11

Percentage of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities: Dr. Bettati's research interests include: Distributed Real-Time Systems, Scheduling Algorithms, Communication Protocols, Traffic Analysis, And Anonymity and Privacy.

Pierce E. Cantrell, Professor, Tenured

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, Tenure-track, January 1982
Promoted, Associate Professor with Tenure, September 1988-Present
Promoted, Associate Provost for Information Technology, 1998-2006
Promoted, V.P. and Associate Provost for Information Technology, March 2006-Present
Promoted, Chief Information Officer for The Texas A&M University System, 2008-Present

Degree	Field	Institution	Date
Ph.D.	Electrical Engineering	Georgia Institute of Technology	1981
M.S.	Electrical Engineering	Georgia Institute of Technology	1971
B.S. (Honors)	Electrical Engineering	Georgia Institute of Technology	1970

Conferences, Workshops, and Professional Development (Last Five Years)

Other Related Computing Experience

U. S. Army

Systems Analyst (Captain). North American Air Defense Command (NORAD), Colorado Springs, Colorado, 1977-1981.

Consulting

None past five years.

Departmental Committee Service 2009-2010	College of Engineering Committee Service 2009-2010
• Search Advisory Committee for Dean of Faculties and Associate Provost, Chair 2009 • Member Teaching and Learning Roadmap Committee, 2009 • Operations and Services Committee, 2009 and Present • Member of the Executive Committee 2009-Present • Southeast Texas Giga PoP, Member Council 2009-Present, Secretary 2009-Present • Information Technology Council for Higher Education (ITCHE), Texas A&M University System Representative 2009-Present • Internet2 Search Advisory Committee for CTO, Member 2009 • Internet2 Search Advisory Committee for Executive Director, Member Relations and Communications, Member 2009 • Internet2 Search Advisory Committee for Director of International Relations, Member 2009	Member of the Computer Engineering Coordination Committee (CECC)

Committee Service 2005-2009

Departmental Committee Service 2005-2009	College of Engineering Committee Service 2005-2009
• Lonestar Education and Research Network (LEARN), Chair of the Board, 2007; Board Member 2004-present • Operations and Services Committee, Chair 2005 and 2006; • Member of the Executive Committee 2005-Present • Southeast Texas Giga PoP, Member Council 2004-Present, Secretary 2004-Present • Information Technology Council for Higher Education (ITCHE), Texas A&M University System Representative 2003-Present	Member of the Computer Engineering Coordination Committee (CECC)

Percentage of time devoted to scholarly and/or research activities: 0%

Please give a brief description of your major research and scholarly activities:

Jinxiang Chai, Assistant Professor, Tenure-Track

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, Tenure-track, September, 2006

Degree	Field	Institution	Date
Ph.D.	Computer Science	Carnegie Mellon University	2006
MS	Computer Science	Chinese Academy	1998
BE	Electrical Engineering	Xi'an Jiaotong University	1995

Conferences, Workshops, and Professional Development (Last Five Years)

Associate Editor: International Journal of Image and Graphics

Technical Program Committee Member

ACM SIGGRAPH/EUROGRAPHICS Symposium on Computer Animation, Pacific Graphics, 2010
ACM SIGGRAPH ASIA, 2009
ACM SIGGRAPH/EUROGRAPHICS Symposium on Computer Animation, 2007, 2008, 2009

Other Related Computing Experience- None

Consulting- None

Departmental Committee Service 2009-2010
• Web Advisory Committee, 2009-2010

Departmental Committee Service 2005-2009
• Undergraduate Student Awards Committee, 2008-2009
• Computing Services Advisory Committee, 2007-2008
• Library Committee, 2006-2007

Principal Publications *Indicates student author

Refereed Journal Publications

J. Min*, Y.-L. Chen* and **J. Chai**, "Interactive Generation of Human Animation Using Deformable Motion Models," *ACM Transactions on Graphics* (*to present in **SIGGRAPH 2010***), *29(1): Article No. 9, 2009.*

M. Lau, **J. Chai**, Y.-Q. Xu and H. Shum, "Interactive Manipulation of 3D Facial Expressions Using Facial Priors," *ACM Transactions on Graphics*, *29(1): Article No. 3, 2009.*

J. Chai and J. Hodgins, "Constraint-based Motion Optimization Using A Statistical Dynamic Mode," *ACM Transactions on Graphics (Proceedings of **SIGGRAPH 2007**)*, 16(3): Article No. 8, 2007.

J. Xiao, **J. Chai** and T. Kanade, "A Closed-form Solution to Nonrigid Shape and Motion Recovery," *International Journal of Computer Vision **(IJCV)**,* 67(2), 233–246, 2006.

J. Chai and J. Hodgins, "Performance Animation from Low-dimensional Control Signals," *ACM Transactions on Graphics (Proceedings of **SIGGRAPH 2005**)*. 24(3):686-696, 2005.

Refereed Conference Papers

Highly Selective Papers (<=30%)

J. Min*, H. Liu* and **J. Chai**, "Synthesis and Editing of Personalized Stylistic Human Motion," *Proceedings of the ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games (i3D 2010)*, 2010.

X. Wei* and **J. Chai**, Modeling 3D Human Poses from Uncalibrated Monocular Images, in Proceedings of *IEEE International Conference on Computer Vision* (*ICCV 2009),* 2009. Acceptance rate [23%].

Y.-L. Chen* and **J. Chai**, "3D Reconstruction of Human Motion and Skeleton from Uncalibrated Monocular Video," Proceedings of *the Ninth Asian Conference on Computer Vision (ACCV 2009).*

Acceptance rate [5.37%, oral] ***Winner of the best paper honorable mention award: 2 out of 670 submissions***.

Y.-L. Chen*, J. Min* and **J. Chai**, "Flexible Registration of Human Motion Data with Parameterized Motion Models," *Proceedings of the ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games (i3D 2009)*. 183-190, 2009. Acceptance rate [**29%**].

X. Wei* and **J. Chai**, "Interactive Tracking of 2D Generic Object with Space Time Optimization," *Proceedings of the European Conference on Computer Vision (ECCV 2008)*, vol. 1, pp. 657-670, 2008. Acceptance rate [**23.3%**].

F. Li, J. Yu and **J. Chai**, "A Hybrid Camera for Motion Deblurring and Depth Superresolution," *Proceedings of the IEEE conference on Computer Vision and Pattern Recognition (CVPR 2008).* Acceptance rate [**27.9%**].

Highly Visible Papers (between 30% and 60%)

M. Lau, **J. Chai**, Y.-Q. Xu and H. Shum, "Face Poser: Interactive Facial Modeling Using Model Priors," *Proceedings of the ACM SIGGRAPG/EUROGRAPHICS Symposium on Computer Animation (SCA 2007), pp.* 161-170, 2007. Acceptance rate [**35%**].

Other Scholarly Activity

Grants

J. Chai - PI, "Interactive Human Motion Control from Low-cost Sensors", Samsung Electronics Co., Amount: $152,281.00 plus $30k equipments (high resolution depth camera and six 6-Dofs motion sensors), 2009-2010.

Course Development

Dr. Chai updated the curricula for the CSCE 641 Computer Graphics course. The focus is now on three sub-areas: animation, rendering, and image and video processing. The students who are interested in modeling are encouraged to take CSCE 645 Geometric Modeling which he has redesigned assignments for the class and written slides for every lecture.

Similarly, Dr. Chai redesigned the curricula for the undergraduate graphics class CSCE 441. He introduced new topics and introduced new materials focusing on basic concepts of character animation and image and video processing. He developed a new lab for the course which allows students to capture their own movements with the department's state-of-art motion capture lab and write their own codes to animate characters with captured motion. In this way, students are able to animate any motions for characters as long as they can act them out with their own body.

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Spring 2010	CSCE 441	Computer Graphics	3.0	30
Spring 2010	CSCE 641	Computer Graphics	3.0	12
Fall 2009	CSCE 689	Computer Animation	3.0	8
Spring 2009	CPSC 441	Computer Graphics	3.0	24
Spring 2009	CPSC 181	Introduction to Computing	1.0	71
Fall 2008	CPSC 641	Computer Graphics	3.0	7
Spring 2008	CPSC 441	Computer Graphics	3.0	24
Fall 2007	CPSC 641	Computer Graphics	3.0	7
Spring 2007	CPSC 689	Data-driven Computer Graphics	3.0	6
Fall 2006	CPSC 689	Data-driven Computer Graphics	3.0	7

Percentage of time devoted to scholarly and/or research activities: 100%

Brief Description of Major Research and Scholarly Activities

Dr. Chai is particularly interested in Character Animation, Data-Driven Approach for Graphics and Vision, Interaction Techniques for 3D Graphics, Vision for Graphics and Animation, Image-Based Rendering and Modeling, Image and Video Processing.

Gwan S. Choi, Professor

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, 1994
Promoted, Associate Professor, 200

Degree	Field	Institution	Date
Ph.D.	Electrical Engineering	University of Illinois	1994
M.S.	Electrical Engineering	University of Illinois	1989
B.S.	Electrical Engineering	University of Illinois	1988

Conferences, Workshops, and Professional Development (Last Five Years)

Other Related Computing Experience

University of Illinois, Urbana

Research Assistant, Coordinated Science Laboratory, 8/88 - 8/94

Tandem Computers Inc., Austin, TX

Visiting Scientist, 4/90 – 9/90

Cray research Inc, Mendota Heights, MN

Engineering Staff, 5/87 – 8/87

Consulting

None

Departmental Committee Service 2009-2010	College of Engineering Committee Service 2009-2010
• Faculty Development and Leave Committee Member	

Committee Service 2005-2009

Departmental Committee Service 2005-2009	College of Engineering Committee Service 2005-2009
• Reviewer for IEEE Transaction on VLSI Circuits • Publicity Chair, IEEE International Performance and Dependability Conference, 1996. • Program Committee, Fault-Tolerant Computing Symposium, FTCS-27, 1997 • Program Committee, IEEE International Workshop, CAD-TD, 1996. • Program Committee, IEEE International Workshop, ETDS, 1995. • Member of the IEEE Computer Society. • Member of the IEEE Technical Committee on Computer Architecture. • Member of the IEEE Technical Committee on Fault Tolerance	

Principle Publications *Indicates student author

Refereed Journals

Rohit Singhal, Gwan Choi, Rabi N. Mahapatra, "Programmable LDPC decoder based on the bubble-sort algorithm", *in proc. IEEE VLSI Design 2006*, pp. 203-208, January 2006.

Praveen Bhojwani, Rohit Singhal, Gwan Choi, Rabi Mahapatra, "Forward error correction for on-chip networks," *Workshop for Unique Chips and Systems (UCAS-2), March 2006*.

Rohit Singhal, Gwan Choi, Rabi Mahapatra, "Information Theoretic Approach to Address Delay and Reliability in Long On-Chip Interconnects," IEEE ICCAD 2006, San Jose, November, 2006.

Weihuang Wang, Gwan Choi, "Minimum-Energy LDPC Decoder for Real-Time Mobile Application" Design, Automation and Test (DATE07), Acropolis, Nice, France, April 2007

K.Gunnam, G. Choi, W. Wang, E. Kim, and M.B. Yeary, "Decoding of quasi-cyclic LDPC Codes using On-The-Fly Computation", 40th Asilomar Conference on Signals, Systems and Computers, October 2006.

K. Gunnam, G. Choi, and M. Yeary, "A low-power preamble detection methodology for packet based RF modems on all-digital sensor front-ends ," IMTC 2007 – IEEE Instrumentation and Measurement Technology Conference Warsaw, Poland, May 1–3, 2007

Refereed Conference Publications

Highly Selective Conferences

Rohit Singhal, Gwan Choi, Rabi Mahapatra, "Information theoretic capacity of long on-chip interconnects in the presence of crosstalk," *Proceedings,* 7th International Symposium on Quality of Electronic Design (ISQED 2006), San Jose, CA, 27-29 March 2006.

E. Kim, N. Jayakumar, P. Bhagawat, A. Selvarathinam, G. Choi, S. Khatri, "A High-Speed Fully Programmable VLSI Decoder for Regular Low Density Parity Check Codes," IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2006), Toulouse, France, May 2006.

Rajesh Garg, Nikhil Jayakumar, Sunil P. Khatri, Gwan Choi: A design approach for radiation-hard digital electronics. IEEE Design Automation Conference DAC2006, San Francisco, CA, July 2006.

Sanghoan Chang, Gwan Choi, "Timing Failure Analysis of Commercial CPUs Under Operating Stress," IEEE International Symposium on Defect and Fault Tolerance in VLSI Systems(DFT'06), Washington DC., October, 2006

Sanghoan Chang, Gwan Choi, "Gate-Level Exception Handling Design for Noise Reduction in High-Speed VLSI Circuits," IEEE VLSI Design Conference, Bangalore, India, January 2007

K.Gunnam, G. Choi, M.B. Yeary "A Parallel Layered Decoder Architecture for Array LDPC Codes", IEEE VLSI Design Conference, Bangalore, India, January 2007

K.Gunnam, G. Choi, W. Wang, and M.B. Yeary, "Multi-Rate Layered Decoder Architecture for Block LDPC Codes of the IEEE 802.11n Wireless Standard" accepted for IEEE Symposium on Circuits and Systems (ISCAS)-2007, New Orleans, LA, May 2007.

K. Gunnam, W. Wang, G. Choi, and M.B. Yeary, "VLSI Architectures for Turbo Decoding Message Passing Using Min-Sum for Rate-Compatible Array LDPC Codes," Accepted for International Symposium on Wireless Pervasive Computing (ISWPC) 2007, Puerto Rico, Feb 2007.

Weihuang Wang, Gwan Choi, " Speculative Energy Scheduling for LDPC Decoding," International Symposium on Quality Electronic Design 2007 (ISQED'07)

Pankaj Bhagawat, Weihuang Wang, Momin Uppal, Gwan Choi, Zixiang Xiong, Mark Yeary and Alan Harris, "An FPGA Implementation of Dirty Paper Precoder," Proceedings, IEEE ICC 2007 Wireless Communications Symposium, Glasgow,Scotland, June 2007.

K.Gunnam, G. Choi, M.B. Yeary, and M. Atiquzzaman, "VLSI Architectures for Layered Decoding for Irregular LDPC Codes of WiMax" Proceedings, IEEE ICC 2007 Wireless Communications Symposium, Glasgow,Scotland, June 2007.

Selective Conferences with High Visibility

Other Scholarly Activities

Grants

Term/Year	Course Number	Course Title	Semester Hours	Class Size

Percentage of time devoted to scholarly and/or research activities: 40%

Please give a brief description of your major research and scholarly activities:

Walter Daugherity, Senior Lecturer, Non-Tenured

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Visiting Assistant Professor/Sr. Lecturer, 1987

Degree	Field	Institution	Year
EdD	Mathematical Education	Harvard University	1977
MAT	Mathematics	Harvard University	1967
BS	Mathematics	Oklahoma Christian University	1966

Conferences, Workshops, and Professional Development (Last Five Years)

"Creating Technology Enhanced Presentations," Faculty Teaching Academy of the Center for Teaching Excellence, 2009

"Teaching Science as a Liberal Art," by 1986 Nobel laureate Dudley Herschbach, Center for Teaching Excellence, 2008.

"Creativity and Generating Research Ideas" seminar sponsored by the Dean of Faculties and the Vice President for Research, 2007.

"Creating Exams That Assess the Learning We Value," Center for Teaching Excellence, 2006.

"Syllabus Workshop," Center for Teaching Excellence, 2005.

"Problem-Based Learning Across the Curriculum," Center for Teaching Excellence, 2005.

"Lecturer as a Professional Career: Roles, Titles, and Responsibilities," Dean of Faculties, 2005.

"Do You Need Money for Your Research? Writing Effective Research Grant Proposals," Dean of Faculties, 2005.

"Recharging Your Batteries: Maintaining a Personal Life with the Rigors of Teaching, Research, and Service," 2005.

Other Related Experience

Blinn College, Brenham, TX

Instructor, Computer Science, 1984-1987

Rose State College, Midwest City, OK

Data Processing Instructor, 1978-1980

ECRM, Bedford, MA

Systems Programmer, 1971-1973

Harvard Computing Center, MA

Telecommunications Specialist, 1970-1971

Consulting- None

Department Committee Service 2009-2010	University Committee Service 2009-2010
• Computing Advisory Committee	• Faculty Senator

Department Committee Service 2005-2009	University Committee Service 2005-2009
• Computing Services Advisory Committee, 2005-09	• Honors Program Committee, 2005-2008 • Faculty Senator, 2008-2009

Principal Publications

Daugherity, Walter C., "Quantum-Type reversible Circuits and Algorithms," *40th Winter Colloquium on the Physics of Quantum Electronics*, to appear in 2010 (invited paper)

Other Scholarly Activities

Grants

"Increasing Computer Science Retention with Peer Teachers and Learning Modules," State of Texas; Valerie Taylor and Jennifer Welch **(Co-PI's),** Lawrence Petersen, **Walter C. Daugherity**, and Joseph Hurley, **$173,158**, September 2004-August 2005.

"Formal Assessment of the Peer Teachers Program," State of Texas; Valerie Taylor and Jennifer Welch **(Co-PI's),** Lawrence Petersen, **Walter C. Daugherity**, and Joseph Hurley, **$93,289**, July 2006-June 2009.

"Phase II: Assessment of the Computer Science at TAMU Peer Teachers Program," State of Texas; Valerie Taylor and Jennifer Welch **(Co-PI's), Walter C. Daugherity** and Teresa Leyk, **$191,711**, August 2006-August 2008.

Term/Year	Course Number	Course Name	Semester Hours	Class Size
Fall 2009	CSCE 113	Intermediate Programming and Design	2.0	61
Fall 2009	CSCE 121 H	Introduction to Program Design and Concepts	4.0	17
Fall 2009	CSCE 121	Introduction to Program Design and Concepts	4.0	129
Summer 2009	CPSC 420	Artificial Intelligence	3.0	15
Summer 2009	CPSC 601	Programming in C and Java	3.0	27
Spring 2009	CPSC 113	Intermediate Programming and Design	2.0	29
Spring 2009	CPSC 121	Introduction to Program Design and Concepts	4.0	88
Spring 2009	CPSC 420	Artificial Intelligence	3.0	19
Fall 2008	ENGR 112/H	Foundations of Engineering II	2.0	45
Fall 2008	CPSC 113	Intermediate Programming and Design	2.0	49
Fall 2008	CPSC 121	Introduction to Program Design and Concepts	4.0	97
Summer 2008	CPSC 420	Artificial Intelligence	3.0	8
Summer 2008	CPSC 601	Programming in C and Java	3.0	13
Spring 2008	ENGR 112/H	Foundations of Engineering II	2.0	177
Spring 2008	CPSC 121	Introduction to Program Design and Concepts	4.0	79
Spring 2008	CPSC 420	Artificial Intelligence	3.0	30
Fall 2007	CPSC 111	Computer Science Concepts and Programming	4.0	45
Fall 2007	ENGR 112	Foundations of Engineering II	2.0	128
Fall 2007	ENGR 112H	Foundations of Engineering II	2.0	10
Fall 2007	CPSC 289	Special Topics in Computer Science	3.0	49
Summer 2007	CPSC 410/611	Operating Systems	3.0	24
Summer 2007	CPSC 601	Programming in C and Java	3.0	15
Spring 2007	ENGR 112	Foundations of Engineering II	2.0	28
Spring 2007	ENGR 112 H	Foundations of Engineering II	2.0	16
Spring 2007	CPSC 601	Programming in C and Java	3.0	21
Spring 2007	ELEN 674/PHYS 674	Introductory to Quantum Computing	3.0	7
Fall 2006	CPSC 111	Computer Science Concepts and Programming	4.0	54
Fall 2006	ENGR 112	Foundations of Engineering II	2.0	57
Fall 2006	CPSC 289	Special Topics in Computer Science	3.0	43
Fall 2006	ENGR 482	Ethics and Engineering	3.0	
Spring 2006	CPSC 332	Programming Language Design	3.0	25
Spring 2006	ENGR 112B	Fundamentals of Engineering II	2.0	37
Summer 2006	CPSC 420/625	Artificial Intelligence	3.0	6

Summer 2006	CPSC 420/625	Artificial Intelligence	3.0	6
Summer 2006	CPSC 310	Database Systems	3.0	9
Summer 2006	CPSC 601	Programming in C and Java	3.0	10
Summer 2006	CPSC 602	Object-Oriented Programming	3.0	8
Spring 2006	CPSC 438	Distributed Objects Programming	3.0	22
Spring 2006	ELEN/PHYS 674	Introductory Quantum Computing	3.0	NA
Fall 2005	CPSC 332	Programming Language Design	3.0	35
Fall 2005	CPSC 438	Distributed Objects Programming	3.0	26
Fall 2005	CPSC 602	Object-Oriented Programming	3.0	16
Summer 2005	CPSC 332	Programming Language Design	3.0	11
Summer 2005	CPSC 431	Software Engineering	3.0	18
Spring 2005	ELEN/PHYS 674	Introductory Quantum Computing	3.0	12
Spring 2005	CPSC 310	Database Systems	3.0	38
Spring 2005	CPSC 332	Programming Language Design	3.0	42
Spring 2005	CPSC 438	Distributed Objects Programming	3.0	26
Spring 2005	CPSC 603	Database Systems and Applications	3.0	3

Percentage of time devoted to scholarly and/or research activities: 100%.

Brief Description of Major Research and Scholarly Activities: Dr. Daugherity serves on the Faculty Senate and is a member of the University Mentoring Program.

Gabriel Dos Reis, Assistant Professor, Tenure-Track

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, Tenure-track, August 2006

Degree	Field	Institution	Year
PhD	Mathematics	École Normale Supérieure de Cachan-France	2001
MS	Mathematics & Computer Science	École Normale Supérieure de Cachan-France	1997
BS	Mathematics	University of Paris VII-France	1997

Conferences, Workshops, and Professional Development (Last Five Years)

Program Committee Member and Session Organizer of the 3rd International Conference on Mathematical Aspects of Computer and Information Sciences; December 2009; Fukuoka, Japan

Co-Chair of the 2009 ACM International Workshop on Programming Languages for Mechanized Mathematics Systems; August 2009; Munich, Germany

Co-organizer of the ISO C++ Standards Committee Meeting at INRIA Sophia Antipolis, June 2008

Member of the IEEE Interval Arithmetic Standards Committee, P1788

Project Leader of the OpenAxiom scientific computation platform, 2007

Member of the ISO C++ Standardization committee since 1997

Member of AFNOR C and C++ Standardization committee since 1997

Developer of the GNU Compiler Collection (GCC is a widely used open source collection of compilers for C, C++, Ada, Java, Fortran), since 1997

Release Manager of GCC

Co-administrator and developer of the Axiom computer algebra system, 2005-2007

Other Related Experience- None

Consulting- None

Department Committee Service 2009-2010
• Library Committee

Department Committee Service 2005-2009
• Library Committee, 2005-2006 • Web Advisory Committee, 2007-2008 • Computing Services Advisory Committee, 2008-2009

Principle Publications *Indicates student author

Refereed Conference Publications

Highly Selective Conferences

Douglas Gregor, Jaakko Järvi, Jeremy Siek, Bjarne Stroustrup, **Gabriel Dos Reis**, and Andrew Lumsdaine. Concepts: Linguistic Support for Generic Programming in C++. In OOPSLA '06: Proceedings of the 21st annual ACM SIGPLAN conference on Object-Oriented Programming Languages, Systems, and Applications, pages 291–310, New York, NY, USA, 2006. ACM Press. Acceptance rate 17%.

Gabriel Dos Reis and Bjarne Stroustrup. Specifying C++ Concepts. In Conference Record of POPL '06: The 33th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages, pages 295–308, Charleston, South Carolina, USA, 2006. Acceptance rate 19.76%.

Selective Conferences with High Visibility

Gabriel Dos Reis and Bjarne Stroustrup. A Principled, Complete, and Efficient Representation of C++. In Proceedings of The Joint Conference of ASCM 2009 and MACIS 2009, volume 22 of Math-for-Industry Lecture Note Series, pages 407–421, Fukuoka, Japan, 2009. Kyushu University.

Gabriel Dos Reis. Exact Numerics In a Categorial Framework. In SCAN'08: The 13th GAMM–IMACS International Symposium on Scientific Computing, Computer Arithmetic and Verified Numerical Computations, El Paso, Texas; USA, September 2008.

Jacob Smith*, **Gabriel Dos Reis**, and Jaakko Järvi. Algorithmic Differentiation in Axiom. In ISSAC '07: Proceedings of the 2007 International Symposium on Symbolic and Algebraic Computation, pages 347–354, Waterloo, Ontario, Canada, July 2007. ACM New York, NY, USA. Acceptance rate 51%.

Other Scholarly Activities

Grants

"Collaborative Research: Next Generation Compilers for Emerging Multicore Systems," National Science Foundation, PI: Lawrence Rauchwerger; **Co-PI: Gabriel Dos Reis**, Bjarne Stroustrup, **$ 496,000.00**, prorated value: **$ 165,333.33**

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Fall 2009	CSCE 315	Programming Studio	3.0	12
Spring 2009	CSCE 314	Programming Languages	3.0	27
Fall 2008	CSCE 689	Special Topics in Static Analysis	3.0	5
Spring 2008	CSCE 314	Programming Languages	3.0	19
Fall 2007	CSCE 689	Special Topics in Symbolic Computations	3.0	7
Spring 2007	CSCE 689	Special Topics in Runtime Systems	3.0	7
Fall 2006	CSCE 689	Special Topics in Symbolic Computations	3.0	5

Percentage of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities:

Dr. Dos Reis's research interests are Computer Algebra, Mathematical Software, Computer Methods in Geometry, Programming Languages and Libraries, Compiler Construction, and Generic Programming.

Edward R. Dougherty, Professor, Tenured

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Professor, August 1996-Present

Degree	Field	Institution	Date
Ph.D.	Mathematics	Rutgers University, New Brunswick, NJ	1974
M.S.	Computer Science	Stevens Institute of Technology, Hoboken, NJ	1986
B.S.	Mathematics	Rutgers University, New Brunswick, NJ	1967

Conferences, Workshops, and Professional Development (Last Five Years)

None

Other Related Computing Experience

Fairleigh Dickinson University

Assistant/Associate Professor, 1975-1988

Rochester Institute of Technology

Associate/Full Professor, 1988-1996

Consulting

Singer, Kodak, Canon, Amoco Technology, NuTec Sciences

Departmental Committee Service 2009-2010	College of Engineering Committee Service 2009-2010

Committee Service 2005-2009

Departmental Committee Service 2005-2009	College of Engineering Committee Service 2005-2009
• Associate Editor: J. Mathematical Imaging and Vision, J. Pattern Recognition. • J. Real-Time Imaging, J. Image Analysis and Stereology • Guest Editor: J. Visual Communication and Image Representation, J. Mathematical • Imaging and Vision (twice), J. Pattern Recognition, EURASIP J. of Signal • Processing, EURASIP J. on Applied Signal Processing • Editorial Board: J. Mathematical Imaging and Vision, J. Real-Time Imaging, J. • Environmental Health Perspectives, J. Pattern Recognition, J. Image Analysis and Stereology, J. Biological Systems, EURASIP J. Signal Processing and Bioinformatics, J.	

Cancer Informatics. • Guest Editor: J. Visual Communication and Image Representation, J. Mathematical • Imaging and Vision (twice). J. Pattern Recognition, EURASIP J. on Signal • Processing, EURASIP J. on Applied Signal Processing, IEEE Transactions on • Signal Processing, IEEE Signal Processing Magazine, J. Current Genomics. • Chair of 27 SPIE Conferences • Chair, Houston Forum on Cancer Genomics and Informatics, 2001 • Chair, SPIE Electronic Imaging Symposium, 1994 • Chair, Workshop on Models for Genetic Regulatory Networks, 2003, 2005. • Chair, IEEE Workshop on Genomic Signal Processing and Statistics, 2006	

Principle Publications *Indicates student author

Refereed Journals

Faryabi, B., Datta, A., and E. R. Dougherty, "On Approximate Stochastic Control in Genetic Regulatory Networks," *IET Systems Biology*, Vol. 1, No. 6, 361-368, 2007.

Hanczar, B., Hua, J., and E. R. Dougherty, "Decorrelation of the True and Estimated Classifier Errors in High-dimensional Settings," *EURASIP Journal on Bioinformatics and Systems Biology*, Article ID 38473, 12 pages, 2007.

Dougherty, E. R., "Validation of Inference Procedures for Gene Regulatory Networks," *Current Genomics*, Vol. 8, No. 6, 351-359, 2007.

Iva, Pal, R., and E. R. nov, I. Dougherty, "Dynamics Preserving Size Reduction Mappings for Probabilistic Boolean Networks," *IEEE Transactions on Signal Processing*, Vol. 55, No. 5, 2310-2322, 2007.

Xiao, Y., and E. R. Dougherty, "The Impact of Function Perturbations in Boolean Networks," *Bioinformatics*, Vol. 23, No. 10, 1265-1273, 2007.

Brun, M., Kim, S., Choi, W., and E. R. Dougherty, "Comparison of Network Models via Steady- State Trajectories," *EURASIP Journal on Bioinformatics and Systems Biology*, Vol. 2007, Article ID 82702, 11 pages, 2007.

Refereed Conference Publications

Highly Selective Conferences

Shmulevich, I., and E. R. Dougherty, *Genomic Signal Processing*, Princeton University Press, Princeton, 2007.

Datta, A., and E. R. Dougherty, *Introduction to Genomic Signal Processing with Control*, CRC Press, New York, 2007.

Dougherty, E. R., and R. A. Lotufo, *Hands-On Morphological Image Processing*, SPIE Press, Bellingham, 2003.

Selective Conferences with High Visibility

Other Scholarly Activities

Grants

Term/Year	Course Number	Course Title	Semester Hours	Class Size

Percentage of time devoted to scholarly and/or research activities: 80%

Please give a brief description of your major research and scholarly activities:

Paul V. Gratz, Professor

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, January 2009

Degree	Field	Institution	Date
Ph.D.	Electrical and Computer Engineering	University of Texas at Austin	12/2008
M.S.	Electrical and Computer Engineering	University of Florida	8/1997
B.S.	Electrical Engineering	University of Florida	8/1994

Conferences, Workshops, and Professional Development (Last Five Years)

Other Related Computing Experience

University of Texas at Austin

Research Assistant, Jan. 2003 – Dec. 2008

Intel Corp., Design Engineer, Sep. 1997 - Dec. 2003

Consulting

N/A

Departmental Committee Service 2009-2010	College of Engineering Committee Service 2009-2010
	• Mentored high school juniors and seniors during Texas A&M University's ECE Unplugged summer camp. July 2009. • Participated in Aggieland Saturday encouraging high school seniors to pursue careers in electrical and computer engineering at Texas A&M University. Feb. 2009.

Committee Service 2005-2009

Departmental Committee Service 2005-2009	College of Engineering Committee Service 2005-2009
• Program committee member, MEDEA 2009 Workshop. • Reviewer for the following conferences and journals: ACM TACO 2009, IEEE TC 2009, IEEE CAL 2009, 2008, ASPLOS 2008, 2009, IISWC 2006, Micro 2006, IPDPS 2005, ASPLOS 2004	•

Principle Publications *Indicates student author

Refereed Journals

Refereed Conference Publications

Highly Selective Conferences

"Evaluation of the TRIPS Computer System," M. Gebhart, B. A. Maher, K. E. Coons, J. Diamond, P. Gratz, M. Marino, N. Ranganathan, B. Robatmili, A. Smith, J. Burrill, S. W. Keckler, D. Burger, K. S. McKinley. *The 14th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS),* March 2009.

"Regional Congestion Awareness for Load Balance in Networks-on-Chip," P. Gratz, B. Grot, and S.W. Keckler. *The 14th IEEE International Symposium on High-Performance Computer Architecture (HPCA),* February 2008.

"On-Chip Interconnection Networks of the TRIPS Chip," P. Gratz, C. Kim, K. Sankaralingam, H. Hanson, P. Shivakumar, S.W. Keckler, and D.C. Burger. *IEEE Micro*, 27(5), pp. 41-50, September/October 2007.

"Implementation and Evaluation of a Dynamically Routed Processor Operand Network," P. Gratz, K. Sankaralingam, H. Hanson, P. Shivakumar, R. McDonald, S.W. Keckler, and D.C. Burger. *The First IEEE International Symposium on Networks-on-Chips (NOCS),* pp 7 - 17, May, 2007.

"Distributed Microarchitectural Protocols in the TRIPS Prototype Processor," K. Sankaralingam, R. Nagarajan, R. McDonald, R. Desikan, S. Drolia, M.S. Govindan, P. Gratz, D. Gulati, H. Hanson, C. Kim, H. Liu, N. Ranganathan, S. Sethumadhavan, S. Sharif, P.K. Shivakumar, S. W. Keckler, D.C. Burger. *The 36th IEEE/ACM International Symposium on Microarchitecture (MICRO)*, pp. 480 - 491, December 2006.

"Implementation and Evaluation of On-Chip Network Architectures," P. Gratz, C. Kim, R. McDonald, S.W. Keckler, and D.C. Burger. *2006 IEEE International Conference on Computer Design (ICCD)*, pp 477 - 484, October, 2006.

Selective Conferences with High Visibility

Other Scholarly Activities

Grants

Term/Year	Course Number	Course Title	Semester Hours	Class Size

Percentage of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities:

Ricardo Gutierrez-Osuna, Associate Professor, Tenured

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, Tenure-track, August 2002

Promoted, Associate Professor, Tenured, September 2006

Degree	Field	Institution	Year
PhD	Computer Science	North Carolina University @Raleigh	1998
MS	Computer Science	North Carolina University @Raleigh	1995
BS	Industrial/Electrical Engineering	Polytechnic University of Madrid	1992

Conferences, Workshops, and Professional Development (Last Five Years)

Program Committee Member

IEEE Conference on Multi-sensor Fusion and Integration (MFI2010), 2010
IEEE Symposium Computational Intelligence for Multimedia Signal and Vision Processing, 2009
International Joint Conference on Neural Networks, 2008, 2009
IEEE Sensors Conference, 2007-2009
International Symposium on Artificial Brain with Emotion and Learning (ISABEL), 2006
Robotics: Systems and Science (RSS), 2006
IEEE International Conference on Autonomic and Autonomous Systems (ICAS), 2005-2006
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2005
International Symposium on Olfaction and Electronic Nose (ISOEN), 2005

Editorial Board

IEEE International Conference on Robotics and Automation, 2009
IEEE Sensors Journal (Associate Editor; 2006-present)
Sensor Letters, 2003-2005

Other Related Experience

Wright State University, Dayton, Ohio

Assistant Professor, Computer Science and Engineering Department, 1998-2002

North Carolina State University, Raleigh, NC

Instructor, Electrical and Computer Engineering Department, 1998
Research Assistant, Biomedical Instrumentation Laboratory, 1996-98
Lecturer, Graduate School, 1997
Teaching Assistant, Electrical and Computer Engineering Department, 1996
Research Assistant, Center for Robotics and Intelligent Machines, 1994-1995

Nomadic Technologies, Inc., Mountain View, CA

Research Assistant, Mobile Robotics Group, 1996

Consulting- None

Department Committee Service 2009-2010	College of Engineering Committee Service 2009-2010
• **Communications Committee**	• Office of Sponsored Research

Department Committee Service 2005-2009	College of Engineering Committee Service 2005-2009
• Colloquium Coordinator, 2005-2006 • Faculty Search Software Sub Committee, 2005-2006 • Undergraduate Curriculum & ABET Committee, 2005 • Faculty Search Information Storage/Retrieval Sub Committee, 2006-2007 • Space Committee, 2006-2008 • Advisory Committee (elected), 2007-2009 • Faculty Search Security Sub Committee, 2007-2008 • Web Advisory Committee, 2008-2009	• Office of Sponsored Research, 2008-2009

Principal Publications * Indicates student author

Refereed Journals

D. Felps*, H. Bortfeld and **R. Gutierrez-Osuna**. "Foreign-accent Conversion in Computer Assisted Pronunciation Training," *Speech Communication*, 51, 920-932, 2009.

J. Rodriguez*, H. Bortfeld, I. Rudomin, B. Hernandez, and **R. Gutierrez-Osuna**. "The Reverse-caricature Effect Revisited: Familiarization with Frontal Facial Caricatures Improves Veridical Face Recognition," *Applied Cognitive Psychology*, 23(5). 733-742, 2008.

F. Nogueira*, D, Felps* and **R. Gutierrez-Osuna**. "Development of an Infrared Absorption Spectroscope Based on Linear Variable Filters," *IEEE Sensors Journal*, 7(8), 1183-1190, 2007.

B. Raman*, P. Sun*, A. Gutierrez-Galvez* and **R. Gutierrez-Osuna**, "Processing of Chemical Sensor Arrays with a Biologically-Inspired Model of Olfactory Coding," *IEEE Transactions on Neural Networks*, 17(4), pp. 1015-1024, 2006.

P. Kakumanu*, A. Esposito, O. N. Garcia and **R. Gutierrez-Osuna**. "A Comparison of Acoustic Coding Models for Speech-Driven Facial Animation," *Speech Communication*, 48(6), pp. 598-615, 2006 (Impact Factor for 2003: 0.672; N/A for 2005).

A. Gutierrez-Galvez* and **R. Gutierrez-Osuna**. "Contrast Enhancement and Background Suppression of Chemosensor Array Patterns with the KIII Model," *International Journal of Intelligent Systems* 21(9), pp. 937-953, 2006 (Impact Factor for 2003: 0.875; N/A for 2005).

High Visibility Conferences (selectivity of 30% - 60%)

J. Choi* and **R. Gutierrez-Osuna**. "Using Heart Rate Monitors to Detect Mental Stress," *Proc. Sixth International Workshop on Body Sensor Networks (BSN 2009)*, 219-223, 2009. (Acceptance Rate: 50%)

A. Pazarloglou*, R. Stoleru and **R. Gutierrez-Osuna**. "High-Resolution Speech Signal Reconstruction in Wireless Sensor Networks," *Proc. IEEE Workshop on Information Retrieval in Sensor Networks*, Las Vegas, NV, January 10-13, 2009. (Acceptance Rate: 40%)

J. Rodriguez*, H. Bortfeld, and **R. Gutierrez-Osuna**. "Reducing the Other-Race Effect through Caricatures," *Proc. 8th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2008)*, Amsterdam, The Netherlands, September 17-19, 2008. (Acceptance Rate: 43%)

H. Choi*, **R. Gutierrez-Osuna**, S. Choi and Y. Choe. "Kernel Oriented Discriminant Analysis for Speaker-Independent Phoneme Spaces," *Proc. 19th International Conference on Pattern Recognition (ICPR 2008)*, Tampa, FL, December 8-11, 2008 (Acceptance Rate: 44%)

Koh, D. Caruso, A. Kerne and **R. Gutierrez-Osuna**. "Elimination of Junk Document Surrogate Candidates Through Pattern Recognition," *Proc. 2007 ACM symposium on Document Engineering*, Winnipeg, Manitoba, Canada, August 28 - 31, 2007, pp. 187-195 (Acceptance Rate: 39%)

Publication of Books or Authoritative References

R. Gutierrez-Osuna. "Electronic Nose", in E. B. Goldstein (Ed.), *SAGE Encyclopedia of Perception*, Sage Publications, 2010.

B. Raman* and **R. Gutierrez-Osuna**. "Relating Sensor/Instrumental Response of Odorants to Their Organoleptic Properties By Means of a Biologically-Inspired Model of Receptor Neuron Convergence Onto Olfactory Bulb," S. Marco and A. Gutierrez-Galvez (Eds.), *Studies in Computational Intelligence*, vol. 188, Springer, 2009, pp. 93-108.

