PROGRAM SELF-STUDY REPORT

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

In preparation for a visit by the

Engineering Accreditation Commission

of

The Accreditation Board for Engineering and Technology

Prepared by

Harley R. Myler, Professor and Chair

with contributions from the EE Faculty and Staff

Department of Electrical Engineering
Lamar University
Beaumont, TX 77710-0029

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Self-Study Report for

Electrical Engineering

A. Background Information

The Lamar University Electrical Engineering Department (LUEE) began graduating students with the BSEE in 1953, two years after Lamar State College of Technology became a four-year university. The school was renamed to Lamar University in 1971. A Master of Engineering Science (with thesis) degree was first offered in 1962 and a Master of Engineering (non-thesis) was approved in 1968. In 1973 the College of Engineering awarded the first Doctor of Engineering degree. The department is currently in the process of developing a Ph.D. program.

The Engineers Council for Professional Development granted accreditation for the BSEE at Lamar on November 8, 1958 and the department has retained accreditation since then. The present location of the department is in the 90,000 square foot Cherry Engineering Building on the Lamar University main campus in Beaumont Texas. The EE department administrative, office and laboratories occupy 14,000 square feet of that space, which we share with the departments of Civil, Mechanical, and Industrial engineering as well as the dean of engineering offices and the campus computer systems.

There are six faculty in the department, three full professors, one associate professor and two assistant professors. Of these faculty, one is an endowed chair. LUEE has always maintained a strong commitment to instructional excellence and an unofficial department motto is the well-known saw: research is inseparable from informed teaching. Since our last ABET visit we have attracted two new full-time, tenure track faculty members and have added a joint appointment member from physics.

1. Degree Titles

LUEE offers the Bachelor of Science, the Master of Science and Doctor of Engineering degrees in Electrical Engineering.

2. Program Modes

The Bachelor of Science Program in Electrical Engineering is a day program. The LU academic calendar comprises two 16-week semesters during a standard academic year and typically students take five to six courses per semester. All undergraduate courses are offered during the day; however, students may choose cross-listed graduate courses as electives that may be offered in the evening hours.

3. Actions to Correct Previous Shortcomings

The report on our program from our 2000 ABET visit is shown below. A discussion of our responses to expressed concerns and suggestions follow.

3.1 Report from 2000 ABET visit

Program Strengths

1. A registered professional engineer with industry experience directs the senior capstone design course.
2. The dedicated faculty has exceptionally close ties with the students. As a group they maintain flexible office hours and provide substantive career and professional guidance.
3. The department is to be commended for its teaching and for imparting professional responsibilities to the engineering student in its excellent first year introductory course.
4. The computer science faculty maintains a very good rapport with the electrical engineering faculty. They depend on each other for support in key areas such as complimentary courses and laboratory facilities. The department has recognized computer science as integral to the new wave of enabling technologies.
5. An active corporate and professional advisory board has been formed as one of the "constituents" in anticipation of complying with EC2000 requirements.

Program Weakness

1. Criterion I.C.6.d: Laboratory Facilities The department's functional plan for the continued replacement, modernization, maintenance, and support of laboratory equipment and related facilities is ad hoc, rather than a carefully constructed, long-term planning document.
    - 14-day response: A Fully documented, comprehensive laboratory plan was submitted during the 14-day response period.
    - This weakness has been resolved

Program Concern

1. Criterion I.C.7.b: Institutional Commitment There is concern over whether a sound fiscal policy is ensured which will provide sufficient funds for the acquisition, retention, and continued professional development of a well-qualified faculty.
    - This concern remains unresolved

Program Observations

1. Not all of the faculty members appear to participate in professional development programs or activities. Students interviewed voiced their desire that all the faculty maintain close ties with industry to ensure current relevance.
2. There appears to be difficulty in filling the several openings for tenure-track positions in the electrical engineering program due to immense competition with industry.

3.2 Actions taken

- Dr. Ruhai Wang (New Mexico State) was hired in 2002 to support computer engineering instruction in the undergraduate program.
- Dr. Selahattin Sayil (Vanderbilt) was hired in 2003 to support circuits and systems, specifically electronics, instruction in the undergraduate program.
- Faculty members are active in IEEE activities (Beaumont Section) and in college initiatives that provide regular interaction with local industry. The Industrial Advisory Board of the department along with our department level alumni initiatives also provide a venue for faculty-industry interaction.
- A grant from the Texas Workforce Development (TWD) program was used to update the undergraduate circuits and electronics laboratory with new equipment and instructional capability.

4. Contact Information

Dr. Harley R. Myler, Professor and Chair
Mitchell Endowed Chair
Department of Electrical Engineering
Lamar University
Beaumont, TX 77710-0029

tel: (409) 880-8747
fax: (409) 880-8121

h.myler@ee.lamar.edu
http://ee.lamar.edu

B. Accreditation Summary

The quality and performance of our students is greatly influenced by the fact that we are a *small* program. In Texas, there are seventeen EE programs, of those; we are one of the smallest in terms of faculty number and student body. As a consequence, we are very *student centered* and by the completion of the junior year the faculty and students have established a strong relationship of respect and teamwork. We strive to use this to our advantage and challenge our students to excel and exceed their personal educational goals. We have students who have gone on to distinguish themselves in well-respected professional degree programs and a plethora of engineering and non-engineering occupations. Our alumni base is very loyal and takes an active role in assisting with assessment of our program.

1. Students

Our approach to outcomes assessment (see Section 3, below) is primarily focused on evaluative rubrics within our curriculum as expressed by our course offerings within the program. As such, our students are evaluated continuously as they progress through the curriculum. In our program objectives (see Section 2, below), we emphasize the *preparation* of our students for their careers and as a consequence we are continuously advising them on options, behaviors and strategies to optimize their future placement in society as active electrical engineers. This level of advisement is difficult to quantify and so we can only emphasize the fact that our size allows us the luxury of individualized attention. However, we have clear evidence to show that our procedures for curriculum advisement and progress monitoring are robust.

1.1 Admission of Students to the Electrical Engineering Program

At Lamar University, we define the *Lower Division* as the set of courses normally taken in the first four long semesters of the Electrical Engineering (EE) program as defined by our curriculum. The *Upper Division* is defined as that set of courses taken in the last four semesters. As such, the EE program admits students in the initial semester of attendance if the following criteria have been met from their secondary (high school) education program:

Four units of English
Two units of Algebra
One unit of Geometry
One unit of Pre-Calculus
One unit each of Chemistry & Physics
One unit of a Foreign Language

Transfer students are required to have a minimum 2.0 GPA on all work prior to entrance. A maximum of 72 hours may be transferred towards the Electrical Engineering degree.

1.2 Students Seeking Admission into the Electrical Engineering Program

Students who apply to the Electrical Engineering program usually come from three areas: from the College of Engineering Pre-Major Program; as a transfer student from another university, college or community college; or as a transfer student from another academic unit within Lamar University. As long

as they have met the above high school requirements and general admission requirements to Lamar University, then they are eligible for admission into the EE program in the Lower Division.

If a **transfer student** comes from another university, that student will need their transfer credits evaluated. This is handled by the University's Transcript Evaluator. Credit for non-equivalent courses is decided by the appropriate teaching department chair. A written record of acceptance of this credit is retained in the student's records in the departmental files and a copy is sent with the final degree plan when the student applies for graduation. The person responsible for a program may assign direct equivalent credit for a non-equivalent course by examining further evidence such as course syllabi, texts and student's knowledge of the content of a particular course. This allows students to transfer into the EE program and not lose credits for courses taken outside Lamar University.

The tables below show the distribution of students in the program in terms of transfer, advancing and the totals for the 2005 academic year to include the summer sessions.

Transfer Students

Period	*External	**Internal	Totals
Spring, 2005	7	5	12
Summer I, 2005	0	1	1
Summer II, 2005	0	4	4
Fall, 2005	9	3	12
	16	13	**29**

*External – From other universities **Internal – From other colleges at Lamar

Advancement of Students
From Lower Division (PREE) to Upper Division (EE)

Period	Advancements
Spring, 2005	9
Summer I, 2005	0
Summer II, 2005	6
Fall, 2005	5
	20

Students in Electrical Engineering Program

Period	*PREE	**EE	Totals
Spring, 2005	118	56	174
Fall, 2005	112	47	159

*Lower Division **Upper Division (Juniors and Seniors)

As of the beginning of the Spring 2006 semester, there are 49 (junior and senior) students in the Electrical Engineering Program.

1.3 Advising and Monitoring Students while in the Program

The Electrical Engineering Department highly values academic advising and we place high emphasis on being *student centered*, which is dependent on academic advising excellence. We work very hard to satisfy the University and College mission that speaks to helping each student reach his or her educational goals. While we prescribe to the dual method of advising, which combines faculty and professional staff academic advising, our College Academic Advisor delivers advising to the undergraduate students in the *Lower Division*. The faculty assist with developmental advising, which addresses the individual student as a whole person based on a close advisor-student relationship to aid students in identifying and assessing alternatives and the consequences of their decisions, thus achieving their personal, educational and career goals. Hopefully, through strong developmental advising, students will be stimulated and supported in their quest for an enriched quality of life. They can focus on identifying life goals by acquiring skills and attitudes to promote their intellectual and personal development. Good developmental advising assists students to make full use of their campus and community resources in addition to quality academic advising which consists of picking and choosing which classes to take each semester. A combination of both developmental and academic advising allows students to enjoy a much richer college experience and have greater success in attaining their educational goals.

The Engineering Academic Advisor, Mrs. Becky Caddy, provides an Advisement Handout to each student when they are enrolled in the engineering introductory classes. This handout gives the college policies and procedures and outlines their course curriculum so they can determine their own path of study in order to meet their self-imposed deadlines for graduation. A printed Curriculum (in the form of a degree plan) is furnished at the time of the initial advisement. Degree plans are included, as well, and are available on the Department website and in the General Studies Catalog. Information is transmitted to students by mail, as well as by electronic means. At the time each new student entering Lamar University attends a mandatory orientation period, that student is provided with a free General Studies Catalog.

When students are admitted to the *Upper Division* of the Electrical Engineering program, they are assigned to a faculty advisor. They must meet with this faculty advisor at least once a semester on a formal basis before they are allowed to register for the next semester. The faculty advisor makes sure that the student has completed the required prerequisites for each course they sign up, although there is automated cross-checking in the registration computer program. A multi-part Advisement Form is completed and signed by the student and advisor. One copy is placed in the student's file and the other is kept by the student as it includes their course schedule.

Academic Advising is individualized for each student in order to cover the following aspects of their academic lives, including but not limited to, the following:

- Course choices and selection, and degree requirements;
- Regulations, policies, and procedures on transfer credits, and transfer curricula;
- Information on scholarships, co-op work opportunities, fellowships, and undergraduate research opportunities;
- Issues surrounding balancing their work schedules and part-time working;

- Insights into their individual behaviors which may or may not be indicative of future success in their engineering degree, such as whether or not they are actually suited for this particular degree if they are displaying a pattern of repeating too many classes.

Students may request an exception or substitution to their degree plan and/or a waiver of prerequisites or corequisites by filling out a form and having it reviewed by the Chair of the Department. Any disputes may be appealed to the Dean of the College of Engineering.

Probation and Suspension: The College of Engineering academic performance standards are higher than those of the University at large. Students with a GPA above 2.0 but below 2.25 are sent a letter reminding them of the College of Engineering requirement to achieve a 2.25 GPA prior to being accepted into an engineering department. Students who do not raise their GPA to at least 2.25 after one long semester will receive a second letter informing them that they are on College of Engineering probation. Students whose GPA falls below 2.0 receive a letter placing them on probation. These students are temporarily removed from the pre-engineering program.

Graduation time: It typically takes a full-time student four years to complete the undergraduate curriculum assuming that no courses are failed and enrollment was possible in the required courses. The College Advisement Office works closely with the department and other colleges in the university to guarantee that required courses will not conflict. For those students who are attending on a part-time basis, it usually takes between five to six years to complete the requirements for the B.S.E.E. degree.

Commencement	BSEE Awarded
Spring, 2005	23
Summer, 2005	3
Fall, 2005	1
Spring, 2006	15

1.4 Scholarship Opportunities

The Department has a modest amount of money available directly to electrical engineering students in the form of endowed scholarships. Over the past six years, four new endowments have been established honoring professors and alumni of the program. The awards are dependent on the equity generated from the scholarship principal. Below is a list of the scholarships specific to the department and their origins, new scholarships since the last evaluation are marked with an asterisk:

*__Carlin__--named for D. Robert Carlin (LUEE '56), Associate Professor Emeritus, initiated by Donna Young (LUEE '01) and endowed by alumni and friends of LUEE.

__Cherry__--named for Lloyd B. Cherry, the first chair of LUEE and Dean of the College of Engineering from 1968 to 1973. Endowed by alumni and friends of LUEE.

*__Cooke__--named for Dr. James T. Cooke, a Professor of EE from 1956 until his retirement in 1991. Initiated by Dr. Wendell Bean (LUEE '55) and endowed by alumni and friends of LUEE.

***Crum**--named for Regents Professor Floyd Crum and endowed by Charles Garrett (LUEE '59).

***Garrett**--named for Charles and Eleanor Garrett and endowed by Charles Garrett (LUEE '59).

Harlow--named for Robert Harlow (LUEE '71) and endowed by Hunter Henry.

1.5 Job Opportunities for Undergraduate Students

The Department is fortunate to have a significant industrial base in the Southeast Texas region with many major corporations engaged in petrochemical production. The demand for Electrical Engineering talent is strong and many companies offer our students engineering internships each semester. These internships often turn into full-time offers of employment when the students have graduated.

In addition to these industry internships, students also have access to co-op work positions to work at some of these same industries. A co-op job is one in which students work for a period of time that runs concurrently with each semester. At the time they are working, most of these students are not enrolled for classes on campus. The purpose of these co-op work positions is to enable students to gain some very valuable engineering work experience and start building a resume to reflect this. Students have experienced a variety of co-ops over the past few years in such varied places as Texas Instruments in Dallas, as well as Dupont, Motiva, Entergy and others in the region.

1.6 Honorary and Professional Societies

The Delta Beta chapter of Eta Kappa Nu has been active since its original charter on March 26th of 1960.

The Lamar University IEEE Student Branch is also active and provides a professional venue for all EE students. The Beaumont Section of Region Five interacts regularly with the student branch, sharing speakers and events. The Beaumont Section also sponsors our students to the IEEE Region V student competitions such as papers, robotics and design.

2. Program Educational Objectives

2.1 Institutional Mission Statements

The Mission of Lamar University, the College of Engineering and the Electrical Engineering Program are presented below. The department mission was developed by the EE faculty along with input from our advisory board. We stress the preparation of students for life-long learning and for acceptance into society as productive citizens in a multi-cultural world, where each mission statement addresses increasingly granular expressions leading to the specifics of our electrical engineering program as defined by our *program objectives* (2.2 (a)).

2.1.1 Lamar University Mission Statement

Lamar University is a comprehensive public institution educating a diverse student body, preparing students for leadership and lifelong learning in a multicultural world, and enhancing the future of Southeast Texas, the state, the nation and the world through teaching, research and creative activity, and service.

Approved by Texas Higher Education Coordinating Board January 24, 2002.

2.1.2 College of Engineering Mission Statement

Our mission is to provide an environment and infrastructure to support the educational objectives of the College of Engineering programs. The College establishes an interface to the University and the entities external to the University to provide and prepare engineering students to be leaders and problem-solvers. The College supports a foundation of strong theoretical emphasis, the development of practical engineering skills, experience in interpersonal communication and teamwork, and an emphasis on ethics, professional conduct and critical thinking. We offer strong and varied academic programs to a diverse student population that prepares our graduates for the challenges of lifelong learning.

2.1.3 Electrical Engineering Mission Statement

The Department of Electrical Engineering supports the mission of the College of Engineering and of Lamar University through teaching, research and service designed to provide the very best undergraduate electrical engineering education possible. It is our goal to provide our students with a strong theoretical foundation, practical engineering skills, experience in interpersonal communication and teamwork, and a daily emphasis on ethics, professional conduct and critical thinking. We prepare our graduates for successful engagement in commercial and industrial enterprise, research and development, and graduate study. We emphasize and support the training necessary for practice as professional engineers.

2.2 (a) Electrical Engineering Program Objectives

The educational objectives of the Electrical Engineering Program is to bring together the faculty, staff, and capital resources to:

> … prepare our students for successful and productive engineering careers, with emphasis on technical competency and with attention to teamwork and effective communication.
>
> …prepare our students for the successful pursuit of graduate studies and for life-long learning in electrical engineering and related fields.
>
> …endow our students with a sense of professionalism with encouragement of professional ethics, professional licensing, and active participation in the affairs of the profession.

Primary feedback (assessment) on the program objectives is obtained on our graduates through employer surveys. Secondary feedback is provided at meetings of our advisory board that contains members from industry and from federal facilities and from questionnaires to our alumni. Details of these processes are outlined in Section 2.3(b).

2.2.1 Relationship between Lamar University, the College of Engineering and Electrical Engineering Program Missions

From the perspective of the Electrical Engineering undergraduate program, the mission of the EE Department that is most closely aligned with the Lamar University mission is that which demands quality teaching, student access to faculty, and careful student counseling as components of preparation of students for leadership and life-long learning. This involves providing students with the skills and knowledge they need to contribute to the state and national economies, and to lead satisfying lives. In particular, success in the department's mission with respect to education will result in a nationally recognized undergraduate program, where students receive a solid foundation in the principles of electrical engineering, industry-relevant training, and a desire for life-long learning. Given this preparation, students graduating from our undergraduate programs are well-prepared to compete for jobs in the technology sector at both the local and national levels. Furthermore, by providing this level of talent, we are helping to fuel the growth of the high-technology industries that are so vital to the state of Texas and the nation.

2.3 (b) The process on which the objectives are determined and evaluated

The faculty of the Electrical Engineering Department has responsibility for implementing changes in the outcomes assessment plan upon recommendation from our significant constituencies comprised of:

- Faculty,
- Students,
- Staff,
- Employers,
- Alumni, and the
- College of Engineering and the University.

Any recommendations for curriculum and program objective changes coming out of the outcomes assessment process are evaluated by the faculty for approval. One of our program strengths (and weaknesses!) is our small size. This means that we can react quickly to programmatic needs and rapidly fine tune our activities to best serve our constituency. Since we have the ability to move quickly, we must observe great care in not to tweak the program so often that it becomes unstable. We avoid this by careful analysis and impact review of all changes that we commit to. Figure 2.1 illustrates the process loop graphically.

Periodic evaluation of the objectives in order to meet the needs of the constituencies is accomplished by the following:

Employer Surveys—this is our primary assessment tool for accomplishment of the *program objectives*, but the surveys also serve as a vehicle for comment on our objectives in an indirect way. Since the objectives are broad, changes to them are neither common nor expected.

Advisory Board Meetings—our advisory board consists of alumni and non-alumni who are active in industry. In addition to senior engineers and engineering managers, we have two members of our board who are recent (2001) BSEE graduates of the program who have been active participants in our board meetings and have given a fresh outlook to discussions of our program.

Faculty Meetings—we assess program objectives and outcomes twice yearly at the start of each long semester of the academic year (fall and spring).

College and University Planning—we participate in the strategic planning processes of both the university and college where we obtain insight into the directions that these entities are taking towards fulfillment or change of their mission statements.