Other Scholarly Activity

Grants

"Stress Monitoring with Non-Linear Dynamical Models and Wearable Sensors," National Priorities Research Program, Qatar National Research Fund, **R. Gutierrez-Osuna (PI)** with co-PI Beena Ahmed (TAMU Qatar), **$1,049,125**, June 2009-May 2012. (Prorated amount: 50%)

"Miniature and Reliable Chemical Sensors for Cell Phones," Department of Homeland Security, **R. Gutierrez-Osuna (PI on subcontract), $142,787**, September 2009-September 2011. (Pro-rated amount: 100%)

"MRI: Acquisition of Mobile, Distributed Instrumentation for Response Research (RESPOND-R)," NSF MRI, **$1,400,000**, R. Murphy (PI) with A. Ames, **R. Gutierrez-Osuna**, D. Song, and R. Stoleru, August 2009-July 2012. (Pro-rated amount: 20%).

"RI: Collaborative Research: Foreign Accent Conversion through Articulatory Inversion Of The Vocal-Tract Frontal Cavity," National Science Foundation (IIS), **R. Gutierrez-Osuna (PI)** and M. Carreira-Perpinan, **$450,000**, September 2008 – August 2011. (Pro-rated amount: 51%)

"Hypothesis Generation for Chemical Threats through Active Perception with Microsensor Arrays," Department of Defense, National Geospatial Intelligence Agency, **R. Gutierrez-Osuna (PI)** and S. Semancik (NIST), $240,000, September 2006-August 2008. (Pro-rated amount: 100%).

"MSK Parameter Analysis Tool. Extension," United Space Alliance, **R. Gutierrez-Osuna (PI),** $28,036, June-December 2005. (Pro-rated amount: 100%).

"Perceptive Sensor Networks Laboratory," (TAMU CoE Dean's Undergraduate Equipment Initiative (CAF): **$50k**, with cost-sharing from the Dept. of Computer Science: **$30k**), A. Kerne (**PI), R. Gutierrez-Osuna** and D. Song, ***$80,000.*** (Pro-rated amount: 33%).

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Spring 2009	CSCE 483	Computer Systems Design	3.0	14
Fall 2008	CSCE 483	Computer Systems Design	3.0	6
Fall 2008	CSCE 689	Pattern Classification	3.0	12
Spring 2008	CSCE 483	Computer Systems Design	3.0	20
Fall 2007	CSCE 483	Computer Systems Design	3.0	14
Fall 2007	CSCE 689	Speech and Face Recognition	3.0	14
Spring 2007	CSCE 483	Computer Systems Design	3.0	14
Fall 2006	CSCE 689	Pattern Recognition	3.0	19
Spring 2006	CSCE 483	Computer Systems Design	3.0	14
Fall 2005	CSCE 689	Pattern Recognition	3.0	25
Spring 2005	CSCE 483	Pattern Recognition	3.0	19

Percentage of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities:
Dr. Gutierrez-Osuna's research interests include: Intelligent Sensors, Speech Processing, Face Recognition, Machine Olfaction, Neuromorphic Computation, Mobile Robotics, Pattern Recognition, and Machine Learning.

Tracy Hammond, Assistant Professor, Tenure-Track

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, Tenure-track, August 2006

Degree	Field	Institution	Year
PhD	Computer Science	Massachusetts Institute of Technology	2007
FTO	Financial Technology Option	Massachusetts Institute of Technology	2003
MA	Anthropology	Columbia University	2001
MS	Computer Science	Columbia University	2000
BA	Mathematics	Columbia University	1997
BS	Applied Mathematics	Columbia University	1997

Conferences, Workshops, and Professional Development (Last Five Years)

Program Committee Chair

Computer Human Interaction (**CHI**) Workshop on Designing Sketch Recognition Interfaces, 2010
Intelligent User Interfaces (**IUI**) Workshop on Sketch Recognition, 2009
Diagrams Workshop on Sketch Tools in Diagramming, 2008

Demo Chair

Sketch-based Interfaces and Modeling (**SBIM**) Demo Chair

Program Committee Member

International Joint conferences on Artificial Intelligence (IJCAI), 2009
Intelligent User Interfaces (IUI), 2009
Intelligent User Interfaces (IUI) Workshop on Sketch Recognition, 2009
Visual Languages & Computing (VLC), 2009
Sketch Based Interfaces & Modeling (SBIM), 2009
AAAI (Association for the Advancement of Artificial Intelligence), 2008
SBIM (Sketch-based Interfaces and Modeling), 2008
IUI (Intelligent User Interfaces), 2008
Visual Languages & Computing (VLC), 2008
AAAI (Association for the Advancement of Artificial Intelligence), 2007: Student Abstracts
NSF Creative IT Workshop, January 2009
AAAI Human-Computer Interaction 1, 2008
AAAI Human-Computer Interaction 2, 2008
FIE (Frontiers in Education), 2007
ESP (Engineer Scholars Program), 2007

Journal Editor

Costagliola, G., Plimmer, B., and Hammond, T. Editors, Special Issue on Sketch Computing in the Journal of Visual Languages and Computing, 2010.

Other Related Experience

Columbia University, Fu School of Engineering and Applied Science

Instructor, 1999-2001
Instructor Mentor (to first time teachers), 2002-2005
Recitation Instructor, Spring 1999
Teaching Assistant, 1998-2000

Columbia University, Continuing Education Department (HSP)

Instructor, Summers of 2000, 2001, 2002

Massachusetts Institution of Technology

Research Assistant, 2000-2006

Consulting- None

Department Service Committees 2009-2010
• Undergraduate Recruiting Committee, 2009-2010

Department Service Committees 2005-2009
• Library Committee, 2006-2007, 2008-2009 • Advisory Committee (elected) 2007-2008 • Graduate Advisory Committee, 2007-2008

Principal Publications * Indicates student author

Refereed Journals

Taele, P.* and Hammond, T. "LAMPS: A Sketch Recognition-Based Teaching Tool for Mandarin Phonetic Symbols I," *Journal of Visual Languages and Computation*, 2010.

Paulson, B.* and Hammond, T. "Perceptual Recognition by Global Features," *Journal of Multimodal User Interfaces*, 2008.

Highly Selective Conferences (selectivity of 30% or less)

Dixon, D.,* Prasad, M.*, & Hammond, T. "iCanDraw? Using Sketch Recognition and Corrective Feedback to Assist a User in Drawing Human Faces," *Proceedings of Computer Human Interaction* ***(CHI 2010)***, ACM Press, Atlanta, Georgia, April 10-17, 2010 (10 pages). (Acceptance Rate 22%)

Bhat, A.* and Hammond, T. "Using Entropy to Differentiate between Shape and Text in Hand-Drawn Diagrams," *International Joint Conference on Artificial Intelligence.* ***(IJCAI 2009)*** Pasadena, CA. July 11-17, 2009. [6 pages] (Acceptance Rate 25%)

Paulson, B.* and Hammond, T. "Office Activity Recognition using Hand Posture Cues," *Human-Computer Interaction (HCI 2008),* September 4, 2008. (10 pages). (Acceptance Rate 30%)

Paulson, B.* and **Hammond, T.** PaleoSketch: Accurate Primitive Sketch Recognition and Beautification. In Proceedings of Intelligent User Interfaces (**IUI 2008**). January, 2008 (8 pages). (Acceptance Rate 16%)

Hammond, T. and Davis, R. Interactive Learning of Structural Shape Descriptions from Automatically Generated Near-miss Examples. Interactive Conference on Intelligent User Interfaces (**IUI 2006**). 2006. (8 pages) (Acceptance Rate 22%)

High Visibility Conferences (selectivity of 30% - 60%)

Hammond. T. et al. "A Sketch Recognition Interface that Recognizes Hundreds of Shapes in Course-of-Action Diagrams," *Computer Human Interaction Works-In-Progress (CHI 2010),* Atlanta, Georgia, April 10-17, 2010. (6 pages) (Acceptance Rate 57%)

Taele, P.* and **Hammond, T.** Hashigo: A Next-Generation Sketch Interactive System for Japanese Kanji. Twenty-First Conference on Innovative Applications for Artificial Intelligence (**IAAI 2009**). Pasadena, CA. July 14-16, 2009. (6 pages) (Acceptance Rate 32%)

Wolin, A.*, Eoff, B.*, and **Hammond, T.** "Search Your Mobile Sketch: Improving the Ratio of Interaction to Information on Mobile Devices," *(IUI 2009) Workshop on Sketch Recognition Short Paper/Talk*. 2009. (4 pages) (Acceptance Rate 36%)

Hammond, T., Eoff, B.*, Paulson B.*, Wolin. A.*, Dahmen, K.*, Johnston, J.*, and Rajan, P.* (2008). Free-Sketch Recognition: Putting the CHI in Sketching," *Proceedings of Computer Human Interaction (CHI 2008)* Works In Progress. April, 2008. (6 pages) (Acceptance Rate 38%)

Choi, H.*, Brandon P.*, and **Hammond, T**. "Gesture Recognition Based on Manifold Learning," *12th International Workshop on Structural and Syntactic Pattern Recognition (SSPR 2008)*, Lecture Notes in Computer Science (LNCS), Springer-Verlag, December 4-6, 2008 (10 pages) (Acceptance Rate 56%)

Taele, P,* and **Hammond, T.** "A Geometric-based Sketch Recognition Approach for Handwritten Mandarin Phonetic Symbols," *International Conference on Distributed Multimedia Systems (**DMS 2008**),* Boston, Massachusetts, September 4-6, 2008. (6 pages) (Acceptance Rate 58%)

Books

Berque, D., Evans, E., **Hammond, T.**, Mock, K., Payton, M., and Sweeny, D. "Tablet PCs in K-12 Education: No More Blank Slates," *International Society for Technology in Education*, 2008.

Other Scholarly Activity

Grants

"Civil Engineering Sketch Workbook," National Science Foundation, **PI: Tracy Hammond**. Co-PI Tony Cahill (CE), **$400,000**, Hammond: **$325,000**, 10/01/09 – 9/31/12.

"Charitable Contributions University Allocations: Hand-Tracking Recognition Course," Rockwell Collins, **PI: Tracy Hammond**, **$30,000**; Hammond: **$30,000**, 7/1/09 – 6/30/10.

"Creative IT: REU Supplement for Grant," National Science Foundation, **PI: Tracy Hammond**, Co-PI: Donald Maxwell, **$16,000**; Hammond: **$16,000**, 06/01/2008-05/31/2010. *Travel Supplement for Grant*, **$15,000**; 06/01/2008-05/31/2010.

"CreativeIT: Pilot: Let Your Notes Come Alive: The SkRUI Classroom Sketchbook," National Science Foundation, **PI: Tracy Hammond**, Co-PI: Donald Maxwell **$200,000**; Hammond: **$200,000,** 06/01/2008-05/31/2010.

"Deep Green: Commander's Associate," DARPA BAE/SIFT (British Aerospace/Smart Information Flow Technologies) **PI: Tracy Hammond**, **$461,916**; Hammond: **$374.888**, 04/22/08-05/31/09.

"Deep Green: Commander's Associate," DARPA SAIC (Science Applications International Corporation) **PI: Tracy Hammond**, **$461,916**; Hammond: **$461,916**, 04/22/08-05/31/109.

"Developing Perception-Based Geometric Primitive-Shape and Constraint Recognizers to Empower Instructors to Build Sketch Systems in the Classroom," National Science Foundation, **PI: Tracy Hammond**, **$149,858**; Hammond: **$149,858**, 6/15/07 – 8/31/08.

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Spring 2009	CSCE 689/624	Sketch Recognition	3.0	11
Spring 2009	**CSCE 436**	**Computer-Human Interaction**	**3.0**	**9**
Fall 2008	CSCE 689/624	Sketch Recognition	3.0	10
Spring 2007	**CSCE 671**	**Computer-Human Interaction**	**3.0**	**7**
Fall 2007	CSCE 689/624	Sketch Recognition	3.0	26
Fall 2006	**CSCE 689/624**	**Sketch Recognition**	**3.0**	**12**

Percentage of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities:
Dr. Hammond's research areas are: Sketch Recognition, Gesture Recognition, Haptics, Hand-Tracking, Artificial Intelligence, and Human Computer Interfaces.

Jiang Hu, Professor

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, August 2002

Degree	Field	Institution	Date
Ph.D.	Electrical Engineering	University of Minnesota, Twin Cities	06/2001
M.S.	Physics	University of Minnesota, Duluth	06/1997
B.S.	Optical Engineering	Zhejiang University, China	06/1990

Conferences, Workshops, and Professional Development (Last Five Years)

Other Related Computing Experience

IBM Microelectronics, Austin, TX

Advisory Software Engineer, 2001-2002

Tech. Center for Aids to Navigation, China

Electronics Engineer, 1990-1995

Consulting

None

Departmental Committee Service 2009-2010	College of Engineering Committee Service 2009-2010

Committee Service 2005-2009

Departmental Committee Service 2005-2009	College of Engineering Committee Service 2005-2009
• ACM/IEEE International Symposium on Physical Design, Technical program committee member, November 2001 – April 2005. • ACM/IEEE Asia and South Pacific Design Automation Conference, Session Chair, January 2004. • IEEE/ACM International Conference on Computer-Aided Design, April 2004 – November 2006, and November 2005, November 2006. • ACM/IEEE Design, Automation and Test in Europe Conference, Technical program committee member, September 2004 – March 2005, and September 2007 – March 2008. • IEEE International Symposium on Circuits and Systems, Review program committee member, October 2003 – May 2006. • ACM-SIGDA Ph.D. Forum, Organizing committee member,	•

February 2004 – June 2007. • ACM/IEEE Design Automation Conference, November 2005 – June 2007 • IEEE Transactions on Computer-Aided Design, Associate Editor, January 2006 – December 2008. • IEEE International Symposium on Quality Electronic Design, Technical program committee member, October 2006 – March 2008. • IET Devices, Circuits and Systems, Special Issue on Design for Manufacturability, Guest Editor, January 2007 – December 2007.	

Principle Publications *Indicates student author

Refereed Journals

Refereed Conference Publications

C. Zhuo, J. Hu, M. Zhao and K. Chen, "Power grid analysis and optimization using algebraic multigrid," *IEEE Trans. Computer-Aided Design*, Vol. 27, No. 4, pp. 738-751, April, 2008.

C. N. Sze, J. Hu and C. J. Alpert, "Place and route aware buffered Steiner tree construction," *Proc. Asia and South Pacific Design Automation Conference*, pp. 355- 360, 2004. (**Best Paper Nominee**)

A. Rajaram, J. Hu and R. Mahapatra, "Reducing clock skew variability via cross links," *Proc. ACM/IEEE Design Automation Conference*, pp. 18-23, 2004. (**Best Paper Nominee**)

G. Venkataraman, J. Hu, "A placement methodology for robust clocking," *International Conference on VLSI Design*, pp. 881-886, 2007.

W. Shen, Y. Cai, X. Hong, J. Hu and B. Lu, "Planar-CRX: a single-layer zero skew clock routing in X-architecture," *IEEE International Symposium on Quality Electronic Design*, pp. 299-304, 2007.

Y. Liu, T. Zhang and J. Hu, "Soft clock skew scheduling for system-level variation tolerance in digital signal processing circuits," *IEEE International Symposium on Quality Electronic Design*, pp. 749-754, 2007.

W. Shen, Y. Cai, X. Hong and J. Hu, "Activity-aware register placement for low power gated clock tree construction," *IEEE Computer Society Annual Symposium on VLSI*, pp. 383-388, 2007.

Y. Wang, Q. Zhou, Y. Cai, J. Hu and X. Hong, "Low power clock buffer planning methodology in FD placement for large scale circuit design," *Asia and South Pacific Design Automation Conference*, 2008.

S. Varadan, J. M. Wang and J. Hu, "Handling partial correlations in yield prediction," *Asia and South Pacific Design Automation Conference*, 2008.

R. Samanta, G. Venkataraman, N. Shah and J. Hu, "Elastic timing scheme for energy-efficient and robust performance," *IEEE International Symposium on Quality Electronic Design*, 2008.

X. Ye, M. Zhao, R. Panda, P. Li and J. Hu, "Accelerating clock mesh simulation using matrix-level macromodels and dynamic time step rounding," *IEEE International Symposium on Quality Electronic Design*, 2008.

Y. Liu, J. Hu and W. Shi, "Multi-scenario buffer insertion in multi-core processor designs," *ACM International Symposium on Physical Design*, 2008.

R. Samanta, J. Hu and P. Li, "Discrete buffer and wire sizing for link-based non-tree clock networks," *ACM International Symposium on Physical Design*, 2008.

W. Shen, Y. Cai, X. Hong and J. Hu, "Activity and register placement aware gated clock network design," *ACM International Symposium on Physical Design*, 2008.

Highly Selective Conferences

Selective Conferences with High Visibility

Other Scholarly Activities

Grants

Term/Year	Course Number	Course Title	Semester Hours	Class Size

Percentage of time devoted to scholarly and/or research activities:

Please give a brief description of your major research and scholarly activities:

Garng M. Huang, Professor

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, 9/84
Promoted, Associate Professor, 9/87
Promoted, Professor, 09/93-Present

Degree	Field	Institution	Date
Ph.D.	Electrical Engineering	Washington Universty, Washington	06/1988
M.S.	Electrical Engineering	Institute of Electronics, Chiao Tung University, Taiwan R.O.C.	06/1977
B.S.	Electrical Engineering	Chiao Tung University, Taiwan, R.O.C.	06/1975

Conferences, Workshops, and Professional Development (Last Five Years)

Other Related Computing Experience

Washington University

Assistant Professor, 1980-1984

Consulting

None

Departmental Committee Service 2009-2010	College of Engineering Committee Service 2009-2010

Committee Service 2005-2009

Departmental Committee Service 2005-2009	College of Engineering Committee Service 2005-2009
• Committee of IEEE Trans. on Automatic Control Society • Member of Editorial Board in IEEE Trans. on Automatic Control in the areas of large sclae optimization, stability, nonlinear and distributed systems • Member of System Control Subcommittee, Computer and Analytical Methods Committee of IEEE PAS Society • Organizer and Chairman of Invited Sessions on Parallel/Distributed Algorithms and Applications, on stability Committee Chairman of Energy Systems Control and control of power systems in IEEE CDC, ACC and ISCAS • Chaired more than twenty sessions in different conferences	• Graduate study committee • Staff hiring committee • Department advisory board • Department award committee • Director of graduate studies • Chairman of graduate studies committee

Principle Publications *Indicates student author

Refereed Journals

1. "Iterative Maximum-Likelihood Sequence Estimation for Space-Time Coded Systems," IEEE Transactions on Communications No. 6, Vol49. June, 2001. Coauthor: Y. Li, C. Georghiades
2. "A Software Architecture For Power Market Supporting System and Re-Engineering of Legacy EMS", IEEE Trans. on Power Systems, Feb. 2003. Coauthors: Q. Zhao, et. al.
3. Y. Li, C. Georghiades and G. Huang, "Transmit Diversity Over Quasi-Static Fading Channels Using Multiple Antennas and Random Signal Mapping" in the IEEE Transactions on Communications, Vol. 51, pp. 1918-1926, November 2003.
4. "A Topological Measurement Placement Method to Maintain Observability during Contingencies," submitted to IEEE trans. on Power Systems. Coauthor: J. Lei.
5. "The Role of Digital Modeling and Simulation in Power Engineering Education", IEEE Trans. on Power Systems, Feb. 2004. Coauthors: M. Kezunovic, A. Abur, etc.
6. "A Novel Topological Approach to Examine Network Observability under a Contingency", IEEE Trans. on Power Systems, to be submitted. Coauthor: J. Lei.
7. "Auction-based Dispatch Algorithms In Deregulated Power Systems," IEEE Trans. on Power Systems, to be submitted. Coauthor: Y. Li.

Refereed Conference Publications

G. Huang, Yishan Li, "Congestion Management Using The Sensitivity Factors And Aggregation For Deregulated Power Systems", Proceedings of ESC Conference, March 2006, Thailand.
2. G. Huang, Kun Men, "A New Fast Simulation Scheme for Long-term Small Disturbance Voltage Stability Analysis," Proceedings of PSCE, paper No. 1619, Oct. 2006, Georgia.
3. G. Huang, J. Lei, "A Novel Topological Approach to Examine Network Observability under a Contingency," Proceedings of IEEE PAS Annual Meeting, June 2007.
7. G. Huang, J. Lei, "A Semantic Based Software Architecture for Power Market Information Integration Managing Large Scale Market Network Models," Proceedings of IEEE PAS Annual Meeting, June 2007.
8. G. M. Huang, W. Dong, Y. Ho, and P. Li, “Tracing SRAM separatrix for dynamic noise margin analysis under device mismatch,” in IEEE Int. Behavioral Modeling and Simulation Conf., Sept. 2007.

Highly Selective Conferences

Selective Conferences with High Visibility

Other Scholarly Activities

Grants

Term/Year	Course Number	Course Title	Semester Hours	Class Size

Percentage of time devoted to scholarly and/or research activities:

Please give a brief description of your major research and scholarly activities:

Anxiao (Andrew) Jiang, Assistant Professor, Tenure-Track

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, Tenure-track, 2005

Degree	Field	Institution	Year
PhD	Electrical Engineering	California Institute of Technology	2004
MS	Electrical Engineering	California Institute of Technology	2000
BS	Electronic Engineering	Tsinghua University @Bejing, China	1999

Conferences, Workshops, and Professional Development (Last Five Years)

Organizing Committee Co-organizer, Co-Chair

IEEE Global Communications Conference - Workshop on The Application of Communication Theory to Emerging Memory Technologies, 2009-2010

Program Committee Member

IEEE International Conference on Computer Communication Networks (ICCCN 2010), Zurich, Switzerland, 2009-2010.

IEEE International Conference on Communications - Ad-hoc, Sensor and Mesh Networking Symposium (ICC-AHS), 2009-2010.

IEEE Global Communications Conference, Boston, MA, 2009-2010.

International Conference on Mobile Ad-hoc and Sensor Networks (MSN), Wuhan, China, 2008-2009.

IEEE International Conference on Computer Communication and Networks (ICCCN), San Francisco, CA, 2008-2009

IEEE International Conference on Communications (ICC), Bejing, China, 2008-2009.

International Conference on Mobile Ad-hoc and Sensor Networks (MSN 2008), 2007-2008.

IEEE International Symposium on Network Computing and Applications (NCA 2008), 2007-2008.

IEEE International Symposium on Network Computing and Applications – Workshop on Trustworthy Network Computing, 2006.

Other Related Experience

California Institute of Technology, Pasadena, CA

Post Doctoral Fellow, 2004-2005

Research Assistant, 1999-2004

California Technical Institute

Teaching Assistant, 2000-2001

Tsinghua University, Beijing, China

Undergraduate Research Assistant, 1996-1999

Consulting

Consulting Researcher, Microsoft Research, Redmond, WA; 6/2009

Consulting Researcher, EMC Corporation, 8/2009-present

Department Committee Service 2009-2010
• Undergraduate Student Awards Committee

Department Committee Service 2005-2009
• Library Committee, 2005-2006 • Web Advisory Committee, 2006-2008 • Undergraduate Student Awards Committee, 2008-2009

Principal Publications (*) Indicates student author

Refereed Journals

Bruck, J., Gao, J., and Jiang, A., "Localization and Routing in Sensor Networks by Local Angle Information," *ACM Transactions on Sensor Networks*, vol. 5, no. 1, article no. 7, 31 pages, February 2009.

Bruck, J., Gao, J. and Jiang, A., "MAP: Medial Axis Based Geometric Routing in Sensor Networks," in *Springer WINET (Wireless Networks) Journal*, vol. 13, no. 6, pp. 835-853, December 2007.

Jiang, A., Cook, M. and Bruck, J., "Optimal Interleaving on Tori," in *SIAM Journal on Discrete Mathematics*, vol. 20, no. 4, pp. 841-879, December 2006.

Jiang, A. and Bruck, J., "Network File Storage with Graceful Performance Degradation," in *ACM Transactions on Storage*, vol. 1, no. 2, pp. 171-189, May 2005.

Jiang, A. and Bruck, J., "Multicluster Interleaving on Paths and Cycles," *IEEE Transactions on Information Theory*, vol. 51, no. 2, pp. 597-611, February 2005.

Refereed Conferences

Highly Selective Conferences

(*) Lu, H., Jiang, A. and Liu, S., "Locality Aware Information Brokerage in Distributed Sensor Networks," in *Proceedings of the 28th IEEE International Conference on Distributed Computing Systems (ICDCS)*, pp. 522 – 529, June 2008. (Acceptance rate 16%)

(*) Zhang, F., Jiang, A. and Chen, J., "Robust Planarization of Unlocalized Wireless Sensor Networks," *Proceedings of the 27th IEEE INFOCOM*, pp. 798-806, April 2008. (Acceptance rate 21%)

(*) Zhang, F., Li, H., Jiang, A., Chen, J. and Luo, P., "Face Tracing Based Geographic Routing in Nonplanar Wireless Networks," in *Proceedings of the 26th IEEE INFOCOM*, pp. 2243-2251, May 2007. (Acceptance rate 18%)

(*) Chen, J., Jiang, A., Kanj, I. A., Xia, G. and Zhang, F., "Separability and Topology Control of Quasi Unit Disk Graphs," in *Proceedings of the 26th IEEE INFOCOM*, pp. 2225-2233, May 2007. (Acceptance rate 18%)

Bruck, J., Gao, J. and Jiang, A., "MAP: Medial Axis Based Geometric Routing in Sensor Networks," in *Proceedings of the 11th ACM International Conference on Mobile Computing and Networking (MobiCom)*, pp. 88-102, August-September, 2005. (Acceptance rate 10%)

Bruck, J., Gao, J. and Jiang, A., "Localization and Routing in Sensor Networks by Local Angle Information," in *Proceedings of the 6th ACM International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc)*, pp. 181-192, May 2005. (Acceptance rate 14%)

Jiang, A. and Bruck, J., "Monotone Percolation and The Topology Control of Wireless Networks," *Proceeding of the 24th IEEE INFOCOM*, pp. 327-338, March 2005. (Acceptance rate 17%)

Other Scholarly Activities

Grants

"CAREER: Information Storage in Flash Memories: From Devices to Networks," National Science Foundation. **PI: Anxiao Jiang**, **$400,000**, pro-rated **$400,000**, 2/1/2008 – 1/31/2013.

"Collaborative Research: BRAM: Balanced Rank Modulation for Data Storage in Next Generation Flash Memories." National Science Foundation, **PI: Anxiao Jiang** (*TAMU as the leading university*), Jehoshua Bruck (Caltech), Paul Hasler (Georgia Institute of Technology) and Christopher Twigg (SUNY at Binghamton), **$600,000**, Pro-rated amount **$150,000**, April 2008 – March 2011.

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Fall 2009	CSCE 310	Database Systems	3.0	15
Fall 2009	**CSCE 603**	**Database Systems and Applications**	**3.0**	**8**
Fall 2009	CSCE 689	Special Topics in Frontiers in Storage Systems	3.0	13
Spring 2009	**CSCE 629**	**Analysis of Algorithms**	**3.0**	**31**
Fall 2008	CSCE 689	Special Topics on Wireless Sensor Networks	3.0	14
Fall 2008	**CSCE 310**	**Database Systems**	**3.0**	**26**
Spring 2008	CSCE 310	Database Systems	3.0	27
Spring 2008	**CSCE 603**	**Database Systems and Applications**	**3.0**	**2**
Spring 2008	CSCE 689	Special Topics on Information Processing in Sensor Networks	3.0	6
Fall 2007	**CSCE 689**	**Special Topics on Wireless Sensor Networks**	**3.0**	**12**
Spring 2007	CSCE 310	Database Systems	3.0	15
Fall 2006	**CSCE 689**	**Special Topics on Ad Hoc and Sensor Networks**	**3.0**	**15**
Spring 2006	CSCE 689	Special Topics on Information Processing in Sensor Networks	3.0	7
Fall 2005	**CSCE 689**	**Special Topics on Ad Hoc and Sensor Networks**	**3.0**	**26**

Percentage of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities:
Dr. Jiang's research interests include: Information Theory, Coding for Flash Memories, Wireless and Sensor Networks, and Algorithms.

Sunil P. Khatri, Professor

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, June 2004

Degree	Field	Institution	Date
Ph.D.	EECS	University of California, Berkeley	12/1999
M.S.	ECE	University of Texas, Austin	06/1989
B.S.	Electrical Engineering	Indian Institute of Technology, Kanpur, India	06/1987

Conferences, Workshops, and Professional Development (Last Five Years)

Other Related Computing Experience

University of Colorado, Boulder

Assistant Professor, 1/00-5/04

Motorola Inc. Austin, TX

Design Engineer with the MC88110 & PowerPC 603 Groups, 7/89-7/93

Xilinx Inc. Longmont, CO

Summer course in VHDL/Verilog, 2000-2002

Consulting

Sun Microsystems, National Semiconductor Corporation, Jasmine Networks, Abhai Systems, ITU Ventures.

Departmental Committee Service 2009-2010	College of Engineering Committee Service 2009-2010
	• Member, UNIX Committee, Texas A&M University (2007- present) • Member, Graduate Admissions Committee, Computer Engineering group, Texas A&M University (2007-present)

Committee Service 2005-2009

Departmental Committee Service 2005-2009	College of Engineering Committee Service 2005-2009
• Member of Dept. of ECE Graduate Studies Committee, University of Colorado, Boulder. 2000-2004 • EEE International Workshop on Logic and Synthesis (IWLS), 2005, 2009. Invited to serve as TPC Chair for IWLS in 2008. • ACM/IEEE Great Lakes Symposium on VLSI (GLS-VLSI), 2007-2009. • Track Co-Chair, Computer Aided Network Design, IEEE International Symposium on Circuits and Systems (ISCAS), 2006-2009 • IEEE International Conference on Computer Design	• Member, UNIX Committee, Texas A&M University (2007- present) • Member, Graduate Admissions Committee, Computer Engineering group, Texas A&M University (2007-present)

(ICCD), 2007-2008 • Technical Program Committee Member, DesignCon, 2007-8. • Technical Program Committee Member, IEEE International Conference on Computer Communications and Networks (ICCCN-04). Invited to join this committee in 2003. • Technical Program Committee Member, IEEE International Workshop on Power and Timing Modeling, Optimization and Simulation (PATMOS-04). Invited to join this committee in 2003. • Invited to serve as Session Chair for several conferences including the International Conference on Computer Aided Design (ICCAD 2008), the Asia-South Pacific Design Automation Conference (ASP-DAC 2006), the International Conference on Networking (ICON-03), and the Design Automation Conference (2005).	

Principle Publications *Indicates student author

Refereed Journals

Cross-talk Noise Immune VLSI Design using Regular Layout Fabrics", Khatri, Brayton, Sangiovanni-Vincentelli. Research Monograph published by Kluwer Academic Publishers. ISBN # 0-7923-7407-X.

Invited chapter "*Logic Synthesis*" in the CRC EDA handbook. Co-authored by Narendra Shenoy,- of Synopsys. The wikipedia entry on "Logic Synthesis" is based on the material in this chapter.

"Circuit-level Design Approaches for Radiation-hard Digital Electronics", Garg, Jayakumar, Khatri, Choi. Accepted for publication at the IEEE Transactions on Very Large Scale Integration Systems.

"Efficient On-Chip Crosstalk Avoidance CODEC Design", Duan, Khatri. Accepted for publication at the IEEE Transactions on Very Large Scale Integration Systems.

"A Fast Hardware Approach for Approximate, Efficient Logarithm and Antilogarithm Computations", Paul, Jayakumar, Khatri. Accepted for publication at the IEEE Transactions on Very Large Scale Integration Systems.

"*Resource Sharing among Mutually Exclusive Sum-of-Product Blocks for Area Reduction*", Das, Khatri. Accepted for publication at the ACM Transactions on Design Automation of Electronic Systems (TODAES).

"*An Efficient, Scalable Hardware Engine for Boolean Satisfiability and Unsatisfiable Core Extraction*", Gulati, Waghmode, Khatri, Shi. Accepted for publication at the IET Computers and Digital Techniques.

"*A Probabilistic Method to Determine the Minimum Leakage Vector for Combinational Designs in the Presence of Random PVT Variations*", Gulati, Jayakumar, Khatri, Walker. Accepted for publication at Integration, the VLSI Journal.

"*SAT-based ATPG using Multi-level Compatible Don't-Cares*", Gulati, Saluja, Khatri. Accepted for publication at the ACM Transactions on Design Automation of Electronic Systems (TODAES).

"A *Dynamically De-skewable Clock Distribution Methodology*", Jayakumar, Kapoor, Khatri. Accepted for publication at the IEEE Transactions on Very Large Scale Integration (TVLSI).

"*A Timing-Driven Approach to Synthesize Fast Barrel Shifters*", Das, Khatri. Accepted for publication at the IEEE Transactions on Circuits and Systems II (TCAS-II).

"*A Novel Hybrid Parallel-Prefix Adder Architecture with Efficient Timing-Area Characteristic*", Das Khatri. Accepted for publication in the IEEE Transactions on Very Large Scale Integration.

"*A Predictably Low Leakage ASIC Design Style*", Jayakumar, Khatri. Accepted for publication in the IEEE Transactions on Very Large Scale Integration.

Refereed Conference Publications

Highly Selective Conferences

Selective Conferences with High Visibility

Other Scholarly Activities

Grants

Term/Year	Course Number	Course Title	Semester Hours	Class Size

Percentage of time devoted to scholarly and/or research activities:

Please give a brief description of your major research and scholarly activities:

Eun Jung Kim, Assistant Professor, Tenure-Track

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, Tenure-track, September 2003

Degree	Field	Institution	Year
PhD	Computer Science	Pennsylvania State University	2003
MS	Computer Science	Pohang University of science and Technology	1994
BS	Computer Science	Korea Advanced Institute of Science & Technology	1992

Conferences, Workshops, and Professional Development (Last Five Years)

Program Committee Member

ACM International Conference on computing Frontiers (CF), Bertinoro, Italy, 2010

International Conference on Algorithms and Architectures for Parallel Processing, (ICA3PP), Busan, Korean, 2010

Other Related Experience

The Pennsylvania State University @ University Park, PA

Research Assistant, Department of Computer Science and Engineering, 5/2000-8/2003, 6/1999-8/1999

Teaching Assistant, 1/2000-5/2000, 9/1999-12/1999, 1/1999-5/1999

Korea Telecom, Seoul, Korea

Member of Technical Staff, Communication Network Research and Development Group, 1994-1997

Pohang University of Science and Technology @Pohang Korea

Research and Teaching Assistant, Department of Computer Science and Engineering, 1992-1994

Consulting- None

Department Committee Service 2009-2010
• **Undergraduate Curriculum & ABET Committee**

Department Committee Service 2005-2009
• **Undergraduate Student Awards Committee, 2005-2006, 2007-2008**
• **Graduate Advisory Committee, 2006-2007**
• **Undergraduate Curriculum & ABET Committee, 2008-2009**

Principle Publications *Indicates student authors

Refereed Journals

Y. Jin, **E. J. Kim**, and K. H. Yum, "Design and Analysis of On-Chip Networks for Large Scale Cache Systems," *IEEE Transactions on Computers*, vol. 59, no. 3, pp. 332-344, Mar. 2010.

*J. Iyer, H. Yu, H. Kim, **E. J. Kim**, K. H. Yum, and P. S. Mah, "Assuring K-Coverage in the Presence of Mobility and Wear-Out Failures in Wireless Sensor Networks," *International Journal of Sensor Networks (IJSNet)*, Vol. 5, Issue 1, pp. 58-65, February 2009.

*M. Lee, and **E.J. Kim**, "A Comprehensive Framework for Enhancing Security in InfiniBand Architecture," *IEEE Transactions on Parallel and Distributed Systems (TPDS)*, Vol. 18, No. 10, pp. 1393-1406, Oct. 2007.

*H. K. Lee, V. Hall, K. H. Yum, K. I. Kim, and **E. J. Kim**, "Bandwidth Estimation in Wireless LANs for Multimedia Streaming Services," *Advances in Multimedia*, vol. 2007, Article ID 70429, 7 pages, 2007.

E. J. Kim, K. H. Yum and C. R. Das. "Exploring IBA Design Space for Improved Performance," *IEEE Transactions on Parallel and Distributed Systems(TPDS)*, Vol. 8, No. 4, pp. 498-510, April 2007.

E. J. Kim, G. M. Link, K. H. Yum, V. Narayanan, M. Kandemir, M. J. Irwin, C. R. Das. "A Holistic Approach to Designing Energy-Efficient Cluster Interconnects," *IEEE Transactions on Computers,* Vol. 54, No. 6, pp. 660-671, June 2005.

E. J. Kim, K. H. Yum, and C. R. Das. "Performance Analysis of a QoS Capable Cluster Interconnect," *Performance Evaluation*, Volume 60, Issues 1-4, pp. 275-302, May 2005.

Publication of Books and Other Authoritative References

E. J. Kim, K. H. Yum, and C. R. Das. "Introduction to Analytical Models," *Performance Evaluation and Benchmarking*, Edited by L. K. John and L. Eeckhout, Taylor & Francis, 2006.

Papers in Refereed Conference Proceedings

Highly Selective Conferences

* H. K. Lee, *B. S. Ahn and **E. J. Kim**. "Adaptive Prefetching Scheme Using Web Log Mining in Cluster-basedWeb Systems," *Proceedings of the International Conference on Web Services (ICWS)*, Los Angeles, USA, July 2009 (Acceptance Rate 18%).

* L. Wang, *H. J. Kim, *Y. Jin and **E. J. Kim**. "Recursive Partitioning Multicast: A Bandwidth-Efficient Routing for Networks-On-Chip," *International Symposium on Networks-on-Chip (NOCS)*, San Diego, CA, May 2009 (Acceptance Rate 23%).

* I. Yeo, C. C. Liu and **E. J. Kim**. "Temperature-Aware Scheduler Based on Thermal Behavior Grouping in Multicore Systems," *Design, Automation and Test In Europe (DATE)*, pp.946-952, Nice, France, April 2009 (Acceptance Rate 23.5%).

* I. Yeo, C. C. Liu and **E. J. Kim**. "Predictive Dynamic Thermal Management for Multicore Systems," *Proceedings of the 45th Design Automation Conference (DAC),* pp.734-739, Anaheim, CA, June 2008. (Acceptance Rate 23%)

* Y. Jin, K. H. Yum, and **E. J. Kim**. "Adaptive Data Compression for High-Performance Low-Power On-Chip Networks", *41st International Symposium on Microarchitecture (MICRO-41)*, pp. 354-363, Lake Como, Italy, 2008. (Acceptance Rate, 19%)

* H. K. Lee, V. Hall, K. H. Yum, K. I. Kim and **E. J. Kim**. "Design of Active Set Top Box in a Wireless Network for Scalable Streaming Services," *Proceedings of the 2007 International Conference on Image Processing (ICIP)*, pp.505-508, San Antonio, 2007. (Acceptance Rate 28%)

* M. Lee, M. S. Ahn, and **E. J. Kim**. "I2SEMS: Interconnects Independent Security Enhanced Shared Memory Multiprocessor Systems," *Proceedings of the 16th International Conference on Parallel Architectures and Compilation Techniques (PACT 2007),* pp.94-103, Brasov, Romania, September, 2007. (Acceptance Rate 19%)

* Y. Jin, **E. J. Kim**, and K. H. Yum. "A Domain-Specific On-Chip Network Design for Large Scale Cache Systems," *Proceedings of 13th International Symposium on High-Performance Computer Architecture (HPCA-13),* pp.318-327, 2007. (16% Acceptance Rate 16%)

* Y. Jin, **E. J. Kim**, and K. H. Yum. "Peak Power Control for a QoS Capable On-Chip Network," *Proceedings of the 2005 International Conference on Parallel Processing (ICPP),* pp.585-592, Norway, June 2005. (Acceptance Rate 28.6%).