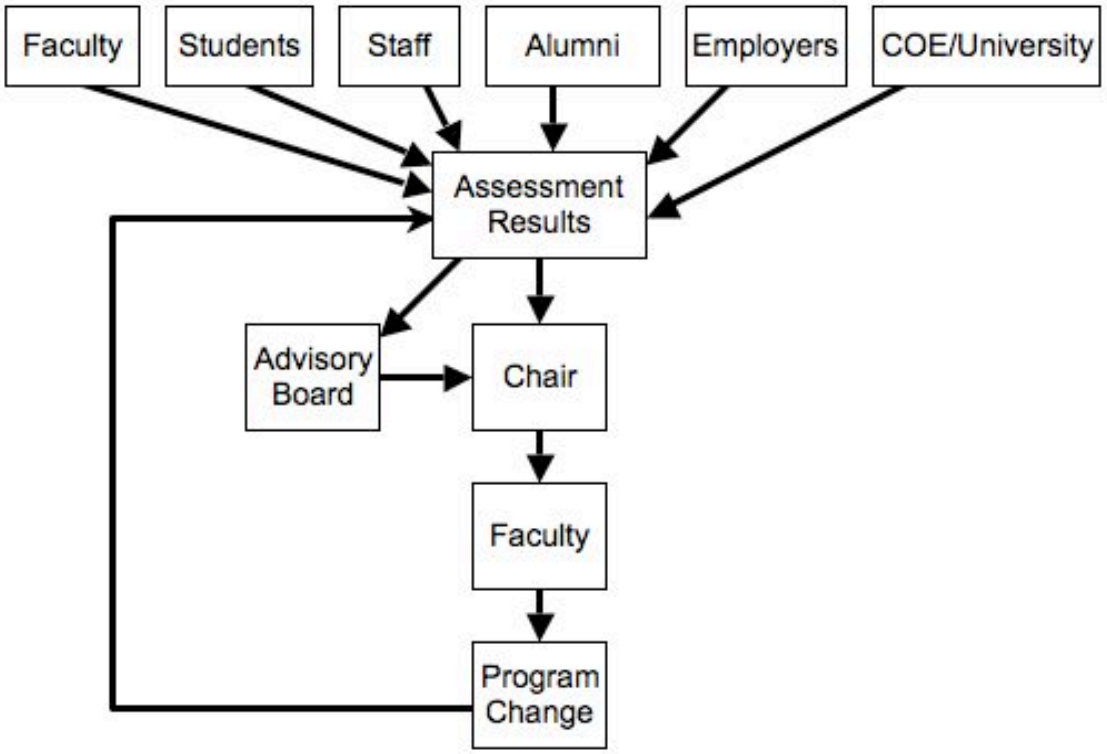


Figure 2.1 Role of assessment results in implementing program change.

2.4 (d) System of on-going evaluation

2.4.1 Assessment instruments

Assessment of the program objectives for the electrical engineering undergraduate program is performed by analysis of two main instruments:

1) **Employer surveys** performed once a year designed to see how well we meet our objectives and to find out how our students compare with students from other universities. The survey is done by phone. A sample of what is asked in our survey is shown in Appendix D. This survey was implemented in the Spring of 2006 following the attendance of the chair at an ABET Workshop sponsored by the Electrical and Computer Engineering Department Heads Association (ECEDHA) in New Orleans in March 2005. At that workshop it was determined that alumni surveys (at the time the primary instrument) alone were insufficient comment on the success or failure of the program to meet objectives. The consensus at that meeting was that *employer*

surveys were a better commentary on whether or not graduates of the program had been equipped to meet objectives that speak to the preparation of students for successful and productive engineering careers (such as ours). It was also concluded that *phone surveys* were more successful than mailed. Many other programs explained that the response rate on mailed surveys was very low since employers are hesitant to comment on employee performance outside of their firms. In our phone surveys, we stress the fact that we seek comments directed to our program and not the individual engineer. This is our goal and it puts the person surveyed at ease and more likely to give constructive criticism. We survey employers of graduates no greater than five years out of our program and preferably three years out.

2) **Alumni surveys** performed every year in the spring with "One year out" and "three year out" periods. This survey is done by mail. A sample survey is shown in Appendix E. This survey assists in the assessment of soft objectives such as life-long learning and participation in the activities of the profession. These include the following:
   - **the impact of engineering solutions in a global and societal context**
   - **recognition of the need for, and an ability to engage in, life-long learning**
   - **knowledge of contemporary issues**
   - **preparedness for OJT (On the Job Training)**
   - **preparedness training courses or in-house training seminars and workshops**

   Finally, the survey requests comments on the IEEE and engineering registration.

In addition to the above surveys, we track our undergraduate students who enter and complete graduate programs, since this supports objective 2. Since our last ABET visit we have had the following feedback from our alumni in this regard:

Degree	**School**	**Status**
PhD EE	Rice University	graduated
PhD EE	Rice University	graduated
MSEE	Texas A&M	graduated
Law (JD)	University of Houston	two years into program
PhD EE	New Jersey Institute of Technology	three years into program
PhD Math	University of Texas	three years into program
MS Music	University of Miami	graduated
PhD EE	University of Washington	recently accepted
PhD EE	Georgia Tech	recently accepted

Finally, we counsel our students with respect to professional licensing (50% of our faculty are registered across three states) and encourage them to study for and take the NCEES Fundamentals of Engineering exam if their career plans indicate that registration would be beneficial to them.

2.4.2 Administration of assessment instruments

Results from each survey are tabulated and kept on record for review by the faculty and the advisory board. The faculty are then responsible for updating the procedures for assessing the objectives and for interpreting the results and implementing changes to the curriculum that are needed based on the assessment results.

2.4.3 Results and Analysis of the surveys

The survey instruments are subjective based on observation of performance (employer) and personal assessment (alumni). As such, the most useful results are statements directed towards program improvements that address specific shortcomings or the perception that specific areas or topics were not adequately addressed in the program.

2.4.3.1 Employer survey results.

A sample of nine employers were polled to find out how well we are meeting our educational objectives. In this sample we included the following employers of our graduates from the last five years:

Chicago Bridge/Tyler, Texas

Deep East Texas Electric Cooperative/San Augustine, Texas

Gerdau-Ameristeel/Vidor, Texas

Motiva Enterprises/Port Arthur, Texas

Exxon-Mobil Beaumont Refinery/Beaumont, Texas

United Space Alliance/Clearlake, Texas

Dell, Inc./Austin, Texas

M&I Electric/Beaumont, Texas

Entergy Texas/Beaumont, Texas

All of the surveys indicated that employers are very satisfied with our graduates and that our program is robust in terms of meeting our outcomes and objectives. There were two specific comments towards improvement:

1) Gerdau-Ameristeel indicated that in comparison to graduates from a significantly larger university in Texas, technical performance and background was comparable; however, problem solving skills were slightly better in the graduates from the larger university.

2) Deep East Texas Electric Cooperative suggested that more power-related courses would help strengthen our program.

In response to the first suggestion, we are going to emphasize more problem-solving skills in our curricula, specifically in the seminar and projects course. With respect to the second suggestion, we are in the process of hiring a new faculty member in the power area—the search was frozen due to budget

constraints from the state and then due to hurricane Rita. Once funding is restored we will resume the search to secure the new faculty position.

2.4.3.2 Alumni Surveys

Each year we poll our alumni using what we call the "One Year Out" and "Three Year Out" surveys. Earlier in this accreditation cycle we were using "Five Year Out" surveys, but we elected to reduce to a three year out given current assessment practice. The response was less than encouraging since we implemented this process (2003) as in 2004 we received no return on the five-year out survey. This is consistent with what other EE departments have experienced as revealed at the March 18th 2005 ABET Workshop sponsored by ECEDHA in New Orleans. At that juncture we learned of telephone interviews with employers and made that instrument our primary assessment of objectives. Nevertheless, we will continue to do alumni surveys, but we consider them a secondary method.

Overall, the responses that we have received indicate that our graduates consider themselves prepared for their work in terms of our program outcomes and objectives. Some commented on the desire to have seminars with industry professionals and we have accommodated that request in the curriculum both in our required seminar course and with the "All College of Engineering" seminar series. There were comments directed towards a lack of emphasis on project management skills and that issue has been addressed with a change in instructor in our senior design course (MS level adjunct to full-professor with PE and industrial experience). Multidisciplinary design was also mentioned and we have instituted program options in our senior projects course that allow students from other disciplines to participate on design teams. Finally, there were comments related to our lack of a process control course or process system training. This is an advisement problem as we have options within the program (electives) for our students to take our graduate level process control course or to take the process control course in Chemical Engineering. We have, however, began to emphasize process control issues in our control engineering course in order to make students aware of what process control as defined by manufacturing is.

3. Program Outcomes and Assessment

3.1 General information

The principle goal of our program is to provide students with the fundamentals of electrical engineering in order that they have a strong foundation for a successful engineering career. This includes building a sufficient reading knowledge and analytical capability so that the graduates can continue to expand their knowledge as their fields of interest and the scope of electrical engineering as a discipline changes. Our core courses are intended to establish a broad base of fundamental knowledge so that those who terminate their formal education with the Bachelor's degree can continue to grow with a penchant for and an understanding of life-long learning. Likewise, the base provides insight into fields that students may choose to study at the graduate level. This goal is met by a curriculum in which there is a progression in course work and in which fundamental knowledge of earlier years is applied in later engineering courses.

Design is the heart of engineering and it distinguishes engineering from science. Design is integrated throughout the program starting with the first electrical engineering introductory course, ELEN1200. Design continues in circuits and electronics, ELEN2311 and ELEN3321 and their attendant laboratories. The design process culminates with our ELEN4206/4207 Senior Projects series. The goal of the design experience is to be able to apply the fundamentals of electrical engineering to identify, formulate, and solve engineering problems and this is a core aspect of how we prepare our students for engineering practice.

3.2 Program Outcomes

Our educational outcomes are determined from performance in courses and the outcomes are assessed by assignments, participation and exams. The linkage between program outcomes and course topics is established by the online syllabi for each course. The educational outcomes that our students can expect to derive from the Lamar University Electrical Engineering Program are the following:

- *apply* knowledge of the physical sciences, mathematics, and engineering fundamentals to the solution of electrical engineering problems.

- *design* and *conduct* experiments in electrical engineering, and to analyze and interpret the data generated by those experiments.

- *design* components, devices, and systems to meet specific needs in electrical engineering.

- *work* effectively on multi-disciplinary teams involving people from diverse backgrounds.

- *identify* and *define* problems in electrical and computer engineering, and to generate and evaluate solutions to those problems.

- *understand* the professional and ethical responsibilities incumbent upon the practicing electrical engineer.

- *communicate* effectively, both orally and in writing, in the field of electrical engineering.

- *understand* the role and impact of electrical engineering in a broader societal and global context.

- *recognize* and *respond* to the need for life-long learning for a successful career in electrical engineering.

- *develop* an understanding of contemporary technical and professional issues in the practice of electrical engineering.

- *use* the techniques, skills, and tools of modern engineering, including the use of computer-based technologies such as programming, use of engineering and business applications, and the use of electronic media, effectively in the practice of electrical engineering.

Students also get the opportunity during their senior year to take electives both in and out of our program to further enhance their knowledge and skills. Table 3-1 shows the 4-year EE curriculum offered by our department, 130 total hours, displayed in terms of spring and fall semesters.

Each course is evaluated each semester both by the instructor and the students (course evaluations) and this feedback is used to improve it. Also, university core courses contribute to meeting our educational outcomes. More specifically, these courses are: Mathematics, English, Technical Writing, Physics, Social/Behavioral Science Elective, Language Elective, Chemistry, Fine Arts Elective and the Core Humanities Elective. We follow the requirements placed on us by the Texas Higher Education Coordinating Board in terms of liberal arts core requirements.

Our *Program Objectives* encompass three major themes: professional preparation, life-long learning, and professional conduct. Professional preparation is addressed specifically by the outcomes that address application, design and identification. We have what may best be described as a *traditional program*. Math and science make up the bulk of our non-engineering curriculum and we transition our students from those topics as viewed by the scientist to the view of the engineer. This is done with our foundational coursework that engages the student with circuits, electronics, signals and systems, electromagnetics and computers—fundamental paradigms of electrical engineering. The program also emphasizes communication skills, teamwork and an understanding of global issues facing today's engineer.

We identify two components to life-long learning, that of both formal and informal continuing education. Graduate programs and professional degrees are examples of formal programs of life-long learning that, in general, require the degree holder to stay current by virtue of their position—lawyers, physicians, researchers and faculty in higher-education. We encourage our students to study beyond the bachelor's degree and we provide the educational background required to enter graduate programs. Informal life-long learning can not be taught explicitly, but it can be emphasized and the requisite mind-set can be accomplished through example.

Professional conduct as an objective is accomplished by the program outcomes that address a need to understand the professional and ethical responsibilities incumbent upon the practicing electrical engineer, the role and impact of electrical engineering in a broader societal and global context and the development of an understanding of contemporary technical and professional issues in the practice of electrical engineering.

Electrical Engineering Curriculum (BSEE)
130 Total Hours

FIRST YEAR

FALL	SPRING
ELEN 1200 Introduction to Electrical Engineering[IN]	ELEN 1301 Intro to Computers
ENGL 1301 English Composition I	ENGL 1302 English Composition II
MATH 2413 Calculus & Analytic Geometry I	MATH 2414 Calculus & Analytic Geometry II
CHEM 1411 Chemistry I	PHYS 2425 Physics I
PHIL 1370 Philosophy of Knowledge	Social Science Elective [SS]
PEGA Physical Education	

SECOND YEAR

MATH 2415 Calculus & Analytic Geometry III	MATH 3301 Ordinary Differential Equations
MATH 2318 Linear Algebra	PHYS 3350 Modern Physics
PHYS 2426 Physics II	ELEN 2311 Circuits I
MATH 3370 Intro to Theory of Statistical Inference	ELEN 2107 Circuits Lab
INEN 2273 Engineering Economics	History Elective[HI]
	Communications / Modern Language [CO]

THIRD YEAR

ELEN 3312 Circuits II	ELEN 3313 Signals & Systems
ELEN 3321 Electronics I	ELEN 3322 Electronics II
ELEN 3108 Electronics Lab	ELEN 3381 Electrical Analysis
ELEN 3371 Electromagnetics	ELEN 3341 Electrical Mach/Transformers
ELEN 3431 Digital Logic Design	ELEN 3109 Electrical Machinery Lab
English Literature Elective	History Elective [HI]

FOURTH YEAR

ELEN 4101 Seminar I	ELEN 4102 Seminar II
ELEN 4206 Senior Projects Design I	ELEN 4207 Senior Projects Design II
ELEN 4486 Microcomputer I & Lab	ELEN 4387 Microcomputers II
ELEN 4351 Control Engineering	ELEN Elective [EE]
ELEN Elective [EE]	Fine Arts Elective[FA]
POLS 2301 American Government I	POLS 2302 American Government II

Notes:
EE -- Math and Science courses may be substituted if approved by the department chair.
SS -- Social science electives are: ECON 1301, PSYC 2301, ANTH 2346 or 2351, SOCI 1301, or (both ECON 2302 & ECON 2301).
CO -- Communication Electives are: COMM 1315, 1360, 2335, 2373, 3310, or 3340; or Introductory Modern Language Course including CMDS 2305.
FA -- Fine arts electives are: ARTS 1301, DANC 2304, HUMA 1315, MUSI 1306, THEA 1310.
HI -- Two semesters of US or Texas history from HIST 1301, 1302, 2372, 2374, 1362, 2377, 2301.
IN -- INEN 1101 may be substituted for this requirement.

Table 3-1 LUEE Curriculum

3.3 Production and Assessment of Program Outcomes

The Program Outcomes are linked to our instructional curriculum and they mirror the ABET a-k outcomes. This linkage is loose for the non-program coursework that comprise the liberal arts core and our math and science requirements. The program outcomes are influenced indirectly by these courses due to inherent requirements; e.g., an ability to apply knowledge of the physical sciences and mathematics.

We tightly couple the program outcomes in the courses that our faculty teach and the matrix in Table 3-2 illustrates this.

Course	ABET Criterion 3									
	a	b	c	d	e	f	g	h	i	j	k
ELEN1200 Introduction to Electrical Engineering	•	•									
ELEN1301 Introduction to Computers and Programming			•		•				•	•	•
ELEN2311 Circuits I	•										
ELEN2107 Circuits Laboratory	•	•		•			•				•
ELEN3312 Circuits II	•										
ELEN3313 Signals & Systems	•		•		•						
ELEN3321 Electronics I	•	•	•					•	•		•
ELEN3322 Electronics II	•	•	•					•	•		•
ELEN3108 Electronics Laboratory	•	•	•	•			•				•
ELEN3431 Digital Logic Design		•	•		•			•	•	•	•
ELEN3381 Electrical Analysis	•	•			•		•				
ELEN3341 Electrical Machines	•		•			•	•	•			
ELEN3109 Machines Laboratory	•	•			•						•
ELEN4486 Microcomputers I	•	•	•								
ELEN4387 Microcomputers II	•		•	•							
ELEN3371 Electromagnetics	•	•	•		•		•	•			
ELEN4351 Control Engineering	•				•						•
ELEN4101/4102 EE Seminar I/II					•	•	•	•	•	•	
ELEN4206/4207 Senior Projects Design I/II	•	•	•	•	•	•	•	•			•

Table 3-2 EE Course Outcomes Matrix

We modified the basic 3a-k outcomes to be consistent with the traditional nature of our program. We then analyzed our instructional offerings to insure that we were meeting the outcomes through course-based assessment. Each of the Criteria 3 outcomes claimed in the table links to specific criteria in the course syllabi. An example of this is shown in Figure 3-1 from the syllabus for ELEN2311 Circuits I.

Objectives (with corresponding ABET Criteria/outcomes):

Ensure students:

- Understand the basic concepts of Ohm's law and Kirchhoff's loop voltage and node current laws. (Criterion 3(a))
- Understand DC and AC circuit analysis for multiple sources, both independent and dependent sources. (Cirterion 3(a))
- Know how to develop Thevenin and Norton equivalent circuits and use in varying load calculations and impedance matching. (Criterion 3(a),(e))
- Can understand and derive first-order differential equations describing circuit variables in transient analyses. (Criterion 3(a),(e))
- Can perform steady-state sinsoidal analysis of linear lumped-parameter circuits. (Criterion 3(a),(e))

Figure 3-1. Program Outcomes Course Linkage

As an example of the linkage, consider the first course objective "Understand the basic concepts of Ohm's law and Kirchhoff's loop voltage and node current laws." This objective links to Criterion 3a, our outcome that states that students *will be able to apply knowledge of the physical sciences, mathematics, and engineering fundamentals to the solution of electrical engineering problems*. Although Ohm's Law is typically introduced in HS physics and then later revisited in college physics, the application of it to electrical engineering problems, specifically those involving Kirchoff's loop voltage and node current laws, occurs in our course.

The metric goals for these course objectives are determined by the faculty in the form of homework assignments, quizzes and exams that validate the student achievement of the objective. The minimal level of achievement necessary to produce graduates that will ultimately achieve our *Program Objectives* following their graduation is set at a minimal score of 70%. We have sufficient overlap in the curriculum to insure program outcome coverage and the results of our Program Objective assessments (see Section 2) have validated this. This minimal score is also consistent with the minimal passing level established by the National Council of Examiners for Engineering and Surveying (NCEES) for the fundamentals (FE) and principles and practice (PE) exams for electrical engineers to obtain professional registration. It is important, however, that we emphasize here that our outcomes assessment is not predicated on GPA, which is an aggregate average across all courses in the curriculum to include the liberal arts core.

Primary qualitative data to assess our program outcomes is determined from course evaluations. Prior to 2004 we used written forms passed out in class near the end of each semester. In 2004 the university ran a pilot program using the College of Engineering as a test case for on-line course evaluations and we have been utilizing that system since then. The company that we use, "Online Course Evaluations .com"[†], sets up student access automatically through the registration database maintained by Lamar University. Approximately three weeks before the end of the semester, access is activated and students may go online through any web browser and input their response to the course surveys. The process is anonymous to the

[†] http://service.onlinecourseevaluations.com/index.aspx

department and the faculty and approximately one week after commencement the results may be viewed. The questions served on the form are broad in nature and comments directed towards teaching effectiveness; however, the survey is a narrative design to encourage students to comment on the course content. Although the faculty collectively do not see the specific survey results, they do get a general summary compiled by the chair.

Secondary qualitative data used to assess our program objectives is derived from our *Commencement Questionnaire* that is given to students near the end of their graduation semester. The survey requests information such as post graduation contact data, job interviews and offers and alternate contact points. This data assists us later with the one-year out and three-year out questionnaires that are used to assess *program objectives*. With respect to *program outcomes*, the survey asks for an opinion of the student with respect to preparedness in terms of overall program outcomes. The survey then focuses on soft outcomes that include the following:

- **the impact of engineering solutions in a global and societal context**
- **recognition of the need for, and an ability to engage in, life-long learning**
- **knowledge of contemporary issues**
- **preparedness for OJT (On the Job Training)**
- **preparedness training courses or in-house training seminars and workshops**

Finally, the survey requests comment on the student section of the IEEE.