Selective Conferences

* I. Yeo, and **E. J. Kim**. "Hybrid Dynamic Thermal Management Based on Statistical Characteristics of Multimedia Applications," *Proceedings of the International Symposium on Low Power Electronics and Design (ISLPED)*, pp.321-326, Bangalore, India, August 2008. (Acceptance Rate 31%)

* H. K. Lee, V. Hall, K. H. Yum, K. I. Kim and **E. J. Kim.** "Bandwidth Estimation In Wireless LANs For Multimedia Streaming Services," *Proceedings of the 2006 International Conference on Multimedia & Expo 2006 (ICME)*, pp.1181-1184 (Acceptance Rate: 22%).

* P. S. Bhojwani, R. N. Mahapatra and **E. J. Kim**. "A Heuristic for Peak Power Constrained Design of Network on Chip (NoC) based Multimode System," *IEEE Proceedings of Intl. Conf. on VLSI Design*, pp. 124-129, IEEE Computer Press, 2005. (Acceptance Rate 35%)

Other Scholarly Activities

Grants

"NSF:CAREER: Communication-Centric Chip Multiprocessor Design," National Science Foundation; PI: **E. J. Kim, $400,000**, 03/01/09 – 2/30/14

"NSF: Collaborative Research: Design and Analysis of High-Performance, Energy Efficient, and Secure Clusters," National Science Foundation; **PI: E. J. Kim**, Ki Hwan Yum, **$150,000**. **($90,000** : TAMU, **$60,000**: UTSA), 04/01/06 – 3/31/09

"ETRI: Design and Analysis of Embedded Software Solutions in Wireless Environments," Electronics and Telecommunications Research Institute (ETRI); **PI: E. J. Kim**, Co-PI: Ki Hwan Yum (UTSA), **$180,000, ($140,000** TAMU, **$40,000** UTSA), 05/01/05– 12/31/07

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Fall 2009	CSCE 350	Computer Architecture and Design	4.0	27
Spring 2009	CPSC 614	Computer Architecture	3.0	45
Spring 2009	CPSC 350	Computer Architecture and Design	4.0	23
Fall 2008	CPSC 689	Special Topics in Chip Multiprocessor Systems	3.0	9
Spring 2008	CPSC 614	Computer Architecture	3.0	37
Spring 2007	CPSC 321	Computer Architecture	4.0	48
Fall 2006	CPSC 614	Computer Architecture	3.0	23
Spring 2006	CPSC 614	Computer Architecture	3.0	29
Fall 2005	CPSC 321	Computer Architecture	4.0	17
Spring 2005	CPSC 614	Computer Architecture	3.0	43

Percentage of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities:
Dr. Kim's research interests include: Computer Architecture, Power Efficient Systems, Parallel/Distributed Systems, Computer Networks, Cluster Computing, QoS Support in Cluster Networks and Internet, Performance Evaluation, and Fault-Tolerant Computing.

Deepa Kundur, Professor

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, January 2003

Degree	Field	Institution	Date
Ph.D.	Electrical Computer Engineering	University of Toronto, Canada	11/1999
M.S.	Electrical Computer Engineering	University of Toronto, Canada	11/1995
B.A.Sc.	Electrical Engineering	University of Toronto, Canada	06/1993

Conferences, Workshops, and Professional Development (Last Five Years)

Participated in 15 week grand writing workshop, participated in "Effective Communications" seminar sponsored by TEES.

Other Related Computing Experience

University of Toronto

Assistant Professor, 1999-2002

Consulting

Defense Research Establishment Ottawa (DREO), Vaytek,

Departmental Committee Service 2009-2010	College of Engineering Committee Service 2009-2010
	• Undergraduate Studies Committee/ABET Committee Member • Women Engineering Faculty Interest Group Steering Committee • TAMU EE Undergraduate Research Awards Program Coordinator, • Undergraduate Affairs Advisor,

Committee Service 2005-2009

Departmental Committee Service 2005-2009	College of Engineering Committee Service 2005-2009
• Guest Editor for the Proceedings of the IEEE Special Issue on Multimedia Security and Digital Rights Management • Frequent Technical Program Committee Member for various IEEE conferences • Frequent reviewer for various IEEE journals	• Undergraduate Studies Committee/ABET Committee Member, 2005-present • Women Engineering Faculty Interest Group Steering Committee, 2005 • TAMU EE Undergraduate Research Awards Program Coordinator, 2005-present • Undergraduate Affairs Advisor, 2007-present

Principle Publications *Indicates student author

Refereed Journals

Refereed Conference Publications

Highly Selective Conferences

W. Luh* and D. Kundur, "Secure Distributed Source Coding with Side-Information," *IEEE Communication Letters*, to appear 2008.

D. Kundur, W. Luh*, U. N. Okorafor* and T. Zourntos, "Emerging Security Paradigms for Vision-Rich Sensor Networks," *Proceedings of the IEEE Special Issue on Distributed Multimedia*, vol. 96, no. 1, pp. 112-130, January 2008.

A. Czarlinska* and D. Kundur, "Towards Characterizing the Effectiveness of Random Mobility Against Actuation Attacks," *Journal of Computer Communications Special Issue on Sensor and Actuator Networks*, vol. 30, no.13, pp. 2546-2558, September 2007.

W. Luh*, D. Kundur and T. Zourntos, "A Novel Distributed Privacy Paradigm for Visual Sensor Networks Based on Sharing Dynamical Systems," *EURASIP Journal of Applied Signal Processing Special Issue on Visual Sensor Networks*, vol. 2007, Article ID 21646, 17 pages.

U. Budhia*, D. Kundur and T. Zourntos, "Digital Video Steganalysis Exploiting Statistical Visibility in the Temporal Domain," *IEEE Transactions on Information Forensics and Security*, vol. 1, no. 3, pp. 502-516, December 2006.

C. Fei*, D. Kundur and R. Kwong, "Analysis and Design of Secure Watermarking-Based Authentication Systems," *IEEE Transactions on Information Forensics and Security*, vol. 1, no. 1, pp. 43-55, March 2006.

W. Luh* and D. Kundur, "New Paradigms for Effective Multicasting and Fingerprinting of Entertainment Media," *IEEE Communications Magazine*, vol. 43, no. 6, pp. 77-84, June 2005.

K. Su*, D. Kundur and D. Hatzinakos, "Statistical Invisibility in Collusion-resistant Digital Video Watermarking," *IEEE Transactions on Multimedia*, vol. 7, no. 1, pp 43-51, February 2005.

K. Su*, D. Kundur and D. Hatzinakos, "Spatially Localized Image-dependent Watermarking for Statistical Invisibility and Collusion Resistance," *IEEE Transactions on Multimedia*, vol. 7, no. 1, pp 52-66, February 2005.

P. Campisi, D. Kundur and A. Neri, "Robust Digital Watermarking in the Ridgelet Domain," *IEEE Signal Processing Letters*, vol. 11, no. 10, pp. 826-830, October 2004.

D. Kundur, C.-Y. Lin, B. Macq, and H.-H. Yu " Enabling Security Technologies for Digital Rights Management," Pro*ceedings of the IEEE Special Issue on Enabling Security Technologies for Digital Rights Management*, vol. 92, no. 6, pp. 879-882, June 2004.

D. Kundur and K. Karthik*, "Video Fingerprinting and Encryption Principles for Digital Rights Management," *Proceedings of the IEEE Special Issue on Enabling Security Technologies for Digital Rights Management*, vol. 92, no. 6, pp. 918-932, June 2004.

R. Akalu and D. Kundur, "DRM and the Courts: Lessons Learned from the Failure of CSS," *IEEE Signal Processing Magazine*, vol. 21, no. 2, pp. 109-117, March 2004.

Y. Zhao*, P. Campisi, and D. Kundur, "Dual Domain Watermarking for Authentication and Compression of Cultural Heritage Images," *IEEE Transactions on Image Processing*, vol. 13, no. 3, pp. 430-448, March 2004.

C. Fei*, D. Kundur and R. Kwong, "Analysis and Design of Watermarking Algorithms for Improved Resistance to Compression," *IEEE Transactions on Image Processing*, vol. 13, no. 2, pp. 126-144, February 2004.

D. Kundur and D. Hatzinakos, "Towards Robust Logo Watermarking using Multiresolution Image Fusion Principles," *IEEE Transactions on Multimedia*, vol. 6, no. 2, pp. 185-198, February 2004.

N. Mathai*, D. Kundur and A. Sheikholeslami, "Hardware Implementation Perspectives of Digital Video Watermarking Algorithms," *IEEE Transactions on Signal Processing*, vol. 51, no. 4, pp. 925- 938, April 2003.

Selective Conferences with High Visibility

Other Scholarly Activities

Grants

Term/Year	Course Number	Course Title	Semester Hours	Class Size

Percentage of time devoted to scholarly and/or research activities: 40%

Please give a brief description of your major research and scholarly activities:

Teresa Leyk, Senior Lecturer, Non-Tenure, Non-Tenure-Track

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Lecturer, Non-Tenure-track, 1997

Promoted, Senior Lecturer, Non-Tenure-track, September 2003

Degree	Field	Institution	Year
PhD	Mathematics	Australian National University, Australia	1998
MS	Computer Science	University of Warsaw, Poland	1992

Conferences, Workshops, and Professional Development (Last Five Years)

Collected course material for ABET for the Fall semester.
Conducted pre- and post-tests for CSCE 221 and provided a statistical summary.
Was responsible for the Peer Teaching (PT) program during the Spring, Summer and Fall semesters.
Assigned PTs to classes and oversaw their activities and payroll related matters during the academic year.
Administrated the PT's end-of-semester surveys and provided their statistical summary.

Other Related Experience

Warsaw Poland

Mathematics Teacher, 1983-1989
Programmer, 1979-1983

Consulting- None

Department Committee Service 2009-2010
• **Undergraduate Curriculum & ABET Committee**
• **Undergraduate Recruiting Committee**

Department Committee Service 2005-2009
• **Undergraduate Curriculum & ABET Committee, 2005-2009**
• **Undergraduate Recruiting Committee, 2005-2009**

Principal Publications

None

Other Scholarly Activities

During 2009, she collaborated and provided guidance to seven Teaching Assistants (CSCE 221 – Hui Lou (09a,b,c), Thomas George (09a), Kia-Ha Fan (09c), Jung-Han Kim (09c); ENGR 112 – (09a) Joseph Lee, Aryan Mandala, Hui-Fang Yang) and to eight peer teachers for my courses (Brad Twit, Kourtney Kebodeaux, Corbin Atkinson, Michael Chenault, John Kossa, Jessica McMillan, Chad Sprat, and Travis Kosarek). Weekly meetings and discussions related to the courses were very beneficial for everyone. The peer teachers involved in courses were very enthusiastic and always ready to learn more about the subject themselves in order to help others.

During Spring, Summer and Fall semesters, Dr. Leyk was responsible for the Peer Teacher (PT) program. Her responsibilities in this program included:
– Assigned 27 PTs (15 in Spring and 12 in Fall) for all participating CSCE courses including ENGR 112 and MATH 151 (that is, 9 courses in Spring and 20 courses in Fall). Around one thousand Computer Science students had opportunity to seek help from the PTs (442 in Spring and 536 in Fall)
– Administrated two surveys about the PT program.
◦ 370 students completed survey at the end of the Spring semester answering questions about their comfort level when asking questions to the instructors, teaching assistants, and peer teachers for assistance in a case when a topic in class was not understood well by them.

Overall, students were most comfortable to ask peer teachers for assistance, followed by teaching assistants. Comparing with the Fall 2008 survey more students asked questions and were more satisfied with PTs assistance mainly because they got better grades and this had a positive impact on moving forward in their degree program.

◦ At the beginning of the Fall semester, Dr. Leyk assigned 12 PTs to 10 freshman and sophomore CSCE (including ENGR 112 and Math 151) courses. At the end of the fall semester, the students were asked to take an online survey to evaluate performance of their peer teachers and to share any thoughts about the PT program. The survey was completed by 236 students and majority of them asked their peer teacher questions on regular basis and their questions were answered well most of the time.
– Kept the PT web page on CSNet updated (see pt.cse.tamu.edu).
◦ It displays PTs courses and sections assigned along with PTs pictures, their office hours and contact information for each semester.

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Fall 2009	CSCE 206	Structured Programming in C	4.0	130
Fall 2009	CSCE 221	Data Structures and Algorithms	4.0	73
Summer 2009	CPSC 221	Data Structures and Algorithms	4.0	13
Spring 2009	CPSC 221	Data Structures and Algorithms	4.0	113
Fall 2008	CPSC 221	Data Structures and Algorithms	4.0	78
Fall 2008	CPSC 311	Analysis of Algorithms	3.0	17
Summer 2008	CPSC 311	Analysis of Algorithms	3.0	5
Spring 2008	CPSC 211	Data Structures and Implementations	4.0	29
Spring 2008	CPSC 221	Data Structures and Algorithms	4.0	51
Spring 2008	CPSC 311	Analysis of Algorithms	3.0	41
Fall 2007	CPSC 211	Data Structures and Implementations	4.0	45
Fall 2007	CPSC 221	Data Structures and Algorithms	4.0	40
Fall 2007	CPSC 311	Analysis of Algorithms	3.0	68
Summer 2007	CPSC 211	Data Structures and Implementations	4.0	10
Summer 2007	CPSC 311	Analysis of Algorithms	3.0	16
Fall 2006	CPSC 211	Data Structures and Implementations	4.0	64
Fall 2006	CPSC 311	Analysis of Algorithms	3.0	56
Summer 2006	CPSC 211	Data Structures and Implementations	4.0	13
Summer 2006	CPSC 311	Analysis of Algorithms	3.0	14
Spring 2006	CPSC 211	Data Structures and Implementations	4.0	103
Spring 2006	CPSC 311	Analysis of Algorithms	3.0	51
Fall 2005	CPSC 211	Data Structures and Implementations	4.0	73
Fall 2005	CPSC 311	Analysis of Algorithms	3.0	77
Summer 2005	CPSC 211	Data Structures and Implementations	4.0	19
Summer 2005	CPSC 311	Analysis of Algorithms	3.0	20
Spring 2005	CPSC 211	Data Structures and Implementations	4.0	108
Spring 2005	CPSC 311	Analysis of Algorithms	3.0	56

Percentage of time devoted to scholarly and/or research activities: <u>100%</u>

Please give a brief description of your major research and scholarly activities: See Other Scholarly Activities above.

Peng Li, Professor

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, 2004

Degree	Field	Institution	Date
Ph.D.	ECE	Carnegie Mellon University, Pittsburgh	12/2003
M.E.	Systems Engineering	Xi'an Jiaotong Univeristy, Xi'an, China	07/1997
B.E.	Information Engineering	Xi'an Jiaotong Univeristy, Xi'an, China	07/1994

Conferences, Workshops, and Professional Development (Last Five Years)

Other Related Computing Experience

None

Consulting

Gradient Design Automation

Departmental Committee Service 2009-2010	College of Engineering Committee Service 2009-2010

Committee Service 2005-2009

Departmental Committee Service 2005-2009	College of Engineering Committee Service 2005-2009
• Associate Editor, IEEE Transactions on Circuits and Systems II (TCAS2). • Technical Program Committee (TPC) member, IEEE/ACM Intl. Conf. on Computer Aided Design (ICCAD) , 2006, 2007, 2008. • Technical Program Committee (TPC) member, ACM/IEEE Workshop on Timing Issues in the Specification and Synthesis of Digital Systems (TAU), 2007, 2008. • Technical Program Committee (TPC) member, IEEE Intl. Symp. On Quality Electronic Design (ISQED), 2007, 2008. • Review Committee Member (RCM), IEEE Intl. Symp. on Circuits & Systems (ISCAS) 2005, 2006, 2007, 2008. • Committee Member, Ph.D. Forum, IEEE/ACM Design Automation Conference (DAC) 2005, 2006, 2007, 2008. • Selection Committee for the ACM Outstanding Ph.D. Dissertation Award in Electronic Design Automation, 2006.	•

Principle Publications *Indicates student author

Refereed Journals

Zhuo Feng and Peng Li, "Performance-Oriented Parameter Dimension Reduction of VLSI Circuits," in IEEE Trans. on Very Large Scale Integration Systems to appear.

Peng Li, Zhuo Feng and Emrah Acar, "Characterizing multi-stage nonlinear drivers and variability for accurate timing and noise analysis," in IEEE Trans. on Very Large Scale Integration Systems, vol. 15, no. 11, pp. 1205-1214, November. 2007.

Wei Dong and Peng Li, "Hierarchical harmonic balance methods for frequency-domain analog circuits analysis," in IEEE Trans. on Computer-Aided Design of Integrated Circuits and Systems, vol. 26, no. 12, pp. 2089-2101, December. 2007.

Guo Yu and Peng Li, "Efficient lookup table based modeling for robust design of Sigma-Delta ADCs," in IEEE Trans. on Circuits and Systems I: Fundamental Theory and Applications, vol. 54, no. 7, pp. 1513-1528, July 2007.

Shiyan Hu, Qiuyang Li, Jiang Hu and Peng Li, "Utilizing redundancy for timing critical interconnect," in IEEE Trans. on Very Large Scale Integration Systems, vol. 15, no. 10, pp. 1067-1080, October 2007.

Xiaoji Ye, Frank Liu, and Peng Li, "Fast variational interconnect delay and slew computation using quadratic models," in IEEE Trans. on Very Large Scale Integration Systems, vol. 15, no. 8, pp. 913-926, August 2007.

Refereed Conference Publications

Highly Selective Conferences

Xiaoji Ye, Wei Dong and Peng Li, "A multi-algorithm approach to parallel circuit simulation", in Proc. of ACM/IEEE Int. Workshop on Timing Issues in the Specification and Synthesis of Digital Systems, February 2008.

Ivick Guerra-Gomez, Esteban Tlelo-Cuautle, Peng Li, and Georges Gielen, "Simulation-based optimization of UGCs performances", in Proc. of the 7th International Caribbean Conference on Devices, Circuits and Systems, April 2008.

Rajesh Garg, Peng Li and Sunil P. Khatri "Modeling dynamic stability of SRAMs in the presence of single event upsets (SEUs)", in Proc. of IEEE Int. Symp. on Circuits and Systems, May 2008.

Guo Yu and Peng Li, "A methodology for systematic built-in self-test of phase-locked loops targeting at parametric failures," in Proc. of IEEE Int. Test Conference, October 2007.

Garng M. Huang, Wei Dong, Yenpo Ho, and Peng Li, "Tracing SRAM separatrix for dynamic noise margin analysis under device mismatch," in Proc. of IEEE Int. Behavioral Modeling and Simulation Conf., pp. 6-10, September 2007.

Wei Dong, Peng Li and Xiaoji Ye, "Efficient frequency-domain simulation of massive clock meshes using parallel harmonic balance," in Proc. of IEEE Custom Integrated Circuits Conference, pp. 631-634, September 2007 (acceptance rate 48.2%).

Zhuo Feng and Peng Li, "Performance-oriented statistical parameter reduction of parameterized systems via reduced rank regression", in Proc. of IEEE/ACM Int. Conf. on Computer-Aided Design, pp. 868-875, November 2006 (acceptance rate 25.1%) (**Best paper award nomination**).

Peng Li and Lawrence Pileggi, "Efficient harmonic balance simulation using multi-level frequency decomposition," in Proc. IEEE/ACM Int. Conf. on Computer-Aided Design (ICCAD), pp. 677-682, November 2004 (acceptance rate 24.4%), (**Best paper award nomination**).

Selective Conferences with High Visibility

Other Scholarly Activities

Grants

Term/Year	Course Number	Course Title	Semester Hours	Class Size

Percentage of time devoted to scholarly and/or research activities:

Please give a brief description of your major research and scholarly activities:

Jhy-Charn (Steve) Liu, Professor, Tenured

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, Tenure-track, 1989

Promoted, Associate Professor with Tenure, 1995; Promoted, Professor, 2008

Degree	Field	Institution	Year
PhD	Electrical and Computer Engineering	University of Michigan	1989
MS	Electrical Engineering	The National Cheng Kung University	1981
BS	Electrical Engineering	The National Cheng Kung University	1979

Conferences, Workshops, and Professional Development (Last Five Years)

Program Committee Member

The Design, Automation, and Test in Europe (DATE) Conference 2008

The 2008 International Conference on Embedded and Ubiquitous Computing (EUC), 2008

First International Workshop on Cyber-Physical Systems (in conjunction with IEEE International Conference on Distributed Computing Systems (ICDCS), 2008

11th International Conference on Principles of Distributed Systems

Workshop on IEEE High Confidence Medical Device, Software and Systems, 2007

11th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications, 2005

General Co-Chair

13th IEEE Real-time and Embedded Technology and Applications Symposium, 2007

Program Co-Chair

12th IEEE Real-time and Embedded Technology and Applications Symposium, 2006

Track Co-Chair

IEEE Real-time Systems Symposium, Hardware-software Co-design, 2007

Editor of Journal of Systems Architecture (JSA - Embedded Software Design), ***Elsevier, 2007-present***

Guest Editor, special issue on sensor systems, ***Journal of Microprocessors and Microsystems, Elsevier, submission due Apr.*** *2006*

Editor of the ***Journal of Microprocessors and Microsystems, June 2005 (3 years), Elsevier***

Other Related Experience

Siantek Company, Taiwan

Engineer, 1983

Consulting- None

Department Committee Service 2009-2010	University Committee Service 2009-2010
• **Computer Engineering Curriculum Coordination Committee** • **Computing Services Advisory Committee, Chair**	• Consortium for the Center on Information Assurance & Security

Department Committee Service 2005-2009
• **Computer Engineering Curriculum Coordination Committee, 2005-2009** • **Computing Services Advisory Committee, Member, 2005-2006, 2008-2009; Chair, 2006-2008** • **Graduate Admissions Committee, 2006-2008**
College of Engineering Committee Service 2005-2009
• **Systems Engineering Specialty Professors Advisory Group, 2005-2007**
University Committee Service 2005-2009
• **Consortium for the Center on Information Assurance & Security, 2006-2009**

Principle Publications *Indicates student author

Refereed Journals

G. Pok, **Jyh-Charn Liu**, Keun Ho Ryu. "Effective Feature Selection Framework for Cluster Analysis of Microarray Data," *Bioinformation* 4(8) 385-389, 2010.

Yueping Zhang, Yong Xiong, **Steve Liu**, Dmitri Loguinov. "Queuing Dynamics and Single-Link Stability of Delay-Based Window Congestion Control," *Journal of Computer Networks*, Elsevier, COMPNW 4129, 20 November, 2009.

J-J. Hu, T.W. Fossum, M.W. Miller, H. Xu*, **S. Liu**, J.D. Humphrey. "Biomechanics of the Porcine Basilar Artery in Hypertension," *Annals of Biomedical Engineering,* Vol. 35, No. 1, pp. 19-29(11), Jan. 2007.

D. Wu*, M. Zhang*, **J.C. Liu**, and W. Bauman. "On the Adaptive Detection of Blood Vessels in Retinal Images," *IEEE Transactions on Biomedical Engineering,* pp. 341-343, Vol. 53, No.2, Feb. 2006.

Weimin Zhang*, Avery L. McIntosh, Hai Xu*, Di Wu*, Todd Gruninger*, Barbara Atshaves, J. C. **Steve Liu** and Friedhelm Schroeder. "Structural Analysis of Sterol Distributions in the Plasma Membrane of Living Cells," *Biochemistry*, 44(8): pp. 2864-84, Mar. 2005.

Refereed Conference Publications

Highly Selective Conferences

Shi Pu, Cheng-Chung Tan and **Jyh-Charn Liu**. "SA2PX: A Tool to Translate SpamAssassin Regular Expression Rules to POSIX," *6th Conference on Email and Anti-Spam*, 2009. (30% Acceptance Rate)

Hong Lu, Andrew Jiang, **Steve Liu**. "Locality Sensitive Information Brokerage in Distributed Sensor Networks," *28th International Conference on Distributed Computing Systems*, June, 2008 (16% Acceptance Rate)

Jian Jia Wu*, **Jyh-Charn Liu**, Wei Zhao. "Utilization-Bound Based Schedulability Analysis of Weighted Round Robin Schedulers," *IEEE Real-Time Systems Symposium (RTSS),* Dec, 2007. (Best Student Paper Award, 25% Acceptance Rate)

Highly Visible Conferences

Gouchol Park, **Jyh-Charn Liu**, Keun Ho Ryu. "Effective Feature Selection Framework for Cluster Analysis of Microarray Data," ***International Conference on Bioinformatics (InCoB), Singapore, 2009.***

Ming Zhang, **Jyh-Charn Liu**. "Directional Local Contrast Based Blood Vessel Detection in Retinal Images," *IEEE International Conference on Image Processing*, June, 2007.

Hong Lu, **Steve Liu**, Anxiao(Andrew) Jiang. "A Cross-layer Design for End-to-End on-Demand Bandwidth Allocation in Infrastructure Wireless Mesh Networks," *International Conference on Wireless Algorithms, Systems and Applications*, Chicago, 2007. (45% Acceptance Rate)

Hong Lu*, **Steve Liu**, "Upper-bounding End-to-End Throughput for Multihop Wireless Mesh Networks," *The First International Conference on Wireless Algorithms, Systems and Applications*, pp. 676-687, Aug. 2006. (39% Acceptance Rate)

Book Chapters

A. McIntosh, B. Atshaves, H. Huang, A. M. Gallegos, A. Kier, F. Schroeder, H. Xu*, W. Zhang, S. Wang and **S. Liu**. "Multiphoton Laser Scanning Microscopy and Spatial Analysis of Dehydroergosterol Distributions on Plasma Membrane of Living Cells Lipid Rafts," *Methods in Molecular Biology*, published by Humana, edited by Tom McIntosh, June 2006, (invited)

F. Schroeder, B. Atshaves, A. Gallegos, A. McIntosh, **J.C. Liu**, A. Kier, H. Huang, J. Ball, "Caveolae Organization and Role in Lipid Cholesterol Metabolism," *Advances in Molecular and Cell Biology*, 36, (Caveolae and lipid rafts: roles in signal transduction and the pathogenesis of human diseases,) pp. 3-36, edited by M. Lisanti and P. Frank, Elsevier, 2005.

Other Scholarly Activities

Grants

Gift grant from Trend Technology, **$30,000**, Sep. 2009

"Parallel XML Document Parsing with Multi-Core Processors," CISCO University Research Program, $**90,000** Apr. 2008-March 2009,

"Instrument support for progressive email classifier," Department of Defense-ARO DURIP program, $**91,000**, Apr. 2008-Apr. 2010,

"CSR-CPS: Smart Sticks," National Science Foundation, **Jyh-Charn Liu (PI),** $**90,000**, Sep. 2007-Aug. 2010

"Progressive Email Classifer (PEC) for Ingress Enterprise Network Traffic Analysis," ARO, **Jyh-Charn Liu (PI)**, $**550,000**, Apr. 2007- Apr.2010

"The next generation of embedded computing systems: Tools, Architectures, and Opportunities," Microsoft Research, **Jyh-Charn Liu (PI),** $**390,000** Dec. 2005-Dec. 2010

"Computer Assisted Diabetic Retinopathy Photo screening for Underserved Populations In Texas," Texas Department of State Health Services, Josie Williams (medical PI), **Jyh-Charn Liu (technology PI)**, ($**300,000/$1,000,000**), July 2005-Dec 2009, Note: the project phase I was completed in two years, and the phase II will be started Sep. 2007 for two years. The total funding commitment remains the same.

"13th IEEE Real-Time and Embedded Technology and Applications Symposium and Workshops," National Science Foundation, **Jyh-Charn Liu (PI)**, $**28,000**, Sep. 2006

"Cybersecurity Remote Education Access Toolkits (CREAT)," NSF DUE-0516825, **Jyh-Charn Liu (PI),** Steven Smith (Co-PI), $**153,000**, Sep. 1, 2005- Aug. 31, 2008,

"Creating a Diabetic Retina Imaging Lab in Mexico City Center," TAMU-Conacyt Special Project, **Jyh-Charn Liu,** $**50,000,** Sep. 2005- Aug. 2006,

"A Workshop on Next Generation of Real-time and Embedded Computing for Cybersecurity, and Networking," National Science Foundation, **Jyh-Charn Liu**, $**20,000**, Apr. 2006

"SGER: Secure Sharing of Information for Distance Collaboration," National Science Foundation, **Jyh-Charn Liu (PI)**, **$100,000**, Sep.1 2005-Aug. 31 2007

"NSA 2006-2007 IASP Program," National Security Agency, **Jyh-Charn Liu (PI),** $**99,000** Sep. 2006

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Fall 2009	CSCE 462	Microcomputer Systems	3.0	22
Spring 2009	CSCE 462	Microcomputer Systems	3.0	13
Fall 2008	CSCE 462	Microcomputer Systems	3.0	22
Spring 2008	CSCE 462	Microcomputer Systems	3.0	13
Fall 2007	CSCE 462	Microcomputer Systems	3.0	21
Spring 2007	CSCE 462	Microcomputer Systems	3.0	17
Fall 2006	CSCE 462	Microcomputer Systems	3.0	37
Spring 2006	CSCE 462	Microcomputer Systems	3.0	7
Fall 2005	CSCE 462	Microcomputer Systems	3.0	15
Spring 2005	CSCE 462	Microcomputer Systems	3.0	19

Percentage of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities:
Dr. Liu's research interests include: Real-time Distributed Computing Systems, Network Performance and Security, Medical Informatics, and Intelligent Transportation Systems (ITS).

William Lively, Professor, Tenured

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, Tenure-track, 1972

Promoted, Associate Professor, Tenured, 1977; Promoted, Professor, 1992

Degree	Field	Institution	Year
PhD	Computer Science and Electrical Engineering	Southern Methodist University	1971
MS	Electrical Engineering	Southern Methodist University	1967
BS	Biology	Southern Methodist University	1962

Conferences, Workshops, and Professional Development (Last Five Years)

Member, IEEE Standards Group on software Engineering, 2008

Co-Founder of the Institute for Software Engineers-ISE; member Executive Board, Treasurer-Secretary, 2006-2007

Work on PE (Professional Engineer) examinations for Software Engineers, 2006

Member of IEEE Standards Balloting Committee, 1999-2007 in Architecture and Software Engineering

Senior Member (awarded Life Senior Member, January 2007), 40 Years of membership

Co-Chair

SSi Hub Workshop, gave presentation entitled, "Web Engineering Courses," University of Texas@ Dallas, TX, 8/2007; gave presentation entitled, "SSiP and Distance Learning," University of Houston@ Clearlake, TX, 10/2006; gave presentation entitled, "SSiP and Distance Learning," 3/2006; Texas A&M University, 8/2005

Other Related Computing Experience

Advanced Scientific Computer (ASC)

Member, Technical Staff, 1971-72

Texas Instruments, Inc.

Design Engineer, Government Equipment Group, 1967-68

Consulting

General Electric Healthcare, 2006-present

Fulbright and Jaworski, 2007

Hastings Law Firm, 2008

Ed Bell Group, South Carolina, 2008

Department Committee Service 2009-2010
• **Computing Services Advisory Committee, Member**

Department Committee Service 2005-2009	College of Engineering Committee Service 2005-2010
• **Web Advisory Committee, 2005-2007** • **Communications Committee, 2007-2008** • **Computing Services Advisory Committee, Chair, 2008-2009**	• ABET Coordinator Computer Science Program, 2005

Principle Publications

Refereed Journals

Wang, Y., **Lively, W.M.,** and D.B. Simmons. "Web Traffic Characteristics and Failure Prediction Model Selection," *Special Issue of Journal of Computational Methods in Science and Engineering*, 2009.

Wang, Y., **Lively, W.M.,** and D.B. Simmons. "Software Security Analysis and Assessment for Web-based Applications," *Special Issue of Journal of Computational Methods in Science and Engineering,* 2009.

Kim, Sang Eun, **Lively, William**, and Dick Simmons. "An Effort Estimation by UML Points in Early Stage of Software Development," *International Conference on Software Engineering Research and Practice*, June 26-29, 2006, Las Vegas, USA. Academic Co-Sponsors: The Massachusetts Institute of Technology's (MIT) Media Lab and Texas advanced Computer Center of University of Texas at Austin.

Refereed Conference Publications

Highly Visible Conferences

Wang, Y., **Lively, W.M.,** and D.B. Simmons. "Software Security Analysis and Assessment for Web-Based Applications," *17th International Conference of Software Engineering and Data Engineering*, Los Angeles, USA, 2008.

Wang, Y., Lively, W.M., and D.B. Simmons. "Web Traffic Characteristics and Failure Prediction Model Selection," *17th International Conference on software Engineering and Data Engineering*, Los Angeles, USA, 2008.

Book Chapters

Simmons, D.B., Nelson, Chris, Urban, Joe and **William Lively**. "Rapid Insertion of Leading Edge Industrial Strength Software into University Classrooms," Handbook of Research on Open Source Software: Technological, Economic, and Social Perspectives, 2006.

Other Scholarly Activities

Grants

"Shared Software Infrastructure (SSI) Hub," IBM. **Co-Principal Investigators** – D. B. Simmons and **W. M. Lively**, **$173.000** (split equally between Simmons and Lively), 1/2007 – 12/2007.

"Shared Software Infrastructure (SSI) Hub," IBM, Intel and AvNet, **Co-Principal Investigators** – D. B. Simmons and **W. M. Lively**, $353,000 (split equally between Simmons and Lively), 1/2006-12/2006.

"Shared Software Infrastructure (SSI) Hub," IBM, **Co-Principal Investigators** – D. B. Simmons and **W. M. Lively**, $200,000 (split equally between Simmons and Lively), 12/2004 – 12/2005.

Term/Year	Course Number	Course Title	Semester Hour	Class Size
Fall 2009	CSCE 606	Software Engineering	3.0	55
Fall 2009	CSCE 431	Software Engineering	3.0	40
Summer 2009	CSCE 606	Software Engineering	3.0	13
Spring 2009	CSCE 431	Software Engineering	3.0	48
Fall 2008	CSCE 606	Software Engineering	3.0	25
Fall 2008	CSCE 431	Software Engineering	3.0	33
Summer 2008	CSCE 606	Software Engineering	3.0	9
Spring 2008	CSCE 431	Software Engineering	3.0	31
Spring 2008	CSCE 431	Software Engineering	3.0	21
Fall 2007	CSCE 606	Software Engineering	3.0	25
Fall 2007	CSCE 431	Software Engineering	3.0	33
Summer 2007	CSCE 606	Software Engineering	3.0	9
Spring 2007	CSCE 431	Software Engineering	3.0	21
Spring 2007	CSCE 431	Software Engineering	3.0	31
Fall 2006	CSCE 431	Software Engineering	3.0	14
Summer 2006	CSCE 431	Software Engineering	3.0	5
Spring 2006	CSCE 431	Software Engineering	3.0	25
Spring 2006	CSCE 606	Software Engineering	3.0	12

Percentage Fall 2007of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities:
Dr. Lively's research interests include: Software Engineering, AI/KB Software Engineering, and Computer-human Interaction.

Dmitri Loguinov, Associate Professor, Tenured

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, Tenure-track, September 2002
Promoted, Associate Professor, Tenured, 2007

Degree	Field	Institution	Year
PhD	Computer Science	City University of New York	2002
BS	Computer Science	Moscow State University, Russia	1995

Conferences, Workshops, and Professional Development (Last Five Years)

Technical Program Committee Member

International World Wide Web Conference, (WWW), Raleigh, NC, 2010
IEEE BroadNets, Madrid, Spain, 2009; London, England, 2008
ACM International Network and Operating Systems Support for Digital Audio and Video, (NOSSDAV), Braunschweig, Germany 2008
IEEE INFOCOM, Conference on Computer Communications, Barcelona, Catalunya, Spain, 2006; Miami, FL, 2005
IEEE International Conference on Image Processing, (ICIP), Genoa, Italy, 2005

Other Related Experience

Michigan State University
Research Assistant, 1/2002-8/2002
City University of New York
Research Assistant, 9/1998-12/2001
Teaching Assistant, 9/1996-8/1998
Kansas State University
Teaching Assistant, 9/1995-6/1996

Consulting- None

Department Committee Service 2009-2010
• Graduate Advisory Committee

Department Committee Service 2005-2009
• Undergraduate Curriculum & ABET Committee, 2005-2007
• Graduate Admissions Committee, 2007-2009
• Graduate Advisory Committee, 2007-2009

Principle Publications *Indicates student author

Refereed Journals

Dai M.*, Zhang Y.*, and **Loguinov, D.** “A Unified Traffic Model for MPEG-4 and H.264 Video Traces,” *IEEE Transactions on Multimedia*, vol. 11, no. 5, pp. 1010-1023, Aug. 2009.
Lee H.-T.*, Leonard D.*, Wang X.*, and **Loguinov D.** “IRLbot: Scaling to 6 Billion Pages and Beyond,” *ACM Transactions on the Web*, vol. 3, no. 3, pp. 1-33, Jun. 2009.
Zhang Y.* and **Loguinov D.** “Local and Global Stability of Delayed Congestion Control Systems,” *IEEE Transactions on Automatic Control*, vol. 53, no. 10, pp. 2356-2360, Nov. 2008.
Zhang Y.*, Leonard D.*, and **Loguinov D.** “JetMax: Scalable Max-Min Congestion Control for High-Speed Heterogeneous Networks,” *Elsevier Computer Networks*, vol. 52, no. 6, pp. 1193-1219, Apr. 2008.
Zhang Y.*, Kang S.-R.*, and **Loguinov D. “**Delay-Independent Stability and Performance of Distributed Congestion Control,” *IEEE/ACM Transactions on Networking*, vol. 15, no. 4, pp. 838-851, Aug. 2007.