3.4 Program Changes Made Since Last Accreditation Cycle To Develop and Improve the Program

In the year following our last accreditation cycle visit, the college made sweeping changes to the engineering core requirements. These actions were a collective decision by the college curriculum council that consists of the Dean and engineering department chairs. Essentially, the core was eliminated in favor of departments adjusting their individual curriculums to address the needs of their graduates better in terms of program specialization and the attainment of program objectives. EE moved to increase the amount of mathematics required since faculty had experienced problems in "math heavy" courses such as electromagnetics and control engineering and the program criteria that specifies that *the program must demonstrate that graduates have knowledge of probability and statistics*. This latter criterion had been loosely interpreted in the past and the addition of MATH3370 *Introduction to the Theory of Statistical Inference* to the required curriculum solved this issue.

Prior to 2002, the department had two "program paths" that were essentially required course options between electrical engineering and computer engineering topics. Following initiatives pioneered at Worcester Polytechnic Institute (WPI) and others, the faculty elected to combine the computer and electrical engineering paths to simplify the program and give it a broader reach. We added a laboratory to the first microcomputer course and also added the second course as a requirement. The curriculum was brought in line to our program objectives by offering a strong base to every graduate while retaining a small amount of flexibility in the six credits of electives in the senior year. Since we have a graduate program, we were able to produce dual-listed courses in faculty research areas that allow the undergraduates to take advantage of specializations using their electives. Our electives reside outside of our ABET required curriculum, so students may also take advanced courses in other engineering disciplines, business or in the sciences or mathematics. This also supports our program objectives by

allowing students flexibility in their career preparations and it addresses requests in the surveys for more electives.

The comments towards program improvements from the *commencement questionnaires* since 2002 may be summarized as follows along with program changes that are supported by the comments. It is important to note that change is not made for the sake of change nor does the department respond to every student comment with a change to the curriculum. Also, some changes become self-fulfilling prophecies in the sense that the change is decided on by the faculty and then is substantiated by student comment.

- More equipment/improved equipment in labs
  - We begin making major improvements to the labs on the summer of 2003 when the Infinity Project equipment was installed in the circuits/electronics/DSP lab.
  - In 2004 we installed National Instruments ELVIS systems for circuits and electronics.
- Work on lab manuals.
  - Lab materials for our intro course, circuits, electronics and machines are on-line and downloadable.
- Availability of computers and software.
  - We standardized our engineering software on Visual C++, MATLAB, Multisim and LabView. These packages are available 24/7 to all EE students.
  - Electronic combination locks are installed on all teaching labs. Students are given unique codes and may use the computer lab (C1306) at any time. For special projects they can be given a code to get into other labs as needed. Seniors enrolled in ELEN4206/4207 Senior Projects have access to the projects lab (C1006) at all times during the fall and spring semesters.
- Lab in microcomputers
  - A separate lab was added to ELEN4486 Microcomputer I for assembly language programming and embedded systems development.
- C++ programming
  - QBASIC was replaced by C/C++ in ELEN1301 Intro to Computers.
- Faculty improvements
  - Two new faculty were hired (PhD & Tenure Track).
  - These faculty replaced adjuncts and retired faculty.
- IEEE
  - A junior faculty member took over the advisement of the IEEE Student Section and has energized activity.

3.5 Materials Available for Review to Demonstrate Achievement of Program Outcomes

The following materials are available on-site for review:

1. Required ELEN course materials collected in support of program outcomes from FA05/SP06.
2. Commencement Questionnaires and summaries since 2002.
3. Faculty and Advisory Board meeting minutes and presentation materials.
4. One-year, Three-year and Five-year out survey results with summaries.
5. Senior Projects Display Boards (capstone course, ELEN4206/4207).

4. Professional Component

The program of study for a BS degree in Electrical Engineering is shown in Table I-1. A total of 130 (semester) credit hours is required for degree certification. One credit normally corresponds to one lecture hour (i.e., 50 minutes). A standard three credit hour course has 48 hours, three hours per week for sixteen weeks.

4.1 Curriculum Course Content

Electrical Engineering requires background and study in many different areas of science and engineering as well as the humanities. LUEE offers a fundamental program and attempts to cover as much material as possible while maintaining attention to our mission and program objectives. We feel that it is essential that our graduates understand what we call the *fundamental paradigms* of electrical engineering: circuits, electronics, computers, signals and systems and electromagnetics. From this foundation, it is possible for our students and graduates to reach into more focused studies of EE. Mathematics, physics and chemistry are core sciences that must be thoroughly studied in order for the student to be prepared to adequately address the challenges that will be encountered in EE studies. Likewise, the modern day engineer must interface with engineers and scientists at a fast pace with multiple cultures and the requirement for global-level communication skills that access technology that is continually changing. As such, our curriculum has elements of the humanities that focus on refining the intellectual development of our students beyond that possible with engineering, science and mathematics alone.

Mathematics and Basic Sciences

The EE Program requires 36 credit hours of mathematics and basic sciences. Students admitted with poor or missing preparation in math (pre-calculus) or science (algebra-based HS physics) are afforded the opportunity to take preparatory courses offered by math, physics and chemistry to accommodate any deficiencies. Table 4.1 shows the courses and hours devoted to college-level math and science that is four credits above the ABET required minimum of 32 hours.

Table 4.1 College-level Mathematics and Basic Science for LUEE

Course	Credits	Lab Content
MATH2413 Calculus I	4	
MATH2414 Calculus II	4	
MATH2415 Calculus III	4	
MATH3301 Differential Equations	3	
MATH2318 Linear Algebra	3	
MATH3370 Statistics	3	
CHEM1411 Chemistry I	4	✓
PHYS2425 Physics I	4	✓
PHYS2426 Physics II	4	✓
PHYS3350 Modern Physics	3	

General Education

The general education component of our program, consisting of 34 credit hours, is primarily dictated by the Lamar University Curriculum Committee and must conform to state guidelines as published by the Texas Higher Education Coordinating Board (THECB). This core was studied and evaluated extensively prior to submission to the THECB.; in fact, the board lauded the curricula for the way it was constructed around "ways of knowing". The university catalog describes the core in the following way (ABET sensitive highlighting has been added):

> Lamar University's "Ways of Knowing" core curriculum satisfies the criteria for compliance with the mandates of Senate Bill 148 (75th Legislature) and for consistency with the statement, recommendations and rules of the Texas Higher Education Coordinating Board regarding core curricula. Lamar's core curriculum includes the **basic competencies, which have long been seen by society as the minimal requirement of an educated person**. Further by synthesizing the core curriculum into a "Ways of Knowing" or methods of inquiry focus and by emphasizing the application of methods of inquiry in the humanities and the sciences, this core addresses the goals of coherence and distinctiveness.
>
> The core is designed to further develop in students the abilities to think critically, to communicate effectively and to understand the major social and personal issues of the times. Core courses include emphases on research, writing and speaking. Core courses encourage participation in university and community organizations and activities.

Table 4.2 shows the liberal arts core courses required by all degree programs at Lamar University.

Table 4.2 General Education Courses

Course	Credits
PHIL1370 Philosophy of Knowledge	3
ENGL1301 English Composition	3
ENGL1302 English Composition	3
PEGA Physical Education	1
POLS2301 American Govt.	3
POLS2302 American Govt.	3
Communications/Modern Language	3
English Lit Elective	3
History Elective	3
Social Science Elective	3
Fine Arts Elective	3

PHIL1370 Philosophy of Knowledge is considered to be the centerpiece of the core and is presented as a freshman-level survey of major knowledge systems, presuppositions and methodologies. The rationale for this is described as follows:

A program of General Education Requirements for undergraduates is based on the premise that certain common, essential qualities, independent of one's academic discipline, are necessary for intellectual growth and professional advancement. These fundamental, "liberating" qualities, which have guided human progress through history, enable one to communicate effectively, think critically and examine values and principles. They provide a working acquaintance with the scientific method, an appreciation of cultural achievements and an understanding of the relationships among people, their cultures and their natural environment. By providing a stronger historical consciousness, they sharpen a citizen's sense of responsibility to family and society.

The above assists us (LUEE) in addressing ***major components*** of our objectives:

… prepare our students for successful and productive engineering careers, with emphasis on technical competency and with attention to teamwork and ***effective communication***.

…prepare our students for the successful pursuit of graduate studies and for ***life-long learning*** in electrical engineering and related fields.

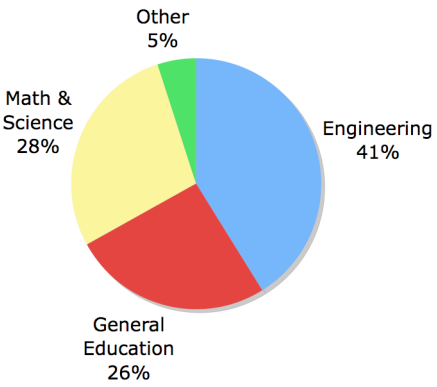
and with specific program outcomes:

- *communicate* effectively, both orally and in writing, in the field of electrical engineering.
- *understand* the role and impact of electrical engineering in a broader societal and global context.
- *recognize* and *respond* to the need for life-long learning for a successful career in electrical engineering.
- *develop* an understanding of contemporary technical and professional issues in the practice of electrical engineering.

The specifics of electrical engineering are added to the base core knowledge as part of our *Engineering Component*.

Engineering Component

The curriculum begins with an introductory level course in either general engineering (INEN1101 Introduction to Engineering) or specific to EE (ELEN1200 Introduction to Electrical Engineering) in the first semester of the freshman year. The next two semesters are spent with the math and science concentrations and then in the fourth semester ELEN2311 Circuits I is taken along with a lab. The last four semesters are then dominated by the EE core curriculum and culminates in our major design experience, ELEN4206/4207 Senior Projects, which spans the last two semesters of the EE program. The distribution of courses is shown in the pie chart to the right.



There is a one-credit difference between ELEN1200 Introduction to EE and INEN1101 Introduction to Engineering and this explains the credit split for ELEN1200. Students may take either course; so only one credit is claimed. The foundational ABET content requirements are met by both courses. The INEN

course is offered three times per year opposed to the fall-only scheduling of ELEN1200. Although we encourage students to take the EE specific introduction, scheduling and other issues sometimes preclude it. Nevertheless, our engineering courses exceed the ABET minimums both in amount (53 > 48) and in overall percentage (41 > 37.5). Of the engineering courses, 51 credits (96%) are ELEN (Electrical Engineering) when the student elects the INEN1101 introductory course. Our ELEN1200 course was implemented using state funding from a program to enhance recruitment and retention.

Preparation for engineering practice is accomplished by four complementary components: general education, math and science theory, engineering theory and engineering laboratory. The last component, engineering laboratory, gives the student the requisite hands-on activity that supports and develops the ability to design. The other components contribute to the ability to design in various ways.

General Education emphasizes critical thinking, the ability to read and comprehend information, communications skills and awareness of other cultures and global issues. There is also a small team-building experience in the Physical Education General Activity (PEGA) course that ultimately adds to the ability to design. Finally, the hallmark of an educated person is the capacity for life-long learning, an ABET expectation, that is fostered in many ways by the General Education component.

Math and Science theory are foundational to engineering education and are complimentary. Figure 4.1 shows the sequency and interdependency of math and science courses as coupled to our foundational subjects and labs that lead to our major design experience, ELEN4206/4207 Senior Projects course. The Erlenmeyer flasks indicate science labs, the black lines the general significance of math and science specific to our foundational areas, the red lines illustrate theory support to the capstone and the blue lines the engineering labs that contribute to it.

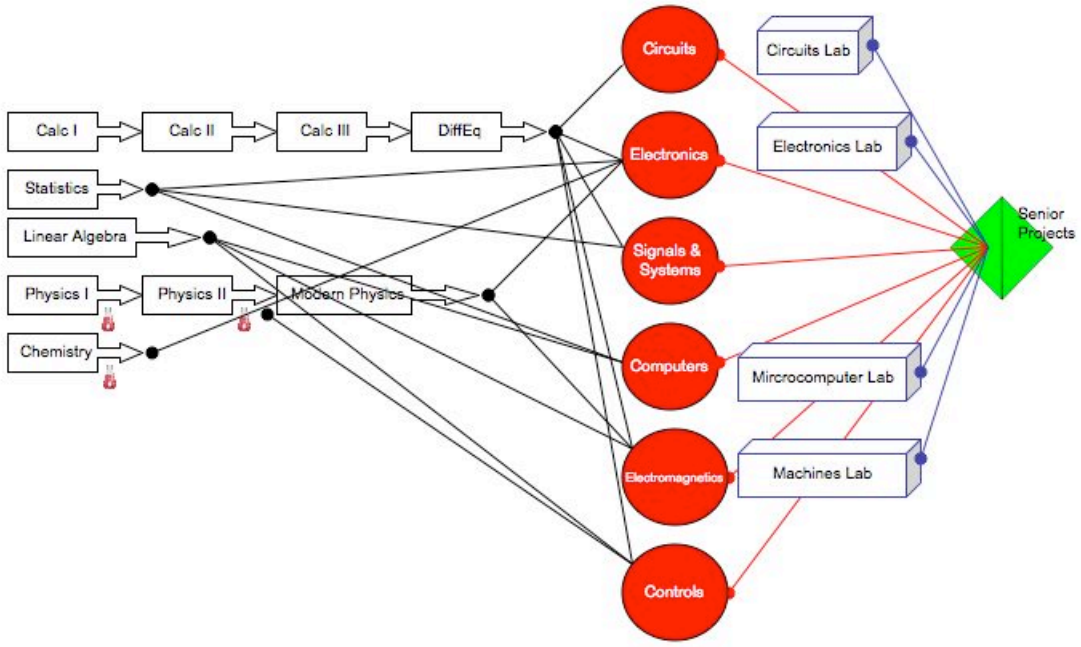


Figure 4.1 Sequency and Interdependence Diagram

Our projects course is designed to introduce the student to industrial projects and is divided into two phases: (1) project definition, feasibility studies and bread-boarding, proposal preparation and approval

and (2) project execution, culminating in a formal engineering report, oral presentation, posters and demonstration. Students are required to establish teams, elect a team leader, research their topic, define the project objectives and specifications, write a formal engineering proposal, design the hardware and software, build appropriate schedules and budgets, manage a project through hardware implementation, testing and project closeout. The course is designed to teach technical ideating and project defining, work breakdown structuring, establishment and execution of appropriate concept feasibility studies and bread-boarding, formal engineering proposal writing and obtaining project approval. Scheduling and budgeting are included in the proposal, project execution and management. This experience incorporates engineering standards since the project must include a hardware product and realistic constraints are imposed through attention to budgeting and the *EE Content* rule.

In 2002 the faculty developed what we call the *EE Content* rule that is applied to projects proposed by students taking our projects course. It must be emphasized that the students select their own project; however, the department provides a suggested list of project ideas on the department website to assist student teams in developing projects, but a project is never forced on a team. The EE Content rule speaks to the outcome of the project and also refers to the technical level of a project. Many students are unclear as to what a senior project entails and think that it might be not far removed from what might be produced for a science fair. Although many science fair projects meet a fair assessment as engineering endeavors, they rarely include the level of project management and design that go into a senior project. EE Content of a project proposal is determined by the faculty and basically says that the design of the project is such that one would not expect a student in a discipline other than EE to be able to produce the project. This is a subjective assessment by the faculty and the course instructor, but it guarantees that the project produced by the team will have essential elements that are possible only as a culminating experience of our curriculum.

In 2003 the concept of Value Added Electrical Engineering (VAEE) was added to the curriculum and the engineering component as an outcome of a Texas Workforce Development project and an equipment gift from National Instruments that allowed us to update our circuits and electronics labs with Electronic Laboratory Virtual Instrumentation Suite (ELVIS) systems, see Figure 4.2.

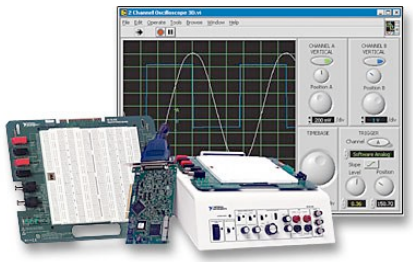


Figure 4.2 National Instruments ELVIS

One of the basic concepts germane to the ELVIS system is the removable prototyping board shown twice in Figure 4.2. One is standing on edge at the far left and the other is mounted to the top of the console unit (box in center with control panel). The student is expected to purchase this board and then use it for lab work involving the ELVIS; in fact, the board is fitted with holes so that it can be inserted into a 3-ring binder for easy transport and storage. Unfortunately, the board is too expensive for most students and many programs simply purchase a board for each ELVIS console unit and leave them installed. Student lab groups then share them.

In our initial implementation of the ELVIS system in our circuits and electronics laboratories, we also used the original prototyping board and had student groups of no more than three share them. In 2004 we developed our own board that is smaller, less expensive and easier to use and carry than the original board. Students purchase the board with a kit of components either in the freshman year if taking ELEN1200 or in the sophomore year when taking circuits lab. The use of the ELVIS system and the LabVIEW programming environment brought a new level of capability to our laboratories. In the past, the department had suffered from increasingly aging equipment and reduced budgets for new instrumentation. At the same time, the use of LabVIEW was more consistent with existing engineering practice where data acquisition systems and computer-controlled instrumentation are the norm rather than the exception.

Students use the ELVIS in circuits and electronics lab where they learn basic principles of EE laboratory procedure and the use of instrumentation. Later, in non-laboratory theory courses such as electromagnetics, control engineering and electronics II, the instructor may assign homework that has a laboratory component—this is the gist of VAEE. At present, no coursework has used VAEE so no assessment is available for it. Fall of 2006 is slated for the initial implementation in ELEN4351 Control Engineering.

Our final discussion for the *Professional Component* addresses ELEN4101/4102, the senior level seminar course. This is a one-credit course sequence offered in the fall and spring of the senior year. The course is taken concurrently with ELEN4206/4207, the senior project sequence. The seminar covers a number of topics and can be considered something of a wrap-up course for the entire program. Two key features of seminar are the requirements that each student prepare and present a technical research paper. The topics covered with the approximate number of lecture hours consumed per semester are:

- Technical Paper Preparation (FA:1 hour)
- Disruptive Technology (FA: 1 hour)
- Problem Solving (FA: 1 hour)
- Entrepreneurship (FA:1 hour)
- Resume Development (FA:1 hour)
- Professionalism (SP:1 hours)
- Global Issues (SP:2 hours)
- Graduate Research (SP:2 hours)
- Ethics (SP:2 hours)
- Technical Presentation and Critique (SP:8 hours)
-

Guest speakers from industry are included and topics cover the gamut of electrical engineering activities and bring expertise from outside for the benefit of the students. This last spring two speakers were invited, Jason Dugas, an engineer at NASA Johnson Space Center and Kathleen Jackson, Public Affairs Manager at Exxon-Mobil Corporation. Mr. Dugas is an alumus of the program and is also a member of our advisory board. His work is with power supplies and converters for space applications and that was the subject of his talk. He touched on issues regarding the difference between instruction and practice and how the university experience translates into the industrial. Mrs. Jackson, a chemical engineer by training and a registered professional engineer, gave a talk on global energy issues. The college also sponsors engineering relevant speakers twice yearly during each long semester.

5. Faculty

5.1 General Information

The Department of Electrical Engineering has six full-time faculty members to include the department chair. In addition, we have one endowed Chair and a joint appointment faculty member from Physics. Currently, we have three full professors, one associate professor, and three assistant professors (including the joint appointment). Many faculty members participate in professional activities such as presenting talks in local, national and international conferences, serving as chairs of sessions for such conferences, and serving as the members of the editorial boards for professional publications as well as holding leadership positions in the IEEE. Some of the faculty members are also involved in consulting and writing books.