Wang, X.* and **Loguinov, D**. "Load-Balancing Performance of Consistent Hashing: Asymptotic Analysis of Random Node Join," *IEEE/ACM Transactions on Networking*, vol. 15, no. 4, pp. 892-905, Aug. 2007.
Dai, M.* and **Loguinov, D.** "Rate-Distortion Analysis and Quality Control in Scalable Internet Streaming," *IEEE Transactions on Multimedia*, vol. 8, no. 6, pp. 1135-1146, Dec. 2006.
Liu X.*, Ravindran K., and **Loguinov D.** "Towards a Generalized Stochastic Model of End-to-End Packet-Pair Sampling," *IEEE Journal on Selected Areas in Communications* (Special Issue on Sampling the Internet), vol. 24, no. 12, pp. 2249-2262, Dec. 2006.
Loguinov D., Casas J.*, and Wang X.*. "Graph-Theoretic Analysis of Structured Peer-to-Peer Systems: Routing Distances and Fault Resilience," *IEEE/ACM Transactions on Networking*, vol. 13, no. 5, pp. 1107-1120, Oct. 2005.
Refereed Conference Publications
Highly Selective Conferences
Smith M.* and **Loguinov D.** "Enabling High-Performance Internet-Wide Measurements on Windows," *PAM,* 10 pages, Apr. 2010 (29.1%).
Reddy C.*, Leonard D.*, and **Loguinov D.** "Optimizing Capacity-Heterogeneous Unstructured P2P Networks for Random-Walk Traffic," *IEEE P2P*, pp. 41-50, Sep. 2009 (19.8%) **(best paper award)**.
Lee H.-T.*, Leonard D.*, Wang X.*, and **Loguinov D.** "IRLbot: Scaling to 6 Billion Pages and Beyond," *WWW*, pp. 427-436, Apr. 2008 (11%) **(best paper award)**.
Bhandarkar S., Reddy A.L.N., Zhang Y.*, and **Loguinov D.** "Emulating AQM from End Hosts," *ACM SIGCOMM*, pp. 349-360, Aug. 2007 (13.6%).
Yao Z.*, Wang X.*, Leonard D.*, and **Loguinov D.** "On Node Isolation under Churn in Unstructured P2P Networks with Heavy-Tailed Lifetimes," *IEEE INFOCOM*, pp. 2126-2134, May 2007 (18%).
Yao Z.*, Leonard D.*, Wang X.*, and **Loguinov D.** "Modeling Heterogeneous User Churn and Local Resilience of Unstructured P2P Networks," *IEEE ICNP*, pp. 32-41, Nov. 2006 (14.2%).
Leonard D.*, Yao Z.*, Wang, X.*, and **Loguinov D.** "On Static and Dynamic Partitioning Behavior of Large-Scale Networks," *IEEE ICNP*, pp. 345-357, Nov. 2005 (17%).
Leonard D.*, Rai V.*, and **Loguinov D.** "On Lifetime-Based Node Failure and Resilience of Decentralized Peer-to-Peer Networks," *ACM SIGMETRICS*, pp. 26-37, June 2005 (13.1%) **(nominated for the best student paper)**.
Liu X.*, Ravindran K., and **Loguinov D.,** "What Signals Do Packet-pair Dispersions Carry?" *IEEE INFOCOM*, pp. 281-292, Mar. 2005 (17.2%).
Dai M.* and **Loguinov D.,** "Analysis and Modeling of H.26L and MPEG-4 Multi-Layer Video Traffic," *IEEE INFOCOM*, pp. 2257-2267, Mar. 2005 (17.2%).
Selective Conferences with High Visibility
Zhang Y.* and **Loguinov D.,** "ABS: Adaptive Buffer Sizing for Heterogeneous Networks," *IEEE IWQoS*, pp. 90-99, Jun. 2008 (36%).
Jain S.*, Zhang Y.*, and **Loguinov D.,** "Towards Experimental Evaluation of Explicit Congestion Control," *IEEE IWQoS*, pp. 121-130, Jun. 2008 (36%).
Khayam S.A., Radha H., and **Loguinov D.,** "Worm Detection at Network Endpoints Using Information-Theoretic Traffic Perturbations," *IEEE ICC*, pp. 1561-1565, May 2008 (36%).
Kang S.-R.* and **Loguinov D.,** "IMR-Pathload: Robust Available Bandwidth Estimation under End-Host Interrupt Delay," *PAM*, pp. 172-181, Apr. 2008 (32%).
Kang S.-R.* and **Loguinov D.,** "Impact of FEC Overhead on Scalable Video Streaming," *ACM NOSSDAV*, pp. 123-128, Jun. 2005 (38%).
Dai M.*, **Loguinov D.,** and Radha H., "Rate-Distortion Modeling of Scalable Video Coders," *IEEE ICIP*, pp. 1093-1096, Sep. 2004 (46%).
Dai M.*, **Loguinov D.,** and Radha H., "Statistical Analysis and Distortion Modeling of MPEG-4 FGS," *IEEE ICIP*, pp. 301-304, Sep. 2003 (44%).
Loguinov D. and Radha H., "Open-loop Rate Control for Real-time Video Streaming: Analysis of Binomial Algorithms," *IEEE ICIP*, pp. 193-196, Sep. 2002 (55%).

Loguinov D. and Radha H., "Effects of Channel Delays on Underflow Events of Compressed Video Over the Internet," *IEEE ICIP*, pp. 205-208, Sep. 2002 (55%).
Ravindran K. and **Loguinov D.,** "Incorporation of Flow and QoS Control in Multicast Routing Architectures," *IEEE ICCCN*, pp. 312-320, Oct. 1998 (41%).

Other Scholarly Activities
Grants
"Bridging Analytical and Empirical Understanding of Churn in Decentralized P2P Networks," National Science Foundation, **PI: D. Loguinov**, **$318,990**, 2007-2010.
REU Supplement for "Bridging Analytical and Empirical Understanding of Churn in Decentralized P2P Networks," National Science Foundation, **PI: D. Loguinov**, **$12,000**, 2007-2010.
"Distributed Congestion Control for Heterogeneous Networks," National Science Foundation, **PI: D. Loguinov**, **$300,000**, 2005-2008.
"Topology Models for Decentralized Random Graphs," National Science Foundation, **PI: D. Loguinov**, **$335,541**, 2004-2007.
"ITR: Efficient Self-Organizing Content Distribution Network for Scalable Video Streaming Services," National Science Foundation, **PI: D. Loguinov**, **$274,999**, 2003-2006.
REU Supplement for *"ITR: Efficient Self-Organizing Content Distribution Network for Scalable Video Streaming Services,"* National Science Foundation, **PI: D. Loguinov**, **$6,000**, 2003-2006.
"Optimal-Diameter Routing and Error Resilience in Peer-to-Peer Networks," National Science Foundation, **PI: D. Loguinov**, **$248,283**, 2003-2006.

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Spring 2010	CSCE 463	Networks and Distributed Processing	3.0	12
Spring 2010	CSCE 619	Networks and Distributed Computing	3.0	15
Fall 2009	CSCE 463	Networks and Distributed Processing	3.0	28
Spring 2009	CSCE 463	Networks and Distributed Processing	3.0	11
Spring 2009	CSCE 689	Special Topics in Overlay Networks	3.0	10
Spring 2008	CSCE 619	Networks and Distributed Computing	3.0	5
Spring 2008	CSCE 689	Special Topics in Overlay Networks	3.0	8
Fall 2007	CSCE 463	Networks and Distributed Processing	3.0	25
Fall 2006	CSCE 463	Networks and Distributed Processing	3.0	13
Fall 2006	CSCE 689	Special Topics in Congestion Control	3.0	7
Spring 2006	CSCE 619	Networks and Distributed Computing	3.0	7
Fall 2005	CSCE 463	Networks and Distributed Processing	3.0	25
Fall 2005	CSCE 689	Special Topics in P2P Networks	3.0	11
Spring 2005	CSCE 689	Special Topics in P2P Networks	3.0	11
Spring 2005	CSCE 619	Networks and Distributed Computing	3.0	7

Percentage of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities:
Dr. Loguinov's research interests include: Real-Time Video Streaming, Congestion Control, Overlay Networks, Content Distribution and Caching, Peer-To-Peer Networks, Internet Traffic Measurement, Performance Analysis, and Stochastic Modeling of Networks.

Mi Lu, Professor

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, 1988

Promoted, Professor

Degree	Field	Institution	Date
Ph.D.	ECE	Rice University	1987
M.S.	ECE	Rice University	1984
B.S.	Electrical Engineering	Shanghai Institute of Mechanical Engineering	1981

Conferences, Workshops, and Professional Development (Last Five Years)

None

Other Related Computing Experience

None

Consulting

None

Departmental Committee Service 2009-2010	College of Engineering Committee Service 2009-2010
• Information Policy Committee in the university. • Search Committee for Vice Chancellor and Dean in the university. • Selection Committee for Distinguished Alumni Awards in the university. • Electrical Engineering Tenure and Promotion Committee. • Electrical Engineering Faculty Award Committee.	

Committee Service 2005-2009

Departmental Committee Service 2005-2009	College of Engineering Committee Service 2005-2009
• Associate Editor, Journal of Computing and Information • International Conference on Computer Science and Informatics, 2000-2003 • Program Committee, 7th IASTED-ISMM International Conference, Parallel and Distributed • Book Reviewer, West Educational Publishing. • Proposal Reviewer, National Science Foundation. • Referee: *IEEE Computer, Information Sciences, Algorithmica, The Computer Journal, Information Processing Letters, IEEE Transaction on Computers, Journal of Parallel and Distributed Computing, IEEE Transactions on Parallel and Distributed System, IEEE Transactions on Circuits and Systems*	•

Principle Publications *Indicates student author

Refereed Journals

1. Lu, M., "Arithmetic and Logic in Computer Systems," book, *John Willey & Sons.*
2. Cai, Z and Lu, M., "Distributed and-to-end bandwidth allocation in Ad Hoc networks," International Journal of Telecommunication Systems, Vol. 22, No. 1-4, 2003, pp. 281-297.
3. Cai, Z., Lu, M., and Wang, X., "Channel access based self-organized clustering in Ad Hoc networks," IEEE Transactions on Mobile Computing, Vol. 22, No. 2, pp. 102-113
4. Cai, Z., Lu, M. and Wang, X., "Distributed initialization algorithms for singl-hop Ad Hoc networks with minislotted carrier sensing," IEEE Transactions on Parallel and Distributed Systems, Vol. 14, No. 5, pp. 516-528.
5. Cai, Z., Lu, M. and Georghiades C., "Topology-transparent TDMA broadcast scheduling in multihop packet radio networks," IEEE Transactions on Vehicular Technology, Vol.52, No. 4, pp.970-984.
6. Peng, D. and Lu, M., "On exploring inter-iteration parallelism within rate-balanced multirate multidimensional DSP algorithms," IEEE Transactions on Very Large Scale Integration Systems, Vol. 13, No. 1, pp. 106-125.
7. Zou, L., Lu, M., "A distributed algorithm for the dead end problem of location based routing in sensor networks," IEEE Transactions on Vehicular Technology, Vol. 43, No. 4, pp. 1509-1522.
8. Peng, D. and Lu, M., "Non-RAM based architectural designs of wavelet-based digital systems based on novel nonlinear I/O data space transformations," IEEE Transactions on Very Large Scale Integration Systems, Vol. 13, No. 1, pp. 58-74.
9. He, C., Qin, G. Lu, M., and Zhao, W., "Optimized high-order finite difference wave equations modeling on reconfigurable computing platform," Journal of Microprocessors and Microsystems, Vol. 31, No. 2, pp. 103-115.
10. Zou, L., Cheng, S., Xiong, Z., Lu, M., and Castleman K., "3D face recognition based on warped example faces," IEEE Transactions on Information Forensics and Security, Vol. 2, No. 3, pp. 513-528.

Refereed Conference Publications
Highly Selective Conferences

Selective Conferences with High Visibility

Other Scholarly Activities

Grants

Term/Year	Course Number	Course Title	Semester Hours	Class Size

Percentage of time devoted to scholarly and/or research activities:

Please give a brief description of your major research and scholarly activities:

Rabi Mahapatra, Professor, Tenured

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Visiting Professor, Non-Tenure-track, August 1995; Hired, Senior Lecturer, 1996
Promoted, TEES Associate Research Professor, Non-Tenured, 2000
Hired, Associate Professor, Tenure-track, 2001; Tenured,

Degree	Field	Institution	Year
PhD	Computer Science	Indian Institute of Technology, India	1992
MS	Electrical Engineering	Sambalpur University of India	1983
BS	Computer Science	Sambalpur University of India	1979

Conferences, Workshops, and Professional Development (Last Five Years)

Steering Committee Chair

International Conference on Information Technology, 2004, 2005

Program Committee Member

ACM/IEEE International Symposium on Low Power Electronics and Design, 2009
ACM/IEEE International Conference on CASES 2009
IEEE Great Lake Symposium on VLSI (GLSVLSI) 2009
IEEE/IFIP International Conference on Embedded and Ubiquitous Computing (EUC) 2006, 2009
4th International Workshop on Software Support for Portable Storage (IWSSPS) 2009
International Workshop on Unique Chip and Systems 2006, 2007, 2008, 2009
IEEE Intl Real-Time System Symposium (RTSS) 2008
International Conference on Embedded Software and Systems, 2007
Design Automation Conference (DAC) 2005, 2006, 2007
Intl. Workshop on Software Support for Portable Systems, 2006
IEEE Second Workshop on High Performance, Fault Adaptive, Large Scale Embedded Real-Time Systems (FALSE) 2005, 2006
International Workshop on Embedded Real-Time Systems Implementation (ERTSI) 2004, 2005

Editorial Activities

• Associate Editor, ACM Transactions on Embedded Computing, 2008 – present

• Editorial Board, International Journal on Information and Communication Technology 2006 – present

Other Related Experience

Indian Institute of Technology, Kargpur, India

Lecturer, 1984-1992
Assistant Professor, 1992-1995

Consulting- None

Department Committee Service 2009-2010
• **Graduate Admissions Committee**
• **Undergraduate Student Awards**

Department Committee Service 2005-2009
• **Graduate Admissions Committee, 2005-2009**
• **Undergraduate Curriculum & ABET Committee, 2006-2008**
• **Undergraduate Student Awards Committee, 2008-2009**
College of Engineering Committee Service
• **ABET Coordinator Computer Science Program, 2006-2008**
University Committee Service
• **Faculty Senator, 2008-2009**

Principal Publications *Indicates student author

Refereed Journals

D. Dechev, **R. Mahapatra** and B. Stroustrup, "Practical and Verifiable C++ Dynamic Cast in Autonomous Space Systems,"*Special Issue on Real-time Distributed Computing and Ubiquitous computing in Memory - Intl. Journal of Computing Science and Engineering (JCSE),* December 2008.

Singhal, R*, Gwan Choi, and **Mahapatra, R.N**. "Data Handling Limits of On-Chip Interconnects," *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, Volume 16, Issue 6, June 2008, Page(s):707 - 713

Bhojwani, P.S*, and **Mahapatra, R.N**. "Robust Concurrent Online Testing of Network-on-Chip-Based SoCs ," *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, Volume 16, Issue 9, Sept. 2008 Page(s):1199 - 1209

Subrata Acharya*, and **Rabi N. Mahapatra**. "A Dynamic Slack Management Technique for Real-Time Distributed Embedded Systems," *IEEE Trans. Computers* 57(2): 215-230 (2008).

John Mark Nolen*, and **Rabi N. Mahapatra**. "Time-Division-Multiplexed Test Delivery for NoC Systems," *IEEE Design & Test of Computers* 25(1): 44-51 (2008)

Seraj Ahmad, and **Rabi N. Mahapatra**. "An Efficient Approach to On-Chip Logic Minimization," *IEEE Trans. VLSI Syst.* 15(9): 1040-1050 (2007)

A. Rajaram*, J. Hu, W. Guo, **R. Mahapatra** and B. Lu. "Analytical Bound for Unwanted Clock Skew Due to Wire Width Variation," *IEEE Trans. on CAD of Integrated Circuits and Systems 25(9)*: 1869-1876 (2006).

A. Kumar and **R. Mahapatra**. "An Integrated Scheduling and Buffer Management Scheme for Input Queued Switches with Finite Buffer Space," *Computers and Communication Journal, Elsevier Publications,* Volume 29, Issue 1, 2005, pp. 42-51.

Refereed Conferences

Highly Selective Conferences

Yoonjin Kim* and Rabi N. Mahapatra, "Dynamic Context Management for Low Power Coarse-Grained Reconfigurable Architecture", to appear in the *Proceedings of the 19th IEEE/ACM Great Lake Symposium on VLSI* (GLSVLSI 2009). Boston, Massachusetts. May 2009. (Acceptance 16%)

S. Mandal*, P. Bhojwani*, S. Mohanty, and **R. Mahapatra**, "IntellBatt: Towards smarter battery design," *Proceedings of 45th ACM/IEE Design Automation Conference, (DAC 2008)*, pp.872-877, 8-13. (Acceptance 147/639, 23%)

J. D. Lee, and **R. Mahapatra**, "In-Field NoC-Based SoC Testing with Distributed Test Vector Storage" *Proceedings of IEEE ICCD 2008*, pp.206-211. (Acceptance 34%)

D. Dechev, **R. Mahapatra**, B. Stroustrup, and D. Wagner. "C++ Dynamic Cast in Autonomous Space Systems," *Proceedings of 11th IEEE International Symposium on Object Oriented Real-Time Distributed Computing , pp.499-507*, (ISORC 2008). (Acceptance 35%)

Yoonjin Kim* and **R. Mahapatra**. "Dynamically Compressible Context Architecture for Low Power Coarse-Grained Reconfigurable Array," *IEEE International Conference on Computer Design,* October 2007, (Acceptance rate 21%).

Selective Conferences with High Visibility

P. Bhojwani*, J. D. Lee* and **Rabi Mahapatra**. "SAPP: Scalable and Adaptable Peak Power Management in NoCs," *Proceedings of Intl. Symposium on Low Power Electronic Devices (ISLPED)*, August 2007. (31%)

R. Singhal*, G. Choi, and **R. Mahapatra**, "Information Theoretic Approach to Address Delay and Reliability in Long On-Chip Interconnects," *Proceedings of ACM/IEEE Intl. Conference on Computer-Aided Design* (ICCAD) 2006. (20% Acceptance Rate)

R. Singhal*, G. Choi and **R. Mahapatra**, "Programmable LDPC Decoder Based on the Bubble-Sort Algorithm," *Proceedings of ACM/IEEE International Conference on VLSI Design 2006,* pp.203-208. (27% Acceptance Rate)

Vivek Rai* and **Rabi Mahapatra**, "Lifetime Modeling of a Sensor Network," *Proceedings of the IEEE Intl. Conf. on Design, Automation and Test in Europe* (*DATE) 2005.* (25% Acceptance Rate)

Other Scholarly Activities

Grants

"Exploring Semantic Routed Network for Cyber Infrastructures," National Science Foundation, **PI: Mahapatra**, **$100,000**, Pro-rated **$50,000**, March 2008- February 2010.

"Safety Net Validation for Microprocessors and SoCs," Dot/FAA, **PI: R. Mahapatra**, **$27,000**, 2009.

"Evaluation of Multi-Core COTS Microprocessors for Safety-Critical Applications," Rockwell Collins, **PI: Mahapatra**, **$30,000**, 2009.

"Validation of Microprocessors for Safety-Critical Applications," AVSI, **PI: R. Mahapatra**, **$107,000**, 2009.

"Microprocessor Evaluation," DoT–FAA, **PI: Mahapatra**, **$23,129**, Dec 2008 – April 2009.

"A Comprehensive Methodology for Early Power-performance Estimation of Nano-CMOS Digital Systems," National Science Foundation, Co-PI: Mohanty, UNT, **PI: R. Mahapatra**, **$200,000**, Pro-rated **$27,000**, September 2007-August 2010.

"Design of Robust and Energy Efficient Cyber-Physical Systems," National Science Foundation, PI: Bhattacharya, **Co-PI: R. Mahapatra**, **$100,000**, Pro-rated **$20,000**, September 2007 – August 2009.

"Safety Analysis Framework of Microprocessors and SoCs in Avionics," FAA and AVSI (BAE, Boeing, GE Aviation, Honeywell, Lockheed Martin, Hamilton Sundstrand), **PI: Mahapatra**, **$162,000**, August 2007 – July 2008.

"Research on Microprocessor Evaluation for Avionics," DoT (FAA), **PI: Mahapatra**, **$240,000**, August 2004-Dec 2006.

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Fall 2009	CSCE 312	Computer Organization	4.0	54
Spring 2009	CPSC 617	Hardware Software Co-design of Embedded Systems	3.0	15
Spring 2009	CPSC 481	Undergraduate Seminar	1.0	60
Fall 2008	CPSC 312	Computer Organization	4.0	32
Spring 2008	CPSC 312	Computer Organization	4.0	18
Fall 2007	CPSC 312	Computer Organization	4.0	13
Spring 2007	CPSC 617	Hardware Software Co-design of Embedded Systems	3.0	19
Fall 2006	CPSC 321	Computer Architecture	4.0	18
Fall 2006	CPSC 483	Computer Systems Design	3.0	3
Spring 2006	CPSC 617	Hardware Software Co-design of Embedded Systems	3.0	5
Fall 2005	ENGR 111	Foundations of Engineering I	2.0	18
Spring 2005	CPSC 617	Hardware Software Co-design of Embedded Systems	3.0	11

Percentage of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities:
Dr. Mahapatra's research interests include: Embedded Systems, System-on-Chip, Reconfigurable Architectures, Real-Time Systems, Cyber Infrastructure, and Semantic Networks.

1. **Name:** Scott L. Miller

2. **Academic Rank:** Professor

3. **Degrees:**
   B.S. (EE) University of California, San Diego, June 1985
   M.S. (EE) University of California, San Diego, June 1986
   Ph.D. (EE) University of California, San Diego, June 1988

4. **Years of Service on this Faculty:** 12

Original Appointment	August 1998
Associate Professor	8/98 – 8/02
Professor	8/02 – present

5. **Other Related Experience:**
   Assistant/Associate Professor, University of Florida, 1988-1998
   Visiting Associate Professor, University of Utah, 1995-1996
   Visiting Associate Professor, University of California, San Diego, 1995-1996

6. **Consulting:**
   Motorola, NASA, General Motors, Raytheon, NSA, Cysip, PivotPoint

7. **Patents**:
   S. L. Miller and R. J. O'Dea, "Radio with Peak Power and Bandwidth Efficient Modulation," #5,621,762, issued April 1997.

8. **State(s) in Which Registered**: None

9. **Selected Recent Publications:**

A. Balasubramanian, S. L. Miller, "The Rate Region of a Cooperative Scheduling Scheme," Proceedings of 2007 CISS.

G. Nagaraj, S. L. Miller, B. Stengel, G. Cafaro, T. Gradishar, S. Olsen, R. Hekmann, "A Self-Calibrating Sub-Picosecond Resolution Digital-to-Time Converter," Proceedings of 2007 Iternational Microwave Symposium.

Y. Yu and S.L. Miller, "A Four-State Markov Frame Error Model for the Wireless Physical Layer," Proceedings of 2007 IEEE Wireless Communication and Networking Conference.

B. J. Peiris, K. R. Narayanan, and S. L. Miller, "A Reduced Complexity Spectral Domain Approach to Designing Spreading Sequences for DS-CDMA Systems in Frequency Selective Fading Channels," IEEE. Trans. on Wireless Comm, vol. 5, no. 9, pp. 2386-2395, Sep. 2006.

J. Hu and S. L. Miller, "Performance Analysis of Convolutionally Coded Systems Over Quasi-Static Fading Channels," IEEE Transaction s on Wireless Communications, vol. 5, no. 4, pp. 789-795, Apr. 2006.

B. J. Peiris, K. R. Narayanan, and S. L. Miller, "The Design of Good Spreading Sequences for Channels with Frequency Selectivity: Quantization Perspectives," IEEE Globecom 2005.

L. Liu, J-F Chamberland, S. L. Miller, "The Uplink Achievable Rate Region of a User Cooperation Scheme," 2005 Canadian Workshop on Information Theory.

Jingyu Hu and Scott L. Miller , "Novel performance upper bounds for space-time trellis codes over quasi-static fading channels," in Proc. IEEE Wireless Communications and Networking Conference, vol. 2, Mar. 2005, New Orleans, LA, USA, pp. 1103-1107.

Bouzekri, H., Miller, S.L., "Distance Spectra and Performance Bounds of Space-Time Trellis Codes Over Quasi_Static Fading Channels," IEEE Transactions on Information Theory, vol. 50, no. 8, pp. 1820-1831, August 2004.

J. McDougall, J. Joseph, Y. Yu, and S. L. Miller, "An Improved Channel Model for Mobile and Ad Hoc Network Simulations," Proceedings of 2004 IASTED International Conference on Communications, Internet and Information Technology.

J. McDougall, Y. Yu, and S. L. Miller, "A Statistical Approach to Developing Channel Models for Network Simulations," Proceedings of 2004 IEEE Wireless Communications and Networking Conference.

Y. Zhang and S. L. Miller, "Code Acquisition in Transmit Diversity DS-CDMA Systems," *IEEE Transactions on Communications*, vol. 51, no. 8, Aug. 2003.

10. Scientific and Professional Societies: IEEE (Senior Member)

11. Honors and Awards:
- Univ. of Florida, Dept. of Electrical Engineering Outstanding Faculty Paper, 1990.
- Univ. of Florida, Dept. of Electrical Engineering Supervisor Outstanding Core Laboratory, 1992.
- Univ. of Florida, Teaching Improvement Award, 1994.
- TAMU, Eugene E. Webb '43 Faculty Fellow, 2004
- TAMU, Dept. of ECE Outstanding Professor Award, 2006

12. Institutional Service:
- Member of Dept. of EE Graduate Studies Committee, 1999-2003
- Chair, Dept. of EE Awards Committee, 2002-2004
- ABET Coordinator and Chair of Undergraduate Studies Committee, 2003-2005
- Member of Dept. of EE Tenure and Promotion Committee, 2004-2007
- Departmental Graduate Coordinator, 2005-present
- Chair of Graduate Studies Committee, 2005-present
- Telecommunications and Signal Processing Group Leader, 2005-present
- Wireless Communication Laboratory Director, 2005-present

13. Significant Professional Service:
- Chair, IEEE Communications Theory Technical Committee, 2007-present
- Editor, IEEE Transactions on Communications, 1995-1998, 2000-2003.
- General Chair, 2001 IEEE Communication Theory Workshop
- Technical Program Co-Chair, 1999 Vehicular Technology Conference

14. Professional and Development Activities in the Last Five Years: None

15. Percent Time Available for Research or Scholarly Activities:

16. Percent Time Committed to the Program:

1. **Name:** Krishna R. Narayanan

2. **Academic Rank:** Associate Professor

3. **Degrees:**
   B.E. (ECE) Coimbatore Institute of Technology, May 1992
   M.S. (EE) Iowa State University, August 1994
   Ph.D. (EE) Georgia Institute of Technology, December 1998

4. **Years of Service on this Faculty:** 12
   Original Appointment December 1998

5. **Other Related Experience:**
   Summer Intern, AT&T Laboratories, May 1995 - August 1995
   Visiting Professor, University of Illinois at Urbana-Champaign, Aug – Dec 2004
   Visiting Professor, Institut Eurecom, Sophia Antipolis, France, Jan – April 2005
   Visiting Professor, Indian Institute of Science, India, May – Aug 2005

6. **Consulting:**
   - GLS Laboratories, Atlanta, GA
   - Microwave Networks, Stafford, TX
   - SIRF technologies, Irvine, CA
   - Wilmer, Cutler and Pickering LLC, Boston, MA

7. **Patents**: None

8. **State(s) in Which Registered**: None

9. **Principal Publications of Last Five Years:**
   J. Jiang and K.R. Narayanan, "Bit level Algebraic Soft Decision Decoding of Reed-Solomon Codes", *to appear in IEEE Transactions on Information Theory*, 2008
   K. Bhattad, K.R. Narayanan and G. Caire, "On the Distortion SNR Exponent of Some Layered Transmission Schemes", *to appear in IEEE Transactions on Information Theory*, 2008
   K. R. Narayanan and N. Nangare, "A Non-Iterative Receiver for Achieving Near Capacity Performance on Inter Symbol Interference Channels", *to appear in IEEE Tran. Communications*, 2008
   G. Caire and K.R. Narayanan, "On the Distortion SNR Exponent of Hybrid Digital Analog Space Time Coding", *IEEE Transactions on Information Theory*, pp. 2867-2878, Vol. 53, No. 8, August 2007
   K. Bhattad and K.R. Narayanan, "An MSE Based Transfer Chart for Analyzing Iterative Decoding Schemes", *IEEE Transactions on Information Theory*, pp. 22-38, Vol. 53, No. 1, Jan 2007
   B. J. Peiris, K. R. Narayanan and S. L. Miller, " A Reduced Complexity Spectral Domain Approach to Design Spreading Sequences for DS-CDMA Systems in Frequency Selective Fading Channels", *IEEE Transactions on Wireless Communications*, pp. 2386-2395, Vol. 5, No. 9, Sept 2006

J. Jiang and K. R. Narayanan, “Iterative Soft Input Soft Output Decoding of Reed-Solomon Codes”, *IEEE Transactions on Information Theory*, pp. 3746-3756, Vol. 52, No.8, August 2006

C. F. Lan, Z. Xiong and K.R. Narayanan, ”Source-optimized Irregular Repeat Accumulate Codes with Inherent Unequal Error Protection Capabilities and Their Application to Scalable Image Transmission”, *IEEE Transactions on Image Processing*, pp. 1740-1750, Vol. 52, No. 7, July 2006

K. Bhattad and K. R. Narayanan, ”A Decision Feedback Based Scheme for Slepian-Wolf Coding of Sources With Hidden Markov Correlation”, *IEEE Communications Letters*, pp. 378-380, Vol. 10, No. 5, May 2006

10. Scientific and Professional Societies: IEEE (Member)

11. Honors and Awards:

- 2007 Best paper award from the IEEE Technical Committee on Signal Processing for Magnetic Recording
- Faculty Early CAREER Award, National Science Foundation, 2001
- TEES Outstanding Young Faculty Award, 2001
- Outstanding Faculty Award, Department of Electrical Engineering, 2002

12. Institutional Service:

None

13. Professional Service:

- Area Editor, Coding Theory and Applications, IEEE Transactions on Communications, 2007 – present
- Editor, Coding Theory and Applications, IEEE Transactions on Communications, 2005 - present
- Lead Guest Editor, IEEE Journal of Selected Areas in Communications Special issue on Equalization Techniques and Its Applications to Wireless Communications
- Technical Program Co-Chair, IEEE Information Theory Workshop, 2007
- Editor, IEEE Transactions on Wireless Communications, 2001-present
- Associate Editor, IEEE Communications Letters, 2000-2003.

14. Professional and Development Activities in the Last Five Years: Developed a web-based tutorial on low density parity check codes which is available through IEEE Communications Society. Attended Faculty Learning Community on gender diversity in science and engineering.

15. Percent Time Available for Research or Scholarly Activities:

16. Percent Time Committed to the Program:

Lawrence Rauchwerger, Professor, Tenured

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, August 1996

Promoted, Associate with Tenure, September 2001; Promoted Professor, September, 2006

Degree	Field	Institution	Year
PhD	Computer Science	University of Illinois @ Urbana-Champaign	1995
MS	Electrical Engineering	Stanford University	1987
Dipl.	Engineer in Electronics and Telecommunications	Polytechnic Institute @ Bucharest, Romania	1980

Conferences, Workshops, and Professional Development (Last Five Years)

Steering Committee Member:

Workshop on Languages and Compilers for Parallel Computing (LCPC), since 2007.
Int. Conf. on Parallel Architectures and Compilation Techniques (PACT) (2007 – present).

Program Chair

The 16th Int. Conference on Parallel Architectures and Compilation Techniques (PACT), 2007.
Main organizer of PACT 2007

Program Vice-Chair, Int. Symp. on Computer Architecture and High Performance Computing (SBAC-PAD), 2010.

Program Committee Member

Int. Parallel and Distributed Processing Symp. (IPDPS), 2002, 2006, 2007, 2010
ACM SIGPLAN Symp. Principles and Practice of Parallel Programming (PPoPP), 2005, 2010
Int. Conf. on High Performance Embedded Architectures & Compilers (HiPEAC), 2007, 2008, 2009.
Int. Symp. on Computer Architecture and High Performance Computing (SBAC-PAD), 2009.
Int. Symp. on Computer Architecture (ISCA), 2008.
Exploiting Parallelism using Transactional Memory and Hardware Assisted Methods (EPHAM), 2008.
IEEE Int. Conf. on Computational Science and Engineering (CSE), 2008.
Int. Conf. on High Performance Computing (HiPC), India, 2000, 2003, 2007, 2008.
ACM SIGPLAN Symposium on Library-Centric Software Design (LCSD), 2007.
Int. Conf. for High Performance Computing and Communications (SC07), 2007.
ACM Int. Conf. on Supercomputing (ICS), 2000, 2006, 2007.
Int. Conf. on High-Performance Embedded Architectures and Compilers (HiPEAC), Belgium, 2007.
Int. Conf. on Computer Design (ICCD), 2006.
Int. Conf. on High Performance Computing and Communications (HPCC), 2006.
ACM Int. Conf. on Computing Frontiers, Italy, 2006.
Int. IEEE W-shop on High Performance Computational Biology (HICOMB), 2005;

Other Related Experience

AT&T Research Laboratories, Murray Hill, NJ
Visiting Scientist, 1996

University of Illinois
Visiting Assistant Professor, Center for Supercomputing R&D, 1995-1996
Research Assistant, Center for Supercomputing R&D, 1992-1994
Teaching Assistant, Computer Science Department, 1993

IBM, TJ Watson Research Center, Yorktown Heights, NY
Predoctoral Researcher, Summer 1992

Center for Integrated Systems, Stanford University
Research Assistant, 1986-1988

Varian Associates, Inc., Thin Film Technology Division, R&D, Palo Alto, CA
R&D Engineer, 1984-1985

Consulting- None

Department Committee Service 2009-2010	University Committee Service 2009-2010
• Graduate Advisory Committee • Space Committee	• Council of Principal Investigators, Member, • High Performance Computing Steering Committee (HPCSC),

Department Committee Service 2005-2009	University Committee Service 2005-2009
• Development Committee, 2005-2006 • Graduate Admissions, 2005-2006 • Faculty Search Systems or Systems Software Sub Committee, 2006-2007 • Graduate Advisory Committee, 2006-2009 • Faculty Search Security Sub Committee, 2007-2008	• High Performance Computing Steering Committee (HPCSC), 2005-2009

Principle Publications

Refereed Journals

N. Thomas, S. Saunders, T. Smith, G. Tanase, and **L. Rauchwerger**. "ARMI: A High Level Communication Library for STAPL," *Parallel Processing Letters*, June, 2006, 16(2):261-280.

Lawrence Rauchwerger and Nancy Amato. "SmartApps: Middle-ware for Adaptive Applications on Reconfigurable Platforms," *ACM SIGOPS Operating Systems Reviews, Special Issue on Operating and Runtime Systems for High-End Computing Systems*, 40(2), 2006, pp. 73–82.

Hao Yu, and **Lawrence Rauchwerger**. "An Adaptive Algorithm Selection Framework," *IEEE Transactions on Parallel and Distributed Systems*, 17 (19), 2006, pp. 1084–1096.

William McLendon III, Bruce Hendrickson, Steven J. Plimpton and **Lawrence Rauchwerger**. "Finding Strongly Connected Components in Distributed Graphs," *Journal of Parallel and Distributed Computing*, 65(8), 2005, pp. 901–910.

Refereed Conference Publications

Highly Selective Conferences

S. Rus, M. Pennings and **L. Rauchwerger**. "Sensitivity Analysis for Automatic Parallelization on Multi-Cores," *Proc. of the ACM Int. Conf. on Supercomputing (ICS07),* Seattle, WA, June 2007. Acceptance ratio: (Acceptance Rate 24%)

S. Rus, G. He, C. Alias and **L. Rauchwerger**. "Region Array SSA," *Proc. of the 15-th Int. Conf. on Parallel Architecture and Compilation Techniques (PACT)*, Seattle, WA, 2006. (Acceptance Rate 28%)

N. Thomas, G. Tanase, O. Tkachyshyn, J. Perdue, N. Amato, and **L. Rauchwerger**. "A Framework for Adaptive Algorithm Selection in STAPL," *Proc. of ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPOPP)*, Chicago, IL, June, 2005, pp. 277–288, Acceptance ratio: 30%

Highly Visible Conferences

A. Buss, T. Smith, G. Tanase, N. Thomas, M. Bianco, N. Amato and **L. Rauchwerger**. "Design for Interoperability in STAPL," *Proc. of the 21-th Workshop on Languages and Compilers for Parallel Computing (LCPC)*, Edmonton, Canada, Aug. 2008. (Acceptance ratio:N/A)

G. Bikshandi, J. Guo, C. von Praun, G. Tanase, B. B. Fraguela, M. J. Garzaran, D. Padua, and **L. Rauchwerger**. "Design and Use of HTAlib – a Library for Hierarchically Tiled Arrays," *Proc. of the 19-th Workshop on Languages and Compilers for Parallel Computing (LCPC),* New Orleans, Louisiana, Nov 2006. (Acceptance ratio:N/A)

Other Scholarly Activities

Grants

"RI: Small: Scalable Roadmap-Based Methods for Simulating and Controlling Behaviors of Interacting Groups: from Robot Swarms to Crowd Control," National Science Foundation, PI: N. Amato, **co-PI: L. Rauchwerger**, **$450,000**, **$225,000** (Rauchwerger), 09/01/09–08/31/12.

"Motion Planning Based Techniques for Modeling & Simulating Molecular Motions," National Science Foundation, PI: N. Amato, **co-PI: L. Rauchwerger**, **$386,000**, Pro-rated **$193,000**, 09/15/08–09/14/11.

"A Compositional Approach to Scalable Parallel Software," National Science Foundation (HECURA Program), **PI: L. Rauchwerger**, co-PIs: N. Amato, B. Stroustrup, **$1,232,000,** Pro-rated **$556,000**, 09/01/08–08/31/11.

"Support of Stockpile Stewardship Program," Lawrence Livermore National Security, PI: J. Morel, **co-PIs:** M. Adams, N. Amato, R. Arroyave, A. Benzerga, T. Cagin, J.-L. Guermond, Y. Jin, B. Mallick, B. Popov, **L. Rauchwerger**, **$2,936,677**, 09/09/08–06/30/11.

"Institute for Applied Mathematics and Computational Science (IAMCS)," King Abdullah University of Science and Technology (KAUST), PI: J. Calvin, **co-PIs:** M. Adams, G. Almes, N. Amato, P. Balbuena, W. Bangerth, R. Carroll, C. Douglas, C. Economides, Y. Efendiev, M. Genton, J.-L. Guermond, C. Hansen, J. Hendler, J. Huang, T. Ioerger, C. Johnson, M. Jun, G. Kanschat, P. Kuchment, R. Lazarov, F. Liang, B. Mallick, J. Pasciak, G. Petrova, B. Popov, **L. Rauchwerger**, H. Sang, G. Qin, W. Rundell, V. Sarin, B. Stroustrup, V. Taylor, J. Walton, W. Zhao. **$25,000,000**, Pro-rated **$100,000** , 06/01/08–05/31/13.

"Center for Radiative Shock Hydrodynamics," The Department of Energy, PSAAP Program, PI: P. Drake (Michigan); **co-PIs**: **L. Rauchwerger (CS,TAMU), et. al,** **$17,000,000**, Pro-rated **$1,850,000** (TAMU), **$375,000** (Rauchwerger, estimate), 4/2008-3/2013. Competitive and subject to peer review.

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Fall 2009	CSCE 434	Compiler Design	3.0	9
Fall 2009	CSCE 681	Graduate Seminar	1.0	36
Spring 2009	CPSC 605	Compiler Design	3.0	8
Spring 2009	CPSC 681	Graduate Seminar	1.0	37
Fall 2008	CPSC 434	Compiler Design	3.0	
Fall 2008	CPSC 481	Undergraduate Seminar	1.0	67
Fall 2008	CPSC 681	Graduate Seminar	1.0	29
Spring 2008	CPSC 654	Supercomputing	3.0	6
Spring 2008	CPSC 481	Undergraduate Seminar	1.0	61
Spring 2008	CPSC 681	Graduate Seminar	1.0	40
Fall 2007	CPSC 434	Compiler Design	3.0	8
Spring 2007	CPSC 481	Undergraduate Seminar	1.0	56
Spring 2007	CPSC 605	Compiler Design	3.0	10
Spring 2007	CPSC 681	Graduate Seminar	1.0	23
Fall 2006	CPSC 434	Compiler Design	3.0	12
Spring 2006	CPSC 689	Special Topics in Run-time Systems for Parallel Computing	3.0	10
Spring 2006	CPSC 654	Supercomputing	3.0	12
Fall 2005	CPSC 434	Compiler Design	3.0	12
Spring 2005	CPSC 605	Compiler Design	3.0	13

Percentage of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities:
Dr. Rauchwerger's research interests include: Compilers for Parallel and Distributed Computing, Parallel and Distributed C++ Libraries, Adaptive Runtime Optimizations, and Architectures for Parallel Computing.