Three new faculty have joined the department since 2001, they are:

2001 Harley R. Myler, Ph.D., P.E. Professor & Chair, Mitchell Endowed Chair
Image and Signal Processing

2002 Ruhai Wang, Ph.D., Assistant Professor
Computer Networks

2003 Selahattin Sayil, Ph. D., Assistant Professor
VLSI and microelectronics

The faculty is the heart of our program and consists of six full-time professors all with Ph.D. degrees in electrical engineering. Please consult Table I-4 for specific data. The faculty is well-distributed in expertise to cover the foundational areas of our program and we include overlap between the undergraduate and graduate coursework to provide advanced coursework for seniors as part of their elective course choices. The basic curricular areas of the program have previously been listed, but we revisit them here: circuits, electronics, signals and systems, electromagnetics and computers. Faculty coverage of them is shown in Figure 5.1.

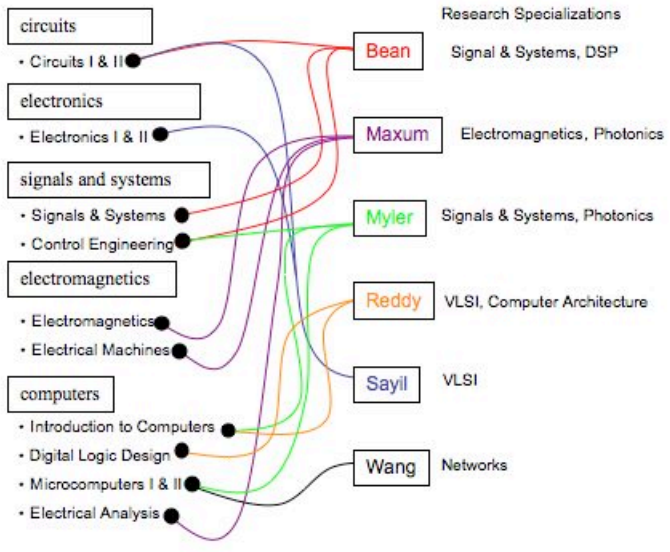


Figure 5-1. EE Faculty topic/course coverage diagram.

The typical teaching load in the EE Department is twelve load units per semester. In addition to teaching in the classroom, most faculty members supervise graduate and undergraduate students in such courses as individual studies, research, thesis and dissertation, and seminar. Teaching load varies from two to four classroom lecture courses per semester depending on activity in research and graduate supervision.

New faculty members do not teach more than two courses per semester to give them time to establish their research programs and adapt themselves to the department. Faculty have the option to buy-out from a course during each semester to a minimum of one course. In the last five years we have used about three adjunct professors to cover all our courses. New faculty are given start-up funds, space for their laboratory, and reduced teaching loads. They are also given preference for summer support.

Faculty performance evaluation is conducted every calendar year. The evaluation is a critical element in the assessment of the success of the program in meeting its educational objectives and in the determination of future objectives. The primary purpose of faculty evaluation is to assess contributions of faculty members to the program, and more broadly, to the mission of the college and university. The process is vitally important for tenure-track faculty. The performance evaluation constitutes one consideration in the determination of salary increases should they be authorized, but other factors such as alleviating salary compression and relative inequity and departmental effectiveness, may also contribute to the determination of merit increases.

The program has between forty to fifty students in the upper division at any time and this is where EE faculty begin primary interaction with them. In the lower division, faculty have an initial encounter in the engineering introductory course (ELEN1200 & INEN1101), in ELEN1301 Introduction to Computers and Programming and in ELEN2311 Circuits I. This interaction is minimal since this is only three courses across four semesters. Also, some sections of ELEN1301 are taught by instructors in Chemical Engineering and this also limits interaction. In both introductory courses, however, students are encouraged to attend and join the student section of the IEEE and participate in other department activities. Each faculty member makes themselves available to students as needed. At the end of each semester, the university conducts student evaluations for every course using a 3rd-party online system. The evaluations play a major role in determining salary increases and promotions.

After students get to the upper division, they begin to interact with the faculty more frequently and for the rest of their time at the university. It is during this stage that the students establish very strong rapport with the faculty. Formal advising is done by the entire faculty and is easily accommodated due to the small number of students. This process is discussed in Section 1.3 of this report.

The faculty are very active in the IEEE (see Table I-4) and involve students in the society activities as much as possible. The Beaumont Section allows the student section chair to sit as a non-voting member of the executive committee. The program also has a active chapter of Eta Kappa Nu (Delta Beta) that the faculty participate in. These interactions serve to enhance the professional awareness of the students and to enforce team-bonds outside of normal classroom and school day activities. This sort of bonding carries over into the professional lives of our students after graduation and many alumni maintain contact with us regularly for this reason. This also establishes contact with industry for our faculty and is an important element of our program assessment in terms of our employer survey process (see Section 2).

Three of our six faculty members are registered professional engineers: one in Texas, one in Texas and Florida and one in California. This establishes a diversity of background in that each state has different procedures and statutes for the maintenance of registration.

Collectively, the EE faculty have over 100 years of experience teaching engineering with forty-five years of government or industry practice to enhance it. The research backgrounds are sufficiently diverse to allow a good distribution of specialties without overtaxing any individual. The nature of our graduate program is such that we can allow for a significant overlap into upper division electives so that the undergraduate program is enhanced while avoiding teaching overload in the areas served by dual-listed courses (graduate courses at the master's level that may be taken by senior undergraduates). The level of scholarship by the faculty is exceptional given our size. Table 5.1 shows scholarly productivity since the last ABET visit.

	2001	2002	2003	2004	2005
Refereed journal papers	1	3	1	2	6
Conference papers	2	1	1	9	6
Books				1	
Patents			1		
Research funding	$115,522	$86,000	$15,000	$10,000	$62,491
Corporate/private donations	$20,730	$2,770	$48,522	$37,897	$20,400

Table 5.1. EE Faculty Scholarly Activity since 2001.

6. Facilities

The university and the EE Department maintain an adequate number of classrooms, facilities and computing resources.

6.1 Classrooms

All of the classrooms used by the EE Department are in the Cherry Engineering building. All of these classrooms are equipped with computer projection equipment and multimedia facilities including Internet connections. Cherry 1103, the EE Library/Seminar room is available for seminars and meetings and is used for ELEN4101/4102 EE Seminar.

6.2 Laboratories and Equipment

The department maintains four teaching laboratories:

Computer Lab – Cherry 1306

Used for EE student computer access and instruction.

10 PC Workstations.

Circuits/DSP Lab – Cherry 1401

Introduction to EE, Circuits and Electronics labs are taught.

20 ELVIS/DSP Workstations

Some senior and graduate student project work is also allowed.

Senior Projects Lab – Cherry 1006

Used for ELEN4206/4207 Senior Projects

Some graduate projects permitted as needed.

Machines Lab – Cherry 1403

Used for ELEN3109 Electrical Machines Laboratory

This lab contains 5 LabVolt workstations and electrical machinery.

Since our last ABET accreditation (2001) several changes were made to our teaching laboratories:

1. Circuits lab was updated with 20 National Instruments ELVIS stations, 20 TI DSP development systems and 20 computer workstations to support them.
2. Wireless networking was installed. Hardwire network drops were added.
3. Whiteboards were added to senior projects lab.
4. Electronic locks were added for security and to give students easier and more frequent access.
5. MATLAB, LabView to include Visual Application Builder, MultiSim and Visual C++ were identified as the primary software packages to support student instruction. Copies of this software are distributed throughout the labs for easy and continuous student access.
6. Department server **http://ee.lamar.edu** was established in 2002 (see infrasture below).

6.3 Infrastructure

All graduate students pursuing the MSEE or DE degrees have their office space where they can meet with students as required if they are assisting with or grading courses. Students have several rooms where they can meet that include the IEEE/HKN student lounge and the entire atrium area in the Cherry Engineering building for studying and gathering. EE seniors have access to the senior projects laboratory where they can meet with their teams. All EE students may request computer lab (Cherry 1306) access codes to use department software, develop materials using the Microsoft Office Suite, perform research on the web or browse for recreation.

The College of Engineering maintains two large general access computer labs with daytime access periods. The University maintains computer labs in the Library that are open during library hours for student use.

In 2002 the department established a webserver, ee.lamar.edu, to support department activities. Since that time, all student lab materials have been published to the server, information regarding the department in terms of students, faculty, staff and alumni are readily accessible. For this ABET cycle we are publishing our entire ABET materials set. The server enhances our departmental presence, provides a showcase for department activity and a data source for students as well as other stakeholders.

6.4 Engineering Tools

Our program is centered on major software tools to enhance our students learning experience as well as provide them with adequate preparation for when they encounter software tools in the workplace.

Microsoft Office Suite: although not explicitly taught in our curriculum, technical papers and other reports must be submitted in Word format. Presentations are delivered using PowerPoint and the use of Excel for data manipulation and graphing is encouraged.

Visual C++ Studio: this software is taught in ELEN1301 Introduction to Computers and Programming. It is heavily used in industry by software developers.

MATLAB: used in ELEN4351 Control Engineering.

MultiSim: used in ELEN3321/3322 Electronics I & II.

LabView: used by the ELVIS stations to produce virtual instrumentation in circuits and electronics labs.

We also afford our students the opportunity for hands-on activities in our department laboratories to reinforce what they have learned in lecture and to prepare them for interface with technologists. Finally, the *EE Content* rule (see Section 4) insures that they will engage in a hardware prototyping activity as part of their capstone design course experience.

7. Institutional Support and Financial Resources

Lamar University is a state supported institution and as such our institutional support and financial resources reflect the requirements and budget control processes dictated by the legislature via the state of Texas comptroller's office. The department was fifty years old in 2001 and so the budget processes are stable and predictable to the extent that no major fluctuations other than those induced by hurricane Rita have been experienced since our last visit.

Institutional support and financial resources are adequate to the accomplishment of our objectives given the size of our program. Although our basic operating expenses are fixed, opportunities exist for support via the Higher Education Assistance Funds (HEAF), course fees, gifts/donations and sponsored research. Table I-5 lists support expenditures since 2004. Key elements of this table are as follows:

Operations:

This value reflects amounts allocated to our program under the Maintenance & Operations (M&O) category. This amount is substantial fixed and increases slightly each year as dictated by the legislature. These funds are used to "run the department" and provide telecommunications services, office supplies, postage, etc.

Travel:

The travel shown is department travel as fixed in the budget and does not include research grant or development travel funded external to the department.

Equipment:

Self explanatory and expounded on in Section 7.3.

Graduate Teaching Assistants:

The department shows no expenditures in this row since we fund student assistants as part-time workers.

Part-Time Assistants:

Lamar University considers a Graduate Teaching Assistantship as a salaried position. As such, the department pays student assistants hourly so that they retain scholarships and to allow for better accountability of work performed.

The Lamar University president, Dr. James Simmons, the Provost, Dr. Stephen Doblin and the College of Engineering Dean, Dr. Jack Hopper, provide significant constructive leadership to the department in support of our educational goals. Drs. Simmons and Hopper were key in the acquisition of the William B. and Mary G. Mitchell endowed chair gift ($1.2M) that resides in the department.

7.1 Program Budget

The budget for the Department of Electrical Engineering is determined, as discussed previously, from state allocations as established by the legislature. However, there are three other sources of funding that the department has available to it. These are discussed below:

Higher Education Assistance Funds (HEAF): An annual appropriation used for acquiring, constructing, or improving tangible assets. HEAF funds are allocated directly to departments from the Provost's office based on perceived and anticipated needs. the funds are relatively unrestricted and are typically used to improve equipment used in the program. HEAF has averaged roughly $12,000/year and has been spent to improve faculty office computer equipment. HEAF is an annual allocation and must be spent before the end of the fiscal year.

Course fees: These are fees attached to various courses (a request must be justified and approved by the Board of Regents) to support special equipment and software as well as instructional aids (projectors, Smart Boards, etc.). Course fees accumulate in a department account and are carried over to the next fiscal year. This allows the fees to be banked pending equipment replacement needs that occur sporadically. The following courses have $70 fees on them, although the college caps the total amount that an engineering student can be charged in any semester to $140.

ELEN1200 Introduction to Electrical Engineering

ELEN2107 Circuits Laboratory

ELEN3108 Electronics Laboratory

ELEN3109 Machines Laboratory

ELEN4206/4207 Senior Projects Design

ELEN4468 Microcomputer I

ELEN4387 Microcomputer II

Gifts/donations: All donations are processed by the University Advancement Office and are distributed to the department either in scholarship accounts, which must be used exclusively for that purpose, or as funds deposited into the unrestricted account. The latter is an account that is undesignated and may be used for purchases not normally allowed for using state accounts.

Sponsored Research: Research accounts are controlled and maintained by the individual PI's that acquire the funding. On overhead generating research, the department receives an allocation determined at the time of proposal submission and disbursed from a college account. At present, the department has no funds available from this option.

7.2 Faculty Professional Development

The faculty in the program are well developed both academically and professionally and a number of opportunities exist for their improvement and maintenance in this regard. The HEAF and unrestricted funds sources discussed in section 7.1 are available when equipment or software is needed. The unrestricted funds may also be used to support travel to conferences and workshops. Because of the restricted amount of funds available, faculty are encouraged to pursue outside sources of funding in the form of grants and contracts.

The University and College of Engineering provide faculty development funding in a number of forms. Research Enhancement Grants are funded twice yearly in the amount of $5,000 each. The EE faculty have been very aggressive in pursuing these very competitive grants and have been successful in obtaining them on a regular basis.

The department plan for faculty development consists of a feedback process that starts with the F2.08 Faculty Annual Review. This form is completed by faculty members at the end of the evaluation year, which was set at January through December in 2004. The form focus is on teaching, research and service activities and is the primary vehicle for the awarding of merit raises. After the F2.08 is completed and submitted to the Chair, it is reviewed with respect to department goals and objectives. Performance on teaching directly affects curriculum issues in the program, research performance speaks to academic development and service directly addresses professional development opportunities. Adherence to ABET criteria maintenance and update as well as attention to the ongoing assessment process is a factor in the evaluation. The faculty are counseled and have the opportunity for debate regarding the outcome of the evaluation. Department resources are then allocated, as needed and as available, to support individual needs.

7.3 Acquisition, Maintenance and Operation of Facilities and Equipment

The department facilities are fairly well constrained and located, which simplifies our ongoing maintenance and operations. Facilities and equipment shared with the college and university are maintained and updated outside of the department. The acquisition, maintenance and operation of computer facilities outside of the college are influenced by faculty members that serve on university committees. Facilities within the college are controlled by the Dean and input from individual departments is received and considered in the process.

Facilities and equipment within the department are managed by the department Lab manager, Mr. Michael Fuller. Mr. Fuller has responsibility for insuring that computers and equipment are properly maintained, stored, repaired and updated. Prior to laboratory classes he makes any required resources available to the instructor as needed. He conducts safety briefings at the start of each semester lab course and this adds to the overall safety of the students and protects equipment from misuse as well. On going maintenance of the teaching and laboratory facilities is supported by course fees and in some instances, the HEAF.

Our program objectives have been well served by this process, which is again an advantage of our small size. Under this structure, variants and deficiencies can be quickly identified and corrected.

7.3 Support Personnel and Institutional Services

The department enjoys the services of two full-time staff members, Mrs. Jane Capps the Administrative Associate for Electrical Engineering, and Mr. Michael Fuller, the Laboratory Manager. Their service to the department has a significant effect on day-to-day operations and the maintenance of a *student-centered* environment that is a component in the accomplishment of our program objectives.

8. Program Criteria

Our program is constrained to that specific for Electrical Electrical engineering, which includes the following topics from Criterion 8:

The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program.

Our program satisfies the breadth requirement by addressing the foundational areas of electrical engineering across 47 credit hours taught by department faculty that represents 36% of the curriculum. We also place a strong emphasis on math, which is a foundational requirement of electrical engineering given the extreme levels of abstraction inherent in the discipline, and in that respect we devote 21 credits or 16% of the program. Breadth is also demonstrated in the spread observed across our program outcomes as seen in Table 3-2 EE Course Outcomes Matrix.

For depth we rely on our senior level electives (six credits) and our culminating design experience (ELEN4206/4207) and seminar course (ELEN4101/4102).

The program must demonstrate that graduates have: knowledge of probability and statistics, including applications appropriate to the program name and objectives; and knowledge of mathematics through differential and integral calculus, basic sciences, computer science, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components, as appropriate to program objectives.

Our graduates have knowledge of probability and statistics from multiple sources: 1) MATH3370 Intro to Theory of Statistical Inference, 2) INEN2273 Engineering Economics and 3) ELEN3381 Electrical Analysis as well as from the sciences.

In our Senior Projects course students design complex electrical and electronic devices using software tools and incorporating hardware and software components. Recent examples of these include the following:

Assistive Technology – project developed hardware and software for assisting persons with disabilities that are able to drive. This project utilized voice recognition technology along with a hand-held chord keyboard controller.

Hearing Aids Improvement – this team developed shielding for hearing aids from cellphone interference.

IEEE Robot – the robot entered in the IEEE Region V 2006 Conference competition in San Antonio had to autonomously navigate a simulated warehouse environment and move colored objects from one room to another. The team placed 11th of 32.

TSGC Advanced Robotic Technology – a NASA Texas Space Grant Consortium sponsored project to remotely control a rover vehicle via Internet.

RFID Data Transmission – this team demonstrated the use of RFID to produce both a wireless and *battery free* keyboard.

Auto-on Amplifier – team designed and constructed an amplifier that would sense signal at the input and turn on automatically. The intended use is for PA systems in classrooms that are only used when a device (computer, VCR, tape recorder, etc.) is plugged in.

Fire Fighter Telemetry – this was a large project that consisted of two teams, one team developed the radio location hardware to locate and identify a firefighter in a building and the other produced the software and GUI for the system.

Programs containing the modifier "electrical" in the title must also demonstrate that graduates have a knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics.

Table 4.1 listed mathematics and science courses taken by our students that develop knowledge of differential equations, linear algebra, complex variables and discrete mathematics. Differential Equations are given extensive treatment in MATH3301 and complex variables are also covered there. Linear algebra is treated in MATH2318 as well as some aspects of discrete math. Figure 8.1 illustrates the demonstration linkages into our program outcomes base (required courses).

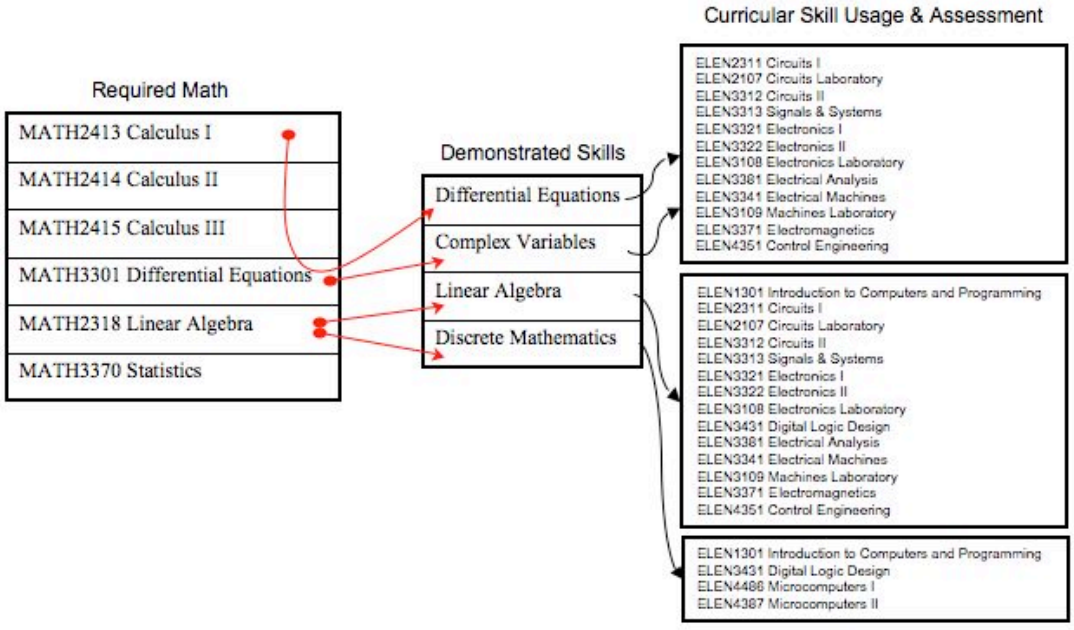


Figure 8.1 Linkage between advanced mathematics instruction and curriculum skill usage and assessment.