1. **Name:** A. L. Narasimha Reddy

2. **Academic Rank:** Professor

3. **Degrees:**
   B.Tech. (Honors, Electronics and Electrical Communications), Indian Institute of Technology, Kharagpur, May1985
   M.S. (CE) University of Illinois, Urbana-Champaign, August 1987
   Ph.D. (CE) University of Illinois, Urbana-Champaign, August 1990

4. **Years of Service on this Faculty:** 10
   Associate Professor 8/95 – 2004

5. **Other Related Experience:**
   Research Staff Member, IBM Almaden Research Center, 1990-1995

6. **Consulting:**
   EMC, TBD Networks, NetGeo Inc., Jones International University

7. **Patents**:
   - Conflict resolution in multi-node communication network, 6,101,194, Aug. '00.
   - 2.Method and System for message status reporting in a multi-node network, 5,717,862, Feb. '98
   - Interconnection network for multimodal data processing system which exhibits incremental scalability, 5,603,044, Feb. '97
   - Adaptive and dynamic message routing system for multimode wormhole networks, 5,602,839, Feb. '97.
   - System and method using chained structured queue for ordering of message delivery between connected nodes wherein unsuccessful message portion is skipped and retried, 5,577,211, Nov. '96.

8. **State(s) in Which Registered**: None

9. **Principal Publications of Last Five Years:**
   - Sukwoo Kang and A. L. Narasimha Reddy, User-centric data migration in networked storage systems , Proc. of IPDPS, April 2008.
   - Y. Liu and A. L. Narasimha Reddy, "Multihoming route control among a Group of Multihomed Stub Networks" , Journal on Computer Communication, Dec. 2007.
   - Sumitha Bhandarkar, A. L. Narasimha Reddy, Yueping Zhang and Dmitri Loguinov, "Emulating AQM from end hosts" Proc. of ACM Sigcomm, Aug. 2007.
   - Sumitha Bhandarkar, and A. L. Narasimha Reddy "Robustness to packet reordering in high-speed networks" Proc. of PFLDNet workshop, Feb. 2007.
   - Sukwoo Kang and A. L. Narasimha Reddy, An approach to virtual allocation in storage systems in ACM Transactions on Storage, vol.2, no.4, 371-399, November, 2006.
   - Camelia Al Najjar and A. L. Narasimha Reddy, A Service Provider's Approach for improving performance of aggregate Voice-over-IP Traffic in IwQOS, June, 2006.
   - Seong Soo Kim, and A. L. Narasimha Reddy, Image-based Anomlay Detection Technique: Algorithm, Implementation and Effectiveness", in IEEE JSAC, 2006.
   - Seong Soo Kim, and A. L. Narasimha Reddy, "NetViewer: A network traffic visualization and analysis tool", , Proc.of USENIX LISA Conf, Dec. 2005.
   - Y. Liu and A. L. Narasimha Reddy, "Route Optimization among a Group of Multihomed Stub Networks" , Proc. of Globecom, Dec. 2005.

- D. W. Kwon, K. Ko, M. Vannucci, A. L. Narasimha Reddy, and S. Kim, "Wavelet methods for the detection of anomalies and their application to network traffic analysis" , the journal of Quality and Reliability International, QREI, 2005.
- Seong Soo Kim, and A. L. Narasimha Reddy, "Modeling network traffic as images" , Proc. of ICC, May 2005.
- Seong Soo Kim, and A. L. Narasimha Reddy, "Real-time detection and containment of network attacks using QOS regulation" , Proc. of ICC, May 2005.
- Seong Soo Kim, and A. L. Narasimha Reddy, "A study of analyzing network traffic as images in real-time" , Proc. of Infocom 05, March 2005.
- Sumitha Bhandarkar, S. Jain, and A. L. Narasimha Reddy "Improving TCP performance in High Bandwidth High RTT links using layered congestion control" Proc. of PFLDNet, Feb. 2005.
- Y. Liu and A. L. Narasimha Reddy, "A fast rerouting scheme for OSPF/IS-IS Networks", Proc. of ICCCN, October 2004.
- Z. Zhao, and A. L. Narasimha Reddy, "Impact of bandwidth-delay product and non-responsive flows on the performance of queue management schemes" , Proc. of ICC, June 2004.
- P. Achanta and A. L. Narasimha Reddy, "Design and evaluation of a partial state router", Proc. of ICC, June 2004.
- Sumitha Bhandarkar, N. Sadry, A. L. Narasimha Reddy and N. Vaidya "TCP-DCR: A novel protocol for tolerating wireless channel errors", IEEE Trans. on Mobile Computing, Oct. 2004.
- Z. Zhao, D. Swaroop and A. L. Narasimha Reddy, "A method for estimating non-responsive traffic at a router", in ACM/IEEE Trans. on Networking, Aug. 2004.
- Seong Soo Kim, A. L. Narasimha Reddy and Marina Vannucci, "Detecting traffic anomalies through aggregate analysis of packet header data" , Proc. of Networking 2004, May 2004.

10. Scientific and Professional Societies: IEEE (Senior Member), ACM

11. Honors and Awards:

- Distinguished Achievement Award for teaching, 2006.
- Outstanding Professor Award, IEEE Student branch, TAMU, 1997-1998.
- NSF Career Award (1996-2000).

12. Institutional Service:

- Member, College Awards Committee, 2006-2008.
- Member, Department Tenure & Promotions committee 2004-2006.
- Member, Computer Engineering Curriculum Committee, 2003- present .
- Faculty Advisory Committee to the Head, Dept. of Electrical Engineering, 2003-2005 .

13. Professional Service:

- Technical Program Committee Member for various conferences
- Frequent panelist for National Science Foundation
- Frequent reviewer for various IEEE journal

14. Professional and Development Activities in the Last Five Years: None

15. Percent Time Available for Research or Scholarly Activities:

16. Percent Time Committed to the Program:

1. **Name:** Srinivas G. Shakkottai

2. **Academic Rank:** Assistant Professor

3. **Degrees:**
B.E. (ECE) Bangalore University, India, August 2001
M.S. (ECE) University of Illinois at Urbana-Champaign, December 2003
Ph.D. (ECE) University of Illinois at Urbana-Champaign, March 2007

4. **Years of Service on this Faculty:** 2
Original Appointment January 2008

5. **Other Related Experience:**
Visiting Scholar, Stanford University, May-August 2008
Postdoctoral Scholar, Stanford University, March-December 2007
Intern, Cooperative Association for Internet Data Analysis, June-August 2006
Intern, Institut National de Recherche en Informatique et en Automatique, May-August 2005
Intern, Cooperative Association for Internet Data Analysis, May-August 2003

6. **Consulting:** None

7. **Patents**: None

8. **State(s) in Which Registered**: None

9. **Principal Publications of Last Five Years:**
S. Shakkottai and R. Srikant, "Economics of Network Pricing with Multiple ISPs," in *IEEE/ACM Transactions on Networking*, December 2006 (earlier version in Infocom 2005) .
H. Han, S. Shakkottai, C. V. Hollot, R. Srikant and D. Towsley, "Multi-Path TCP: A Joint Congestion Control and Routing Scheme to Exploit Path Diversity on the Internet," in *IEEE/ACM Transactions on Networking*, December 2006.
S. Shakkottai, E. Altman and A. Kumar, "The Case for Non-cooperative Multihoming of Users to Access Points in IEEE 802.11 WLANs", in *IEEE Journal on Selected Areas in Communication, Special Issue on Non-Cooperative Behavior in Networking*, August 2007 (earlier version in Infocom 2006).
S. Shakkottai, and R. Srikant, "Peer to Peer Networks for Defense against Internet worms" in *IEEE Journal on Selected Areas in Communication, Special Issue on Peer to Peer Streaming Systems*, December 2007 (earlier version in InterPerf 2007).
S. Shakkottai, R. Srikant, A. Ozdaglar, and D. Acemoglu, "The Price of Simplicity", To appear in *IEEE Journal on Selected Areas in Communication, Special Issue on Game Theory in Networks*, 2008 (earlier version in Asilomar 2008).
S. Shakkottai, X. Liu and R. Srikant, "The Multicast Capacity of Large Multihop Wireless Networks", *in preparation* (earlier version in MobiHoc 2007).
S. Shakkottai and R. Johari, "Resource Management for Content Distribution on the Internet" *in preparation* (earlier version at Allerton Conference 2007).

10. Scientific and Professional Societies: IEEE (Member)

11. Honors and Awards:

- International Programs in Engineering (IPENG) Fellowship 2005 University of Illinois at Urbana-Champaign, USA
- Young Scientist Fellowship *(Kishore Vaigyanik Protsahan Yojana)* 1999–2001 Dept. of Science and Technology, Govt. of India: Comprises of an undergraduate & graduate school fellowship (if carried out in India), and internship opportunities at any Indian research institution. In 1999, 14 fellowships were awarded from a pool of 1200 of the top engineering students in India.
- National Merit Scholarship 1997
- Central Board of Secondary Education, India: In recognition of standing within the top 05% of approximately 300000 graduating students.

12. Institutional Service:

Serving on the committees of 3 PhD students and 4 Masters' students.

13. Professional Service:

- Technical Program Committee Member for IEEE conferences, such as MobiHoc 2008, BroadNets 2008, Infocom 2009.

- Frequent reviewer for various IEEE journals, such as Transactions on Networking, Transactions on Selected Areas in Communication, Transactions on Wireless Communication

14. Professional and Development Activities in the Last Five Years: None

15. Percent Time Available for Research or Scholarly Activities:

16. Percent Time Committed to the Program:

Dylan Shell, Assistant Professor, Tenure-Track

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, Tenure-track, 2009

Degree	Field	Institution	Year
PhD	Computer Science	University of Southern California	2008
MS	Computer Science	University of Southern California	2006
BS (Honors)	Computer Science	University of the Witwatersrand	2001
BS	Computational and Applied Mathematics and Computer Science	University of the Witwatersrand	2000

Conferences, Workshops, and Professional Development (Last Five Years)

Associate Editor

IEEE Robotics and Automation Society, International Conference on Robotics and Automation 2010, 8/8/2009-11/20/2009.

Other Related Experience

University of Southern California, Department of Computer Science

Post-Doc Research Associate, fall 2008-summer 2009

Consulting- None

Department Committee Service 2009-2010
• **Library Committee**

Principle Publications *Indicates student author

Refereed Journals

E. Drumwright and D. Shell. **"Continuous Collision Detection for Rigid Bodies with Various Geometries"**. Submitted to *ACM Transactions on Graphics.*

E. Drumwright and D. Shell**. "A Polynomial Time Multibody Dynamics Model for Simultaneous Contacts without Complementarity Constraints".** Submitted to *International Journal of Robotics Research.*

* R. Murphy, D. Shell, A. Hopper, B. Duncan, B Fine, K Pratt, T Zourntos **"A Midsummer Night's Dream (with Flying Robots)".** Submitted to *Autonomous Robots special issue on Community-Based Robots.*

Refereed Conference Publications

Highly Selective Conferences

* L. Liu and D. Shell. **"Assessing Optimal Assignment under Uncertainty: An Interval-based Algorithm"** submitted to *Robotics Science and Systems* 2010.

* John O'Hollaren and D. Shell. **"Incremental Multi-Robot Deployment for Line-of-Sight Chains Using on Radio Signal Strength"** submitted to 2010 to the Twenty-Fourth AAAI Conference on Artificial Intelligence. (Acceptance rate for 2009 was 25%)

E. Drumwright and D. Shell. **"An Evaluation of Methods for Modeling Contact in Multibody Simulation"** submitted to *Robotics Science and Systems* 2010.

High Visibility Conferences

D. Shell and M. Mataric. **"High-fidelity Radio Communications Modeling for Multi-Robot Simulation"** *Proceedings of the 2009 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS),* St. Louis, MO. 3447-3452. (Acceptance rate 58%)

E. Drumwright and D. Shell. **"A Robust and Tractable Contact Model for Dynamic Robotic Simulation,"** *Proceedings of the 2009 ACM Symposium on Applied Computing (SAC)*, Honolulu, Hawaii, 1176-1180. (Acceptance rate 29%)

Other Scholarly Activities

Grants

"Landroids Phase II Task a Control Software," DARPA (Subcontractor to Intelligent Automation, Inc.), **PI: Dylan Shell**, **$100,000**, 8/19/2009-11/30/2010.

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Fall 2009	CSCE 689	Special Topics in Multi-Robot Systems	3.0	15

Percentage of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities:
Dr. Shell's research interests include: Distributed AI, Biologically-Inspired Multi-Robot Systems, Coordinated System, Analysis of Multi-Agent Systems, and Crowd Modeling.

1. **Name:** Weiping Shi

2. **Academic Rank:** Associate Professor

3. **Degrees:**

   B.S. (CS) Xian Jiaotong University, China, Jan 1982
   M.S. (CS) Xian Jiaotong University, China, Oct 1984
   Ph.D. (CS) University of Illinois at Urbana-Champaign, Aug 1992

4. **Years of Service on this Faculty:** 6

Original Appointment	August 2000
Associate Professor	8/00 – present

5. **Other Related Experience:**

   Assistant/Associate Professor, University of North Texas, 1992 - 2000
   Consultant (on sabbatical from UNT), 1999-2000

6. **Consulting:** PDF Solutions, Teklicon.

7. **Patents**:

8. **State(s) in Which Registered**: None

9. **Principal Publications of Last Five Years:**

   W. Shi, J. Liu, N. Kakani and T. Yu, ``A fast hierarchical algorithm for 3-D capacitance extraction," *Proc. 35th Design Automation Conference (DAC)*, June 1998, San Francisco, CA, pp. 211-217. **Best Paper Award.**
   W. Shi and D. B. West, `` Diagnosis of wiring networks: An optimal randomized algorithm for finding connected components of unknown graphs", *SIAM Journal on Computing*, Vol. 28, No. 5, 1999, pp. 1541-1551.
   W. Shi and C. Su, `` The rectilinear Steiner arborescence problem is NP-complete", *Proc. 11th ACM-SIAM Symposium on Discrete Algorithms (SODA),* San Fransisco, CA, Jan. 2000, pp. 780-787.
   F. Shahrokhi and W. Shi, ``On crossing sets, disjoint sets and page number", *Journal of Algorithms*, Vol. 34, No. 1, Jan. 2000, pp. 40-53.
   W. Shi and D. West, `` Structural diagnosis of wiring networks: Finding connected components of unknown subgraphs," *SIAM Journal on Discrete Mathematics*, Vol. 14, No. 4, Oct. 2001, pp. 510-523.
   W. Shi, J. Liu, N. Kakani and T. Yu, `` A fast hierarchical algorithm for 3-D capacitance extraction", *IEEE Transactions on Computer-Aided Design*, Vol. 21, No. 3, March 2002, pp. 330-336.
   H. Mahawar, V. Sarin and W. Shi, `` Solenoidal basis method for efficient inductance extraction," *Proc. 39th Design Automation Conference (DAC),* New Orleans, LA, June 2002, pp. 751-756.
   Z. Li, X. Lu, W. Qiu, W. Shi and H. Walker, ``A circuit level fault model for resistive opens and bridges," *Proc. 21st IEEE VLSI Testing Symposium (VTS),* Napa Valley, CA, April 2003.
   W. Shi and Z. Li, ``An O(nlogn) time algorithm for optimal buffer insertion," *Proc. 40th Design Automation Conference (DAC),* Anaheim, CA, June 2003, pp. 580-585.

10. **Scientific and Professional Societies**: IEEE (Senior Member)

11. Honors and Awards:

Research Initiation Award, National Science Foundation, 1993.
Best Paper Award, Design Automation Conference, 1998.
Outstanding Professor Award, Dept of EE, Texas A&M University, 2001.

12. Institutional Service:

Graduate admissions, Computer Engineering Group, 2001-present
Member, ABET Committee, 2003-present

13. Professional Service:

Frequent Technical Program Committee Member for various IEEE conferences
Frequent panelist for National Science Foundation
Frequent reviewer for various IEEE journals

14. Professional and Development Activities in the Last Five Years: None

Dezhen Song, Assistant Professor, Tenure-Track

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Assistant Professor, Tenure-track, 2004

Promoted, Associate Professor with Tenure,

Degree	Field	Institution	Year
PhD	Industrial Engineering and Operations Research	University of California @Berkeley	2004
MS	Industrial Automation	Zhejiang University	1998
BS	Process Control	Zhejiang University	1995

Conferences, Workshops, and Professional Development (Last Five Years)

Session Chair, Network Teleoperation

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2007

Session Co-Chair

IEEE International Conference on Automation Science and Engineering (CASE), 2008

IEEE International Conference on Robotics and Automation, 2008

Co-Chair, Technical Committee on Networked Robots

IEEE Robotics Science and Systems (RSS), 2006-2009

Co-Chair

The Workshop on Network robot Systems: Ubiquitous, Cooperative, Interactive Robots for Human Robot Symbiosis, San Diego, California, USA,

Program Committee Member

IFAC Workshop on Networked Robotics, 10/2009, Golden, CO

International Workshop on Robotic Wireless Sensor Networks (RWSN 2009), held in conjunction with the International Conference on Distributed Computing in Sensor Systems (DCOSS).

Special track on Physically Grounded Artificial Intelligence (PGAI), AAAI 2008

The First Workshop on wireless Multihop Communications in Networked Robotics, 4/2008, Berlin, Germany

International Conference on Advanced Robotics (ICAR), 2005; 2007

International Workshop on Algorithmic Foundations of Robotics (WAFR), 2006

IEEE International conference on Robotics and Automation (ICRA), 2006

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2006 and 2005

IEEE International Conference on Mechatronics and Automation (ICMA), 2005

Associate Editor, IEEE Transactions on Automation Science and Engineering, 2010-present

Associate Editor, IEEE Transactions on Robotics, 2008-present

Guest Editor, Special Issue on Networked Robots, Journal of Intelligent Service Robotics, 2009

Associate Editor, IEEE Robotics and Automation Society, Conference Editorial Board, 2006-09

Other Related Experience

University of California, Berkeley; Department of Industrial Engineering and Operations Research

Graduate Student Researcher, 5/2001-8/2004

Programmer/Analyst/Graduate Student Instructor, 9/2000-8/2001

Mississippi State University, Department of Industrial Engineering

Graduate Research Assistant, 8/1998-7/2000

Nanwang (Southern Video), China

Chief Software Engineer/Head of Research & Development Department/CTO, 1/1997-8/1998

Zhejiang University, Institute of Industrial Process Control

Graduate Research Assistant, 9/1995-1/1998

Zhejiang University, Department of Chemical Engineering, Computer & Network Center

Undergraduate Research Assistant/Network Administrator, 9/1993-8/1995

Consulting- None

Department Committee Service 2009-2010
• **Advisory Committee (elected), 2009-2010** • **Undergraduate Curriculum & ABET Committee, 2009-2010**

Department Committee Service 2005-2009
• **Space Committee, 2005-2006** • **Communications Committee, 2006-2007** • **Web Advisory Committee, 2007-2008** • **Advisory Committee (elected), 2008-2009** • **Undergraduate Curriculum & ABET Committee, 2008-2009**

Principal Publications *Indicates student author

Refereed Journals

D. Song, *C. Kim, and J. Yi . "Simultaneous Localization of Multiple Unknown CSMAbasedWireless Sensor Network Nodes Using a Mobile Robot with a Directional Antenna" *Journal of Intelligent Service Robots* vol. 2, No. 4, pp 219-233, October, 2009.

J. Yi, *H. Wang, *J. Zhang, **D. Song**, S. Jayasuriya, and J. Liu. "Modeling and Analysis of Skid-Steered Mobile Robots with Applications to Low-Cost Inertial Measurement Unit-Based Motion Estimation" *IEEE Transactions on Robotics* Vol. 25, No. 5, pp. 1087-1097, October, 2009.

D. Song, *N. Qin, and K. Goldberg. "Systems, Control Models, and Codec for Collaborative Observation of Remote Environments with an Autonomous Networked Robotic Camera," *Autonomous Robots*, Vol. 24, No. 4, pp. 435449, May 2008.

D. Song and K. Goldberg. "Approximate Algorithms for Collaborative Camera Control," *IEEE Transactions on Robotics*, Vol. 23, No. 5, pp. 1061-1070, Oct. 2007.

D. Song, A. F. van der Stappen, and K. Goldberg. "Exact Algorithms for Single Frame Selection on Multi-Axis Satellites." *IEEE Transactions in Automation Science and Engineering*, Vol. 3, No. 1, pp.16-28, January 2006.

Monograph Book

Song, D. "Sharing a Vision: Systems and Algorithms for Collaboratively-Teleoperated Robotic Cameras" *Monograph, Springer Tracts in Advanced Robotics*, Vol. 51, 187 pages, 2009.

Book Chapters

D. Song, K. Goldberg, and N. Y. Chong. "Chapter 32: Networked Teleoperation," *Springer Handbook on Robotics*, Springer, 2008, pages 510-519 (Award for Excellence in *Physical Sciences & Mathematics*, 2009, for Springer Handbook of Robotics, Association of American Publishers, Inc.)

D. Song and K. Goldberg. "Networked Robotic Cameras for Collaborative Observation of Natural Environments," Robotics Research, *The12th International Symposium*, Editors: Sebastian Thrun, Hugh Durrant-Whyte, and Rodney Brooks, *Springer Tracts on Advanced Robotics*, Springer 2007, pp. 510-519.

Peer Reviewed Conferences

Highly Selective Conferences

None

Selective Conferences with High Visibility

D. Song, *C. Kim, and J. Yi. "Monte Carlo Simultaneous Localization of Multiple Unknown Transient Radio Sources Using a Mobile Robot with a Directional Antenna," *IEEE International Conference on Robotics and Automation (ICRA), Kobe, Japan, May 12-17, 2009. (Acceptance rate 43%)*

*H. Wang, *J. Zhang, J. Yi, **D. Song,** S. Jayasuriya, and J. Liu. "Modeling and Analysis of Skid-Steered Mobile Robots," *IEEE International Conference on Robotics and Automation (ICRA),* Kobe, Japan, May 12-17, 2009. (Acceptance rate 43%)

D. Song, H. Lee, and J. Yi. "On the Analysis of the Depth Error on the Road Plane for Monocular Vision-Based Robot Navigation," *The Eighth InternationalWorkshop on the Algorithmic Foundations of Robotics (WAFR), Dec. 7-9, 2008, Guanajuato, Mexico, (Acceptance rate 43%)*

*N. Qin, **D. Song**, and K. Goldberg. "Aligning Windows of Live Video from an Imprecise Pan-Tilt-Zoom Robotic Camera into a Remote Panoramic Display," *IEEE International Conference on Robotics and Automation (ICRA)* May. 2006, Orlando, Florida (Acceptance rate 38.7%)

J. Yi, **D. Song**, A. Levandowski, and S. Jayasuriya. "Trajectory Tracking and Balance Stabilization Control of Autonomous Motorcycles," *IEEE International Conference on Robotics and Automation (ICRA)* May 2006, Orlando, Florida (Acceptance rate 38.7%)

Other Scholarly Activities

Grants

"*MRI: Acquisition of a Mobile, Distributed Instrument for Response Research (RESPOND-R),"* National Science Foundation, PI: Robin Murphy, **Co-PIs:** Ricardo Gutierrez-Osuna, **Dezhen Song**, Aaron D. Ames,and Radu Stoleru, **$2,000,000**, 6/2009- 6/2014. (Pro-rated amount 20%)

"Human-Robot Interaction to Monitor Climate Change Effects via Networked Robotic Observatories," Microsoft Human-Robot-Interaction program, **PIs: Dezhen Song** and Ken Goldberg (UC Berkeley), **$70,000**, 4/2008 – 3/2009, (Pro-rated amount 50%)

"Robotic BioTelemetry," National Science Foundation, Faculty Early Career Development (CAREER), National Science Foundation, $400,000, Jan. 2007- Jan. 2012, (Pro-rated amount 100%)

"Collaborative Observatory for Natural Environment," National Science Foundation, **PI: Dezhen Song** **$202,160**, 7/2005 – 7/2008.

"CAF: Perceptive Sensor Networks Laboratory," CAF Proposal, PI: Andruid Kerne, **Co-PIs:** Ricardo Gutierrez-Osuna and **Dezhen Song**, **$80,000**, 2005, (Prorated amount 33%).

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Fall 2009	CSCE 452	Robotics and Spatial Intelligence	3.0	10
Spring 2009	CPSC 643	Seminar in Intelligent Systems and Robotics	3.0	5
Spring 2009	CPSC 483	Computer Systems Design	3.0	14
Fall 2008	CPSC 689	Computer Vision	3.0	9
Spring 2008	CPSC 452	Robotics and Spatial Intelligence	3.0	26
Spring 2008	CPSC 643	Advanced Robotics	3.0	7
Fall 2007	CPSC 689	Computer Vision: Multi-view Geometry	3.0	9
Spring 2007	CPSC 452	Introduction to Robotics	3.0	9
Spring 2007	CPSC 643	Advanced Robotics	3.0	7
Spring 2006	CPSC 452	Introduction to Robotics	3.0	12
Fall 2005	CPSC 689	Networked Robots	3.0	10
Spring 2005	CPSC 452	Introduction to Robotics	3.0	21

Percentage of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities:
Dr. Song's research interests include: Networked Robotics, Computer Vision, Multimedia, Autonomous Vehicle, Optimization, and Automation.

1. **Name:** Alex Sprintson

2. **Academic Rank:** Assistant Professor

3. **Degrees:**
B.S. (CE) Technion, Israel Institute of Technology, Haifa, Israel, May 1997
M.S. (EE) Technion, Israel Institute of Technology, Haifa, Israel, May 2000
Ph.D. (EE) Technion, Israel Institute of Technology, Haifa, Israel, May 2003

4. **Years of Service on this Faculty:** 5
Original Appointment August 2005
Assistant Professor 8/05 – present

5. **Other Related Experience:**
Postdoctoral Research Fellow, California Institute of Technology 2003-2005

6. **Consulting:** N/A

7. **Patents**:
Y. Bejerano, Y. Breitbart, A. Orda, R. Rastogi and A. Sprintson. "Algorithms for computing QoS paths with restoration" Filed Sept. 2003. Application # 20050091350
Y. Bejerano, J. Naor and A. Sprintson. "Efficient Schemes for Shared Backup Allocation in Networks with Partial Information." Filed Oct. 2004. Application #20060067243
M. Langberg, A. Sprintson and J. Bruck. "Optimal Schedules for Asynchronous Transmission of Discrete Packets". Filed Oct. 2005. Application #20060198352

8. **State(s) in Which Registered**: None

9. **Principal Publications of Last Five Years:**
M. Langberg and A.Sprintson. "On the Hardness of Approximating the Network Coding Capacity". To appear in the proceedings of ISIT 2008, Toronto, Canada.
S. El Rouayheb, A. Sprintson, and C. Georghiades. "On the Relation Between the Index Coding and the Network Coding Problems". To appear in the proceedings of ISIT 2008, Toronto, Canada.
G. Booker, A. Sprintson, C. Singh, and S. Guikema. "Efficient Availability Evaluation for Transport Backbone Networks" In proceedings of 12th Conference on Optical Network Design and Modeling. March 12-14, 2008. Vilanova i la Geltru, Spain.
M. A. R. Chaudhry and A. Sprintson. "Efficient Algorithms for the Index Coding Problem". Infocom Student Workshop, Arizona, May 12-17, 2008.
A. Orda and A. Sprintson. "Approximation Algorithms for the Restricted Steiner Tree Problem." In the proceedings of 2007 Allerton Conference on Communication, Control and Computing, Monticello, IL, USA.
M. Yannuzzi, X. Masip-Bruin, R. Serral-Graci, E. Marin-Tordera, A Sprintson, and A. Orda. "Maximum Coverage at Minimum Cost for Multi-Domain IP/MPLS Networks." In the proceedings of IEEE Infocom 2008 Mini-Symposium, April 2008, Phoenix, Arizona, USA.
S. Y. El Rouayheb, C. N. Georghiades, E. Slojanin, and A. Sprintson. "Bounds on Codes Based on Graph Theory". In proceedings of 2007 IEEE International Symposium on Information Theory (ISIT), June 2007, Nice, France.

K. Narayanan, M. P. Wilson and A. Sprintson. Joint Physical Layer Coding and Network Coding for Bi-Directional Relaying. To appear in the proceedings of 2007 Allerton Conference on Communication, Control and Computing, Monticello, IL, USA.

A. Sprintson, M. Yannuzzi, A. Orda and X. Masip-Bruin. "Reliable Routing with QoS Guarantees for Multi-Domain IP/MPLS Networks". In proceedings of IEEE Infocom 2007, Anchorage, AK, USA, 6-12 May 2007.

A. Sprintson, S. El Rouayheb, and C. Georghiades. "Robust Network Coding for Bidirected Networks". In Proceedings of Proceedings of the Information Theory and its Applications (ITA) Workshop, UCSD, San Diego, CA (Invited Paper), February 2007.

S. El Rouayheb, A. Sprintson, and C. Georghiades. "Simple Network Codes for Instantaneous Recovery from Edge Failures in Unicast Connections". In Proceedings of Information Theory & Applications (ITA) Inaugural Workshop, UCSD, San Diego, CA, February 2006.

10. Scientific and Professional Societies: IEEE (Member)

11. Honors and Awards:

Prof. Andrew Viterbi post-doctoral fellowship, Technion- Israel Institute of Technology 2003.

12. Institutional Service:

N/A

13. Professional Service:

- Associate Editor, IEEE Communications Letters, 2006 - present.
- Technical Program Committee member, IEEE Infocom 2006-2009
- Frequent Technical Program Committee Member for other IEEE conferences
- National Science Foundation, panelist June 2007
- Frequent reviewer for various IEEE journals

14. Professional and Development Activities in the Last Five Years:

- California Institute of Technology, Postdoctoral Research Fellow, 2003-2005
- Faculty Teaching Academy, TAMU 2008.
- Tutorial on "Network Coding and its Application" (with T. Ho) DIMACS tutorial on Algorithms for Next Generation Networks, DIMACS center, Rutgers University, August 6-9, 2007.
- Tutorial on "Survivable Routing: Algorithms and Protocols." In 13th IEEE International Conference on Network Protocols November 6-9, 2005 Boston, Massachusetts, USA.

15. Percent Time Available for Research or Scholarly Activities:

16. Percent Time Committed to the Program:

Valerie Taylor, Royce E. Wisenbaker Professor and Department Head, Tenured

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Department Head and Stewart and Stevenson Professor, Tenured, 2003

Degree	Field	Institution	Year
PhD	Computer Science	University of California @Berkeley	1991
MS	Computer Science	Purdue University @West Lafayette	1986
BS	Computer and Electrical Engineering	Purdue University @West Lafayette	1985

Conferences, Workshops, and Professional Development (Last Five Years)

General Co-Chair, Grid 2007.

Program Committee, IPDPS 2005

Member, Steering Committee, Grace Hopper Celebration of Women in Computing Conference, 2000-2005

Chair, Nomination Committee, IEEE TCPP, 2004-2005

Member, ACM Job Migration Task Force, 2004

Coalition to Diversify Computing, a joint organization of the ACM, CRA and IEEE-CS, **Co-Chair**, 2000-2002; **Chair,** 2002-2003; **Past-Chair**, 2003-2004, **Chair-Elect**, 2004-2005, **Chair,** 2005-2006, **Past Chair,** 2006-2007

Editorial Activities

Editorial Board, **Cluster Computing: The Journal of Networks, Software Tools and Applications**, 2000-present

Editorial Board, **Parallel Computing**, June 1, 2004 – January, 2007

Editorial Board, **Journal on Grid Computing**, 2001 – 2007

Other Related Experience

Northwestern University, Evanston, Illinois

Professor, Electrical Computer Engineering, 2002

Associate Professor, Electrical Computer Engineering, 1997-2002

Assistant Professor, Electrical Computer Engineering, 1991-1997

University of California, Berkeley, California

Research Assistant, Electrical Engineering, 1987-1991

Teaching Assistant, "CPSC 252- Advanced Computer Architecture", 1989

Hughes Research Laboratories, Malibu, California

Consultant- Installed the software tool RAB, fall 1989

NASA Langley Research Center, Hampton, Virginia

Participant in the Langley Aerospace Research Summer Scholars Program- Investigated various methods for decreasing the execution time of static finite-element applications, summer 1988

Purdue University, West Lafayette, Indiana

Research Assistant, Electrical Engineering, 1985-1986

Consulting- None

University Committee Service 2005-2010
• **Member, Computing Information Systems (CIS) Executive Associate Director Search Committee, 2008-present.** • **Member, Enterprise Information Systems (EIS) Steering Committee, 2008-present.** • **Member, Department Head Steering Committee, 2007-present.** • **Member, Council on Climate and Diversity, 2008-present.** • **Member, Provost Search Committee, 2008.** • **Member, Vision 2020 Council to the President, 2004-2005**

Publications

Refereed Journals

A. Coker, V. Taylor, D. Bhaduri, S. Shukla, A. Raychowdhury, and K. Roy, "Multi-Junction Fault Tolerance Architecture for Nanoscale Crossbar Memories," *IEEE Transactions on Nanotechnology*, Volume 7, No. 2, March 2008, Pages: 202 -208.

Z. Lan, V. Taylor, Y. Li, "DistDLB: Improving Cosmology SAMR Simulations on Distributed Computing Systems through Hierarchical Load Balancing," *Journal on Parallel and Distributed Computing*, Vol. 66(5), pp. 716-731, 2006.

Refereed Conference Publications

Sameh Sharkawi, Don DeSota, Raj Panda, Rajeev Indukuru, Stephen Stevens, Valerie Taylor, and Xingfu Wu, "Performance Projection of HPC Applications Using SPEC CFP2006 Benchmarks,"*IPDPS* 2009, May 2009.

Charles Lively, Sadaf Alam, Jeffrey Vetter, and Valerie Taylor, "A Methodology for Developing High Fidelity Communications Models for Large-scale Applications on Multicore Systems," *20th International Symposium on Computer Architecture and High Performance Computing (SBAC-PAD 2008)*, IEEE Computer Society Press, Oct. 29-Nov. 1, 2008, Campo Grande, Mato Grosso do Sol, Brazil.

Xingfu Wu and Valerie Taylor. "Performance Analysis of Parallel Visualization Applications and Scientific Applications on an Optical Grid," *International Conference on CyberWorlds (CW2008)*, IEEE Computer Society Press, Sep. 22-24, 2008, Hangzhou, China.

Xingfu Wu, Valerie Taylor, Charles Lively and Sameh Sharkawi. "Performance Analysis and Optimization of Parallel Scientific Applications on CMP Cluster Systems," *ICPP2008 SMECS Workshop*, IEEE Computer Society Press, September 8-12, 2008, Portland, Oregon.

Ayodeji Coker and Valerie Taylor. "Error Correction Code Crossbar Nanomemory Demultiplexer: Performance and Reliability Analysis," *IEEE NANO Conference 2008*, August 2008.

X. Wu and V. Taylor, "Processor Partitioning: An Experimental Performance Analysis of Parallel Applications on SMP Cluster Systems," the *19th International Conference on Parallel and Distributed Computing and Systems (PDCS 2007)*, November 19-21, 2007.

A. Coker and V. Taylor. "Performance and Reliability Analysis of a Scaled Multi-Switch Junction Crossbar Nanomemory and Demultiplexor," *IEEE NANO Conference 2007*.

Y. Zuo, X. Wu, V. Taylor. "Performance Analysis and Optimization of the Regional Ocean Model System on the TeraGrid," *TeraGrid '07*, Madison, WI, June 2007.

A. Coker and V. Taylor, "Performance Analysis of a Scaled Multi- Junction Molecular Switch Crossbar Nanomemory with ECC Enhanced Demultiplexer (invited talk), *Design Automation and Test in Europe (DATE)*, April 2007.

X. Wu, V. Taylor, S. Garrick, D. Yu, J. Richard. "Performance Analysis, Modeling, and Prediction of a Parallel Multiblock Lattice Boltzmann Application Using Prophesy System," *IEEE International Conference on Cluster Computer*, September 2006, Barcelona, Spain.

X. Wu, V. Taylor, J. Paris. "A Web-based Prophesy Automated Performance Modeling System," 2006 *IASTED International Conference on Web Technologies, Applications, and Service (WTAS2006)*, July 2006, Calgary, Canada.

A. Coker, V. Taylor, D. Bhaduri, S. Shukla, A. Raychowdhury, K. Roy. "Mulit-Junction Fault Tolerance Architecture for Nanoscale Crossbar Memories," *IEEE Conference on Nanotechnology*, July 2006.

D. Dhaduri, A. Coker, S. Shukla, V. Taylor. "A Hybrid Framework for Design and Analysis of Fault-Tolerant Architectures and its Applications to Nanoscale Molecular Crossbar Memories," *Design, Automation, and Test in Europe (DATE)*, April 2006.

Seung-Hye Jang, Valerie Taylor, Xingfu Wu, Mieke Prajugo, Ewa Deelman, Gaurang Mehta, Karan Vahi. "Performance Prediction-based Site Selection: Quantifying the Difference," *18th International Conference on Parallel and Distributed Computing Systems (PDCS 2005)*, Las Vegas, Nevada, 12-14 September 2005.

Xingfu Wu, Valerie Taylor, Jason Leigh, and Luc Renambot. "Performance Analysis of 3D Parallel Volume Rendering Application, Volatile, on Scalable Tiled Displays," *International Conference on Computer Graphics, Imaging and Vision (CGVI05)*, Beijing, China, 26-29 July 2005.

Other Scholarly Activities

Grants

"Research Experiences at Texas A&M University Department of Computer Science for Undergraduate Students," National Science Foundation, **PI: Taylor**, **$255,000**, 2004-2007; Renewed for **$300,000**, 2007-2010.

"Nanoelectronics," NASA URETI Program, **Co-PI: Taylor,** (Principal Investigator): **$350,000**, 2002-2008, subcontract to TAMU.

"Graduate Assistantships for Areas of National Need," Department of Education, **$390,000**, 2003- 2007.

"OptiPuter," National Science Foundation, **Co-PI: Taylor, $13,000,000**; subcontract to (Principal Investigator): **$675,000**, 2002-2007.

.

"New Approaches to Human Potential Realization through Information Technology Research," National Science Foundation, **Co-PI: Taylor, $1,300,000**; subcontract (Principal Investigator): **$500,000**, 2000-2006.

"Grid Physics Network GriPhyN) Project," National Science Foundation, **Co-PI: Taylor, $11,000,000**; subcontract to (Principal Investigator): **$349,642,** 2000-2006.

Equipment Grant

"CRI: A Cluster Testbed for Experimental Research in High Performance Computing," National Science Foundation, **PI: Taylor, $533,000,** 2006-2009.

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Fall 2009	CSCE 181	Introduction to Computing	1	102
Fall 2008	CPSC 181	Introduction to Computing	1	109
Fall 2007	CPSC 181	Introduction to Computing	1	76
Fall 2006	CPSC 289	Special Topics in Computer Science	3	31
Spring 2005	CPSC 689	Special Topics in Computer Science	3	10

Percentage of time devoted to scholarly and/or research activities: 0% . At this time Dr. Taylor is the Department Head of the Computer Science and Engineering Department and 100% of her time is spent managing the department.

Please give a brief description of your major research and scholarly activities:

Dr. Taylor's research interests include: High Performance Computing, with Particular Emphasis on the Performance Analysis and Modeling of Parallel and Distributed Applications.

Duncan Walker, Graduate Advisor and Professor, Tenured

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Associate Professor, Tenure-track, September 1993
Appointed Associate Head of Computing and Facilities Services, 2000
Promoted, Professor, 2006; Appointed Graduate Advisor, 2006

Degree	Field	Institution	Year
PhD	Computer Science	Carnegie Mellon University	1993
MS	Computer Science	Carnegie Mellon University	1984
BS	Engineering with Honors	California Institute of Technology	1979

Conferences, Workshops, and Professional Development (Last Five Years)

Steering Committee Member

IEEE International Workshop on Defect and Data Driven Te3sting (D3T), 2008-present
IEEE International Workshop on Defect Based Testing, 2005-2007
Program Committee Member
IEEE North Atlantic Test Workshop, Hopewell Junction, NY, May 2010; May 2009.
IEEE International Test Synthesis Workshop, Austin, TX, 2009; Santa Barbara, CA, 2008; San Antonio, TX, 2007
IEEE International Symposium on Defect and Fault Tolerance in VLSI Systems, Cambridge, MA, 2008.
National Science Foundation CPS CAREER Panel on Design Automation and Test, 2007; 2005.
IEEE International Workshop on Design for Manufacturability and Yield, Santa Clara, CA, 2006;
National Science Foundation CPS Panel on Embedded and Hybrid Systems, 2005.

Panel Chair

IEEE International Workshop on Defect Based Testing, "Defect Based Test in a Foundry Environment: Holy Grail or Reality?" Palm Springs, CA, May, 2005.

Panel Member

IEEE International Test Synthesis Workshop, "Process Variation: The Opportunity," Santa Barbara, CA, March 2005.
Associate Editor, IEEE Transactions on Computer-Aided Design of Circuits and Systems, 2010-present.

Other Related Experience

IBM Austin Research Laboratory
Academic Visitor, 1997
Carnegie Mellon University, Department of Electrical and Computer Engineering
Assistant Director and Research Engineer, SRC-CMU Research Center for Computer-Aided Design, 1986-1993.
California Institute of Technology
Teaching Assistant, 1978-79.
Digital Equipment Corporation, Hudson, Massachusetts
Part Time Engineer, 1979-81
Hughes Aircraft Company, Culver City, California
Summer Engineer, 1977-78

Consulting- None

Department Committee Service 2009-2010
• Computer Engineering Curriculum Coordination Committee
• Graduate Advisory Committee (Ex Officio)
• Graduate Assistantship & Scholarship Selection Committee
• Promotion and Tenure Committee

College of Engineering Committee Service 2009-2010
• Graduate Instruction Committee
University Committee Service, 2009-2010
• Faculty Senator

Department Committee Service 2005-2009
• Computer Engineering Curriculum Coordination Committee, 2005-2009 • Faculty Search Information Storage/Retrieval & Graphics, 2005-2006 • Graduate Assistantship & Scholarship Selection Committee, 2005-2009 • Faculty Search Systems or Systems Software Sub Committee, 2006-2007 • Graduate Advisory Committee (Ex Officio), 2006-2009 • Faculty Search Senior Hire Sub Committee, Chair, 2007-2008 • Promotion and Tenure Committee, 2007-2009
College of Engineering Committee Service, 2005-2009
• Graduate Instruction Committee, 2006-2009
University Committee Service, 2005-2009
• Faculty Senator, 2005-2009 • PAM (Program for Advanced Manufacturing) Academic Council, 2005-2006

Principle Publications *Indicates student author

Refereed Journals

K. Gulati*, N. Jaykumar*, S. P. Khatri and **D. M. H. Walker**. "A Probabilistic Method to Determine the Minimum Leakage Vector for Combinational Designs in the Presence of Random PVT Variations," *Integration, the VLSI Journal*, vol. 41, no. 3, May 2008, pp. 399-412.

S. Sabade* and **D. M. H. Walker.** "Estimation of Fault-Free Leakage Using Wafer-Level Spatial Information," *IEEE Transactions on VLSI Systems,* vol. 14, no. 1, January 2006, pp. 91-94.

X. Lu*, Z. Li*, W. Qiu*, **D. M. H. Walker** and W. Shi. "Longest Path Selection for Delay Test under Process Variation," *IEEE Transactions on Computer-Aided Design*, vol. 24, no. 12, December 2005, pp. 1924-1929.

S. Sabade* and **D. M. H. Walker.** "IC Outlier Identification Using Multiple Test Metrics," *IEEE Design and Test of Computers*, vol. 22, no. 6, November-December 2005, pp. 586-595.

Highly Selective Conferences

Z. Wang* and **D. M. H. Walker**. "Compact Delay Test Generation with a Realistic Low Cost Fault Coverage Metric," *IEEE VLSI Test Symposium*, Santa Cruz, CA, May 2009. (Acceptance rate ~30%)

Z. Wang* and **D. M. H. Walker.** "Dynamic Compaction for High Quality Delay Test," IEEE VLSI Test Symposium, Rancho Bernardo, CA, May 2008, paper 8.1. (Acceptance rate ~30%)

W. Qiu*, **D. M. H. Walker**, N. Simpson, D. Reddy and A. Moore. "Comparison of Delay Tests on Silicon," *IEEE International Test Conference*, Santa Clara, CA, October 2006, paper 11.3. (Acceptance rate <30%)

J. Wang*, X. Lu*, W. Qiu*, Z. Yue*, S. Fancler*, W. Shi and **D. M. H. Walker**. "Static Compaction of Delay Tests Considering Power Supply Noise," *IEEE VLSI Test Symposium*, Palm Springs, CA, May 2005, pp. 235-240. (Acceptance rate ~30%)

High Visibility Conferences

Z. Wang* and **D. M. H. Walker**. "A Low Cost Path Generation Method Targeting Local and Global Delay Defects," *Semiconductor Research Corporation Technical Conference (SRC TECHCON),* Austin TX, September 2009, paper 1.2. Acceptance rate: 50%. [online http://www.src.org]

Z. Jiang* and **D. M. H. Walker**. "Efficient Power Model and Pattern Reordering Algorithm for Constant Test Power," *Semiconductor Research Corporation Technical Conference (SRC TECHCON),* Austin TX, September 2009, paper 1.3. (Acceptance rate: 50%) [online http://www.src.org]

Z. Wang* and **D. M. H. Walker**. "Improved Dynamic Compaction for Delay Test," *Semiconductor Research Corporation Technical Conference (SRC TECHCON)*, Austin TX, November 2008, paper 1.4. (Acceptance rate: 52%) [online http://www.src.org]

B. Xue* and **D. M. H. Walker.** "IDDQ Test Using Built-In Current Sensing of Supply Line Voltage Drop," *IEEE International Test Conference*, Austin, TX, Oct. 2005, paper 37.1, pp. 954-963. (Acceptance rate 37%)

J. Wang*, Z. Yue*, X. Lu*, W. Qiu*, W. Shi and **D. M. H. Walker.** "A Vector-based Approach for Power Supply Noise Analysis in Test Compaction," *IEEE International Test Conference,* Austin, TX, Oct. 2005, paper 22.2, pp. 517-526. (Acceptance rate 37%)

Other Scholarly Activities

Grants

"At-Speed Tests Considering DSM and Power," Semiconductor Research Corporation, **$150,000**, 8/2007- 7/2010.

"Delay Test and Diagnosis Considering DSM and Power," National Science Foundation, **$150,000**, 7/2007-6/2010.

"Reliability Screening Via Outlier Analysis," National Science Foundation, **$230,000**, 9/2003 to 8/2007.

"Fault Counting, Die Products Consortium," **$12,000**, 12/2005-12/2006.

"Testing Tri-State and Pass Transistor Circuit Structures," Semiconductor Research Corporation, **$30,000**, 10/2004 to 8/2005.

Term/Year	Course Number	Course Title	Semester Hours	Class Size
Fall 2009	ENGR 111	Foundations of Engineering I	2.0	245
Spring 2009	CSCE 312	Computer Organization	4.0	30
Fall 2008	ENGR 111	Foundations of Engineering I	2.0	258
Spring 2008	CSCE 680	Testing and Diagnosis of Digital Systems	3.0	29
Spring 2008	ECEN 680	Testing and Diagnosis of Digital Systems	3.0	23
Fall 2007	ENGR 111	Foundations of Engineering I	2.0	226
Spring 2007	CSCE 614	Computer Architecture	3.0	50
Fall 2006	ENGR 111	Foundations of Engineering I	2.0	228
Spring 2006	CSCE 321	Computer Architecture	4.00	50
Fall 2005	CSCE 661	Integrated Systems Design Automation	3.0	7
Fall 2005	CSCE/ELEN 680	Testing and Diagnosis of Digital Systems	3.0	16
Spring 2005	CSCE 321	Computer Architecture	4.0	47

Percentage of time devoted to scholarly and/or research activities: 70%. Dr. Walker spends 30% of his time as Graduate Advisor for the Department of Computer Science and Engineering.

Please give a brief description of your major research and scholarly activities:
Dr. Walker's research interests include: Integrated Circuit Test, Defect-Based Test, Delay Test, IDDQ Test, Fault Diagnosis, Realistic Fault Modeling, Parametric and Functional Yield Prediction.

1. Name: Karan Watson

2. Academic Rank: Regents Professor of Electrical and Computer Engineering

3. Degrees:

Ph.D., Electrical Engineering, Texas Tech University, 1982.
M.S., Electrical Engineering, Texas Tech University, 1981.
B.S., Electrical Engineering, Texas Tech University, 1977

4. Years of Service on this Faculty: 27

7/09-present: Texas A&M University Interim Provost and Executive Vice President
1/09-7/09: Texas A&M University Interim Vice President and Associate Provost for Diversity
12/08-7/09: Texas A&M University Vice Provost for Strategic Initiatives
2/02-1/09: Texas A&M University Dean of Faculties and Associate Provost (Evaluated in 2006 by faculty and administrators and reappointed to a second 4 year term)
11/05-8/06: Texas A&M University Interim Vice President and Associate Provost for Diversity
12/96-1/02: Texas A&M University College of Engineering, Associate Dean of Graduate and Undergraduate Studies, and Special Programs (including Honors, Minority, and Women's Programs).
6/91-1/02: Program Head for Interdisciplinary Engineering Programs
6/91-11/96: Texas A&M University College of Engineering, Assistant Dean of Graduate Studies and Special Programs.
9/94-1/02: Foundation Coalition Interim Director (6/95-10/95), Management Team member directing institutionalization and change management strategies
1/95-present: Texas Alliance for Minority Participation Director
9/83-present: Texas A&M University Department of Electrical and Computer Engineering, currently a Regents Professor (9/99).

5. Other Related Experience:

9/82-8/83: Texas Tech University Department of Electrical Engineering, Visiting Assistant Professor.
9/79-8/82: Texas Tech University Department of Electrical Engineering, Research Assistant.
3/79-10/79: Hicks & Ragland Engineering Company, Lubbock, Texas, Communication Consulting Engineer.
7/78-2/79: AT&T Long Lines, Houston, Texas, Management Development Training.
5/77-8/77: IBM, Boulder, Colorado, Student Engineer.

6. Consulting: None

7. Patents: None

8. State(s) in Which Registered: Texas 72117

9. Principal Publications of Last Five Years:

Kimball, Jorja*, Bryan Cole, Margaret Hobson, Karan Watson, Christine Stanley, "A Study of Women Engineering Students and Time to Completion of First Year Required Courses at Texas A&M University," Journal of Women and Minorities in Engineering, accepted

Kerns, Sherra and Karan Watson, "Overcoming resistance to Change," Spurlin, J., Rajala, S., & Lavelle, J. (2008) (eds.) *Designing Better Engineering Education Through Assessment: A Practical Resource for Faculty and Department Chairs on Using Assessment and ABET Criteria to Improve Student Learning*. Sterling, Va: Stylus Publishing.

Watson, Karan and Froyd, Jeffrey. "Diversifying the US Engineering Workforce: a New Model," Journal of Engineering Education, January 2007.

Stanley, C.A., Watson, K.L. "Meeting the professional development needs of new faculty: A three-year evaluation study of a new faculty orientation program." Journal of Faculty Development, Vol. 21, No. 3, 2007.
Stanley, C.A., Watson, K.L., & Algert, N.E. "A Faculty Development Model for Mediating Diversity Conflicts in the University Setting. " Journal of Faculty Development. Vol. 20, No. 3, November 2005, pp. 129-142

10. Scientific and Professional Society Memberships:
IEEE (Fellow)
ASEE (Fellow)

11. Honors and Awards:
- Electrical and Computer Engineering Division of the ASEE Distinguished Educator Award, June 2008.
- Senior Fellow of the Center for the Advancement of the Science of Engineering
- Education of the National Academy of Engineering, 2003
- Women in Engineering Programs & Advocates Network's Founders Award, 1999.
- American Association for the Advancement of Science Mentoring Award, 1999
- U.S. President's Award for Excellence in Science and Technology Mentoring, 1997
- American Society of Engineering Educators Minorities in Engineering Award, 1997
- Harriett B. Regis Award, Hewlett-Packard Company and IEEE, 1996
- IEEE Undergraduate Teaching Medal, Board of Directors of IEEE, 1996

12. Institutional Service:
- Dean of faculties and Associate Provost,
- Interim Vice President and Associate Provost for Diversity
- Interim Provost and Executive Vice President

13. Professional Service:
- NAE Committee on Engineering Education, 2006-present
- ABET Board of Directors, 2006-2011

14. Professional and Development Activities in the Last Five Years:

15. Percent Time Available for Research or Scholarly Activities: 5%

16. Percent Time Committed to the Program: 0%

1. **Name:** Zixiang Xiong

2. **Academic Rank:** Professor

3. **Degrees:**

   B.S. (EE) Wuhan University, China, July 1987
   M.A. (Math) University of Kansas, KS, May 1991
   M.S. (EE) Illinois Institute of Technology, IL, June 1992
   Ph.D. (EE) University of Illinois at Urbana-Champaign, IL, October 1996

4. **Years of Service on this Faculty:** 11

Original Appointment	September 1999
Assistant Professor	8/99 – 8/02
Associate Professor	8/02 – 8/07
Professor	9/07 – present

5. **Other Related Experience:**

   Assistant Professor, University of Hawaii, 1997-1999
   Research Associate, Princeton University, 1996-1997
   Visiting Student, Princeton University, 1995-1996

6. **Consulting:** Microsoft and Fastvideo

7. **Patents**:
   1. Data encoding and decoding using Slepian-Wolf coded nested quantization to achieve Wyner-Ziv coding, US patent #7,295,137
   2. Packetization of FGS/PFGS video bitstreams, US patent #7,283,589
   3. Data encoding and decoding using Slepian-Wolf coded nested quantization to achieve Wyner-Ziv coding, US patent #7,256,716
   4. Enhanced method for digital data hiding, US patent #7,076,659
   5. Method and apparatus for audio error concealment using data hiding, US patent #7,047,187
   6. Memory efficient 3-D wavelet transform for video coding without boundary effects, US patent #6,795,504
   7. Apparatus and method for quadtree based variable block size motion estimation, US patent #6,084,908

8. **State(s) in Which Registered**: None

9. **Principal Publications of Last Five Years:**
   1. Z. Xiong, A. Liveris, and Y. Yang, ``Distributed source coding," *Handbook on Array Processing and Sensor Networks*, S. Haykin and K. J. R. Liu (Eds.), to appear.
   2. V. Stankovic, A. Host-Madsen, and Z. Xiong, ``Cooperative diversity: Capacity bounds and code designs," *Adaptive Signal Processing for Wireless Communications*, M. Ibnkahla (Ed.), CRC Press, to appear.
   3. C. Khirallah, V. Stankovic, L. Stankovic, Y. Yang, and Z. Xiong, ``Bandwidth efficient multi-station streaming based on complete complementary sequences," *IEEE Trans. Wireless Communications*, to appear.
   4. M. Uppal, V. Stankovic, and Z. Xiong, ``Code design for MIMO broadcast channels," *IEEE Trans. Communications*, to appear.
   5. Q. Xu, J. Hua, Z. Xiong, M. Bittner, and E. Dougherty, ``The effect of microarrary image compression on expression-based classification," *Signal, Images and Video Processing*, to appear.
   6. Y. Yang, S. Cheng, Z. Xiong, and W. Zhao, ``Wyner-Ziv coding based on TCQ and LDPC codes," *IEEE Trans. Communications*, to appear.
   7. Y. Yang, V. Stankovic, Z. Xiong, and W. Zhao, ``On multiterminal source code design," *IEEE Trans. Information Theory*, vol. 54, May 2008.
   8. Y. Sun, M. Uppal, A. Liveris, S. Cheng, V. Stankovic, and Z. Xiong, ``Nested turbo codes for the Costa problem," *IEEE Trans. Communications*, vol. 56, pp. 388-399, March 2008.

9. R. Hamzaoui, V Stankovic, Z. Xiong, K. Ramchandran, R. Puri, A. Majumdar, and J. Chou ``Channel protection and joint source channel coding techniques," *Multimedia over IP and Wireless Networks: Compression, Networking, and Systems*, M. van der Schaar and P. Chou (Eds.), Academic Press, 2007.
10. R. Hamzaoui, V Stankovic, and Z. Xiong, ``Forward error control for packet loss and corruption," *Multimedia over IP and Wireless Networks: Compression, Networking, and Systems*, M. van der Schaar and P. Chou (Eds.), Academic Press, 2007.

10. Scientific and Professional Societies: IEEE

11. Honors and Awards:

- 2008 IEEE Circuits and Systems Society Distinguished Lecturer
- 2007 IEEE fellow
- 2006 *IEEE Signal Processing Magazine* best paper award
- 2003 TEES Young Faculty Award, Texas A&M University
- 2002 Select Young Faculty Award, TEES, Texas A&M University
- 2001 Eugene Webb Faculty Fellow Award, Texas A&M University

12. Institutional Service:

Member of ECE Dept. Graduate Studies Committee, 2002-2003

13. Professional Service:

1. Associate editor: *IEEE Trans. Systems, Man, and Cybernetics, Part B*, 2005-present
2. Associate editor: *IEEE Trans. Signal Processing*, 2002-2006
3. Associate editor: *IEEE Trans. Image Processing*, 2002-2005
4. Associate editor: *IEEE Trans. Circuits and Systems for Video Tech*, 1999-2005
5. Editor: *The ETRI Journal*, 2006-2007
6. Guest editor, *IEEE Journal of Selected Topics in Signal Processing: Special Issue on MIMO-Optimized Transmission Systems for Delivering Data and Rich Content*, 2008
7. Guest editor, *IEEE Signal Processing Magazine: Special Issue on Signal Processing for Multiterminal Communication Systems*, September 2007
8. Guest editor, *EURASIP Signal Processing: Special Issue on Distributed Source Coding*, November 2006

14. Professional and Development Activities in the Last Five Years:

1. Tutorial chair: ISIT'10, Austin, TX, 2010
2. Technical program committee co-chair, ITW'07, Lake Tahoe, CA, September 2007
3. Publications chair, ICASSP'07, Honolulu, HI, April 2007
4. Panelist, Distributed Video Coding: Trends and Challenges, PCS'07, Lisbon, Portugal, Nov. 8, 2007
5. Member: *IEEE Communications Society Multimedia Communications Technical Committee*, 2001-present
6. Member: *IEEE Circuits and Systems Society Multimedia Systems & Applications Technical Committee*, 2001-present
7. Technical program committee member: ICASSP'02-ICASSP'08
8. Technical program committee member: ICIP'98-ICIP'08
9. Technical program committee member: ICME'01-ICME'08
10. Technical program committee member: ISCAS'98-ISCAS'08
11. Technical program committee member: VCIP'99-VCIP'08

15. Percent Time Available for Research or Scholarly Activities:

16. Percent Time Committed to the Program:

Salih Yurttas, Senior Lecturer, Non-Tenured/Non-Tenure-Track

Experience, Department of Computer Science and Engineering, Texas A&M University

Hired, Visiting Professor, Senior Lecturer, Non-Tenured/Non-Tenure-track, 1982

Degree	Field	Institution	Year
PhD	Computer Science	Ege University @Izmir, Turkey	1981
MS	Industrial Engineering	Ege University @Izmir, Turkey	1975
BS	Industrial Engineering	Middle East Technical University @Ankara, Turkey	1972

Conferences, Workshops, and Professional Development (Last Five Years)

First International Conference on the Networked Digital Technologies, Ostrava, Czech Republic, July 29, 2009.

Second International Conference on the Applications of Digital Information and Web Technologies 2009, London, Aug 4, 2009.

IEEE Proceedings of the World Congress on Nature and Biologically Inspired Computing (NaBIC'09), December 09-11, 2009, Coimbatore, India.

IADIS International Conference, **WWW/INTERNET 2009**, Rome, Italy, 19 - 22 November 2009.

2nd International Conference on Computer and Electrical Engineering (ICCEE 2009), 28 - 30, December 2009, Dubai, UAE.

Other Related Experience

Lecturer, Computer Science, Ege University @ Izmir, Turkey, 1981

Teaching Assistant, Department of Industrial Engineering, Ege University @ Izmir, Turkey, 1972-1976

Consulting

AdventGX, 2008

Department Committee Service 2009-2010
• Undergraduate Recruiting Committee
Department Committee Service 2005-2009
• Undergraduate Recruiting Committee

Principal Publications

Refereed Conferences

Yurttas, Salih and Joseph Pally. “Intelligent Immersive Omni-Functional Documents,” *First International Conference on the Networked Digital Technologies* at Ostrava, Czech Republic on July 29, 2009.

Yurttas, Salih and Joseph Pally. “Websheets: Calculation Enabled Web Documents,” *Second International Conference on the Applications of Digital Information and Web Technologies 2009,* London on Aug 4, 2009.

Yurttas, Salih and Joseph Pally. “Function-Agnostic Omni-Functional Computing based on the Design of the Genome,” ***IEEE** Proceedings of the World Congress on Nature and Biologically Inspired Computing (NaBIC'09)*, December 09-11, 2009, Coimbatore, India.

Yurttas, Salih and Joseph Pally. “Interactive Omni-functional Distributed Documents for the Semantic Web,” *IADIS International Conference, **WWW/INTERNET 2009***, Rome, Italy, 19 - 22 November 2009.

Yurttas, Salih and Joseph Pally. “Omni-Functional Websheets: Advantages of Deeply Calculation Enabled Web Documents,” *2nd International Conference on Computer and Electrical Engineering (**ICCEE** 2009),* 28 - 30, December 2009, Dubai, UAE.

Other Scholarly Activities

Dr. Yurttas advises several local and global companies on software products, decisions, and recruitment activities. He has developed online resources which are shared by CSCE students, former graduates, and professionals all over the world. Monthly up to ten thousand page accesses are made to his online resources by one thousand unique users.

Dr. Yurttas has added Team Systems (VSTS Foundation Server and Client) and SharePoint Software use both Software Engineering and Distributed Object Programming. On average eight to ten project teams per semester develop software projects with design, implementation, testing, deployment aspects fully integrated.

Dr. Yurttas presents and teaches new languages like Ruby, new improvements in the Libraries of Java, C#, and C++.

Term/Year	Course Number	Course Name	Semester Hours	Class Size
Fall 2009	CSCE 332	Programming Language Design	3.0	11
Fall 2009	CSCE 438	Distributed Objects Programming	3.0	51
Fall 2009	CSCE 602	Object-Oriented Programming, Development and Software Engineering	3.0	27
Summer 2009	CSCE 431	Software Engineering	3.0	30
Summer 2009	CSCE 438	Distributed Objects Programming	3.0	11
Spring 2009	CSCE 310	Database Systems	3.0	28
Spring 2009	CSCE 332	Programming Language Design	3.0	21
Spring 2009	CSCE 438	Distributed Objects Programming	3.0	50
Spring 2009	CSCE 603	Database Systems and Applications	3.0	18
Fall 2008	CSCE 332	Programming Language Design	3.0	10
Fall 2008	CSCE 438	Distributed Objects Programming	3.0	30
Fall 2008	CSCE 602	Object-Oriented Programming, Development and Software Engineering	3.0	28
Summer 2008	CSCE 332	Programming Language Design	3.0	33
Summer 2008	CSCE 431	Software Engineering	3.0	6
Spring 2008	CSCE 332	Programming Language Design	3.0	35
Spring 2008	CSCE 438	Distributed Objects Programming	3.0	50
Spring 2008	CSCE 602	Object-Oriented Programming, Development and Software Engineering	3.0	38
Fall 2007	CSCE 332	Programming Language Design	3.0	34
Fall 2007	CSCE 438	Distributed Objects Programming	3.0	42
Fall 2007	CSCE 602	Object-Oriented Programming, Development and Software Engineering	3.0	22
Summer 2007	CSCE 310	Database Systems	3.0	19
Summer 2007	CSCE 431	Software Engineering	3.0	43
Summer 2007	CSCE 603	Database Systems and Applications	3.0	10
Spring 2007				
Fall 2006	CSCE 332	Programming Language Design	3.0	40
Fall 2006	CSCE 438	Distributed Objects Programming	3.0	96
Fall 2006	CSCE 602	Object-Oriented Programming, Development and Software Engineering	3.0	72
Summer 2006	CSCE 310	Database Systems	3.0	12
Summer 2006	CSCE 602	Object-Oriented Programming, Development and Software Engineering	3.0	12
Summer 2006	CSCE 603	Database Systems and Applications	3.0	9
Spring 2006	CSCE 310	Database Systems	3.0	42
Spring 2006	CSCE 332	Programming Language Design	3.0	37

Spring 2006	CSCE 438	Distributed Objects Programming	3.0	36
Spring 2006	CSCE 603	Database Systems and Applications	3.0	18
Fall 2005	CSCE 332	Programming Language Design	3.0	58
Fall 2005	CSCE 438	Distributed Objects Programming	3.0	44
Fall 2005	CSCE 602	Object-Oriented Programming, Development and Software Engineering	3.0	18
Summer 2005	CSCE 332	Programming Language Design	3.0	14
Summer 2005	CSCE 431	Software Engineering	3.0	29
Spring 2005	CSCE 310	Database Systems	3.0	55
Spring 2005	CSCE 332	Programming Language Design	3.0	57
Spring 2005	CSCE 438	Distributed Objects Programming	3.0	33
Spring 2005	CSCE 603	Database Systems and Applications	3.0	6

Percentage of time devoted to scholarly and/or research activities: 100%

Please give a brief description of your major research and scholarly activities: See Other Scholarly Activities.

1. **Name:** Xi Zhang

2. **Academic Rank:** Professor

3. **Degrees:**

B.S. (EE/CS) Xidian University, Xi'an, China 1982
M.S. (EE/CS) Xidian University, Xi'an, China 1984
M.S. (EE/CS) Lehigh University, Bethlehem, PA 1995
Ph.D. (EE) University of Michigan, Ann Arbor, MI 2002

4. **Years of Service on this Faculty:** 8

Original Appointment 2002
Associate Professor 2008

5. **Other Related Experience: N/A**

6. **Consulting:** N/A

7. **Patents**: N/A

8. **State(s) in Which Registered**: None

9. **Selected Recent Publications:**

1. Hang Su* and Xi Zhang, "Cross-Layer Based Opportunistic MAC Protocols for QoS Provisionings Over Cognitive Radio Mobile Wireless Networks," *IEEE Journal on Selected Areas in Communications (JSAC)*, Vol. 26, No. 1, pp. 118--129, January 2008.
2. Jia Tang* and Xi Zhang, "Cross-Layer Modeling for Quality of Service Guarantees Over Wireless Links," *IEEE Transactions on Wireless Communications*, Vol. 6, No. 12, pp. 4504--4512, December 2007.
3. Jia Tang* and Xi Zhang, "Quality-of-Service Driven Power and Rate Adaptation for Multichannel Communications Over Wireless Links," *IEEE Transactions on Wireless Communications*, Vol. 6, No. 12, pp. 4349--4360, December 2007.
4. Jia Tang* and Xi Zhang, "Cross-Layer-Model Based Adaptive Resource Allocation for Statistical QoS Guarantees in Mobile Wireless Networks," *IEEE Transactions on Wireless Communications*, Vol. 6, No. 12, December 2007.
5. Jia Tang* and Xi Zhang, "Quality-of-Service Driven Power and Rate Adaptation Over Wireless Links," *IEEE Transactions on Wireless Communications*, Vol. 6, No. 8, pp. 3058--3068, August 2007.
6. Xi Zhang and Qinghe Du*, "Cross-Layer Modeling for QoS-Driven Multimedia Multicast/Broadcast Over Fading Channels in Mobile Wireless Networks," *IEEE Communications Magazine*, Vol. 45, No. 8, pp. 62--70, August 2007.
7. Jia Tang* and Xi Zhang, "QoS-Driven Power Allocation Over Parallel Fading Channels With Imperfect Channel Feedback Information in Wireless Networks," *IEEE Transactions on Wireless Communications*, to appear in December 2007
8. Hang Su* and Xi Zhang, "An Efficient Single-Transceiver CDMA-Based MAC Protocol for Wireless Networks," *IEEE Transactions on Wireless Communications*, Accepted and to appear 2007.
9. Jia Tang* and Xi Zhang, "Cross-Layer Resource Allocation Over Wireless Relay Networks for Quality of Service Provisioning," *IEEE Journal on Selected Areas in Communications (JSAC)*, Vol. 25, No. 4, pp. 645--657, May 2007. *(Nominated for the IEEE JSAC Best Paper Award)*
10. Hang Su* and Xi Zhang, "Clustering-Based Multi-Channel MAC Protocols for QoS-Provisionings Over Vehicular Ad Hoc Networks," *IEEE Transactions on Vehicular Technology*, Vol. 56, No. 6, pp. 3309--3323, November 2007.

11. Xi Zhang, Jia Tang*, and Hsiao-Hwa Chen, "Space-Time Diversity-Enhanced QoS Provisioning for Real-Time Service Over MC-DS-CDMA Based Wireless Networks," *Wiley's Journal on Wireless Communications and Mobile Computing*, June 2007.
12. Qinghe Du* and Xi Zhang, "QoS-Driven Power Control for Downlink Multiuser Communications Over Parallel Fading Channels in Wireless Networks," *ACM/Springer Journal on Mobile Networks and Applications*, Accepted and to appear, 2007.
13. Hsiao-Hwa Chen, Xi Zhang, and Wen Xu, ``Guest Editorial - Next Generation CDMA vs. OFDMA for 4G Wireless Applications," *IEEE Wireless Communications Magazine*, Vol. 14, No. 3, June 2007.

10. Scientific and Professional Societies: IEEE (Senior Member)

11. Honors and Awards:

- NSF Early Career Award, 2004-2009
- NSF CNS-ITR-NeTS Travel Grant Award for IEEE INFOCOM 2007
- TEES Select Young Faculty Award for Excellence in Research Performance, 2006
- IEEE Globecom 2007 Best Paper Award, 2007
- Nominated for the IEEE Communications Society Leonard G. Abraham Prize, 2007
- Best Paper Award Candidate, 2006
- NSF/IEEE Grant Award for IEEE INFOCOM, 2001
- NSF/IEEE Grant Award of INFOCOM, 1997
- 1996 AT&T Bell Labs Graduate Fellowship
- 1994 OTC PhD Student Fellowship
- 1989-1990 Overseas Research Fellow Fellowship
- 1988-1989 Excellent Teaching Award

12. Institutional Service:

Founding Director, Networking and Information Systems Laboratory, Department of Electrical & Computer Engineering, Texas A&M University

13. Significant Professional Service 2005 - Present:

- Editor, IEEE Transactions on Wireless Communications
- Editor, Wiley's Wireless Communications and Mobiles Computing Journal
- Editor, Journal of Computer Systems, Networking, and Communications
- Chair, TPC, RWS, 2009
- Chair, TPC, IWCMC
- Chair, IEEE Symposium on Cross-Layer Optimized Wireless Networks
- Chair, TPC, IEEE International Wireless Comm. & Mobile Computing Conf.
- Chair, Panel for IEEE ICCCN 2007

14. Professional and Development Activities in the Last Five Years: None

15. Percent Time Available for Research or Scholarly Activities:

16. Percent time Committed to the Program:

APPENDIX C: LABORATORY EQUIPMENT

For a detailed description of the laboratory equipment available to our CE students please refer to Table VII.4 in Chapter VII (Facilities).

APPENDIX D: INSTITUTIONAL SUMMARY

The complete Appendix D - Institutional Summary is provided as a separate Document. For convenience, Table D-3, D-4, D-5, and D-6 are provided herein.

Table D-3 Support Expenditures

Computer Science and Engineering

Fiscal Year	FY 08/09	FY 09/10	FY 10/11
Expenditure Category			
Operations (not including staff)[4]	\$538,788	\$735,960	\$735,960
Travel[5]	\$53,609	\$49,064	\$52,130
Equipment[6]			
(a) Institutional Funds	\$3,211	\$40,710	\$18,399
(b) Grants and Gifts[7]	0	0	0
Graduate Teaching Assistants	\$480,531	\$490,640	\$490,640
Part-time Assistance[8] (other than teaching)	\$79,867	\$79,729	\$79,729
Faculty Salaries	\$3,123,236	\$3,323,126	\$3,189,160

Table D-3. Support Expenditures

Electrical and Computer Engineering

Fiscal Year	FY 08/09	FY 09/10	FY 10/11
Expenditure Category			
Operations (not including staff)[4]	$1,896,997	$1,953,907	$1,953,907
Travel[5]	125,462	131,735	131,735
Equipment[6]	2,213,675	1,451,714	1,451,714
(a) Institutional Funds	2,122,423	1,401,714	1,401,714
(b) Grants and Gifts[7]	91,252	50,000	50,000
Graduate Teaching Assistants	485,716	545,616	545,616
Part-time Assistance[8] (other than teaching)			
Faculty Salaries	6,593,501	7,078,402	7,078,402

Table D-4. Personnel and Students

Computer Science and Engineering
(includes the Computer Science and Computer Engineering - CECN track - programs)

Year[1]: Fall 2009

	HEAD COUNT**		FTE[2, 7]	RATIO TO FACULTY[3]
	FT	PT		
Administrative[4]	3	0	2.33	
Faculty (tenure-track)	36	1	36.5	
Other Faculty (excluding student Assistants)	4	5	5.3	
Student Teaching Assistants	0	0	0	0.0
Student Research Assistants	0	64	64	1.6
Technicians/Specialists	5	0	5	0.1
Office/Clerical Employees	18	1	18.5	0.4
Others[5]	0	57	57	1.4
Undergraduate Student enrollment[6]	523	40	511.0	12.4
Graduate Student enrollment[7]	267	43	271.2	6.6

Table D-4. Personnel and Students

Electrical and Computer Engineering
(includes the Electrical Engineering and Computer Engineering – CEEN track - programs)

Year[1]: Fall 2009

	HEAD COUNT**		FTE[2, 7]	RATIO TO FACULTY[3]
	FT	PT		
Administrative[4]	1.75	1.25	3	
Faculty (tenure-track)	55.25	5.75	56.55	
Other Faculty (excluding student Assistants)	2	2	2.67	
Student Teaching Assistants	0	49	49	0.8
Student Research Assistants	0	143	143	2.4
Technicians/Specialists	7	0	7	0.1
Office/Clerical Employees	17	0	17	0.3
Others[5]	0	45	26.5	0.4
Undergraduate Student enrollment[6]	702	45.0	690.9	11.7
Graduate Student enrollment[7]	484	45.0	486.2	8.2

Table D-5. Program Enrollment and Degree Data

Computer Engineering (CECN + CEEN + CPEN majors)**

	Academic Year		Enrollment Year						Total UG	Total Grad	Degrees Conferred*			
			1st	2nd	3rd	4th	5th	6th+			Bachelor	Master	Doctor	Other
CURRENT	2009	FT	119	108	66	53	26	10	382	172	54	31	7	0
		PT	5	4	1	1	7	4	22	14				
1	2008	FT	150	89	75	59	28	9	410	142	79	29	7	0
		PT	4	2	1	2	5	9	23	20				
2	2007	FT	129	103	74	62	41	8	417	133	57	18	12	0
		PT	2	4	1	4	13	3	27	12				
3	2006	FT	160	108	75	75	26	8	452	109	90	21	9	0
		PT	2	1	5	9	7	4	28	12				
4	2005	FT	160	96	100	51	39	10	456	94	114	18	3	0
		PT	0	4	4	9	14	5	36	22				
5	2004	FT	140	148	92	90	49	8	527	90	110	16	3	0
		PT	2	8	6	9	14	8	47	19				

* Degrees Conferred are for the AY indicated in the "Academic Year" column;
i.e., Degrees Conferred for AY 2009 include fall 2008, spring 2009 and summer 2009 degrees granted.

** Computer Engineering degrees are offered by the Computer Science and Engineering and the Electrical and Computer Engineering Departments.

Give official fall term enrollment figures (head count) for the current and preceding five academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.
FT--full time PT--part time

Table D-6. Faculty Salary Data

Academic Year 2009-2010

Dwight Look College of Engineering

	Professor	**Associate Professor**	**Assistant Professor**	**Instructor**
Number	154	85	116	36
High	$348,424	$162,000	$129,852	$144,023
Mean	$179,638	$129,686	$111,202	$85,500
Low	$117,154	$88,307	$97,396	$40,200

- All salaries are for 12-months.
- Salaries include Department Heads, chaired professors and distinguished professors.
- The above table does not include Biological and Agricultural Engineering which is administratively located in the College of Agriculture and Life Sciences.

Table D-6. Faculty Salary Data – Program Data

Academic Year 2009-2010

For Computer Engineering, Computer Science, and Electrical Engineering Programs

Departments / Programs		**Professor**	**Associate Professor**	**Assistant Professor**	**Instructor**
Computer Science and Engineering	Number	16	10	13	7
	High	$293,460	$149,496	$129,852	$87,120
	Mean	$188,167	$145,045	$122,559	$75,101
	Low	$130,117	$135,072	$113,333	$58,920
Electrical and Computer Engineering	Number	29	9	24	2
	High	$272,319	$137,780	$124,659	$76,392
	Mean	$173,589	$127,117	$117,967	$70,102
	Low	$117,154	$110,676	$104,794	$63,811

Appendix E: Instruments for Assessment

E.A 2004 Alumni Survey Instrument for Outcome and Objective Assessment

The following pages contain the Spring 2004 Alumni Survey Forms. We sent a survey form to graduates one year out with survey questions addressing outcomes. To students 3 and 5 years out we sent a survey addressing objectives.

SURVEY OF TAMU COMPUTER ENGINEERING GRADUATES

Spring 2004 Survey

Your TAMU Computer Engineering home department was (check one) _____ Electrical Engineering _____ Computer Science	Class of (year) _____________

Job Related Data:

Current Employment: Industry ( ) Government ( ) Academia ( ) Other ( ) ____________________________

Current Position: Programmer ( ) System Specialist ( ) Project Manager ( ) Administrator ( )

Teacher/Professor ( ) Graduate Student ( ) Other ( ) ____________________________

How did you find your first job after graduation with a BS? Career Center ( ) Job Advertisement ( )

Internship/Coop ( ) Friends/relatives ( ) Other ( ) ______________________________

Do you (or did you) go to Graduate School after graduation from TAMU? Yes ( ) No ( )

If Yes, what field? Computer Eng. ( ) Computer Sc. ( ) Electrical Eng. ( )
MIS ( ) MBA ( ) Other ( ) ____

If No, are you considering going to Graduate School in the near future? Seriously ( ) Maybe ( ) No ( )

Are you member of any professional organizations? IEEE ( ) ACM ( ) Other ( ) _________________________

Are you a registered Professional Engineer? Yes ( ) No ( )

General Questions about the Computer Engineering Program at Texas A&M

Based on **your experience at Texas A&M**, what can the Computer Engineering Program do to best help their current students?

Based on **your job search and early employment experience**, which areas should the Computer Engineering Program focus on in its future curriculum?

Anything else you think Texas A&M University should do?

Assessment of Program Educational Outcomes

The following gives a list of Educational Outcomes that we set ourselves and that we attempt to achieve in the Computer Engineering Program at Texas A&M. Please indicate – **based on your professional experience** – how much you agree that the Computer Engineering Program at Texas A&M helped you progress toward each of the following objectives.