The figure shows instruction on the left with the set of required mathematics courses in the program. The center box lists the ABET required knowledge that graduates must have downstream from the appropriate the source courses where those topics are taught. The boxes at the right show the EE curriculum courses where those skills are required and thus indirectly assessed through our program outcomes assessment process (see Section 3).

A. Tabular Data for Program

Table I-1. Basic-Level Curriculum

Electrical Engineering

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours)			
		Math & Basic Sciences	Engineering Topics *Check if Contains Significant Design (✓)*	General Education	Other
1,1	ELEN1200 Intro to EE		1( )		1
	INEN1101 Intro to Engr		( )		1
	ENGL1301 English Composition		( )	3	
	MATH2413 Calculus I	4	( )		
	CHEM1411 Chemistry I	4	( )		
	PHIL1370 Phil of Knowledge		( )	3	
	PEGA Physical Education		( )	1	
1,2	ENGL1302 English Composition		( )	3	
	MATH2414 Calculus II	4	( )		
	PHYS2425 Physics I	4	( )		
	Social Science Elective		( )	3	
	ELEN1301 Intro to Computers		3( )		
2,1	MATH2415 Calculus III	4	( )		
	MATH2318 Linear Algebra	3	( )		
	PHYS2426 Physics II	4	( )		
	MATH3370 Statistics	3	( )		
	INEN2273 Engineering Econ		2( )		
2,2	MATH3301 DiffEq	3	( )		
	PHYS3350 Modern Physics	3	( )		
	ELEN2311 Circuits I		3 ( )		
	ELEN2107 Circuits Lab		1( )		
	History Elective		( )	3	
	Communications/ML		( )	3	
3,1	ELEN3312 Circuits II		3 (✓)		
	ELEN3321 Electronics I		3 (✓)		
	ELEN3108 Electronics Lab		1 (✓)		
	ELEN3371 Electromagnetics		3( )		
	ELEN3431 Digital Logic Design		4 (✓)		
	English Lit Elective		( )	3	
3,2	ELEN3313 Signals & Systems		3 (✓)		
	ELEN3322 Electronics II		3 (✓)		
	ELEN3381 Electrical Analysis		3 (✓)		

(continued on next page)

Table 1. Basic-Level Curriculum (continued)

Electrical Engineering

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Credit Hours)			
		Math & Basic Science	Engineering Topics *Check if Contains <u>Significant</u> Design (✓)*	General Education	Other
3,2	ELEN3341 Electrical Machines		3( )		
	ELEN3109 Machines Lab		1( )		
	History Elective		( )	3	
4,1	ELEN4101 EE Seminar I		1( )		
	ELEN4206 Senior Projects I		2 (✓)		
	ELEN4486 Microcomputer I		4 (✓)		
	ELEN4351 Control Engineering		3( )		
	ELEN Elective		( )		3
	POLS2301 American Govt.		( )	3	
4,2	ELEN4102 EE Seminar II		1( )		
	ELEN4207 Senior Projects II		2 (✓)		
	ELEN4387 Microcomputer II		3( )		
	ELEN Elective		( )		3
	Fine Arts Elective		( )	3	
	POLS2302 American Govt.		( )	3	
TOTALS-ABET BASIC-LEVEL REQUIREMENTS		**36**	**53**	**34**	**7**
OVERALL TOTAL FOR DEGREE	**130**				
PERCENT OF TOTAL		**28%**	**41%**	**26%**	**5%**
Totals must satisfy one set	Minimum semester credit hours	32 hrs	48 hrs		
	Minimum percentage	25%	37.5 %		

Note that instructional material and student work verifying course compliance with ABET criteria for the categories indicated above will be required during the campus visit.

Table I-2. Course and Section Size Summary

Electrical Engineering

Course No.	Title	No. of Sections offered in Current Year	Avg. Section Enrollment	Type of Class[1]			
				Lecture	Laboratory	Recitation	Other
ELEN 1200	INTRO TO ELEC ENGR	1	28	50%	50%		
ELEN 1301	INTRO COMPUTERS/PROG	4	28	100%			
ELEN 2107	CIRCUITS LAB	1	30		100%		
ELEN 2311	CIRCUITS I	1	30	100%			
ELEN 3108	ELECTRONICS LAB	1	25		100%		
ELEN 3109	ELECTRIC MACHINES LAB	1	20		100%		
ELEN 3312	CIRCUITS II	1	24	100%			
ELEN 3313	SIGNALS AND SYSTEMS	1	22	100%			
ELEN 3321	ELECTRONICS I	1	26	100%			
ELEN 3322	ELECTRONICS II	1	21	100%			
ELEN 3341	ELECTRIC MACHINES	1	21	100%			
ELEN 3371	ELECTROMAGNETICS	1	24	100%			
ELEN 3381	ELECTRICAL ANALYSIS	1	22	100%			
ELEN 3431	DIGITAL LOGIC DESIGN	1	23	75%	25%		
ELEN 4101	ELEC ENGR SEMINAR I	1	21	100%			
ELEN 4102	ELEC ENGR SEMINAR II	1	21	50%		50%	
ELEN 4201	SENIOR PROJECTS DESIGN I	1	21		100%		capstone design
ELEN 4207	SENIOR PROJECTS DESIGN II	1	21		100%		capstone design
ELEN 4351	CONTROL ENGINEERING	1	22	100%			
ELEN 4486	MICROCOMPUTERS I	1	20	75%	25%		
ELEN 4387	MICROCOMPUTERS II	1	21	100%			

Enter the appropriate percent for each type of class for each course (e.g., 75% lecture, 25% recitation).

Table I-3. Faculty Workload Summary

Electrical Engineering

Faculty Member (Name)	FT or PT (%)	Classes Taught (Course No./Credit Hrs.) Term and Year1	Total Activity Distribution[2]		
			Teaching	Research	Other[3]
Wendell Bean	FT	ELEN 1200/2, ELEN 3312/3, ELEN 4304-35/3, ELEN 4304-36/3, ENGR 5346/3 **FA05** ELEN 2311/3, ELEN 3109/1, ELEN 3313/3, ELEN 4304-36/3, ENGR 5390 **SP06**	100%		
Bernard Maxum	FT	ELEN 3381/3, ELEN 4206/2, ENGR 5373/3, ENGR 6310/3, ENGR 5390/3 **FA05** ELEN 3341/3, ELEN 3371/3, ELEN 4207/2, ENGR 6310/3, ENGR 5391/3 **SP06**	75%	25%	
Harley Myler	FT	ELEN 4101/1, ELEN 4351/3,ENGR 5301/3, ENGR 5390/3, ENGR 5391/3, **FA05** ELEN 4102/1, ELEN 4304-34/3, ENGR 5365/3, HNRS 3360/3, ENGR 5301-34/3M EBGR 5390/3, ENGR 5391/3, ENGR 6601/6 **SP06**	40%	10%	50% (admin)
G. N. Reddy	FT	ELEN 1301/3, ELEN 3431/4, ELEN 2300/3, ENGR 5301-39/3, ENGR 6310/3, ENGR 5390/3 **FA05** ELEN 1301/3, ENGR 5301-39/3, ENGR 6358/3, ENGR 5390/3 **SP06**	90%	10%	
Selahattin Sayil	FT	ELEN 3108/1, ELEN 3321/3, ELEN 4304-32/3, ENGR 5301-32/3, ENGR 5301-36/3 **FA05** ELEN 2107/1, ELEN 3322/3, ENGR 5301-32/3, ENGR 5301-33/3, ENGR 5390/3 **SP06**	60%	40%	
Ruhai Wang	FT	ELEN 4486/4, ELEN 4304-30/3, ENGR 5301-30/3, ENGR 5301-31/3, ENGR 5391/3 **FA05** ELEN 4387/3, ELEN 4304-30/3, ENGR 5301-30/3, ENGR 5301-31/3, ENGR 5390/3, ENGR 5391/3 **SP06**	60%	40%	

1. Indicate Term and Year for which data apply.
2. Activity distribution should be in percent of effort. Faculty member's activities should total 100%.
3. Indicate sabbatical leave, etc., under "Other."

Table I-4. Faculty Analysis

Electrical Engineering

Name	Rank	FT or PT	Highest Degree	Institution from which Highest Degree Earned & Year	Years of Experience			State in which Registered	Level of Activity (high, med, low, none)		
					Govt./ Industry Practice	Total Faculty	This Institution		Professional Society (Indicate Society)	Research	Consulting/ Summer Work in Industry
Harley R. Myler	3	0.5	Ph.D.	NMSU/1985	3	22	5	TX,FL	HIGH/IEEE	MED	MED
Wendell Bean	3	1.0	Ph.D.	Pitt/1961	14	38	38	TX	LOW/IEEE	LOW	NONE
Bernard Maxum	3	1.0	Ph.D.	UCB/1963	28	17	14	CA	HIGH/IEEE	MED	NONE
Ganesha Reddy	2	1.0	Ph.D.	IIT/1982	0	22	16	-	MED/IEEE	LOW	NONE
Selahattin Sayil	1	1.0	Ph.D.	Vanderbilt/2000	0	6	3	-	HIGH/IEEE	HIGH	NONE
Ruhai Wang	1	1.0	Ph.D.	NMSU/2001	0	4	4	-	LOW/IEEE	HIGH	NONE

1: Professor
2: Associate
3: Assistant

Table I-5. Support Expenditures

Electrical Engineering

Fiscal Year	1 2004	2 2005	3 2006	4 2007
Expenditure Category				
Operations (not including staff)	37,886.96	38,758.27	42,361.00	44,600
Travel	3,955.56	4,891.70	1,615.32	4,000
Equipment (Totals)	44,876.26	28,394.81	10,283.57	39,000
Institutional Funds	24,110.41	13,948.81	2,725.00	18,000
Grants and Gifts	20,765.85	14,446.00	7,558.57	21,000
Graduate Teaching Assistants†	0	0	0	0
Part-time Assistance†† (other than teaching)	10,428.35	10,049.15	10,100.00	10,100.00

†LU GTA's are a salaried position, LUEE pays student assistants hourly so that they retain scholarships and to allow for better accountability of work performed.

††LUEE teaching assistants are paid hourly and thus are part-time.

B. Course Syllabi

ELEN 1200 Introduction to Electrical Engineering
(Required*)

Catalog Description: A survey of electrical engineering principles and introduction to the design process with emphasis on signal processing hardware and software.

Prerequisites:
By course: Prerequisites: None; Corequisite: MATH 2413 Calculus & Analytical Geometry I
By topic: None.

Courses that require this as a prerequisite: None

Credits: 2

Offered: Fall Annually

Instructors:
Primary: Wendell C. Bean
Secondary: H. R. Myler

Textbook: *Electrical Engineering Uncovered*, White & Doering, Prentice Hall, Second Edition, 2001, ISBN 0-13-091452-5.

References: None

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:
- Understand basic engineering formula and concepts related to electrical engineering. (Criterion 3(a))
- Understand binary states, basic logic functions, and Boolean algebra. (Criterion 3(a))
- Understand logic function minimization, and minimization tools. (Criterion 3(a))
- Are able to use DSP hardware and software in the laboratory. (Criterion 3(b))
- Are able to use proto-circuit boards with an electronic laboratory virtual instrument system (ELVIS). (Criterion 3(b))

Lecture Topics (approximate number of lecture hours):
- Introduction to electrical engineering. (1 hour)
- DC circuit fundamentals. (3 hours)
- AC circuits; capacitors. (1 hour)
- DC circuits, inductance, transformers. (1 hour)
- Field of electrical engineering. (1 hour)
- DC circuit fundamentals. (3 hours)
- AC current, voltage; capacitors. (1 hour)
- RC circuits; inductance, transformers. (1 hour)
- Binary numbers, decimal-binary conversions. (1 hour)
- Digital logic devices, truth tables, Boolean logic. (1 hour)
- Logic functions, minimizations. (2 hours)
- Wireless communications; RLC resonance. (1 hour)
- Operational amplifiers; ideal op-amp circuit gains. (1 hour)

Lab Topics (approximate number of lab hours)

- Intro to Visual Applications Builder and DSP board. (2 hours)
- DSP versus PC, Test of Systems. (2 hours)
- Demos; plots of speech. (1 1/2 hours)
- Musical instrument digital interface. (2 hours)
- Image quantization; sampling & aliasing; color representation. (2 hours)
- Transmitting/receiving video over a network. (1 1/2 hours)
- Creating an image. (1 1/2 hours)
- Audio steganography, hiding information in images. (1 1/2 hours)
- Intro to ELVIS system. (2 hours)
- ELVIS-digital logic experiment. (1 1/2 hours)
- ELVIS-series RLC circuit frequency response. (1 1/2 hours)
- ELVIS-operational amplifier behaviors. (1 hour)

Structure: One 50-minute lecture per week. Twelve 2 hour laboratory sessions. Two one-hour exams. About five homework assignments.

Policy: Homework is due the second class after it has been assigned. Homework late by one class is subject to 20% penalty. No homework accepted after graded work is returned. It is your responsibility to know all exam dates. No make-up exams will be given in this class except for written medical excuse. Punctual attendance is expected of all students. A roll will be called at each class meeting. A bonus of three points on course average for 90% attendance.

Contribution to professional component:

Math and basic science	0.0 (units)
Engineering Topics	2.0 (units)
Does this course contain significant design experience?	No

*May substitute INEN 1101 Intro to Engineering for this course.

Prepared by Wendell C. Bean May 2006

ELEN 1301 Introduction to Computers & Programming
(Required)

Catalog Description: Digital computers, program organization, algorithm development using engineering examples and high-level languages.

Prerequisites:
By course: Corequisite: MATH 2413 or equivalent.
By topic: Basic computer skills.

Courses that require this as a prerequisite: ELEN 2311, ELEN 3381

Credits: 3

Offered: Fall and Spring Annually

Instructors:
Primary: G. N. Reddy
Secondary: Selahattin Sayil

Textbook: *C++ For Engineers and Scientists*, Gary J. Bronson, Thomson Course Technology, Second Edition, 2006, ISBN 0-534-99380-X.

References: *C++ How to Program*, H. M. Deitel & P. J. Deitel, Prentice Hall Publishers, Fourth Edition, 2003, ISBN 0-13-038474-7.
WebCT Supplemental Class Notes, G. N. Reddy, Fall 2005.

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:
- Are familiar with state-of-the-art programming practices. (Criterion 3(i),(j))
- Use modern programming platforms to implement the assigned projects. (Criterion 3(k))
- Implement comprehensive examples. (Criterion 3(e))
- Have learned Object Oriented Programming - OPP. (Criterion 3(j))
- Have learned basic computer architecture, devices, and application execution on these devises. (Criterion 3(c))
- Have learned program interface to the outside world. (Criterion 3(c))

Topics (approximate number of lecture hours):
- INTRODUCTION TO COMPUTERS (supplemental class notes on WebCT)
    - Introduction to basic computer architecture and computer devices. Program compilation and execution. Device interfaces, ADC, DAC, and number systems. (6 hours)
    - Introduction to programming languages, level of programming, and styles of programming, and program development phases. (4 hours)
- PROGRAMMING (C++ Programming -- Text Book)
    - Program development environment. (2 hours)
    - Introduction to classes. (2 hours)
    - Introduction to Object-Oriented Programming using C++. (2 hours)
    - C++ Code design guideline: Indentation, structuring spacing alignment, formatting, redundancy, positive-negative logic. (2 hours)

- Program debug: Identification of syntactical and logical errors. (2 hours)
- Assignment and interactive input. (2 hours)
- Data types. (2 hours)
- I/O File streams and data files. (3 hours)
- Arithmetic and logical operations. (3 hours)
- Selection structures. (3 hours)
- Repetition Structures. (3 hours)
- Arrays (2 hours)

Structure: Two 75-minute lectures per week or three 50-minute lectures per week. Two design projects per week. Two 75-minute mid-term exams and a 2-hour final comprehensive exam.

Policy:
Projects & Tests:
Each week's projects must be emailed by the following Monday. For late submissions, there is a 10% penalty for each working day. All class materials will be on WebCT, they are frequently updated as necessary. All tests will be online-tests. There will be two mid-term exams and a final exam. You can find practice tests on the WebCT. Any questions on your tests must be clarified within one week from the day of returning the exam; afterwards no questions will be entertained.

Cell phones & Attendance:
You must turn-off the cell phones or put them in "manner-mode" before you enter into the class. If cell phone rings during the class, you will loose that day's attendance. Attendance counts for 10% of your grade.

Contribution to professional component:

Math and basic science	0.5 (units)
Engineering Topics	2.5 (units)
Does this course contain significant design experience?	Yes

Prepared by: Dr. G. N. Reddy May 2006

ELEN 2311 Circuits I
(Required)

Catalog Description: Linear network analysis. Fundamental network laws and methods. Transient response. Sinusoidal steady state analysis and response.

Prerequisite:
By course: MATH 2414 Calculus & Analytic Geometry II, PHYS 2426 Calculus Based Physics II, and ELEN 1301 Introduction to Computers and Programming with grade of C or better.
By topic: KCL, KVL, basic DC and AC circuit analysis.

Courses that require this as a prerequisite: ELEN 3312, ELEN 3321, ELEN 3371 and ELEN 3381.

Credits: 3

Offered: Spring Annually

Instructors:
Primary: Wendell Bean
Secondary: Selahattin Sayil

Textbook: *Engineering Circuit Analysis*, Hayt, McGraw Hill, Sixth Edition, 2002, ISBN 0-07-418724-4.

References: None

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:

- Understand the basic concepts of Ohm's law and Kirchhoff's loop voltage and node current laws. (Criterion 3(a))
- Understand DC and AC circuit analysis for multiple sources, both independent and dependent sources. (Criterion 3(a))
- Know how to develop Thevenin and Norton equivalent circuits and use in varying load calculations and impedance matching. (Criterion 3(a),(e))
- Can understand and derive first-order differential equations describing circuit variables in transient analyses. (Criterion 3(a),(e))
- Can perform steady-state sinusoidal analysis of linear lumped-parameter circuits. (Criterion 3(a),(e))

Topics (approximate number of lecture hours):

- Voltage, current, power, Ohm's law. (2 hours)
- Kirchhoff's laws for loop/mesh voltages and node currents with simple circuits. (2 hours)
- Equivalent resistance used with voltage and current division principles. (2 hours)
- Nodal analysis and supernodes. (2 hours)
- Mesh analysis and supermeshes. (2 hours)
- Superposition and source transformations. (2 hours)
- Thevenin/Norton equivalent circuits; maximum power to load. (2 hours)
- Capacitors and inductor, stored energy effects. (1 hour)
- Source-free RL and RC circuits, time constants. (2 hours)
- Driven RL and RC circuits. (4 hours)

- Parallel RLC circuits. (4 hours)
- Series RLC circuits. (3 hours)
- Complete responses of RLC circuits. (3 hours)
- Sinusoidal voltages, currents, phasors. (3 hours)
- Impedance and admittance. (1 hour)
- Frequency-domain equivalent circuits. (1 hour)
- Sinusoidal steady-state analysis methods. (5 hours)

Structure: Three 50-minute lectures per week. No labs. Three one-hour exams, and a two and a half hour final. About 26 homework assignments.

Policy: Homework is due the second class after it has been assigned. Homework late by one class is subject to 20% penalty. No homework accepted after graded work is returned. It is your responsibility to know all exam dates. No make-up exams will be given in this class except for written medical excuse. Punctual attendance is expected of all students. A roll will be called at each class meeting. A bonus of three points on course average for 90% attendance.

Contribution to professional component:

Math and basic science	0.0 (units)
Engineering Topics	3.0 (units)
Does this course contain significant design experience?	No

Prepared by: Dr. Wendell Bean May 2006

ELEN 2107 Circuits Laboratory
(Required)

Catalog Description: Experience in the use of elementary electrical equipment and elements, including the oscilloscope.