Answer from **Strongly Disagree** to **Strongly Agree**	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
My knowledge of differential and integral calculus, differential equations, linear algebra, complex variables, discrete mathematics, probability and statistics.	O	O	O	O	O
My ability to identify, formulate, and solve computer engineering problems.	O	O	O	O	O
My ability to design a system, component or process to meet desired needs.	O	O	O	O	O
My ability to collaborate with a multidisciplinary team to solve engineering problems that no one individual would have the necessary skills to solve	O	O	O	O	O
My ability to design and conduct experiments, as well as to analyze and interpret data.	O	O	O	O	O
My understanding of professional and ethical responsibility.	O	O	O	O	O
My ability to communicate effectively.	O	O	O	O	O
The broad education necessary to understand the impact of computing solutions in a global and societal context.	O	O	O	O	O
My recognition of the need for, and my ability to engage in, life-long learning.	O	O	O	O	O
My knowledge of contemporary issues.	O	O	O	O	O
My ability to use the techniques, skills and modern computing tools necessary for the computer engineering practice.	O	O	O	O	O

Please use the enclosed envelope to return this survey to:

ABET Coordinator,
Computer Engineering Program
Department of Computer Science
Texas A&M University
College Station, TX 77843-3112

Thank you for your time and support.

SURVEY OF TAMU COMPUTER ENGINEERING GRADUATES

Spring 2004 Survey

Your TAMU Computer Engineering home department was (check one) _____ Electrical Engineering _____ Computer Science	Class of (year) ____________

Job Related Data:

Current Employment: Industry ( ) Government ( ) Academia ( ) Other ( ) ______________________

Current Position: Programmer ( ) System Specialist ( ) Project Manager ( ) Administrator ( )

Teacher/Professor ( ) Graduate Student ( ) Other ( ) ______________________

How did you find your first job after graduation with a BS? Career Center ( ) Job Advertisement ( )

Internship/Coop ( ) Friends/relatives ( ) Other ( ) ______________________

Do you (or did you) go to Graduate School after graduation from TAMU? Yes ( ) No ( )

If Yes, what field? Computer Eng. ( ) Computer Sc. ( ) Electrical Eng. ( )
MIS ( ) MBA ( ) Other ( ) ______________________________________

If No, are you considering going to Graduate School in the near future? Seriously ( ) Maybe ( ) No ( )

Are you member of any professional organizations? IEEE ( ) ACM ( ) Other ( ) ____________________

Are you a registered Professional Engineer? Yes ( ) No ( )

General Questions about the Computer Engineering Program at Texas A&M

Based on **your experience at Texas A&M**, what can the Computer Engineering Program do to best help their current students?

Based on **your employment experience**, which areas should the Computer Engineering Program focus on in its future curriculum?

Anything else you think Texas A&M University should do?

Survey Spring 2004

Assessment of Program Educational Objectives

The following gives a list of four Educational Objectives that we set ourselves and that we attempt to achieve in the Computer Engineering Program at Texas A&M. Please indicate the extent to which you believe each of these objectives were met as a result of you attending the program.

Answer from **Strongly Disagree** to **Strongly Agree**	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I have the necessary knowledge, both in breadth and depth, to pursue the practice, or advanced study, of computer engineering.	O	O	O	O	O
I understand the importance of life-long learning, and I am prepared to learn and understand new technological developments in my field.	O	O	O	O	O
I understand the technical, social, and ethical context of my engineering contributions.	O	O	O	O	O
I developed the communication, teamwork, and leadership skills necessary to carry on the legacy of excellence of an Aggie Engineer.	O	O	O	O	O

Summary

Please summarize how you assess your overall educational experience in the Computer Engineering Program at Texas A&M University. Indicate the extent to which you agree with the following statements.

I am highly satisfied with the preparation I received as an undergraduate at Texas A&M University.	O	O	O	O	O
I will recommend others to major in Computer Engineering at Texas A&M University.	O	O	O	O	O

Please use the enclosed envelope to return this survey to:

ABET Coordinator,
Computer Engineering Program
Department of Computer Science
Texas A&M University
College Station, TX 77843-3112

Thank you for your time and support.

E.B Outcome Evaluation CPSC 483 (Capstone Design)

E.B.1 Outcome Evaluation CPSC 483 (Capstone Design): Spring 2004

CPSC 483: Computer System Design
Texas A&M University
Spring 2004

INDUSTRY FEEDBACK

Project title:

Your name and affiliation:

Please use a rank between 0 (very poor) and 5 (excellent) to answer each of the following questions:

Question	Rating
Was the problem clearly stated and requirements identified?	Outcome 5
Were design alternatives considered, as well as a rationale for choosing among them?	Outcome 3
Was the system-level functional description well thought-out?	
Were the designs for each system component technically sound?	
Did the students demonstrate in-depth knowledge about the project?	
Was there evidence of effective teamwork?	
Were engineering standards (safety, economics, ethics) properly addressed?	
Did the students demonstrate effective communication skills?	

Additional comments about the project:

Figure E.1: Industry Feedback Instrument for CPSC 483 Computer Systems Design (Capstone Design Course)

E.B.2 Outcome Evaluation CPSC 483 (Capstone Design): Spring 2005

CPSC 483: Computer System Design
Texas A&M University
Spring 2005

INDUSTRY FEEDBACK

Project title: Robot Navigation with RFID Tags

Your name and affiliation: Tamra Kerns National Instruments

Please use a rank between 0 (very poor) and 5 (excellent) to answer each of the following questions:

Question	Rating
Was the problem clearly stated and requirements identified?	2
Were design alternatives considered, as well as a rationale for choosing among them?	3.5
Was the system-level functional description well thought-out?	4
Were the designs for each system component technically sound?	4
Did the students demonstrate in-depth knowledge about the project?	3
Was there evidence of effective teamwork?	3
Were engineering standards (safety, economics, ethics) properly addressed?	4
Did the students demonstrate effective communication skills?	3 ~~[illegible]~~ *

Additional comments about the project

Didn't have a clear picture of goal of project at the beginning of presentation - made it hard to follow design discussion - eventually got there though
* their presentation just didn't explain project as well as it could have, and ~~[illegible]~~ individuals failed to explain key concepts without being prompted

Figure E.2: Industry Feedback Instrument for CPSC 483 Computer System Design (Capstone Design Course) - Example

E.B.3 Outcome Evaluation CPSC 483 (Capstone Design): Spring 2006

CPSC 483: Computer System Design
Texas A&M University
Spring 2006

INDUSTRY FEEDBACK

Project title: AUTONOMOUS HELICOPTER

Your name and affiliation: JOHN HEMPHILL, HP

Please use a rank between 0 (very poor) and 5 (excellent) to answer each of the following questions:

Question	Rating
Was the problem clearly stated and requirements identified?	4
Were design alternatives considered, as well as a rationale for choosing among them?	~~4~~ 5
Was the system-level functional description well thought-out?	~~4~~ 5
Were the designs for each system component technically sound?	~~4~~ 5
Did the students demonstrate in-depth knowledge about the project?	~~4~~ 5
Was there evidence of effective teamwork?	~~5~~ 5
Were engineering standards (safety, economics, ethics) properly addressed?	4
Did the students demonstrate effective communication skills?	4

Additional comments about the project

The "simple layout" slide needed to be more descriptive.
WiFi: role - protocol
Failure mode

Good Presentation - some of the slides could have been more graphically communicating. The system slide could have been more descriptive.
The team seemed to be cohesive.

Oscar, Tan, Oliver

Figure E.3: Industry Feedback Instrument for CPSC 483 Computer System Design (Capstone Design Course) - Example

E.B.4 Outcome Evaluation CPSC 483 (Capstone Design): Spring 2007

Industrial Academic Assessment & Review Panel
Texas A&M University
Computer Engineering Program (CECN) Review
May 2007

Feedback on Capstone Design Project Presentations

Project Title: ____

Reviewer Name and Affiliation: ______________________________

Please use a rank between 0 (very poor) and 5 (excellent) to answer each of the following questions. Feel free to (sparingly) use N/A if you think the question is not applicable to the project.

Question	Rating
Was the problem clearly stated and requirement identified?	
Were design alternatives considered, as well as a rationale for choosing among them?	
Was the system-level functional description well thought-out?	
Were the designs for each system component technically sound?	
Did the students demonstrate in-depth knowledge about the project?	
Was there evidence of effective teamwork?	
Were engineering standards (safety, economics, ethics) properly addressed?	
Did the students demonstrate effective communication skill?	

Additional comments about the project:

Figure E.4: Industry Feedback Instrument for CPSC 483 Computer System Design (Capstone Design Course)

IAARP Project Review Results

Computer Engineering
Spring 2007

Results of Project Evaluations. Ratings are on a scale from 0 (Not at all agreeable) to 6 (extremely agreeable)
Note: The rating scale is skewed: 2 means "slightly agreeable", and 4 means "quite agreeable".

Questions

Q1	The problem was clearly stated and requirements were identified.
Q2	Design alternatives were considered, as well as a rationale for choosing among them.
Q3	The system-level functional description was well thought out.
Q4	Designs for each system component were technically sound.
Q5	Students demonstrated in-depth knowledge about the project
Q6	There was evidence of effective teamwork.
Q7	Engineering standards (safety, economics, ethics) were properly addressed.
Q8	Students demonstrated effective communication skills.

Project	**Reviewer**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**
Ambient Display	Farrell	4	2	4	2	4	4	4	2
	Ward	4	2	3	3	4	4	4	2
	Nogueira	5	3	4	4	4	4	4	4
	Webb	3	5	4	5	5	6	5	5
Labyrinth	Farrell	4	4	4	3	5	6	3	4
	Ward	5	4	4	4	5	5	5	5
	Nogueira	2	3	4	5	4	5	3	4
	Webb	6	6	5	5	6	6	5	6
Pet Deterrent	Farrell	3	3	2	3	4	3	3	2
	Ward	4	3	1	3	4	3	3	2
	Nogueira	4	2	2	2	3	4	2	4
	Webb	5	6	5	4	6	5	4	4
Panavision	Farrell	6	5	6	5	4	6	5	4
	Ward	5	5	4	4	5	5	4	5
	Nogueira	4	5	4	4	4	4	4	5
	Webb	6	5	5	6	6	5	6	6
Average		**4.375**	**3.9375**	**3.8125**	**3.875**	**4.5625**	**4.6875**	**4**	**4**
avg (normalized)		72.91666667	65.625	63.54166667	64.58333333	76.04166667	78.125	66.66666667	66.66666667
min		2	2	1	2	3	3	2	2
		33.33333333	33.33333333	16.66666667	33.33333333	50	50	33.33333333	33.33333333
max		6	6	6	6	6	6	6	6
		100	100	100	100	100	100	100	100

Figure E.5: Industry Feedback Results for CPSC 483 Computer System Design (Capstone Design Course)

E.B.5 Outcome Evaluation CPSC 483 (Capstone Design): Spring 2008

The following pages contain the Spring 2008 Industry Academic Assessment Review Panel (IAARP) Assessment Report for the CPSC 483 Capstone Projects. The signed originals are available upon request.

Industrial Academic Assessment & Review Panel (IAARP)
Texas A&M University
Computer Engineering Program (CECN) Review
May 2008

Panel Summary on Capstone Design Project Presentations

Please use the following table to summarize the findings of the panel regarding how well the preparation of the students satisfies the following educational outcomes. These findings should be based on the review of the students' capstone design projects, the presentation of the projects, and on any other information gathered during the question-answer sessions during the presentations.
The findings should represent the set of all evaluated students and should represent a consensus reached by the panel.

Summary of Educational Outcomes based on Review of Capstone Design Projects and Project Presentations	Score 1-poor 5-excellent
Ability to apply knowledge of mathematics, science, and engineering	4
Math/science knowledge came out after questions, not always in presentation. The results did show that students needed knowledge of DSP,FFT,etc.	
Ability to design and conduct experiments, and analyze and interpret data	4
Most teams showed experimental results and analysis of test data (battery life, hours/GB storage)	
Ability to design a system, component, or process to meet desired needs	5
Each team layed out requirements, and showed how they met them	
Ability to function on a multi-disciplinary team	NA
We believe the students could work on multi-disciplinary teams, and they showed division of responsibility within the team. However, they are all CPE students.	
Ability to identify, formulate and solve engineering problems	5
Each team presented an engineering solution to a defined need. They also overcame specific obstacles in their respective project, ie. Vendor issues, software compatibility	
Ability to communicate effectively	4
There was a fair amount of variability per team (presence,passion,eye contact) but each team had rehearsed and thought out transitions and presentation.	
An understanding of professional and ethical	3

responsibility	
Each team had a slide on this topic, but only one integrated ethical issues into their product. This concept could be better incorporated in the future.	
Ability to use the techniques, skills, and modern engineering tools	5
Teams used VC++,C#,MFC,LabVIEW,ZigBEE … nothing that was out of date.	

Additional comments:

Each team commented that they started the semester working as individual members,then moved to more of a team approach to tackling problems. We suggest this be addressed at the beginning of the semester.

Some projects did not consider the real-world use case of their project (Heart Rate Logger, relive Camera). Future teams should add more thought to "why" they are doing the project.

We expected teams to reveal more team dynamics, ie. Dominant personalities. However, when asked questions, all team members were involved and able to answer questions.

Product demos should be better integrated into the presentations, rather than saved til the end, in order to give better frame of reference of the application.

Overall the projects were well presented and interesting.

Signed:

Todd Anglin, Telerik Date

Eric Dean, National Instruments Date

Selen Ustun, KBSI Date

E.B.6 Outcome Evaluation CPSC 483 (Capstone Design): Spring 2009

The following pages contain the Spring 2009 Industry Academic Assessment Review Panel (IAARP) Assessment Report for the CPSC 483 Capstone Projects. The signed originals are available upon request.

Industrial Academic Assessment & Review Panel (IAARP)
Texas A&M University
Computer Engineering Program Review
May 2009

Panel Summary on Capstone Design Project Presentations

Please use the following table to summarize the findings of the panel regarding how well the preparation of the students satisfies the following educational outcomes. These findings should be based on the review of the students' capstone design projects, the presentation of the projects, and on any other information gathered during the question-answer sessions during the presentations.
The findings should represent the set of all evaluated students and should represent a consensus reached by the panel.

Summary of Educational Outcomes based on Review of Capstone Design Projects and Project Presentations	Score 1-poor 5-excellent
Ability to apply knowledge of mathematics, science, and engineering	4
Overall, very good especially when considering the research required outside of CS and CE skill sets. However, not all team members have a full mastery of the problem space and subject matter.	
Ability to design and conduct experiments, and analyze and interpret data	3.5
One project in particular did not document or display any test results. There should have been some results of alternatives presented for practical comparison despite budget and time constraints. Recommend student finish projects possibly two weeks before deadline in order to conduct true analysis of the systems.	
Ability to design a system, component, or process to meet desired needs	3.75
The projects were lacking in user validation and there is room to improve. Team should look at the use of there system from the domains perspective and the way it is used.	
Ability to function on a multi-disciplinary team	4
Each team did well in self selecting in roles. It would be a great improvement to include students from other departments outside of college of engineering acting as subject matter experts. The rating is based upon the assumptions that multidisciplinary teams in this context are defined as including CS and CE.	
Ability to identify, formulate and solve engineering problems	4
Given the time and financial constraints given to them the students did very well.	
Ability to communicate effectively	3.5
The ability ranges widely from 1 to 5. The program would benefit from formal training in presentation and public speaking.	

Understanding the impact of engineering solutions in a global and societal context	4
All the teams tried, but this did not necessarily pertain to projects in a significant way.	
Ability to use the techniques, skills, and modern engineering tools	3.5
There are some high points; however, more emphasis and support should be placed in area by the university. The students were able to achieve this through their own initiative and creativity.	

Additional comments:

Please schedule the introduction and presentations closer together. The reviewers would appreciate a five minute hiatus in between presentation to collect thoughts and notes about projects. We would also appreciate more time to compile this report.

Faculty should play a smaller role in the Q and A sessions at the end of the presentations.

Signed:

Najib Abusalbi, Schlumberger Date

Eric Dean, National Instruments Date

Ed Grannan, Improving Enterprises Date

Curtis Hite, Improving Enterprises Date

John Januskey, Frogslayer Date

Toni Smith, Schlumberger Date

Ross Wright, Frogslayer Date

E.B.7 Outcome Evaluation CPSC 483 (Capstone Design): Spring 2010

The following pages are an empty evaluation form with rubric and signed copies of the Spring 2010 Industry Academic Assessment Review Panel (IAARP) Assessment Report for the CPSC 483 Capstone Projects. The signed originals and the detailed evaluation forms are available upon request.

Industrial Academic Assessment & Review Panel
Texas A&M University
Computer Engineering Program (CECN) Review
May 2010

Feedback on Capstone Design Project Presentations

Project Title: ____

Reviewer Name and Affiliation: ______________________________

Please use a rank between 1 (very poor) and 5 (excellent) to answer each of the following questions. See next page for information about grading calibration. Feel free to (sparingly) use N/A if you think the question is not applicable to the project.

Question	Rating
Was the problem clearly stated and requirement identified?	
Were design alternatives considered, as well as a rationale for choosing among them?	
Was the system-level functional description well thought-out?	
Were the designs for each system component technically sound?	
Did the students demonstrate in-depth knowledge about the project?	
Was there evidence of effective teamwork?	
Were engineering standards (safety, economics, ethics) properly addressed?	
Did the students demonstrate effective communication skills?	

Additional comments about the project:

Grading Outcomes

For each of the outcomes, the IAARP will be asked to assign a numeric score from 1 to 5. To give you guidance, please consider the following grades.

- 5 – The students demonstrate a full mastery of this area. This has been demonstrated to us at the highest level we would reasonably expect from graduating students. The outcome is satisfied, and compared to other areas; this should not be a focus of improvement.
- 4 – Students have demonstrated a good understanding of this area. It is in line with or somewhat exceeds the level we would expect of graduating students. The outcome is satisfied but there remains room for improvement.
- 3 – While students demonstrate some competence in this area, there are significant deficiencies. This is not at a level we would expect of students graduating with a B.S. degree in this area. There are several ways in which this area could be improved.
- 2 – Students show only a minimal competency in this area, with their deficiencies clearly outweighing their positives. We would be disappointed to find a graduating student had this poor of a level of achievement in this area. The outcome is not being satisfied and many improvements will be needed in order to remedy it.
- 1 – Students show no or almost no competency in this area. It is an embarrassment that graduating students would demonstrate this low of a level of competency. Major coordinated effort for improvement will be needed for this outcome to be met.

In our evaluation process, a 3.5 or above is considered to be a satisfactory score – i.e. an indication that our program is meeting the desired outcome. If the score is below 3.5, it indicates that we are not meeting that outcome, and need to take steps to address it. That is not to say that we will not take action on outcomes with scores at or above 3.5; they will not be a “red flag” indication, but will still be considered as something to possibly improve on.

Industrial Academic Assessment & Review Panel (IAARP)
Texas A&M University
Computer Engineering Program Review
May 2010

Panel Summary on Capstone Design Project Presentations

Please use the following table to summarize the findings of the panel regarding how well the preparation of the students satisfies the following educational outcomes. These findings should be based on the review of the students' capstone design projects, the presentation of the projects, and on any other information gathered during the question-answer sessions during the presentations. The findings should represent the set of all evaluated students and should represent a consensus reached by the panel.

Summary of Educational Outcomes based on Review of Capstone Design Projects and Project Presentations	Score 1-poor 5-excellent
Ability to apply knowledge of mathematics, science, and engineering	4
(please elaborate) Even though the teams had specific constraints, there were areas in which they could have thought "outside the box" to better the project as a whole. They could have presented their investigation of all the moving parts and how they could have been made more efficient or cheaper even if it was not their main task.	
Ability to design and conduct experiments, and analyze and interpret data	3
(please elaborate) The teams were able to perform some rudimentary module testing but did not perform more in-depth testing (system, performance, negative, etc.). Also, the teams seem to have been given a lot of components and, even though they did present some component comparative analysis, it seems that most when with what was either provided to them or easiest or quickest to procure.	
Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	4
(please elaborate) It seems that all the teams were given specific problem spaces with very confining constraints. Within the constraints they seemed to do what was asked of them. These projects could be split across semesters to let the teams do more investigative analysis and do more than exactly what they where asked.	
Ability to function on a multi-disciplinary team	5
(please elaborate) The teams seemed to work very well together and understand the other team members' space as well. Most of the teams also worked with other departments which had varied disciplines. This was very impressive. Also, most of the teams ensured they had effective team communication and collaboration.	
Ability to identify, formulate and solve computer engineering problems	3
(please elaborate) The teams did what they were told and produced what they were told to produce. They seemed to list alternative solutions because they were supposed to but that the solution components were predefined. They were given no room for creative thinking or problem solving. The teams seem to have been "guided" so that they would have something demonstrable by the end of the semester instead of giving them room to fail.	

Ability to communicate effectively	4.5
(please elaborate)The teams communicated very effectively. The presentations were not organized as well as they could have been however, the teams did a great job of communicating with the audience. They also did a great job of demonstrating team work by letting each team member do a part of the presentation. It seems that time was taken to rehearse the presentations.	
Understanding the impact of engineering solutions in a global, economic, environmental, and societal context	3.5
(please elaborate) The teams seemed to add these considerations because it was something they were supposed to do. Each team had some canned responses for each of these impacts and it seemed that not much thought was put into this requirement.	
Ability to use the techniques, skills, and modern engineering tools	5
(please elaborate) Teams did a very good job of choosing and using techniques, skill and engineering tools. The teams used configuration management tools (E.g. SVN), communications tools (E.g. Google wave), and presentation tools. Their choices of coding tools were good. They also used diagramming tools and common notation.	

Additional comments:

The teams seem to be severely constrained. The goals could be more conducive to encouraging creative thinking and allow room for failure. The students should be given more latitude for innovation and investigation.

Signed:

5/5/10

Ed Grannan, Improving Enterprises Date

5/5/2010

Toni Smith, Schlumberger Date

5/5/2010

Ross Wright, Frogslayer Date

E.C Multi-Disciplinary 405 with ME Department (Spring 2003) Chin B. Su

This 405 class consists of 3 teams. 3M company provides problems and students provide solutions. All teams are required to write a final report and give a presentation that includes a demonstration to 3M. Students grades are determined by ME counterpart and myself.

Team 1 consists of 4 EE students. Their responsibility is to implement a fiber-optic fault detection concept requiring designing and building electrical circuits and performing laboratory measurements.

Their grades : All 4 students receive A.

Team 2 consists of 4 CE students. Their responsibility is to demonstrate fault identification based on software methods.

Their grades : All 4 students receive A

Team 3 consists of 2 EE students. Their goal is to build a thermal cabinet for housing optoelectronic components.

Their grades : 2 EE students receive B

Student Outcomes

(I am using your Graduating Senior ABET Survey form with explanations as necessary. Outcomes that do not apply because they are not used in the project are omitted)

Student Outcomes

Item	Description/Comments	Grade			
	Team 1 (4 EE Students)				
7	Graduates will have a knowledge of physics (mechanics, electricity and magnetics, and optics). *They have reasonable knowledge of optics and circuits as evidence of their capability in putting together a working circuit and making optical measurements. However, optics terms such as Rayleigh scattering and Fresnel reflection need to be explained to them.*	0	1	$\boxed{\textbf{2}}$	3
11	Graduates will have an ability to use modern electronic tools including oscilloscopes, signal generators, volt-meters, and spectrum analyzers. *I have the opportunity to observe them while they worked in my lab. They use equipment such analogue and digital oscilloscope, pulse generator, power meters etc.*	0	1	2	$\boxed{\textbf{3}}$
12	Graduates will have an ability to use modern electrical engineering CAD tools including MATLAB and SPICE. (They use Protel SPICE to simulate and design circuit)	0	1	2	$\boxed{\textbf{3}}$
13	Graduates will have an ability to identify, formulate, and solve engineering problems.	0	1	$\boxed{\textbf{2}}$	3
14	Graduates will have an ability to design a system, component, or process to meet specified needs.	0	1	$\boxed{\textbf{2}}$	3

(continued)

(continued)

Item	Description/Comments	Grade
15	Graduates will have an ability to design and conduct experiments as well as to analyze and interpret data.	0 1 $\boxed{2}$ 3
16	Graduates will have an ability to communicate effectively in writing. *Excellent final report to 3M.*	0 1 2 $\boxed{3}$
17	Graduates will have an ability to communicate effectively orally. *Excellent presentation to 3M.*	0 1 2 $\boxed{3}$
18	Graduates will have an ability to collaborate with other engineers with differing skill sets to solve engineering problems that individually none would have the necessary skills to solve. *(Do not apply because this team consists of only EE students)*	0 1
19	Graduates will have an understanding of ethical and professional responsibility.	0 $\boxed{1}$
20	Graduates will have the broad education necessary to understand the impact of engineering solutions in a global and societal context. *I think their interaction with 3M company definitely help in this regard.*	0 $\boxed{1}$
21	Graduates will have a recognition of the need for, and an ability to engage in self-learning. *These projects require them to come up with their own idea to reach a solution, requiring lots of self-study especially in the optics area. After going through these projects Im sure they can appreciate the value of self learning, digging through reference books, internet, and asking questions to appropriate personnel.*	0 $\boxed{1}$
22	Graduates will have a knowledge of contemporary issues as they relate to electrical engineering practice.	0 $\boxed{1}$
	Team 2 (4 CE Students)	
9	Graduates will have an ability to program a computer. *They develop and implement the network monitor software using Java and ASP code on a central server to monitor disconnect and fault in a prototype local area network, and it works as evidence in the successful demonstration to 3M !*	0 1 2 $\boxed{3}$
13	Graduates will have an ability to identify, formulate, and solve engineering problems.	0 1 2 $\boxed{3}$
14	Graduates will have an ability to design a system, component, or process to meet specified needs.	0 1 2 $\boxed{3}$
16	Graduates will have an ability to communicate effectively in writing. *Excellent report to 3M. Very comprehensive and well organize.*	0 1 2 $\boxed{3}$
17	Graduates will have an ability to communicate effectively orally. *Excellent presentation to 3M.*	0 1 2 $\boxed{3}$
18	Graduates will have an ability to collaborate with other engineers with differing skill sets to solve engineering problems that individually none would have the necessary skills to solve.	0 1

(continued)

(continued)

Item	Description/Comments	Grade
	No ME students are involved in this project.	
19	Graduates will have an understanding of ethical and professional responsibility.	0 **[1]**
20	Graduates will have the broad education necessary to understand the impact of engineering solutions in a global and societal context.	0 **[1]**
21	Graduates will have a recognition of the need for, and an ability to engage in self-learning.	0 **[1]**
22	Graduates will have a knowledge of contemporary issues as they relate to electrical engineering practice.	0 **[1]**
	Team 3 (2 EE Students)	
7	Graduates will have a knowledge of physics (mechanics, electricity and magnetics, and optics).	0 1 **[2]** 3
13	Graduates will have an ability to identify, formulate, and solve engineering problems.	0 1 **[2]** 3
14	Graduates will have an ability to design a system, component, or process to meet specified needs.	0 1 2 **[3]**
16	Graduates will have an ability to communicate effectively in writing. *They receive B grades because their report are lacking in important details.*	0 **[1]** 2 3
17	Graduates will have an ability to communicate effectively orally. *Excellent presentation to 3M.*	0 1 2 **[3]**
18	Graduates will have an ability to collaborate with other engineers with differing skill sets to solve engineering problems that individually none would have the necessary skills to solve.	0 **[1]**
19	Graduates will have an understanding of ethical and professional responsibility.	0 **[1]**
20	Graduates will have the broad education necessary to understand the impact of engineering solutions in a global and societal context.	0 **[1]**
21	Graduates will have a recognition of the need for, and an ability to engage in self-learning.	0 **[1]**
22	Graduates will have a knowledge of contemporary issues as they relate to electrical engineering practice.	0 **[1]**

E.D Outcome Assessment through Exit Interviews of Graduating Students

E.D.1 Exit Interviews of Graduating Students: Spring 2007

The following pages contain the Spring 2007 Exit Interview Industry Academic Assessment Review Panel (IAARP) Assessment Report. This report is based on exit interviews with graduating students. The signed originals are available upon request.

In the following the reader will find first the instrument (including reviewer training information) for the exit interview, followed by the final report by the IAARP Exit Interviews Panel.

Industrial Academic Assessment & Review Panel
Texas A&M University
Computer Engineering Program (CECN) Review

Student Interviews

Background

We are required by our accreditation body (ABET) to have a continuous performance monitoring and improvement process in place. As part of this process we are inviting a select group of practitioners and engineers with an industrial background to serve as the Industrial Academic Assessment & Review Panel (IAARP) of the Computer Engineering Program.

The IAARP is asked to assess the level of academic preparation of our graduating seniors through (a) evaluation of the presentations of the senior capstone design projects, and through (b) interviews with small groups of students ("IAARP interviews").

The **objective of the interviews** is two-fold: First, we welcome **any form of feedback** that would improve the level of academic preparation of our graduates in general.

Second, we are interested in the IAARP's opinion on how well our program addresses a well-defined set of educational **outcomes**.

ABET and Program Outcomes

We are required by ABET to formulate, monitor, and respond to, a set of so-called **Program Outcomes**. Outcomes describe what we expect students to be proficient in **by the time they graduate**.

The following table lists the Computer Engineering (CECN) Program Outcomes:

Outcome No	Program Outcome
Outcome 1	Knowledge of differential and integral calculus, differential equations, linear algebra, complex variables, discrete mathematics, probability and statistics.
Outcome 2	An ability to design and conduct experiments, as well as to analyze and interpret data.
Outcome 3	An ability to design a system, component or process to meet desired needs.
Outcome 4	An ability to collaborate with a multidisciplinary team.
Outcome 5	An ability to identify, formulate, and solve computer engineering problems.
Outcome 6	An understanding of professional and ethical responsibility.
Outcome 7	An ability to communicate effectively.
Outcome 8	The broad education necessary to understand the impact of computing solutions in a global and societal context.
Outcome 9	A recognition of the need for, and an ability to engage in, life-long learning
Outcome 10	Knowledge of contemporary issues.
Outcome 11	An ability to use the techniques, skills and modern computing tools necessary for computer engineering practice.

General Recommendations for Interview Process

- In conducting the exit interviews, it is important to get inputs from all of the students.
- The interviewers should ask specific individuals to respond to questions as required.
- If there is a negative response to a question, then the interviewer should confirm that opinion with the other students, and also ask the students what corrective action would fix the situation.

Sample Questions

1. Did CPSC 483 (capstone design courses) give you the opportunity or ability to function as part of a team? a multi-disciplinary team?
   (Outcome #4)

2. Was you experience in Engr 482 (Engineering Ethics) worthwhile?
   (Outcome #6)

3. How do you maintain knowledge of contemporary issues?
   (Outcome #10)

4. In what course (or courses) did you best learn to identify, formulate and solve engineering problems?
   (Outcome #5)

5. Do you feel that your professors provided you with the tools necessary for a practicing computer engineer?
   (Outcome #11)

6. Do you feel that CPSC 431 (Software Engineering) and CPSC 410 (Operating Systems) gave you the ability to design, conduct, analyze and interpret data?
   (Outcomes #2)

7. Now that you are graduating, is there any need for you to keep studying?
   (Outcome #9)

8. How will you be able to use your education to impact societal issues in your lifetime?
   (Outcome #8)

9. How did you apply what you learned in CPSC 321 (Computer Architecture) to your design in the Senior Design Course?

10. How did you apply what you learned in CPSC 410 (Operating Systems) to your design in the Senior Design Course?

11. How did you apply what you learned in CPSC 462 (Microcomputer Systems) to your design in the Senior Design Course?

12. How did you apply what you learned in CPSC 431 (Software Engineering) to your design in the Senior Design Course?

13. Have you had a chance to apply any of what you learned in your electives to your design in the Senior Design Course? (list electives)

14. What do you consider to be the strengths of the computer engineering program?

15. What do you consider to be the weaknesses of the program?

16. What changes and/or improvements in the program would you suggest? That is, do you have any suggestions for improving areas of the curriculum, the facilities, laboratories? Do you have any suggestions for the faculty?

17. What engineering tools, for example, what software, are you using in your classwork?

Interviewer:

Results from May 2007 IAARP			
ABET Outcome	Student Group 1	Student Group 2	Student Group 3
(1) Apply math, science and engineering			
(2) Design & conduct experiments			
(3) Design a system			
(4) Function on teams			
(5) Identify and solve problems			
(6) Ethical responsibility			
(7) Effective communication			
(8) Impact of solution			
(9) Life-long learning			
(10) Contemporary issues			
(11) Use of modern tools			

* Five Point Scale with 5 as highest

Evaluation of ABET Educational Outcomes Sheet

1. Ability to apply knowledge of mathematics, science, and engineering
2. Ability to design and conduct experiments, and analyze and interpret data
3. Ability to design a system, component, or process to meet desired needs
4. Ability to function on a multi-disciplinary team
5. Ability to identify, formulate and solve engineering problems
6. Understanding of professional and ethical responsibility
7. Ability to communicate effectively
8. Understanding the impact of engineering solutions in a global and societal context
9. Recognition of the need for and an ability to engage in life-long learning
10. Knowledge of contemporary issues
11. Ability to use the techniques, skills, and modern engineering tools

Scoring scale
5 = Excellent
4 = Very Good
3 = Good
2 = Fair
1 = Poor
U = Undetermined

Interviewer:

Group:

Results from IAARP Interviews of Graduating Seniors

Program Strengths

Results from IAARP Interviews of Graduating Seniors

Program Weaknesses

Results from IAARP Interviews of Graduating Seniors

Recommendations

Results from IAARP Interviews of Graduating Seniors

Recommendations regarding IAARP Process

Results From May 2007 IAARP

Reviewer Teams	**Team 1**	**Team 2**	**Team 3**	**Team 4**	**avg**	**normalized**	**min**		**max**	
Apply Math, Science and engineering	5	4	2	5	**4**	80	2	40	5	100
Design & conduct experiments	3	4	3.5	2	**3.125**	62.5	2	40	4	80
Design a system	4	4	3	3	**3.5**	70	3	60	4	80
Function on Teams	4	5	3.5	5	**4.375**	87.5	3.5	70	5	100
Identify and solve problems	4	5	4	4	**4.25**	85	4	80	5	100
Ethical responsibility	2		2	2	**2**	40	2	40	2	40
Effective communication	4	5	3.5	5	**4.375**	87.5	3.5	70	5	100
Impact of solution	3	4	4	2	**3.25**	65	2	40	4	80
life-long learning	5	5	4	4	**4.5**	90	4	80	5	100
Contemporary issues	4	5	3	4	**4**	80	3	60	5	100
Use of modern tools	4	3	4	4	**3.75**	75	3	60	4	80

Reviewer Teams:

Team 1	Geoff Webb, FutureSoft Inc
	Felipe , Schlumberger
Team 2	Ron Phillips, KBSI
	Selen Ustun, KBSI
Team 3	Tim Farell, FutureSoft Inc
Team 4	Ronnie Ward, retired Compact/AltaVista

Comments on Outcomes:

Team 1:

(2) "Do you feel that CPSC 431 and CPSC 410 gave you the ability to design, conduct, analyze and interpret data?" 431 - no, definitely no. 410 - more so.
(4) Not much structure in team work. No major problems, however.
(5) 462 -- seems that being thrown-in with support was highly effective. 325 has a bad reputation for not providing that support.
(6) ENGR 482 not really worthwhile. Perfunctory responses are all that is required. No sense of relevance.
(8) "How will you be able to use your education to impact societal issues in your lifetime?" To some extent.
(9) Strong inclination towards further study.
(10) Students maintain knowledge on contemporary issues using on-line/RSS sources. Disklike of T.V. sources.
(11) Students feel that professors provide them with the tools necessary for a practicing computer engineer. Variability in T.A.'s was much more of an issue.

Team 2:

(1) Students applied Science and Engineering, but were not challenged to apply Mathematics as much.
(2, 3) Students said that most of the projects they worked on were too small for formal design process. More importantly, the SE class, which is supposed to teach them system design, was useless according to them.
(5) Students thought that the ethics course was 80% common sense and 20% interesting case studies. They thought that their ethical behavior was due to their own moral values rather than what they learned in that course.
(9) They had a strong sense of need for life-long learning but they were not affiliated with professional organizations.
(11) Students said that some of the computers in their labs were broken. They even said that the computers in open-access labs were better than those in their labs.

Team 3:

(no comments)

Team 4:

(2) Very poor opinion of 111 & 211, Good opinion of 332
(3) Very poor opinion o ELEN 325, good opinion of 462
(6) Good idea, not well implemented, needs to be taught by case-study method [rb: this is probably about ENGR 482]
(11) very poor opinion of 431, good opinion of 310, 410

General comments: ELEN 314 is not useful
My sense is they need to improve critical thinking skills

E.D.2 Exit Interviews of Graduating Students: Spring 2008

The following pages contain the Spring 2008 Exit Interview Industry Academic Assessment Review Panel (IAARP) Assessment Report. This report is based on exit interviews with graduating students.

In this section the reader will find the following items:

- Agenda of the Spring 2008 IAARP Exit Interviews meeting.
- Instrument and training material for the IAARP Exit Interviews.
- Final Exit Interviews IAARP Report for Spring 2008. (Signed copies of the report are available upon request.)

Industrial Academic Assessment & Review Panel
Texas A&M University
Computer Engineering Program (CECN) Review
May 2007

Agenda

Tuesday, May 8, 2007

12:00 – 1:00 Welcome, Working Lunch, Briefing (Room 302)

1:00 – 3:00 Project Presentations, Capstone Design Course, Computer Engineering Program (Room 302)

3:00 – 3:15 Break (summarize thoughts)

3:15 – 4:00 Student Interviews (Rooms 302, 307, 501a)

4:00 – 4:15 Break (summarize thoughts)

4:15 – 5:00 Debriefing and Closing Remarks (Room 302)

Industrial Academic Assessment & Review Panel
Texas A&M University
Computer Engineering Program Review

Student Interviews

Background

We are required by our accreditation body (ABET) to have a continuous performance monitoring and improvement process in place. As part of this process we are inviting a select group of practitioners and engineers with an industrial background to serve as the Industrial Academic Assessment & Review Panel (IAARP) of the Computer Engineering Program.

The IAARP is asked to assess the level of academic preparation of our graduating seniors through (a) evaluation of the presentations of the senior capstone design projects, and through (b) interviews with small groups of students ("IAARP interviews").

The **objective of the interviews** is two-fold: First, we welcome **any form of feedback** that would improve the level of academic preparation of our graduates in general.

Second, we are interested in the IAARP's opinion on how well our program addresses a well-defined set of educational **outcomes**.

ABET and Program Outcomes

We are required by ABET to formulate, monitor, and respond to, a set of so-called **Program Outcomes**. Outcomes describe what we expect students to be proficient in **by the time they graduate**.

The following table lists the Computer Engineering Program Outcomes:

Outcome No	Program Outcome
Outcome 1	Knowledge of differential and integral calculus, differential equations, linear algebra, complex variables, discrete mathematics, probability and statistics.
Outcome 2	An ability to design and conduct experiments, as well as to analyze and interpret data.
Outcome 3	An ability to design a system, component or process to meet desired needs.
Outcome 4	An ability to collaborate with a multidisciplinary team.
Outcome 5	An ability to identify, formulate, and solve computer engineering problems.
Outcome 6	An understanding of professional and ethical responsibility.
Outcome 7	An ability to communicate effectively.
Outcome 8	The broad education necessary to understand the impact of computing solutions in a global and societal context.
Outcome 9	A recognition of the need for, and an ability to engage in, life-long learning
Outcome 10	Knowledge of contemporary issues.
Outcome 11	An ability to use the techniques, skills and modern computing tools necessary for computer engineering practice.