Prerequisites:
By course: Corequisite: ELEN 2311 Circuits I.
By topic: KCL, KVL, basic circuit analysis including DC, AC, and transient analysis.

Courses that require this as a prerequisite: ELEN 3108, ELEN 3109

Credits: 1

Offered: Spring Annually

Instructors:
Primary: Selahattin Sayil
Secondary: Wendell Bean

Textbook: None

References: *Engineering Circuit Analysis*, William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, McGraw Hill Publishers, Sixth Edition, ISBN 0-07-228364-5.

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:

- Are able to use elementary electrical equipment and elements. This equipment will include voltmeters, digital voltmeters, signal generators, oscilloscopes and National Instruments Electronic Laboratory Virtual Instrument System (ELVIS) console. (Criterion 3(b),(d),(k))
- Are able to use NI ELVIS system and their protoboards to analyze electrical circuits. (Criterion 3(b),(d),(k))
- Are able to gather data and write reports as part of their laboratory assignments. (Criterion 3(b),(g),(k))
- Will gain hands on experience on KCL, KVL, mesh and nodal analysis. (Criterion 3(a),(b),(d),(k))
- Will gain hands on experience on network theorems such as Superposition, Thevenin, Maximum Power. (Criterion 3(a),(b),(d),(k))
- Will put into practice the theory they learned on high pass, low pass filter and resonance circuits. (Criterion 3(a),(b),(d),(k))
- Are able to do impedance measurements. (Criterion 3(a),(b),(d),(k))
- Are able to measure transient response of RL, RC and RLC circuits. (Criterion 3(a),(b),(d),(k))

Topics (One lab each week):

- Introduction to ELVIS NI.
- Kirchhoff's laws - loop and nodal analysis.
- Voltage and current division.
- Linearity and Superposition Theorem.
- Thevenin equivalent and maximum power transfer.

- Transient response of RC circuit.
- Transient response of RL circuit
- Resonance in RLC circuits.
- Lowpass & highpass filters.
- Bandpass filters.
- Impedance measurement.

Structure: 180 minute lab per week. One-hour practice test and a two-hour practice final. Lab report assignment each week. Reports include objectives, methods, equipment list, and the lab results (sometimes in the form of tables and graphs created by Excel), solution to lab assignments and conclusion.

Policy: Lab reports are due next week same day after it has been assigned. Late reports, if accepted, are subject to 20% Penalty. You are encouraged to work together on lab assignments; however it should be your work that is submitted. It is your responsibility to know all exam dates and arrival times for the exam. No make-up exams will be given in this class except for written medical excuse and no extra time will be given for late students. No exam is given if you are 30 minutes late. Even if you are late in the exam, you must turn in at the due time. Punctual attendance is expected of all students. A roll will be taken at each lab meeting. This consists of signing your name on the attendance record for that date. Unexcused absences will result in the assessment of a penalty affecting the student's grade.

Contribution to professional component:

Math and basic science 0.0 (units)
Engineering Topics 1.0 (units)
Does this course contain significant design experience? No

Prepared by: Dr. Selahattin Sayil May 2006

ELEN 3312 Circuits II
(Required)

Catalog Description: Power calculations, polyphase circuits. Frequency response, resonance, magnetically coupled circuits, two port networks. Fourier series. Fourier and Laplace transform application.

Prerequisite:
By course: Prerequisite: ELEN 2311 Circuits I with grade of C or better; Corequisite: MATH 3301 Ordinary Differential Equations.
By topic: KCL, KVL, basic circuit analysis including DC, AC, and transient analysis.

Courses that require this as a prerequisite: ELEN 3313, ELEN 3341

Credits: 3

Offered: Fall Annually

Instructors:
Primary: Wendell C. Bean
Secondary: Selahattin Sayil

Textbook: *Engineering Circuit Analysis*, Hayt, McGraw Hill, Sixth Edition, 2002, ISBN 0-07-418724-4.

References: None

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:
- Can perform complex-frequency domain analysis of linear, lumped parameter circuits using Laplace transform techniques. (Criterion 3(a))
- Understand the relationship between time-domain, complex frequency domain, and frequency domain techniques. (Criterion 3(a))
- Are able to analyze passive frequency-selective circuits. (Criterion 3(a))
- Understand Fourier series and Fourier transform, and their application in circuit analysis. (Criterion 3(a))
- Can analyze two-port circuits. (Criterion 3(a))

Topics (approximate number of lecture hours):
- Average power; rms V and I; power factor; apparent and complex power. (3 hours)
- Three-phase systems, delta and wye connected sources and loads; Two-watt meter power measurement. (3 hours)
- Mutual inductance; ideal transformer; primary and secondary voltage and current ratios. (2 hours)
- Voltage adjustments; transformers and impedance matching for maximum load power. (1 hour)
- Complex frequency; Laplace transforms, -for time functions; inverse transform techniques, basic Laplace theorems. (3 hours)
- S-Domain circuit analysis; Z(s), Y(s) use; nodel and mesh analysis; poles, zeros; transfer functions. (3 hours)
- Convolution integral frequency dependence of magnitude and phase; natural response and the s-plane. (3 hours)

- Parallel resonance, quality factor; bandwidth; series resonance; high Q circuit approximations. (3 hours)
- Bode diagrams, asymptote approximations for magnitude db and phase plots; filter frequency responses. (2 hours)
- One and two port networks; admittance, impedance, hybrid, and transmission parameters. (4 hours)
- Fourier series; Fourier circuit analysis; coefficient evaluation and use of symmetry; Fourier transform; transform-time function pairs; system function concept. (4 hours)

Structure: Three 50-minute lectures per week. No labs. Three one-hour exams, and a two hour final. About 29 homework assignments.

Policy: Homework is due the second class after it has been assigned. Homework late by one class is subject to 20% penalty. No homework accepted after graded work is returned. It is your responsibility to know all exam dates. No make-up exams will be given in this class except for written medical excuse. Punctual attendance is expected of all students. A roll will be called at each class meeting. A bonus of three points on course average for 90% attendance.

Contribution to professional component:

Math and basic science	0.0 (units)
Engineering Topics	3.0 (units)
Does this course contain significant design experience?	No

Prepared by: Dr. Wendell Bean May 2006

ELEN 3321 Electronics I
(Required)

Catalog Description: Design and analysis of circuits using diodes, transistors, and linear and digital integrated circuits.

Prerequisites:
By course: ELEN 2311 Circuits I with grade of C or better.
By topic: KCL, KVL, basic circuit analysis including DC, AC, and transient analysis.

Courses that require this as a prerequisite: ELEN 3322

Credits: 3

Offered: Fall Annually

Instructors:
Primary: Selahattin Sayil
Secondary: Wendell Bean

Textbook: *Electronic Circuit Analysis* & Design, Donald A. Neaman, McGraw Hill Publishers, Second Edition, 2001, ISBN 0-07-245194-7.

References: *Schematic Capture with Electronics Workbench Multisim*, Marc E. Herniter, Prentice Hall, 2004, ISBN 0-13-049614-6.
Microelectronic Circuit, Adel S. Sedra and Kenneth C. Smith, Oxford University Press, Fifth Edition, 2004, ISBN 0-19-514251-9.

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:
- Are familiar with current and future applications of electronics with an emphasis on microelectronics. (Criterion 3(h),(i))
- Understand basic physics and operation of diodes, BJTs, MOSFETs and JFETs. (Criterion 3(a))
- Understand the concepts of DC and small-signal analysis. (Criterion 3(a))
- Understand the analysis and design of basic amplifier configurations. (Criterion 3(a),(c))
- Are able to use the circuit simulator SPICE for analysis of electronic circuits. (Criterion 3(a),(b),(k))
- Understand the ideal op-amp and various op-amp applications. (Criterion 3(a),(c))

Topics (approximate number of lecture hours):
- Introduction to semiconductors and diode physics. (3 hours)
- Diodes: physics, DC and small-signal model, applications. (5 hours)
- BJTs: physics, biasing, small-signal model. (6 hours)
- BJT single-stage amplifiers: analysis and design. (6 hours)
- MOSFETs, JFETs: physics, DC analysis, small-signal model. (8 hours)
- MOSFET single-stage amplifiers: analysis and design. (6 hours)
- The Ideal Operational amplifier. (4 hours)
- Digital electronics (3 hours)

Structure: Two 75-minute lectures per week. No labs. Three 75-minute exams and a two hour final. Frequent homework assignments, some involving SPICE usage.

Policy: Homework is due next week same day after it has been assigned. Late homework, if accepted, is subject to 20% Penalty. No homework accepted after solution is posted. You are encouraged to work together on homework; however it should be your work that is submitted. It is your responsibility to know all exam dates and arrival times for the exam. No make-up exams will be given in this class except for written medical excuse and no extra time will be given for late students. No exam is given if you are 30 minutes late. Even if you are late in the exam, you must turn in at the due time. Punctual attendance is expected of all students. A roll will be taken at each class meeting. This consists of signing your name on the attendance record for that date. Unexcused absences will result in the assessment of a penalty affecting the student's grade. Exam Rules: There will be no borrowing of any items during exam.

Contribution to professional component:

Math and basic science	0.0 (units)
Engineering Topics	3.0 (units)
Does this course contain significant design experience?	Yes

Prepared by: Dr. Selahattin Sayil May 2006

ELEN 3108 Electronics Laboratory
(Required)

Catalog Description: Analysis and design of diode circuits and amplifiers using diodes, transistors and passive components. Later stages of the course include the use of linear integrated circuits and timer applications.

Prerequisites:
By course: ELEN 2107 Circuits Laboratory with grade of C or better. Corequisite: ELEN 3321 Electronics I.
By topic: KCL, KVL, basic circuit analysis including DC, AC, and transient analysis, Diode, Transistor, and Op-amp Characteristics, DC and small signal analysis of diodes and transistors.

Courses that require this as a prerequisite: ELEN 4206 and ELEN 4207

Credits: 1

Offered: Fall Annually

Instructors:
Primary: Selahattin Sayil
Secondary: Wendell Bean

Textbook: None

References: *Electronic Circuit Analysis & Design*, Donald A. Neaman, McGraw Hill Publishers, Second Edition, 2001, ISBN 0-07-245194-7.

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:

- Are able to learn the functional purpose of discrete components and integrated circuits by having hands on experience. (Criterion 3(a),(b),(d),(k))
- Are able to design active component circuits and enhance their test and measurement skills. (Criterion 3(a),(b),(c),(d),(k))
- Physically test and study the characteristics of different types of diodes. (Criterion 3(a),(b),(d),(k))
- Are able to gain hands on experience on designing and analyzing clipper and clamper diode circuits using NI Electronic Laboratory Virtual Instrument System (ELVIS) console. (Criterion 3(a),(b),(c),(d),(k))
- Learn how to derive BJT transistor characteristics for different configurations by experimentation. (Criterion 3(a),(b),(d),(k))
- Learn how to derive DC and AC characteristics for BJT and FET transistor amplifiers by taking measurements. (Criterion 3(a),(b),(d),(k))
- Learn how to measure non-ideal parameters for a real Operational Amplifier. (Criterion 3(a),(b),(c),(d),(k))
- Understand advanced uses of op-amps using hands on experience. (Criterion 3(a),(b),(d),(k))
- Are able to use NI ELVIS system and their NI ELVIS boards to analyze and design electronics circuits. (Criterion 3(a),(b),(c),(d),(k))
- Are able to gather data and write reports as part of their laboratory assignments. (Criterion 3(a),(b),(g),(k))

Topics (One lab each week):

- Diode Characteristics
- Diode Applications
- BJT Characteristics
- BJT Amplifiers
- JFET Characteristics
- Op-Amp Characteristics
- Op-Amp Applications -I
- Op-Amp Applications -II
- JFET Amplifiers
- 555 Timer Applications

Structure: 180-minute lab per week. One-hour practice test and a two-hour practice final. Lab report assignment each week. Reports include pre-lab assignment, objectives, methods, equipment list, and the lab results (sometimes in the form of tables and graphs created by Excel), solutions to lab assignments and conclusion.

Policy: Lab reports are due next week same day after it has been assigned. Late reports, if accepted, are subject to 20% Penalty. You are encouraged to work together on lab assignments; however it should be your work that is submitted. It is your responsibility to know all exam dates and arrival times for the exam. No make-up exams will be given in this class except for written medical excuse and no extra time will be given for late students. No exam is given if you are 30 minutes late. Even if you are late in the exam, you must turn in at the due time. Punctual attendance is expected of all students. A roll will be taken at each lab meeting. This consists of signing your name on the attendance record for that date. Unexcused absences will result in the assessment of a penalty affecting the student's grade.

Contribution to professional component:

Math and basic science 0.0 (units)
Engineering Topics 1.0 (units)
Does this course contain significant design experience? Yes

Prepared by: Dr. Selahattin Sayil May 2006

ELEN 3371 Electromagnetics
(Required)

Catalog Description: Vector analysis, coordinate systems, static and quasi-static electric fields, electric potential, dielectrics, capacitance, current, conductance, magnetic vector potential, electromagnetic forces. Maxwell's Equations, plane waves, transmission lines and Smith chart analysis.

Prerequisites:
By course: MATH 2318 Linear Algebra, MATH 3301 Ordinary Differential Equations, ELEN 2311 Circuits I, and PHYS 2426 Calculus Based Physics II with grade of C or better.
By topic: DC and AC Circuits; Calculus-Based Physics in Electricity and Magnetism; Analytic Geometry and Calculus II including Vector Analysis and Vector Calculus; Differential Equations; and Linear Algebra.

Courses that require this as a prerequisite: None

Credits: 3

Offered: Spring Annually

Instructors:
Primary: Bernard Maxum
Secondary: None Assigned

Textbook: *Applied Electromagnetism*, Shen and Kong, PWS International Thomson Press, Third Edition, 1999, ISBN 0-534-94722-0.
Field Mathematics for Electromagnetics, Photonics, and Materials Science: A Guide for the Scientist and Engineer, Bernard Maxum, SPIE, 2004, ISBN 0-8194-5523-7.

References: *Engineering Electromagnetics*, Hayt, McGraw Hill Publishers, Sixth Edition, 2001, ISBN 0-07-424005-6.
Electromagnetics for Engineers, Ulaby, Pearson Prentice Hall, 2005
Electromagnetics for Engineers, Schwarz, Oxford University Press, 1990
Fields and Waves in Communication Electronics, Ramo, Whinnery, Vanduzer, Wiley Press, Third Edition, 1994
Introduction to Electric Fields, Rogers, McGraw Hill Publishers
Electromagnetics with Applications, Kraus and Fleisch, McGraw Hill Publishers, Fifth Edition, 1999

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:
- Understand how electromagnetics broadly permeates electrical engineering disciplines such as circuits, electronics, VLSI, communications, power systems, computer engineering, controls, antennas, electromagnetic transmission lines, and optical engineering. (Criterion 3(f),(h))
- Garner an appreciation for the need for vector calculus concepts in applying Maxwell's Equations to the design of electrical engineering equipment and systems. Become attentive to the assumptions that are implicit in these developments and where these assumptions are no longer valid extend this appreciation to the appropriate mathematical formulations. (Criterion 3(a),(b))

- Be able to write Maxwell's Equations in differential form and the constitutive relations between the flux densities and field intensities of the electric and magnetic fields. (Criterion 3(a))
- Recognize the Helmholtz wave equations in its various forms and the wave nature of their solutions for time-harmonic waves. Acquire an appreciation for the physical form of the corresponding wave (such as plane wave, sperical wave and their direction of travel) by simply observing the form of the wave phasor. (Criterion 3(a),(b))
- Acquire an understanding of guided waves and the development and use of the Smith Chart for electromagnetic transmission-line analysis. Be able to work transmission-line problems through the "stub matching ". (Criterion 3(b),(c),(e))
- Appreciate the concepts of scalar and vector potential fields and their applications to electromagnetic antennas. Acquire an understanding of the basic Hertzian dipole and various other antennas that stem from it. Become aware of various antenna patterns and how they can be used in antenna design and applications. (Criterion 3 (b),(c),(e))
- Appreciate how electromagnetic concepts provide the foundations for optical engineering such as fiber optic communications and holography. (Criterion 3(b),(c),(e))
- Recognize and appreciate how electromagnetics concepts may be applied to individual topics of interest by preparing an engineering presentation to the class on a specific area of interest. (Criterion 3(e),(g),(h))

Topics (approximate number of 50-minute lectures):

- Introduction to Electromagnetics I with review of vector calculus. (4)
- Maxwell's Equations in differential form. (6)
- The Helmholtz Wave Equations and Plane Waves. (6)
- Reflection and Transmission of Waves. (1)
- Electromagnetic Transmission Lines and the Smith Chart. (5)
- Applications of Transmission-line Techniques. (2)
- Vector Calculus-integral forms. (4)
- Electric scalar potential and Magnetic vector potential. (3)
- Antennas-linear, dish, array antennas. (4)
- Individual topics in field and waves in modern communications. (4)
- Review (1)

Structure: Three 50-minute lectures per week. Homework, three exams, term project, and final comprehensive exam.

Policy: Homework is due next week same day after it has been assigned. Late homework is subject to 10% penalty if submitted before other students' homework is returned and 50% penalty thereafter. You are encouraged to work together on homework; however it should be your work that is submitted. It is your responsibility to know all exam dates and arrival times for the exams. Exam rules: There will be no borrowing of any item and no use of transmitting/receiving devices during the exams.

Contribution to professional component:

Math and basic science	1.0 (units)
Engineering Topics	2.0 (units)
Does this course contain significant design experience?	Yes

Prepared by: Dr. Bernard Maxum May 2006

ELEN 3431 Digital Logic Design
(Required)

Catalog Description: Switching algebra. Formulate and manipulate switching functions. Combinational networks. Flip-flops. Sequential networks.

Prerequisites:
By course: ELEN 1200 Introduction to Electrical Engineering (desirable).
By topic: Basic understanding of computers, working knowledge in working with computers, and some familiarity with computer devices.

Courses that require this as a prerequisite: ELEN 4486, ELEN 4206

Credits: 4

Offered: Fall Annually

Instructors:
Primary: G. N. Reddy
Secondary: Selahattin Sayil

Textbook: *Digital Fundamental*s, Thomas Floyd, Prentice Hall Publishers, Eighth Edition, 2003, ISBN 0-13-094-200-6.

References: *Fundamentals of Logic Design*, Charles Roth, Thomson Brooks/Cole, Fifth Edition, 2004, ISBN 0-534-37804-8.
WebCT Supplemental Class Notes, G. N. Reddy, Fall 2005

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:
- Are familiar with modern hierarchy of digital hardware design. (Criterion 3(c),(e),(h),(i),(j))
- Are familiar with the state-of-the-art computer hardware design methodologies. (Criterion 3(h),(i),(j))
- Have learned how to design and simulate logic circuits. (Criterion 3(b),(c),(e),(k))
- Have learned how to search, find, and read data sheets of various logic gates and functions. (Criterion 3(i))

Topics (approximate number of 75-minute lectures):
- INTRODUCTION TO DIGITAL HARDWARE DESIGN (Supplemental Class notes on WebCT).
    - Modern hierarchy of digital hardware design. (3)
    - Introduction to digital hardware design languages. (2)
- INTRODUCTION TO LOGIC DESIGN. (The text book)
    - Logic gates. (2)
    - Boolean algebra. (2)
    - Combinational-logic functions. (2)
    - Logic simplification methods. (3)
    - Analog-to-digital & digital -to-analog conversion; Number systems (3)
    - Memory Elements - flip-flops. (3)
    - Sequential logic functions. (3)

- Memories. (3)
- Computer devices (2)
- Basic Computer Architecture. (2)

Structure: Two 75-minute lectures per week. One laboratory design project per week. Two 75-minute mid-term exams and a 2-hour final comprehensive exam.

Policy:
Design Projects:
Projects are scheduled for Friday. Each week's, Micro-cap simulated, project is due by midnight, Thursday. If you have not emailed your project, you will not be allowed into the lab on Friday. When you come to the lab, make sure you have the printout of the project schematic and the data sheets of the individual chips to be used in the project. You loose 20% of the lab-grade if you miss a lab, you may make it up the following week if you do it fast enough. There will be one make-up class at the end of the semester as well.

Class Materials & Tests:
All class materials will be on WebCT, they are frequently updated as necessary. All tests will be online-tests. There will be two mid-term tests and a final exam. You can find practice tests on the WebCT. Any questions on your tests must be clarified within one week from the day of returning the test; afterwards no questions will be entertained.

Cell phones & Attendance:
You must turn-off the cell phones or put them in "manner-mode" before you enter into the class. If cell phone rings during the class, you will loose that day's attendance. Attendance counts for 10% of your grade.

Contribution to professional component:

Math and basic science	0.5 (units)
Engineering Topics	2.5 (units)
Does this course contain significant design experience?	Yes

Prepared by: Dr. G. N. Reddy May 2006

ELEN 3313 Signals and Systems
(Required)

Catalog Description: Circuit design concepts using frequency domain. Pole-zero characterization of system response. Synthesis of passive and active networks.

Prerequisites:
By course: ELEN 3312 Circuits II, MATH 2318 Linear Algebra, and MATH 3301 Ordinary Differential Equations with grade of C or better.
By topic: Laplace and Fourier transforms, and their use in circuit analysis; one and two port network parameters.

Courses that require this as a prerequisite: ELEN 4351, ELEN 4206

Credits: 3

Offered: Spring Annually

Instructors:
Primary: Wendell Bean
Secondary: Selahattin Sayil

Textbook: *Network Analysis & Synthesis of Passive and Active Networks*, Aram Budak, Waveland Press, 1991, ISBN 0-88133-625-4.

References: None.

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:
- Can analyze and design circuits containing ideal operational amplifiers. (Criterion 3(a),(c),(e))
- Understand the effect of system poles and zeros on the transient and frequency responses of systems. (Criterion 3(a))
- Understand the concept of a system, and basic LTI system properties. (Criterion 3(a),(e))
- Understand the analysis of linear time-invariant (LTI) systems using convolution. (Criterion 3(a))
- Can design LC and RC analog filters as realizable networks with specified element values and circuit configurations. (Criterion 3(a),(c))

Topics: (approximate number of lecture hours):
- System functions; common and difference mode excitations and responses. (2 1/2 hours)
- Network poles; time response; frequency response and Bode plots. (4 hours)
- Input impedance; magnitude and frequency scaling; zeros and poles of LC and RC networks. (4 hours)
- LC Foster network design; LC Cauer network design. (2 1/2 hours)
- RC Foster network design; RC Cauer network design. (2 1/2 hours)
- Ladder networks; transfer function realization of two-port LC ladder designs using resistive terminations at the input port, or at the output port. (6 hours)
- Second-order systems; step response characteristics; frequency response. (1 1/2 hours)
- Pole-zero loci of second-order circuits; sensitivity functions for circuit measure changes due to small deviations in circuit parameter values. (2 1/2 hours)

- Ideal operational amplifier characteristics; op-amp circuits for various signal functions. (2 1/2 hours)
- Actual operational amplifier characteristics; three-pole model, frequency response; stability conditions. (2 1/2 hours)

Structure: Two 75-minute lectures per week. No labs. Three 75-minute exams, and a two and a half hour final. About eighteen homework assignments.

Policy: Homework is due the second class after it has been assigned. Homework late by one class is subject to 20% penalty. No homework accepted after graded work is returned. It is your responsibility to know all exam dates. No make-up exams will be given in this class except for written medical excuse. Punctual attendance is expected of all students. A roll will be called at each class meeting. A bonus of three points on course average for 90% attendance.

Contribution to professional component:

Math and basic science	0.0 (units)
Engineering Topics	3.0 (units)
Does this course contain significant design experience?	Yes

Prepared by: Dr. Wendell Bean May 2006

ELEN 3322 Electronics II
(Required)

Catalog Description: In depth study of semiconductor devices and integrated circuit characteristics, stability, feedback amplifiers and frequency response.

Prerequisites:

By course: ELEN 3321 Electronics I and ELEN 3312 Circuits II with grade of C or better.

By topic: KCL, KVL, basic circuit analysis including DC, AC, and transient analysis. Basic physics and operation of diodes, BJTs and FETs. DC and small-signal analyses of these devices and SPICE modeling. Analysis and design of basic amplifier configurations. The ideal op-amp circuits.

Courses that require this as a prerequisite: ELEN 4206, ELEN 4207

Credits: 3

Offered: Spring Annually

Instructors:

Primary: Selahattin Sayil
Secondary: Wendell Bean

Textbook: *Electronic Circuit Analysis & Design*, Donald A. Neaman, McGraw Hill Publishers, Second Edition, 2001, ISBN 0-07-245194-7.

References: *Schematic Capture with Electronics Workbench Multisim*, Marc E. Herniter, Prentice Hall, 2004, ISBN 0-13-049614-6.
Microelectronic Circuit, Adel S. Sedra and Kenneth C. Smith, Oxford University Press, Fifth Edition, 2004, ISBN 0-19-514251-9.

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:

- Are familiar with current and future applications of electronics with an emphasis on microelectronics. (Criterion 3(h),(i))
- Are able to design and analyze operational amplifier circuits. (Criterion 3(a),(c))
- Understand the non-ideal effects in operational amplifier circuits. (Criterion 3(a))
- Understand the frequency response of transistors and the effect of circuit capacitors on the frequency response. (Criterion 3(a))
- Are able to construct the bode plots of amplifier circuits. (Criterion 3(a),(k))
- Understand characteristics of power transistors and power amplifiers. (Criterion 3(a))
- Understand integrated circuit biasing and current source configurations. (Criteria 3(a),(c))
- Are able to analyze differential and multistage amplifiers. (Criterion 3(a))
- Are able to analyze and understand the stability of feedback circuits. (Criterion 3(a))
- Are able to design integrated circuits for a target application. (Criterion 3(a),(c))
- Are able to use the circuit simulator SPICE for analysis of electronic circuits. (Criterion 3(a),(b),(k))

Topics (approximate number of lecture hours):

- Current and future applications of electronics. (1 hour)
- Op-amp applications. (3 hours)
- Frequency response of transistors and transistor amplifiers. (6 hours)
- Power transistors and power amplifiers. (3 hours)
- Integrated circuit biasing, current mirrors. (6 hours)
- Differential and multistage amplifiers. (6 hours)
- Analysis of feedback circuits, and Stability. (6 hours)
- Nonideal effects in Analog IC's. (4 hours)
- Applications of integrated circuits. (5 hours)

Structure: Three 50-minute lectures per week. No labs. Three 50-minute exams, and a two hour final. Frequent homework assignments, some involving SPICE usage.

Policy: Homework is due next week same day after it has been assigned. Late homework, if accepted, is subject to 20% Penalty. No homework accepted after solution is posted. You are encouraged to work together on homework; however it should be your work that is submitted. It is your responsibility to know all exam dates and arrival times for the exam. No make-up exams will be given in this class except for written medical excuse and no extra time will be given for late students. No exam is given if you are 30 minutes late. Even if you are late in the exam, you must turn in at the due time. Punctual attendance is expected of all students. A roll will be taken at each class meeting. This consists of signing your name on the attendance record for that date. Unexcused absences will result in the assessment of a penalty affecting the student's grade. Exam Rules: There will be no borrowing of any items during exam.

Contribution to professional component:

Math and basic science	0.0 (units)
Engineering Topics	3.0 (units)
Does this course contain significant design experience?	Yes

Prepared by: Dr. Selahattin Sayil May 2006

ELEN 3341 Electric Machines
(Required)

Catalog Description: A study of static and quasi-static magnetic fields and circuits, inductance and mutual inductance, with applications to transformers and electric machinery. DC and AC motors and generators.

Prerequisites:
By course: ELEN 3312 Circuits II and ELEN 3371 Electromagnetics I with grade of C or better.
By topic: DC and AC circuits; calculus based physics in electricity and magnetism; analytic geometry and calculus and vector analysis.

Courses that require this as a prerequisite: ELEN 4206 and ELEN 4207

Credits: 3

Offered: Spring Annually

Instructors:
Primary: Bernard Maxum
Secondary: Wendell Bean

Textbook: *Electric Machinery and Power System Fundamentals*, Stephen J. Chapman, McGraw Hill Publishers, 2002, ISBN 0-07-4197347.

References: *Electric Machinery*, Syed A. Nasar, Schaum's Outline Series, O. Pierce, Ginn and Company.

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:

- Know how to flawlessly convert between the English system of units to SI units, especially for mechanical units, such as torque, work and power. (Criterion 3(a))
- Learn the fundamentals of mechanical and electrical energy transfer especially for rotational machines. (Criterion 3(a),(c))
- Understand how three-phase AC power is generated, the advantages of three-phase systems, and the advantages and disadvantages of various three-phase connections. Be able to recognize three-phase power distribution and transmission systems. (Criterion 3(a))
- Become aware of the importance of transformer systems and learn about the various types of transformers and their characteristics. (Criterion 3(a),(c))
- Learn the characteristics and applications of various types of DC and AC motors and generators and garner an appreciation for their principle advantages and disadvantages. (Criterion 3(a),(c))
- Recognize electric distribution and transmission systems in the field and acquire an appreciation for the differences in the needs that they supply. (Criterion 3(c))
- Attain a respect for electric power systems and machinery and acquire a consciousness for safety for yourselves and fellow workers when working with and around electric machines and power systems. (Criterion 3(f),(g),(h))

Topics (approximate number of 75-minute class periods):

- Electro-mechanical fundamentals. (4)
- Three-phase power circuits-Generation, distribution and loading. (4)

- Transformers. (4)
- DC machines-characteristics of series and shunt wound types. (4)
- AC machinery fundamentals. (2)
- Induction machines. (4)
- Synchronous machines. (2)
- Quizzes, midterm and final exams (6)

Structure: Two 75-minute lectures per week. Homework, three quizzes, midterm and final exams. Field trips to local companies in motors/generators, power system module manufacturer, and local utility company.

Policy: Homework is due next week same day after it has been assigned. Late homework is subject to 10% penalty if submitted before other students' homework is returned and 50% penalty thereafter. You are encouraged to work together on homework; however it should be your work that is submitted. It is your responsibility to know all exam dates and arrival times for the exams. Exam rules: There will be no borrowing of any item and no use of transmitting/receiving devices during the exams.

Contribution to professional component:

Math and basic science	0.0 (units)
Engineering Topics	3.0 (units)
Does this course contain significant design experience?	Yes

Prepared by: Dr. Bernard Maxum May 2006

ELEN 3109 Machines Laboratory
(Required)

Catalog Description: Three phase circuits, DC and AC motors and generators; transformers.

Prerequisites:
By course: Prerequisite: ELEN 2107 Circuits Laboratory with grade of C or better. Corequisite: ELEN 3341 Electric Machines.
By topic:

Courses that require this as a prerequisite: None

Credits: 1

Offered: Spring Annually

Instructors:
Primary: Wendell Bean
Secondary: Bernard Maxum

Textbook: No Book Required. Laboratory manual experiment sheets are provided.

References: (ELEN 3341 Machines Text) *Electric Machinery and Power System Fundamentals*, Stephen J. Chapman, McGraw Hill, 2002.

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:

- Have ability to apply theoretical concepts learned in ELEN 3341 in a laboratory setting. (Criterion 3(a),(e),(k))
- Are familiar with common laboratory instruments and techniques. (Criterion 3(b),(k))
- Are competent at assembling needed equipment for, and executing experiments with electric machines. (Criterion 3(a),(e),(k))

Topics (approximate number of laboratory hours):

- Laboratory safety. (1/2 hour)
- Three-phase circuits review/experiment. (2 1/2 hours)
- Single-phase transformer. (3 hours)
- Auto-transformer. (1 1/2 hours)
- Distribution transformer. (1 1/2 hours)
- Three-phase transformer connections (3 hours)
- DC shunt motor. (3 hours)
- DC series motor. (3 hours)
- DC generator, separate shunt excitation. (3 hours)
- DC generator, self-excited shunt excitation. (3 hours)
- Three-phase alternator (generator). (3 hours)
- Three-phase induction motor. (3 hours)
- Electric machine repair facility tour. (2 hours)

Structure: 180-minute lab per week and a 90-minute practical final. Reports containing experimental data, calculations, and written answers to questions about the results obtained, are due one week after each experiment is done.

Policy: Lab reports are due next week same day after it has been assigned. Late reports, if accepted, are subject to 20% penalty. You are encouraged to work together on lab experiments; however it should be your work and report that is submitted. Punctual attendance is expected of all students. A roll will be taken at each lab meeting.

Contribution to professional component:

Math and basic science	0.0 (units)
Engineering Topics	1.0 (units)
Does this course contain significant design experience?	No

Prepared by: Dr. Wendell Bean May 2006

ELEN 3381 Electrical Analysis
(Required)

Catalog Description: Application of the digital computer to analysis and design of electrical systems using numerical methods.

Prerequisite:
By course: ELEN 1301 Intro to Computers & Programming, ELEN 2311 Circuits I, MATH 2318 Linear Algebra, and MATH 3301 Ordinary Differential Equations with grade of C or better.
By topic: Know at least one engineering programming language (such as C++) and one symbolic processor software package (such as Matlab); Circuit theory; and Differential and integral calculus, differential equations and linear algebra.

Courses that require this as a prerequisite: ELEN 4206

Credits: 3

Offered: Fall Annually

Instructors:
Primary: Bernard J. Maxum
Secondary: H. R. Myler

Textbook: *Numerical Mathematics and Computing,* Ward Cheney and David Kincaid, Thomson Brooks/Cole, Fifth Edition, 2004, ISBN 0-534-8993-7.

References: *Numerical Analysis*, Burden, Faires, Fifth Edition; *An Intro to Applied Numerical Analysis*, (especially Ch 9) Plybon; *An Intro to Numerical Computations,* Yakowitz.

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:
- Acquire an appreciation for the potential of the modern computer for solving numerical problems that may arise in electrical engineering careers. (Criterion 3(a),(b))
- Develop and hone problem solving and programming skills. (Criterion 3(a))
- Understand how errors arise in numerically solving problems with digital computers, how to detect and predict them, and learn methods for minimizing and controlling these errors. (Criterion 3(a))
- Individually perform a numerical computer experiment using advanced numerical analysis methods, write a formal engineering report and orally present results to the class using Power-Point (or equivalent) presentation methods. (Criterion 3(a),(b),(e),(g))

Topics (approximate number of lecture hours):
- Taylor Series, Mean-Value Theorem. (3 hours)
- Loss of significance with computer experiments. (5 hours)
- Number representation, errors. (4 hours)
- Roots of equations, Polynomial interpolation. (4 hours)
- Derivative estimate - Richardson extrapolation. (5 hours)
- Numerical Integration - Romberg algorithm. (4 hours)
- System of equations - Gaussian elimination methods, scaled partial pivoting. (4 hours)

- Approximation by cubic splines. (3 hours)
- Ordinary differential equation methods - Runge-Kutta methods. (4 hours)
- Advanced numerical methods topic to be chosen uniquely by each student. (5 hours)

Structure: Three 50-minute lectures per week. Homework, three midterm examinations and a final individual computer experiment, formal oral presentation and engineering report.

Policy: Homework is due next week same day after it has been assigned. Late homework is subject to 10% penalty if submitted before other students' homework is returned and 50% penalty thereafter. You are encouraged to work together on homework; however it should be your work that is submitted. It is your responsibility to know all exam dates and arrival times for the exams. Exam rules: There will be no borrowing of any item and no use of transmitting/receiving devices during the exams.

Contribution to professional component:

Math and basic science	2.0 (units)
Engineering Topics	1.0 (units)
Does this course contain significant design experience?	No

Prepared by: Dr. Bernard Maxum May 2006

ELEN 4351 - Control Engineering
(Required)

Catalog description: An introduction to linear control theory in the classical and modern domains. This includes transfer functions, stability criteria, time response, frequency response, and state-space analysis and design.

Prerequisites:
By course: ELEN 3313 Signals and Systems with grade of C or better.
By topic: Differential equations, Laplace transforms, transfer functions, Bode plots.

Courses that require this as a prerequisite: None

Credits: 3

Offered: Fall Annually

Instructors:
Primary: H. R. Myler
Secondary: Wendell Bean

Textbook: *Control Engineering for Electrical Engineers, H. R. Myler, in preparation*. Students are given text as CD.

References:
Feedback Control of Dynamic Systems
Gene F. Franklin, J. David Powell, Abbas Emami-Naeini
Prentice Hall; 4th edition, (January 15, 2002) ISBN: 0130323934
Schaum's Outline of Feedback and Control Systems, 2nd Edition.
Allen J. Stuberud, Ivan J. Williams and Joseph J. DiStefano
McGraw-Hill 1994 ISBN: 007010525

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:
- Know how to derive state space models from block diagrams, electrical circuits, and physical systems. (Criterion 3(a))
- Use block diagrams to obtain closed-loop transfer functions. (Criterion 3(a))
- Learn the system types and steady state errors. (Criterion 3(a))
- Understand PID controllers and their relationship to Process Control. (Criterion 3(a),(e))
- Analyze system stability using Routh table. (Criterion 3(a))
- Understand the concepts of controllability and observability. (Criterion 3(a))
- Understand the root locus and its use in design. (Criterion 3(a),(e))
- Learn the observer design and observer-based compensator design. (Criterion 3(a),(e),(k))
- Can design lead and lag compensators from Bode plots. (Criterion 3(a),(e),(k))

Topics (approximate number of 75-minute lectures):
- The general concept of control system design. (4)
- Mathematical techniques for the control engineer. (4)

- Transfer function, block diagram, and signal flow graph. (2)
- State variable analysis, controllability, observability. (8)
- Control system stability. (4)
- Root locus techniques. (2)
- Time domain analysis and design. (4)
- Frequency domain analysis and design. (2)

Structure: Two 75-minute lectures per week. No labs. Homework assignments approximately weekly. Homework often requires use of MATLAB. Two 75-minute exams and a two-hour final.

Policy: Regular attendance at lecture is assumed, please make arrangements with Dr. Myler if you need to miss class. Please place cell phones on silent, vibrate or off before coming to class. Use of laptops or any device that access the Internet during lecture is not permitted. Audio recording of lectures is permitted, but please let Dr. Myler know that you plan to do so. Please do not bring food or beverages into class. Homework due dates will be given when homework is assigned. Late homework is subject to a 50% penalty. No homework is accepted after the solution is given or discussed in class. Students are encouraged to work together on homework; however, only individual work should be submitted. It is your responsibility to know exam dates and start times. No make-up exams will be given unless prior arrangements are made with Dr. Myler. Late arrivals to exams are permitted up until the first student to complete the exam leaves.

Contribution to professional component:

Math and basic science	0.0 (units)
Engineering Topics	3.0 (units)
Does this course contain significant design experience?	Yes

Prepared by: Dr. Harley Myler May 2006

ELEN 4486 Microcomputers I
(Required)

Catalog Description: Introduction to assembly language programming, microcomputer architecture, and operating systems.

Prerequisites:
By course: ELEN 3431 Digital Logic Design with grade of C or better.
By topic: Switching algebra, formulation and manipulation of switching functions, combinational networks, flip-flops, sequential networks.

Courses that require this as a prerequisite: ELEN 4387

Credits: 4

Offered: Fall Annually

Instructors:
Primary: Ruhai Wang
Secondary: H. R. Myler

Textbook: *68HC12 Microcontroller*, Pack and Barrett, Prentice Hall Publishers, 2002, ISBN 0-13-033776-5.