General Recommendations for Interview Process

- In conducting the exit interviews, it is important to get inputs from all of the students.
- The interviewers should ask specific individuals to respond to questions as required.
- If there is a negative response to a question, then the interviewer should confirm that opinion with the other students, and also ask the students what corrective action would fix the situation.
- In the following pages you will find a set of example questions. Feel free to use these questions to get the conversation going. Experience has shown that pointed follow-up questions are very helpful.
- Keep in mind that you are trying to evaluate a program, not primarily individual classes or instructors. This will require a lot of discipline in keeping the interview process on track.

Sample Questions

1. Did CPSC 483 (capstone design courses) give you the opportunity or ability to function as part of a team?a multi-disciplinary team? Why? Why not? Give examples.
   (Outcome #4)

2. Did your experience in Engr 482 (Engineering Ethics) make you better understand ethical issues in the Engineering profession? How would you address a difficult ethical issue (e.g. intellectual property) in your profession? Give examples.
   (Outcome #6)

3. How do you maintain knowledge of contemporary issues? Give examples. Primarily through the media? Technical societies?
   (Outcome #10)

4. In what course (or courses) did you best learn to identify, formulate and solve engineering problems? Give specific examples of where and how you did this.
   (Outcome #5)

5. Do you feel that your professors provided you with the tools necessary for a practicing computer engineer? Give examples of such tools.
   (Outcome #11)

6. Do you feel that CPSC 431 (Software Engineering) and CPSC 410 (Operating Systems) gave you the ability to design, conduct, analyze and interpret data? (for example evaluate a part or full system components?) Give examples.
   (Outcomes #2)

7. In what courses did you apply your knowledge in basic math or science? Give examples (e.g., Used differential equations in signals or algorithms course, set theory in databases, etc…)
(Outcome #1)

8. How do you keep yourself updated in the fast changing field like Computer Engineering? Do you attend seminars regularly? Are you member of IEEE/ACM society? Do you subscribe to any journals or other venues to keep you updated? Do you consider going to grad school?
(Outcome #9)

9. How will you be able to use your education to impact societal issues in your lifetime? Give examples.
(Outcome #8)

10. What engineering tools, for example, what software, are you using in your classwork? (Outcome #11)

11. Have you had a chance to apply any of what you learned in your electives to your design in the Senior Design Course? (list electives) Give examples.

12. What do you consider to be the strengths of the computer-engineering program? Give specific examples.

13. What do you consider to be the weaknesses of the program? Give specific examples.

14. What changes and/or improvements in the program would you suggest? That is, do you have any suggestions for improving areas of the curriculum, the facilities, and laboratories? Do you have any suggestions for the faculty?

Interviewer:

Results from May 2008 IAARP			
ABET Outcome	Student Group 1	Student Group 2	Student Group 3
(1) Apply math, science and engineering			
(2) Design & conduct experiments			
(3) Design a system			
(4) Function on teams			
(5) Identify and solve problems			
(6) Ethical responsibility			
(7) Effective communication			
(8) Impact of solution			
(9) Life-long learning			
(10) Contemporary issues			
(11) Use of modern tools			

* Five Point Scale with 1 as lowest, 5 as highest

Evaluation of ABET Educational Outcomes Sheet
1. Ability to apply knowledge of mathematics, science, and engineering 2. Ability to design and conduct experiments, and analyze and interpret data 3. Ability to design a system, component, or process to meet desired needs 4. Ability to function on a multi-disciplinary team 5. Ability to identify, formulate and solve engineering problems 6. Understanding of professional and ethical responsibility 7. Ability to communicate effectively 8. Understanding the impact of engineering solutions in a global and societal context 9. Recognition of the need for and an ability to engage in life-long learning 10. Knowledge of contemporary issues 11. Ability to use the techniques, skills, and modern engineering tools Scoring scale 5 = Excellent 4 = Very Good 3 = Good 2 = Fair 1 = Poor U = Undetermined

Interviewer:

Group:

Results from IAARP Interviews of Graduating Seniors
Program Strengths

Results from IAARP Interviews of Graduating Seniors

Program Weaknesses

Results from IAARP Interviews of Graduating Seniors

Recommendations

Results from IAARP Interviews of Graduating Seniors

Recommendations regarding IAARP Process

Industrial Academic Assessment & Review Panel
Texas A&M University
Computer Engineering Program Review
May 2008

Panel Summary on Student Exit Interviews

Please use the following table to summarize the findings of the panel regarding how well the preparation of the students satisfies the following educational outcomes. These findings should be based on exit interviews with graduating students
The findings should represent the set of all evaluated students and should represent a consensus reached by the panel.

Scoring scale
5 = Excellent
4 = Very Good
3 = Good
2 = Fair
1 = Poor
U = Undetermined

Summary of Evaluation of Educational Outcomes based on Exit Interviews with Graduating Students.	
Program Outcome	Score
Outcome 1: Knowledge of differential and integral calculus, differential equations, linear algebra, complex variables, discrete mathematics, probability and statistics.	4
Math and physics fundamentals were taught and students were given opportunity to apply them.	
Outcome 2: An ability to design and conduct experiments, as well as to analyze and interpret data.	3
There was an ability, but it was unrecognized by the students and there was limited opportunity to apply.	
Outcome 3: An ability to design a system, component or	3

process to meet desired needs.	
Some disparity between groups. Ability to design a system seemed to be internalized late in the program. Individual projects were not lengthy or sizeable enough to really accomplish the goal. Some of the knowledge was gained outside core curriculum. That said, the end result appears to be a class that has met this outcome.	
Outcome 4: An ability to collaborate with a multidisciplinary team.	4
Small team experience was significant. Larger teams would be helpful as would more mentoring.	
Outcome 5: An ability to identify, formulate, and solve computer engineering problems.	3.5
Students appear to be reasonably prepared to apply problem-solving experience gained through their years here. However, there seemed to be a lack of support for formal learning of techniques and methodologies for problem-solving.	
Outcome 6: An understanding of professional and ethical responsibility.	3.5
The courses (Engineering Ethics plus Aggie Code of Honor etc.) seemed to have a significantly varied reception and somewhat varied effect. Overall an understanding of ethical concepts but we are not sure of ability to apply them.	
Outcome 7: An ability to communicate effectively.	3
The program has limited, specific class-work that provides communications skills. The students generally do communicate well verbally, but this does not seem to be directly related to the curriculum.	
Outcome 8: The broad education necessary to understand the impact of computing solutions in a global and societal context.	2
The overall TAMU education is reasonably broad. The Computer Science education did not effectively relate to the broader concept due to its theoretical nature.	
Outcome 9: A recognition of the need for, and an ability to engage in, life-long learning	3
Mixed level of formal learning of the benefits of life-long learning. Desire was to focus on practical needs – some expected knowledge to come to them. Some were exceptions with a reasonable	

number expecting to achieve advanced degrees.	
Outcome 10: Knowledge of contemporary issues.	1.5
The program seems focused on theory and research. Many lecturers focus on research and considered teaching as a distraction. Contemporary issues learned through self-learning.	
Outcome 11: An ability to use the techniques, skills and modern computing tools necessary for computer engineering practice.	2.5
Use of technical programming tools seems to be reasonably solid. Testing (unit, integration, system, nonfunctional) seems to be absent as does debugging. Project management/scheduling and business modeling tools are also underrepresented at best.	

Results from IAARP Interviews of Graduating Seniors

Program Strengths:

- Significant project and lab work.
- Capstone Design courses are a positive aspect of the program. (Could still be improved.)
- Different programming languages were used.
- Emphasis on teamwork in projects.
- Ability to apply math, science, and engineering concepts throughout the program.
- Encouragement of internships and co-ops.
- Exit interview program is considered positive.

Results from IAARP Interviews of Graduating Seniors

Program Weaknesses:

- Labs get ahead of lecture.
- Theory stressed over practical application early in the program.
- Lecturers focused on research with little incentive to improve effectiveness of teaching, especially contemporary topics.
- Lack of larger scale projects (multi-semester, larger than 5-person teams, etc).
- Soft skills training (technical writing, speech communication) is lacking.
- Programming toolset is available and used, but gaps exist in business modeling, project management, testing, and database tool availability and usage.
- Electives scheduling and alignment with professional specializations.
- Career and curriculum guidance (especially ELEN for CS and CPSC for EE).

Results from IAARP Interviews of Graduating Seniors

Recommendations:

- More career and curriculum advice early in the program.
- Align electives with career specializations (testing, usability/HCI, database)
- Scheduling of electives to prevent conflict with core curriculum (and support career specializations as above).
- Including ethical considerations in more/all coursework. (Possibly instead of dedicated class.)
- More industry speakers to tie contemporary issues to coursework.
- Integration of more contemporary methods, practices, and technologies into core coursework. (Design Patterns, project management discipline, UML/whiteboard design/formal design)
- More practical project experience early in curriculum.
- Improve balance between theoretical and practical (closer to 50-50).
- Mandatory database class (or significant requirement in project work).
- Mandatory communication class (written and oral).
- Seminar earlier in curriculum.
- Have seminar provide interviewing skills in addition to just outlining Career Center benefits (and costs).
- Capstone design (and earlier projects) should be longer is possible – spanning multiple semesters – and should involve larger teams.

Results from IAARP Interviews of Graduating Seniors

Recommendations regarding IAARP Process:

- Fourth semester interviews and possibly entry interviews to establish baseline.
- Background on students being interviewed (coursework, resumes) a week in advance of event.
- Keep groups smaller and/or allocate more time to facilitate more effective communication.
- Have multiple interviewer groups speak to the same students.

Signed:

Michael Abney, Valtech Date

Todd Anglin, Telerik Date

Eric Dunn, IBM Date

Padu Namasivayam, Schlumberger Date

Toni Smith, Schlumberger Date

E.D.3 Exit Interviews of Graduating Students: Spring 2009

The following pages contain the Spring 2009 Exit Interview Industry Academic Assessment Review Panel (IAARP) Assessment Report. This report is based on exit interviews with graduating students.

In this section the reader will find the following items:

- Agenda of the Spring 2009 IAARP Exit Interviews meeting.
- Instrument and training material for the IAARP Exit Interviews.
- Final Exit Interviews IAARP Report for Spring 2009. (Signed copies of the report are available upon request.)

Department of Computer Science & Engineering

AGENDA FOR PROJECT REVIEWS AND EXIT INTERVIEWS

Wednesday, May 6, 2009

12:30-2:30	Lunch and Briefing for Project Reviews
	Curtis Hite, Ed Grannan, Eric Dean, Toni Smith, Najib Abusalbi
3:00-5:00	Project Reviews CPSC 483
5:00-6:00	Reviewer Write-up
6:30-9:00	Dinner at the Republic

Thursday, May 7, 2009

8:30-9:30 Full Breakfast and Training for Reviewers

9:30-10:30 **Session I Panel Reviews**

Group CE1	**Toni Smith, Tim Doshier**	**425B HRBB**
Group CE2	**Natalia Canahuati, Padu Namasivayam**	**501A HRBB**
Group CE3	**Jonathan Preston, Najib Abusalbi**	**516 HRBB**
Group CS1	**Ross Wright, Lynn Hewitt**	**302 HRBB**
Group CS2	**Ryan Goldfine, Danna Rother**	**307 HRBB**
Group CS3	**John Januskey, Curtis Hite**	**320 HRBB**

10:30-11:30 Break and Panels Summarize Interview Results

11:00-12:00 **Session II Panel Reviews**

Group CE1	**Toni Smith, Tim Doshier**	**425B HRBB**
Group CE2	**Natalia Canahuati, Padu Namasivayam**	**501A HRBB**
Group CE3	**Jonathan Preston, Najib Abusalbi**	**516 HRBB**
Group CS1	**Ross Wright, Lynn Hewitt**	**302 HRBB**
Group CS2	**Ryan Goldfine, Danna Rother**	**307 HRBB**
Group CS3	**John Januskey, Curtis Hite**	**320 HRBB**

12:00-12:30 **Panels Summarize Interview Results**

12:30-1:30	Lunch	
1:30-3:30	Write Final Reports Summarizing All Interview Results	
3:30-4:30	Wrap-up Meetings	
	Undergraduate Curriculum Committee- Computer Science Panels	**302 HRBB**
	Computer Engineering Curriculum Coordination Committee- Computer Engineering Panels	**307 HRBB**

Industrial Academic Assessment & Review Panel
Texas A&M University
Computer Engineering Program Review
May 2009

Student Exit Interviews

Background

We are required by our accreditation body (ABET) to have a continuous performance monitoring and improvement process in place. As part of this process we are inviting a select group of practitioners and engineers with an industrial background to serve as the Industrial Academic Assessment & Review Panel (IAARP) of the Computer Engineering Program.

The IAARP is asked to assess the level of academic preparation of our graduating seniors through (a) evaluation of the presentations of the senior capstone design projects, and through (b) interviews with small groups of students ("IAARP exit interviews").

The **primary objective of the interviews** is:

> *To obtain an evaluation of how well our program addresses a well-defined set of educational* ***outcomes***.

As a secondary objective, we welcome any form of **feedback** that would improve the level of academic preparation of our graduates in general. For this reason, we ask the IAARP to list particular program strengths, weaknesses, and recommendations.

ABET and Program Outcomes

We are required by ABET to formulate, monitor, and respond to, a set of so-called **Program Outcomes**. Outcomes describe what we expect students to be proficient in **by the time they graduate**.

The following table lists the Computer Engineering Program Outcomes:

Outcome No	Program Outcome
Outcome 1	Knowledge of differential and integral calculus, differential equations, linear algebra, complex variables, discrete mathematics, probability and statistics.
Outcome 2	An ability to design and conduct experiments, as well as to analyze and interpret data.
Outcome 3	An ability to design a system, component or process to meet desired needs.
Outcome 4	An ability to collaborate with a multidisciplinary team.
Outcome 5	An ability to identify, formulate, and solve computer engineering problems.
Outcome 6	An understanding of professional and ethical responsibility.
Outcome 7	An ability to communicate effectively.
Outcome 8	The broad education necessary to understand the impact of computing solutions in a global and societal context.
Outcome 9	A recognition of the need for, and an ability to engage in, life-long learning
Outcome 10	Knowledge of contemporary issues.
Outcome 11	An ability to use the techniques, skills and modern computing tools necessary for computer engineering practice.

Exit Interview Process

The students who will be reviewed are graduating seniors. The objective here is to evaluate these students and the program, based on their experiences.

Interviewers will be divided into groups, with each group interviewing two sets of students. Following these interviews, the IAARP members will come together to write a single report summarizing the evaluation from all members/groups. At the end of the day, the report(s) will be presented to the Undergraduate Curriculum Committee (for Computer Science) or the Computer Engineering Curriculum Coordinating Committee (for Computer Engineering).

The exact process by which the interviews are conducted and the combined report is generated is up to the panel members. However, in the end we will need a single numerical score, along with relevant comments, for each of the program objectives. In addition, more general information on program strengths, weaknesses, and recommendations is requested.

General Considerations

The following is some general advice regarding the interviewing process:

- The goal is to understand how well the students we are graduating meet the outcomes of the program. This will presumably have some relation to courses and specific curriculum issues, but the main issue is whether or not the outcome is achieved.
    - For example, if students all meet an outcome, that outcome can be considered as having been met satisfactorily regardless of whether the students had any formal coursework or training in the area.
    - Likewise, even if a course would seem to address an outcome directly, if the graduating students do not meet that outcome, the outcome may be judged not satisfactory
- Keep in mind that the outcomes are meant as part of the overall educational program, which includes students taking a number of classes outside of the Department of Computer Science and Engineering. While department-specific suggestions are most directly useful, evaluating outcomes should be in terms of the overall program.
- Try to frame questions to address the program outcomes. Some examples of possible questions are provided below. Although students may want to (and probably will) want to give feedback on particular courses and instructors, try to focus not just on what students have been taught in class, but on what they are capable of doing.
- You might want to ask questions about specific courses, but this should be done in the context of evaluating a particular outcome. For example, if you find that an outcome is being met well, or is not being met, and find that there was a course that ought to be addressing the outcome, it might be appropriate to ask students about that course, and mention the course in the notes as either being effective or not in addressing the outcome.
- In conducting the exit interviews, it is important to get inputs from all of the students. Try not to let a single student dominate the discussion. Keep in mind that there may be outliers in terms of opinions and understanding, so do not give too much weight to a single opinion, unless corroborated by others.

- If there is a negative response to a question, then you should confirm that opinion with the other students, and also ask the students what corrective action would fix the situation.
- You should feel free to ask specific individuals to respond to questions as required.
- Your questions should not be of the type to “stump” or “test” students, look for obscure or overly specific knowledge, etc. The idea is not to make them feel that they’re taking an exam. Rather, try to have a conversation with the students in which you can still address the specific program objectives.
- Students will probably want to use this as an opportunity to discuss the things they liked and didn’t like about the program. This is fine, but try not to let that happen to such an extent that you are not able to evaluate the outcomes appropriately.

Good and Bad Questions

Questions are best if they can focus on student outcomes, and not on particular courses or topics. To give you a sense, here are some “better” and “worse” questions that might address particular outcomes.

Worse Questions	Better Questions
What did you learn in your Software Engineering class?	If you were asked to develop a piece of software for a client, what steps would you follow?
Did you discuss privacy or security issues in your courses here?	Let’s say you are building a major software system for a credit card company to use to keep track of all purchases. Can you tell me some of the non-technical issues you would need to consider? How would you approach these?
Have you used Rational’s Purify system?	Tell me how you would go about finding a memory/pointer error.
Did you take a public speaking class?	Do you feel comfortable putting together an oral presentation? Why or why not?

Sample Questions

These are meant to give you ideas. They are not meant to be restrictive or required. These sample questions do not cover every aspect of the outcomes, just aspects of each.

1. Can you describe a way you have used math or science to solve a problem? (Outcome: 1)

2. Say I asked you to do XXXXX. Do you think you could do it? How would you go about it? (Outcome: 1, 2, 3, 5)

3. If you had a program to do XXXXX that was performing slowly, how would you find out why this is the case? (Outcome: 2)

4. What are some ways that you would go about finding whether a software system you developed was working correctly and ready to deploy? (Outcome: 2)

5. Say there was a system to do XXXXX, and you were asked to redesign the portion that did XXXXX. Do you think you could do this? If so, how? (Outcome: 3)

6. What do you think are some keys to teams functioning effectively? Can you describe some of the ways you have worked on teams? (Outcome: 4)

7. Do you ever find yourself writing code or developing software to address something outside of your schoolwork? What is an example? (Outcome: 1, 5)

8. In your job, do you expect to face many ethical dilemmas? What are some examples? How would you go about addressing those? (Outcome: 6)

9. How would you handle a situation where XXXXX? (Put students in situation to react so as to evaluate his/her understanding of security, social, legal, ethical issues; scenarios can involve privacy, intellectual property, licensing, safety issues, etc.) (Outcome: 6)

10. Would you feel comfortable giving a presentation about one of your course projects? How often do you talk in front of groups? (Outcome: 7)

11. Can you describe some of the writing you have done? Do you feel comfortable writing a memo/requirements document/design document/etc. (Outcome: 7)

12. How do you see your work as a computer scientist having an impact on society or the world at large? (Outcome: 8)

13. How do you keep yourself up to date with recent developments in a fast-changing field such as computer science? How will you do so after you graduate? (Outcome: 9, 10)

14. Do you attend seminars regularly/ever? Are you a member of IEEE/ACM? Do you subscribe to or regularly read any journals to keep you updated? Do you consider going to graduate school? (Outcome: 9)

15. Are you familiar with current practices in industry? What do you think about XXXXX? Are you familiar with current research areas and trends in hardware and software design? What here has given you this familiarity? (Outcome: 10)

16. What programming environments and design tools are you familiar with? What software development tools (e.g. source control, project management, etc.) are you familiar with? (Outcome: 11)

17. What changes and/or improvements in the program would you suggest? That is, do you have any suggestions for improving areas of the curriculum, the facilities, and laboratories? Do you have any suggestions for the faculty? (Open ended)

Grading Outcomes

For each of the outcomes, the IAARP will be asked to assign a numeric score from 1 to 5. To give you guidance, please consider the following grades.

- 5 – The students demonstrate a full mastery of this area. This has been demonstrated to us at the highest level we would reasonably expect from graduating students. The outcome is satisfied, and compared to other areas, this should not be a focus of improvement.
- 4 – Students have demonstrated a good understanding of this area. It is in line with or somewhat exceeds the level we would expect of graduating students. The outcome is satisfied but there is still room for improvement.
- 3 – While students demonstrate some competence in this area, there are significant deficiencies. This is not at a level we would expect of students graduating with a B.S. degree in this area. There are several ways in which this area could be improved.
- 2 – Students show only a minimal competency in this area, with their deficiencies clearly outweighing their positives. We would be disappointed to find a graduating student had this poor of a level of achievement in this area. The outcome is not being satisfied and many improvements will be needed in order to remedy it.
- 1 – Students show no or almost no competency in this area. It is an embarrassment that graduating students would demonstrate this low of a level of competency. Major coordinated effort for improvement will be needed for this outcome to be met.

In our evaluation process, a 3.5 or above is considered to be a satisfactory score – i.e. an indication that our program is meeting the desired outcome. If the score is below 3.5, it indicates that we are not meeting that outcome, and need to take steps to address it. That is not to say that we will not take action on outcomes with scores at or above 3.5; they will not be a “red flag” indication, but will still be considered as something to possibly improve on.

Interviewer:

Results from May 2009 IAARP			
ABET Outcome	Student Group 1	Student Group 2	Student Group 3
(1) Apply math, science and engineering			
(2) Design & conduct experiments			
(3) Design a system			
(4) Function on teams			
(5) Identify and solve problems			
(6) Ethical responsibility			
(7) Effective communication			
(8) Impact of solution			
(9) Life-long learning			
(10) Contemporary issues			
(11) Use of modern tools			

* Five Point Scale with 1 as lowest, 5 as highest

Evaluation of ABET Educational Outcomes Sheet

1. Ability to apply knowledge of mathematics, science, and engineering
2. Ability to design and conduct experiments, and analyze and interpret data
3. Ability to design a system, component, or process to meet desired needs
4. Ability to function on a multi-disciplinary team
5. Ability to identify, formulate and solve engineering problems
6. Understanding of professional and ethical responsibility
7. Ability to communicate effectively
8. Understanding the impact of engineering solutions in a global and societal context
9. Recognition of the need for and an ability to engage in life-long learning
10. Knowledge of contemporary issues
11. Ability to use the techniques, skills, and modern engineering tools

Scoring scale
5 = Excellent
4 = Very Good
3 = Good
2 = Fair
1 = Poor
U = Undetermined

Industrial Academic Assessment & Review Panel
Texas A&M University
Computer Engineering Program Review
May 2009

Student Exit Interviews

Background

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As a secondary objective, we welcome any form of **feedback** that would improve the level of academic preparation of our graduates in general. For this reason, we ask the IAARP to list particular program strengths, weaknesses, and recommendations.

Interviewer:

Results from May 2009 IAARP				
ABET Outcome	Student Group 1	Student Group 2	Student Group 3	Overall
(1) Apply math, science and engineering	4	4	4.5	4.16
Good in-depth engineering content, practices, constructs shown in most design projects.				
(2) Design & conduct experiments	3.5	4	4.3	4
Critical Design Reviews (CDR) and checkpoints were great improvement from last year. To get to the next level, suggest an emphasis on methodology.				
(3) Design a system	4	3.75	4.7	4.16
Some bright spots were apparent but inconsistent across the teams. Some teams lacked basic understanding of design concepts and processes.				
(4) Function on teams	3.25	4.25	4	3.8
Students understood what makes an effective team. Their exposure to other disciplines was limited. More coaching would be helpful.				
(5) Identify and solve problems	3.25	3.75	4.5	3.75
Problems were solved, but there was some inconsistent use of structured processes.				
(6) Ethical responsibility	4	3.5	3.8	3.75
Emphasis within the department was excellent. General coursework still suffers from problems that were identified last year (lack of domain specificity, superficiality)				
(7) Effective communication	2.5	4	3.85	3.4
Mixed results. Some polished communicators but curriculum should be more effective at helping students with weak communication skill sets.				
(8) Impact of solution	4	4	4.8	4.3
Students were well aware of role of computing and value to society.				
(9) Life-long learning	4	3.5	4.8	4.16
Pragmatic approach to life-long learning was cultivated through the program.				
(10) Contemporary issues	2.5	3	4.6	3.25
Need more encouragement or opportunity to engage in understanding contemporary issues and industry trends. Some noted bright spots. Energetic Googlers.				
(11) Use of modern tools	3.5	3.75	4	3.75
Need more exposure to industry tools (IDEs, debugging, source control). Good understanding of theory and principles behind the languages.				

* Five Point Scale with 1 as lowest, 5 as highest

Evaluation of ABET Educational Outcomes Sheet
1. Ability to apply knowledge of mathematics, science, and engineering 2. Ability to design and conduct experiments, and analyze and interpret data 3. Ability to design a system, component, or process to meet desired needs 4. Ability to function on a multi-disciplinary team 5. Ability to identify, formulate and solve engineering problems 6. Understanding of professional and ethical responsibility 7. Ability to communicate effectively 8. Understanding the impact of engineering solutions in a global and societal context 9. Recognition of the need for and an ability to engage in life-long learning 10. Knowledge of contemporary issues 11. Ability to use the techniques, skills, and modern engineering tools Scoring scale 5 = Excellent 4 = Very Good 3 = Good 2 = Fair 1 = Poor U = Undetermined

Interviewer:

Group:

Results from IAARP Interviews of Graduating Seniors

Program Strengths

- The faculty listened to the students and made curriculum based upon student feedback.
- Labs and internships solidified their learning experience.
- The computer science faculty were interested and present for the students.
- Peer teacher program very effective.
- Strong interdisciplinary content in the CE track senior projects (a lot of eng/math/physics). Mathematically sound.
- During senior design projects, the instructor would add requirements mid-stream. Good at subjecting projects to realistic adversity.
- Senior project documentation requirements were excellent (checkpoints and elaborate documentation requirements throughout)
- Excellent think on the fly skills.
- Multimedia use was encouraged during senior design projects
- Excellent promotion of personal accountability and honor standards in every class led by the instructor (Aggie Code of Honor)
- Exposure to open source products, issues, and licensing protocols
- Students understood the power of communication in their teams, with professors, acquiring resources, etc.
- Students motivated to seek additional information and projects with others. Advisors were supportive of this. Students are proactive in getting the work done, amount of energy, especially in working in teams.
- Wide breadth of seminars, blogs, venues to keep up with latest technology
- *Practice of writing clean code and role of supportive engineering products (eg documentation)*

Results from IAARP Interviews of Graduating Seniors

Program Weaknesses

- Career development skills came way too late in the curriculum (presentations, resumes, interviewing)
- Need and want web development courses early on
- Want dedicated time for career development activities (eg time off to attend career fairs)
- Quality of the TAs are hit-and-miss. Need better screening of TAs. Not knowledgeable of the subject matter of the course that they were teaching. Verbal communication skills need improvement.
- Some noted weak areas related to project methodology exposure and application
- Sequencing of theory leading to application (course pre-requisites)
- Not enough exposure to practical application until senior project
- Process to acquire resources is time consuming(labs, equipment, slow computers in EE lab)
- No opportunity for exposure to student organizations related to their field of study due to class load and knowledge of organizations
- Quality isn't emphasized as much as functionality. Lack of time to complete testing
- Lack of flexibility within curriculum (choice of electives, but they aren't offered at needed time)
- Weak engagement of software engineering 431 professor in labs, adherence to methodology
- Teamwork comes too late in the curriculum. Early projects are groups of 2 or so.
- Lacking in exposure to industry applications (Simulink, Visual Studio, Advanced Excel, Websphere)
- Not enough exposure to project management and source control
- Some professors are disengaged in EE courses and labs
- Engineering Ethics class has same complaints as last year

(a lot of material is common sense; not enough comp sci case studies; everything focused on civil/mechanical engineer, so of limited use)
- Lack of exposure to debugging tools and techniques
- Project schedule seem too compressed

Results from IAARP Interviews of Graduating Seniors

Recommendations
- Improve exposure to mainstream tools and environments (IDEs, source control, debuggers)
- More hands-on opportunities to apply methodologies in a structured way (agile, SCRUM, waterfall, prototyping)
- Provide more guidance on how to handle team dynamics (underperforming team members)
- Better selection criteria for TAs (match expertise with class, communication skills)
- Increase the length of senior design project and/or increase the number of credit hours given
- Consider ways to encourage career-related activities (career fairs, seminars) and exposure to industry trends
- Look into streamlining, incorporating internships/co-ops into overall program
- Increased opportunities to make presentations early on, as well as better coaching
- Need earlier and more comprehensive introduction to debugging
- Increase opportunities for multi-disciplinary teams (from different departments/colleges)

Results from IAARP Interviews of Graduating Seniors

Recommendations regarding IAARP Process

- Cookies, please ☺
- Distribute the curriculum beforehand (comp eng and/or comp sci)
- Good: Improvement over earlier format (more time between sessions, enough time for roll-up)
- Make sure audiovisual equipment is functioning properly (projector bulb)

E.E Assessment of ENGR 482 (Engr. Ethics)

E.E.1 Assessment of ENGR 482: Spring 2004

ENGR 482 Course Assessment Data

Introduction

This brief summary provides an assessment of ABET outcomes influenced by ENGR 482 using data collected during the Fall 2002 semester. Student responses to questions concerning each of six outcomes influenced by ENGR 482 were surveyed and distributed to the representative departments. The analysis here, while thought to be representative, includes the responses of about 132 Civil Engineering students.

Survey Results

Students responded using the following scale to each of six questions: (5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree and 1 = Strongly Disagree): The letter indicates correspondence with one of the ABET program outcomes.

(d) Do you agree that the *ENGR 482 course* has helped you learn to **function on multidisciplinary teams**?
(f) Do you agree that the *ENGR 482 course* has helped you learn to **have an understanding of professional and ethical responsibility**?
(g) Do you agree that the *ENGR 482 course* has helped you learn to **communicate effectively**?
(h) Do you agree that the *ENGR 482 course* has helped you learn to **understand the impact of engineering solutions in a global and societal context**?
(i) Do you agree that the *ENGR 482 course* has helped you learn to **recognize the need for and an ability to engage in life-long learning**?
(j) Do you agree that the *ENGR 482 course* has helped you learn to **have knowledge of contemporary issues**?

Question	1 Strongly disagree	2 Disagree	3 Don't know	4 Agree	5 Strongly agree	AVG SCORE
d. Ability to function on multidisciplinary teams	2	5	11	21	4	3.0
f. Understanding of professional and ethical responsibility	1	3	2	23	15	4.2
g. Communicate effectively	1	7	12	22	1	3.0
h. Understand impact of engineering solutions in global/societal context	0	4	3	25	12	4.1
i. Recognize need and ability to engage in life-long learning	2	2	6	23	11	3.6
j. Knowledge of contemporary issues	2	3	7	25	7	3.5

The students gave strongly positive scores to items f and I, and surprisingly low scores to g. However, a significant change in the course was made in the year after these surveys were taken, to increase the emphasis on writing and communications. The only other response that did not exceed 3.0 (agree) was the ability to function on multidisciplinary teams, and this outcome is hardly influenced by this course. The students have some occasion to address ethical situations in team format, but largely this is not addressed.

Figure E.6: Assessment Instrument for ENGR 482 (Engr. Ethics) used in Spring 2004

E.E.2 Assessment of ENGR 482: 2009A

		Questions						1-3 = professionalism; 4-6 = ethics		
Question Number (PM)		1	2	3	4	5	6	Avg Q 1-3	Avg Q 4-6	Avg Q 1-6
Number of Students		317	317	317	317	317	317	317	317	317
Number not Responding		9	9	9	9	9	9	9	9	9
Number Incorrect		35	34	21	87	65	43	30	65	47.5
Number Correct		291	292	305	239	261	283	296	261	279
Percent Correct		91.8%	92.1%	96.2%	75.4%	82.3%	89.3%	93.4%	82.3%	87.9%
Major	Number	Percent Correct by major								
AERO	21	86%	95%	90%	76%	86%	90%	90.5%	84.1%	87.3%
AGEN	3	100%	67%	100%	67%	100%	67%	88.9%	77.8%	83.3%
BAEN	3	100%	100%	100%	67%	100%	100%	100.0%	88.9%	94.4%
BMEN	29	86%	93%	97%	90%	86%	90%	92.0%	88.5%	90.2%
CECN	6	83%	67%	83%	83%	100%	83%	77.8%	88.9%	83.3%
CEEN	3	100%	100%	100%	67%	100%	67%	100.0%	77.8%	88.9%
CHEN	21	81%	95%	95%	62%	71%	86%	90.5%	73.0%	81.7%
CPSC	9	89%	89%	100%	78%	89%	78%	92.6%	81.5%	87.0%
CVEN	46	89%	87%	96%	70%	87%	76%	90.6%	77.5%	84.1%
ELEN	34	94%	91%	100%	68%	82%	88%	95.1%	79.4%	87.3%
ENTC	24	79%	88%	75%	67%	71%	88%	80.6%	75.0%	77.8%
IDIS	0									
INEN	6	83%	100%	100%	83%	83%	83%	94.4%	83.3%	88.9%
MEEN	30	83%	90%	97%	73%	83%	90%	90.0%	82.2%	86.1%
NUEN	12	100%	100%	92%	75%	83%	92%	97.2%	83.3%	90.3%
OCEN	26	85%	77%	92%	73%	65%	88%	84.6%	75.6%	80.1%
PETE	42	100%	88%	90%	69%	64%	90%	92.9%	74.6%	83.7%
RHEN	0									

Figure E.7: Assessment Results for ENGR 482 (Engr. Ethics) used in Spring 2009

FINAL EXAM
PHIL/ENGR 482, SPRING 2009 P.M. EXAM

NAME TRAVIS MCNEAL

SECTION 912 **TA** Kaylan Chigdey

UIN 414-00-3597

Aggie Code of Honor: An Aggie does not lie, cheat, or steal or tolerate those who do.

____________________________**(Signature)**

Please be sure that you enter your correct UIN number on the Scantron.

1. A professional _________.
a. Possesses special knowledge
b. Pursues a trade or vocation
c. Pursues jobs requiring low skill levels
d. Is self-employed

2. When professional autonomy is granted by law and members of the profession set standards and monitor compliance, this is known as:
a. Strict adherence
b. Self-regulation
c. The minimalist position
d. Fundamental canon

3. In engineering, a professional engineer's primary responsibility is to the________.
a. Client
b. Environment
c. Public
d. Principle of sustainability

4. What is the basic reason why dishonesty is wrong for an engineer?
a. Your client may lose life, property or incur injury
b. The public may be endangered
c. You will lose respect in the profession
d. You may incur penalty or liability

5. A condition which promotes the risk of exploitation is _____________.
a. Imbalance of power of individuals
b. A paternalistic approach
c. Strong application of Golden Rule
d. United Nations International Bill of Human Rights

Figure E.8: Assessment Instrument (Final Examination) for ENGR 482 (Engr. Ethics) used in Spring 2009 (Part I)

6. Relatively new additions to codes of ethics of professional societies are responsibilities to:
a. Foreign clients and governments under FCPA
b. U.S. federal, state and local governments
c. The profession of engineering and professional societies
d. Environment and sustainability

7. In case involving engineer Paul Lorenz and Martin Marietta, the Colorado Supreme Court considered Mr. Lorenz's claim that he had been wrongfully discharged for failing to modify the notes of a technical meeting between Martin Marietta and NASA. The Court said that
a. Mr. Lorenz would have had a stronger case if he had been a registered professional engineer
b. Mr. Lorenz should have appealed to the code of the National Society of Professional Engineers, because this code covers all engineers, not just mechanical engineers
c. Mr. Lorenz had presented sufficient evidence at some of his other trials to make at least a plausible case for wrongful discharge under the "public policy" exception to the doctrine of employment at will
d. Both a and c

8. Richard DeGeorge believes that whistle blowing is only rarely morally obligatory, but that it can be morally permissible if three criteria are met. Which of the following criteria are in this group?
a. The harm that could be done is serious and considerable
b. The employee is a registered professional engineer who will have the protection of the state board of registration if he/she is threatened by the employer
c. The employee has no family obligations that override the obligation to blow the whistle
d. Both b and c

9. Which of the following is (are) best described as a "negative" right (i.e. a right that requires others only to refrain from interfering in your action)?
a) Right to life
b. Right to freedom of assembly
c. Right to a minimal standard of living
d. Both a and b

10. According to professors Gardoni and Murphy, which of the following statements are TRUE with respect to traditional (i.e. non-capabilities) approaches to disaster analysis?
a. Traditional disaster analysis attempts to take into account the total consequences of disasters, including such consequences as the effect of a disaster on recreation, religious attendance, etc.
b. Traditional disaster analysis lacks an accurate and uniform metric for measuring all of the consequences of a disaster
c. Both a and b
d. Traditional disaster analysis is not susceptible to quantification

Figure E.9: Assessment Instrument (Final Examination) for ENGR 482 (Engr. Ethics) used in Spring 2009 (Part II)

E.E.3 Assessment of ENGR 482: 2010A

Examples of what they learn are demonstrated by the last six questions on the final examinations for spring, 2010. The first three of the last six questions on each exam dealt were designed to be questions about ethics and the last three were about professionalism. The last five questions on each exam were very similar (the last five are identical except for the next to last question whose answers were different, with the morning exam having two correct answers).

Those questions are repeated here and the number and percentage of the various responses are indicated. This data is for all students taking the morning and afternoon final examinations in Spring 2010 and includes all programs in the Look College of Engineering including Engineering Technology and Industrial Distribution. Correct answers are marked with an *.

Question 28 (morning examination). The fourth amendment to the US Constitution is quoted below the responses to this question. It mainly derives from which of the following ethical ideals?

A. Creative middle way (45, 14%)

B. Utilitarianism (5, 2%)

C. Respect for persons* (259, 82%)

D. Self interest (5, 2%)

> Amendment IV: The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no warrants shall issue, but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

Question 28 (afternoon examination). Question 28. The preamble to the US Constitution is quoted below the responses to this question. It mainly derives from which of the following ethical ideals?

A. Creative middle way (15, 5%)

B. Utilitarianism* (236, 73%)

C. Respect for persons (64, 20%)

D. Self interest (9, 2%)

> Preamble: We the people of the United States, in order to form a more perfect union, establish justice, insure domestic tranquility, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America.

Question 29. Col. Bertha's lecture emphasized the value of what approach in solving ethical problems in the international arena?

A. Creative middle way* (591, 93%)

B. International law (12, 2%)

C. Common morality (32, 5%)

D. The big gun on the Humvee (1, 0%)

Question 30. A main feature of proper sustainable development is:

A. Risk-benefit analysis (12, 2%)

B. Life cycle analysis* (559, 88%)

C. Cost-benefit analysis (49, 8%)

D. Zero energy consumption (16, 3%)

The following three questions dealt with **professionalism** and were the same on morning and afternoon exams, except that there was a mistake on the afternoon exam which caused question 31 essentially to be disregarded in scoring the afternoon examination.

Question 31. A proper engineering decision (PED) is one which should be made by engineers or governed by professional engineering standards because it:

A. Increases organizational profitability. (9, 3%)

B. Relates to scheduling and marketing. (1, 0%)

C. Does not force professionals to break their own professional standards.* (289, 92%)

D. Both *A.* and *B.* (14, 5%)

Question 32. Relatively recent additions to some professional codes deal with engineers' responsibilities to the:

A. Environment* (631, 99%)

B. Public (4, 1%)

C. Client (0, 0%)

D. Government (1, 0%)

Question 33. What advice did General McDivitt give to anyone who finds the corporate or organizational culture of his or her employer unacceptable?

A. Join the union, if one exists. (13, 2%)

B. Form a union, if one does not exist. (5, 1%)

C. Work as an individual within the culture to change it. (58, 9%)

D. Find another place to work.* (557, 88%)