References: *The 68HC11 Microcontroller*, Joseph D. Greenfield, Saunders College Publishing, 1991, ISBN 0-03-051588-2.
MC68HC12 An Introduction: Software and Hardware Interfacing, Han-Way Huang, Thomson Delmar Learning, 2003, ISBN 0-7668-83448-4

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:

- Understand the basics of computers, elementary computer operations, and the basics of Motorola's 68HC12 microprocessor. (Criterion 3(a))
- Understand the hardware configuration and subsystems of the 68HC12 microprocessor, including register block, port system, clock and timer modules, memory system, analog-to-digital (ATD) converter, and communication systems. (Criterion 3(a))
- Understand the reset and exception systems aboard the 68HC12 and know their operation. (Criterion 3(a))
- Ability to use in simple assembly language programs the instruction set, addressing modes, branch instructions, and directives developed for and allowed by the 68HC12 microprocessor. (Criterion 3(b))
- Ability to verify the content of registers and memory locations after executing a set of instructions. (Criterion 3(b))
- Ability to use the stack memory for temporary data saving, parameter passing and procedure calling, and the D-Bug utility subroutines of the 68HC12 microprocessor. (Criterion 3(b))
- Ability to use the internal register set of the 68HC12 microprocessors in real mode. (Criterion 3(c))
- Ability to use the arithmetic and logic instructions for some basic operations. (Criterion 3(c))
- Ability to write and analyze simple routines for file management. (Criterion 3(c))

Topics (approximate number of 75-minute lectures and 2-hour labs):

- Introduction to computers and the 68HC12 microcontroller. (2 lectures)
- Assembly language programming. (5 lectures and 4 labs)
- Advanced assembly programming. (6 lectures and 4 labs)
- Hardware configuration. (3 lectures and 3 labs)
- Interrupts. (4 lectures)
- Clock Module & Time Module. (4 lectures)
- 68HC12 memory system. (2 lectures and 2 labs)
- 68HC12 A/D Conversion System. (2 lectures)
- 68HC12 Communication Systems. (2 lectures and 2 labs)

Structure: Two 75-minute lectures and one 2-hour lab per week. Homework assignments/lab project approximately weekly. Lab projects involve the WinIDE and SIM12CPU Simulator, the 16-bit Motorola CML-912SDP256 board and Axiom development kits. One 150-minute exam and a final project.

Policy: Homework is due next week same day after it has been assigned. Late homework, if accepted, is subject to 20% Penalty. No homework accepted after solution is posted. You are encouraged to work together on homework; however it should be your work that is submitted. It is your responsibility to know all exam dates and arrival times for the exam. No make-up exams will be given in this class except for written medical excuse and no extra time will be given for late students. No exam is given if you are 30 minutes late. Even if you are late in the exam, you must turn in at the due time. Punctual attendance is expected of all students. A roll will be taken at each class meeting. This consists of signing your name on the attendance record for that date. Unexcused absences will result in the assessment of a penalty affecting the student's grade. Exam Rules: There will be no borrowing of any items during exam.

Contribution to professional component:

Math and basic science	0.0 (units)
Engineering Topics	4.0 (units)
Does this course contain significant design experience?	No

Prepared by: Dr. Ruhai Wang May 2006

ELEN 4387 Microcomputers II
(Required)

Catalog Description: Advanced assembly language, microcomputer organization, interfacing with peripheral devices and computer software development systems.

Prerequisites:
By course: ELEN 4486 Microcomputers I with grade of C or better.
By topic: Assembly language programming, microcomputer architecture, and operating systems.

Courses that require this as a prerequisite: None

Credits: 3

Offered: Spring Annually

Instructors:
Primary: Ruhai Wang
Secondary: H. R. Myler

Textbook: *Computer Systems: Organization & Architecture*, Carpinelli, Pearson, 2001, ISBN 0-201-61253-4.

References: *Computer Organization & Architecture*, William Stallings, Prentice Hall Publishers, Sixth Edition, 2003, ISBN 0-13-035119-9.

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:

- Understand the design and application of basic arithmetic circuits-adders, adder/subtractors, multipliers, dividers, and arithmetic logic units (ALUs). (Criterion 3(a))
- Understand design methods applied to a variety of shift registers and counters. (Criterion 3(a))
- Are familiar with the assembly language instruction set architectures. (Criterion 3(a))
- Understand a general-purpose computer organization and RTL. (Criterion 3(a))
- Have the ability to analyze and design a microcomputer organization including memory, I/O subsystems and their interfacing. (Criterion 3(c),(d))
- Understand the basics of CPU design and have the ability to analyze and design a simple CPU. (Criterion 3(a),(c),(d))
- Understand the microsequencer control unit design and have the ability to design and implement a simple microsequencer. (Criterion 3(a),(c))
- Understand memory organization and know the operation of hierarchialmemory systems, cache memory and virtual memory. (Criterion 3(a))
- Display familiarity with computer input/output organization. (Criterion 3(a))

Topics (approximate number of 75-minute lectures):

- Review of digital logic fundamental and finite state machine. (4)
- Instruction set architectures and assembly language. (4)
- Computer organization. (6)
- Register Transfer Languages (RTL). (2)
- CPU design. (4)

- Microsequencer control unit design (4)
- Memory organization. (4)
- Input/Output Organization. (2)

Structure: Two 75-minute lectures per week. No labs. Homework assignment approximately weekly. One 150-minute exam and a two-hour final.

Policy: Homework is due next week same day after it has been assigned. Late homework, if accepted, is subject to 20% Penalty. No homework accepted after solution is posted. You are encouraged to work together on homework; however it should be your work that is submitted. It is your responsibility to know all exam dates and arrival times for the exam. No make-up exams will be given in this class except for written medical excuse and no extra time will be given for late students. No exam is given if you are 30 minutes late. Even if you are late in the exam, you must turn in at the due time. Punctual attendance is expected of all students. A roll will be taken at each class meeting. This consists of signing your name on the attendance record for that date. Unexcused absences will result in the assessment of a penalty affecting the student's grade. Exam Rules: There will be no borrowing of any items during exam.

Contribution to professional component:

Math and basic science	0.0 (units)
Engineering Topics	3.0 (units)
Does this course contain significant design experience?	Yes

Prepared by: Dr. Ruhai Wang May 2006

ELEN 4101/4102 Electrical Engineering Seminar I/II
(Required)

Catalog Description: Preparation, presentation and discussion of material on the engineering profession, the interface between technology and society, and new areas of engineering involvement.

Prerequisites:
By course: Corequisite: ELEN 4206/4207 Senior Projects Design I/I I.
By topic: Presentation and technical writing skills., engineering professionalism, engineering ethics and the engineer in global, economic, environmental, and societal context.

Courses that require this as a prerequisite: None

Credits: 1 each

Offered: ELEN 4101 in Fall and ELEN 4102 in Spring, Annually

Instructors:
Primary: H. R. Myler
Secondary: Berne Maxum

Textbook: No Book Required.

References: None

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students have:

- knowledge of engineering problem solving approaches; ability to recognize disruptive technology and develop strategies to deal with it. (Criterion 3(e))
- an understanding of professional and ethical responsibility. (Criterion 3(f))
- an ability to communicate effectively through written and oral presentation. (Criterion 3(g))
- an understanding of the impact of engineering solutions in a global, economic, environmental, and societal context. (Criterion 3(h))
- a recognition of the need for, and an ability to engage in life-long learning and electrical engineering professionals. (Criterion 3(i))
- a knowledge of contemporary issues through the development and critique of technical research papers and presentations. (Criterion 3(j))

Topics (approximate number of lecture hours):

- Technical Paper Preparation (FA:1 hour)
- Disruptive Technology (FA: 1 hour)
- Problem Solving (FA: 1 hour)
- Entrepreneurship (FA:1 hour)
- Resume Development (FA:1 hour)
- Professionalism (SP:1 hours)
- Global Issues (SP:2 hours)
- Graduate Research (SP:2 hours)
- Ethics (SP:2 hours)
- Technical Presentation and Critique (SP:8 hours)

Structure: One 50-minute lecture per week. Grading is based on attendance, class participation, production of a technical paper (fall) and technical presentation (spring).

Policy: Regular attendance at lecture is assumed, please make arrangements with Dr. Myler if you need to miss class. Please place cell phones on silent, vibrate or off before coming to class. Use of laptops or any device that access the Internet during lecture is not permitted. Audio recording of lectures is permitted, but please let Dr. Myler know that you plan to do so. Please do not bring food or beverages into class. Homework due dates will be given when homework is assigned. Late homework is subject to a 50% penalty. No homework is accepted after the solution is given or discussed in class. Students are encouraged to work together on homework; however, only individual work should be submitted. It is your responsibility to know exam dates and start times. No make-up exams will be given unless prior arrangements are made with Dr. Myler. Late arrivals to exams are permitted up until the first student to complete the exam leaves.

Contribution to professional component:

Math and basic science	0.0 (units)
Engineering Topics	1.0 (units) (each)
Does this course contain significant design experience?	No

Prepared by: Dr. Harley Myler May 2006

ELEN 4206 Senior Projects Design I
ELEN 4207 Senior Projects Design II
(Required)

Catalog Description: Senior design projects with hardware implementation and testing. Preparation of project proposals, formal report and presentation.

Prerequisites:
By course: ELEN 3313 Signal and Systems, ELEN 3322 Electronics II, ELEN 3431 Digital Logic Design, ELEN 3341 Electric Machines, and ELEN 3381 Electrical Analysis with grade of C or better.
By topic: Senior Electrical Engineering Status after having successfully completing circuits, electronics, signals and systems, digital logic design, electric machines, and electrical analysis.

Courses that require this as a prerequisite: Corequisite: ELEN 4101 and ELEN 4102

Credits: 2 + 2

Offered: ELEN 4206 in Fall and ELEN 4207 in Spring Annually

Instructors:
Primary: Bernard Maxum
Secondary: H. R. Myler

Textbook: No Book Required

References: Pertinent technical reference data. Current catalogs of electronic and electrical components.

Overall objective of the two semester sequence:

This is the senior capstone design experience of the electrical engineering program. It is designed to introduce the student to industrial projects. This pair of courses is a two-semester experience divided into two Phases:

- Phase I Project Definition, Feasibility Studies and Bread-boarding, Proposal Preparation and Approval
- Phase II Project Execution, culminating in Formal Engineering Report, Oral Presentation, Posters and Demonstration

Students are required to establish teams, elect a team leader, research their topic, define the project objectives and specifications, write a formal engineering proposal, design the hardware and software, build appropriate schedules and budgets, manage a project through hardware implementation, testing and project closeout.

Course Objectives:

This course is designed to teach technical ideating and project defining, work breakdown structuring, establishment and execution of appropriate concept feasibility studies and bread-boarding, formal engineering proposal writing and obtaining project approval. Scheduling and budgeting are included in the proposal, project execution and management.
The course objectives are for the student to:

Objectives (with corresponding ABET Criteria/outcomes):
Ensure students:

- Learn how to establish and work in teams. (Criterion 3(d))
- Learn the concepts of Project Definition, Estimating, Scheduling, Approval, Management, Execution, and Tracking. (Criterion 3(a),(b),(c),(e))
- Apply the engineering concepts learned during the entire engineering academic curriculum to the design of a capstone project. (Criterion 3(c))
- Define, implement and demonstrate an electrical or computer device or system of appropriate complexity to constitute a two-semester effort. (Criterion 3(c))
- Develop good analytical and design skills. (Criterion 3(b))
- Learn and use appropriate engineering approximations to simplify the analysis and design for practical implementation. (Criterion 3(b),(c),(e))
- Gain experience in the proper use of electronic instruments as testing and diagnostic tools. (Criterion 3(a),(b),(c),(e))
- Develop teamwork and good organizational skills associated with a successful project environment. (Criterion 3(a),(b),(c),(d),(e),(f),(g))
- Learn to develop and present; project schedules and budgets, and to make use of them in the tracking and reporting of project status during project execution. (Criterion 3(b),(c),(e),(g))
- Learn to prepare and present project status reports and a project close out report. (Criterion 3(g),(h),(k))

Topics (approximate number of three hour lab periods):

ELEN 4206 - Phase I

- Introduction / Organization / Brainstorming (2)
- Project Descriptions / Project Objectives / Top-Level Diagrams (2)
- Research / Background Information (2)
- Project Selection / Schedules / Budgets / Design (3)
- Design / Schematics / Parts Lists (2)
- Interim Reports / Presentation (2)
- Circuit Bread boarding / debugging (2)
- PC Board Design and Fabrication (2)
- Circuit Construction (2)
- Debugging / Demonstration / Final Report (2)
- Preliminary Project Proposal (2)
- Review / Final Proposal Preparation (1)
- Final Proposal Preparation / Review (2)
- Last Changes / Final Proposal Submission to Instructor (1)
- Presentations by each team (2)

ELEN 4207 - Phase II

- Implementation of project (12)
- Interim report(s) (2)
- Midterm report and presentation (1)
- Final report, presentation, demonstration and close-out (2)

Structure:
This course is taught in two three-hour lab periods per week over two semesters. On the average the first half hour of each three-hour lab consists of lecture. Each semester is designed so that either Phase I or Phase II may be taught in any given semester and both Phases I and II may be taught simultaneously *(although in recent years Phase I has been offered only in the Fall and Phase II only in the Spring)*. When both phases are being taught simultaneously, the students will be divided into two groups. Students who are taking Senior Projects Design for the first time will be Group I, and will be pursuing Project Definition and Approval, Phase I. Group II students will have completed the first semester of Senior Projects Design, have written a formal proposal and have obtained approval of their project and will be pursuing Project Execution, Phase II.

Phase I Course Grading

Grades for Phase I will be based given on the following basis:

Concept Proposals 10%
Grading will be based on the report quality as well as the innovativeness of the proposed problems and solutions.

Preliminary and Final Proposals 60%
Grading will be based on the overall report quality and timeliness as well as how well each team understands and defines the chosen problem, how they decide to solve it, and how well the proposed solution is thought out.

Final Presentation 30%
Grading will be based on the group's ability to prepare and present, and defend their project in a coherent presentation that thoroughly conveys their Project problem in the allotted time.

Phase II Course Grading

Grades for Phase II will be awarded on the following basis:

Interim Reports 15%
The interim reports will be graded on report presentation, quality, and the ability of each team to track progress and remain on schedule.

Midterm Report 20%
The midterm report will be graded on report presentation, quality, and the ability of each team to track progress, cost, and remain on schedule.

Final Report 15%

A formal written close out report and close out presentation will be made at the end of the semester. The presentation will be made to the entire class, instructor, faculty, alumni and invited guests. It shall include a summary of the initial project definition, the team performance against that definition, problems encountered, the impact of those problems (cost and schedule) and a demonstration of the performance of the final product. At the end of the presentation a question and answer session will be conducted.

Project 50%

Implementation 10%

An on going evaluation will be made throughout the semester of the efficient use of hardware and circuitry that is used to achieve final goals. This will also include how well each team makes use of test and measurement equipment.

Final Product 40%

The final design shall meet all the design criteria as established by the final proposal in Phase I. The percent accomplishment of design criteria by the final product will determine the grade for this section. Failure of the final product to operate will result in a grade no greater than 25% for this section.

Contribution to professional component:

Math and basic science 0.0 (units)
Engineering Topics 2.0 (units)
Does this course contain significant design experience? Yes

Prepared by: Dr. Bernard Maxum May 2006

INEN 1101 - Introduction to Engineering
Spring, 2006 Semester
Required of all Engineering majors.

2006-2008 Catalog Data: INEN 1101: Introduction to Engineering. Credit 1. History of Engineering, Philosophy of Engineering practice, and analysis of the problems of being an engineering student.

Prerequisites by topic: None

Textbook: Landis, Raymond, Studying Engineering, 2nd Edition, Discovery Press, 2000.

References: Paul Wright, *Introduction to Engineering*, 2nd Edition, John Wiley & Sons Inc, 1994, ISBN:0-471-57930-0
M.Burghardt, *Introduction to Engineering Design and Problem Solving*, McGraw-Hill's Best, Basic Engineering Series and Tools, WCB/McGraw-Hill, 1999, ISBN: 0-07-012188-5
C. Fleddermann, *Engineering Ethics*, E source, The Prentice Hall Engineering Source, 1999, ISBN: 0-13-784224-4
Beakley, Evans, Keats, *Engineering, An Introduction to a Creative Profession*, 5th Edition, Macmillan Publishing Company, 1982, ISBN: 0-02-307090-0
Eide, Jenison, Mashaw & Northup, *Engineering Fundamentals and Problem solving*, 3rd Edition, WCB McGraw-Hill, 1997, ISBN : 0-07-021306-2
National Academy Press, Washington D.C., *Improving Engineering Design, Designing for Competitive Advantage*, 1991, ISBN: 0-309-04478-2

Coordinator: Dr. James L. Thomas, Associate Professor, Department of Industrial Engineering.

Objectives: This course is designed to acquaint incoming prospective engineering students with the real world of engineering problem solving. Problems associated with becoming a successful engineer and engineering ethics are presented. Students will gain access to the internet and develop skills in using it for learning.

Topics (One 50 minute lecture per week):

1. Introduction; Keys to Success in Engineering Study (2 weeks)
2. The Engineering Profession (1 week)
3. Academic Success Strategies (1 week)
4. Professionalism and Ethics (2 weeks)
5. Personal Growth and Development (1 week)
6. Engineering Career Fields (6 weeks)
7. Resume Writing (1 week)
8. Career Center Services (1/2 week)
9. Engineering Cooperative Education (1/2 week)

Computer Usage: Internet, word processing, resume writing.

Outcomes Achieved: 6 (P), 8 (P), 9 (P), 10 (N)

OUTCOME 6: An understanding of professional and ethical responsibility, Criterion 3(f)

OUTCOME 8: A broad education necessary to understand the impact of engineering solutions on society both locally and globally, Criterion 3(h)

OUTCOME 9: A recognition of the need for, and ability to engage in life-long learning, Criterion 3(i)

OUTCOME 10: A knowledge of contemporary issues, Criterion 3 (j)

ABET Category content as estimated by the faculty member who prepared this course description:

Professional component: 1 Credit of Engineering Topics

Prepared by: Dr. James L. Thomas

Link: http://dept.lamar.edu/industrial/classes/INEN_1101_Spring_2006.htm

Last Update: 04/03/06

INEN 2273 - Engineering Economics
Fall, 2005 Semester
Required of all engineering majors

2006-2008 Catalog Data: INEN 2273: Engineering Economics. Credit 2. The time value of economic resources, engineering project investments analysis, effect of taxes on engineering project decisions Prerequisites: ENGR-1301, MATH-2413.

Prerequisites by Topic: 1. Algebra, 2. Differential Calculus, 3. Use of internet and spreadsheet software

Textbook: White, Agee, Pratt, Case, *Principles of Engineering Economic Analysis*, 4th ed., Wiley, 1998, *ISBN: 0-471-11027-2*

References: Blank and Tarquin, *Engineering Economy*, 6th ed., McGraw-Hill, 2005.
Thuesen and Fabrycky, *Engineering Economy*, 9th ed., Prentice-Hall, 2001.
Riggs et. al., *Engineering Economics*, 4th ed., McGraw- Hill, 1996.
Grant, et. al., *Principles of Engineering Economy*, 8th ed., Wiley, 1990.
Park, *Contemporary Engineering Economics*, 3rd ed., Addison Wesley, 2001.
Newman, Donald G. et al , *Engineering Economic Analysis*, 9th ed., Engineering press,2004.

Coordinator: Dr. Victor Zaloom, Professor and Chairman of Industrial Engineering.

Objectives: Competence in making quantitative evaluations of engineering alternatives in terms of worth and cost should be achieved by each student. The student's awareness of the economic problems and choices confronting an industrial enterprise or other organization will be heightened.

Topics (Two 50 minute lectures per week):

1. The time value of money, interest and interest rates (all classes)
2. Present value, Annual worth, Future worth, Rate of return (1 week)
3. Comparison of alternatives (5 weeks)
4. Replacement Analysis (1 week)
5. Depreciation and taxes (3 weeks)
6. Cost terminology, Breakeven analysis (1 week)
7. Accounting principles, Cash flow (1 week)
8. Test (2 weeks)

Computer Usage: Use of spreadsheet software and specific function in MS Excel are discussed at appropriate times throughout the semester.

Projects: Students are required to select a publicly held company and follow stock price performance of the company during the semester. They must produce an Excel or other spreadsheet software table and graph of the daily high, low, and closing price for these company's stocks. A report analyzing the company selected must also be submitted at the end of the semester. Data and other information for the company analysis is to be obtained from the internet, library and other sources.

Outcomes Achieved: 1 (P), 5 (N), 7 (P), 10 (N)

OUTCOME 1: An ability to apply knowledge of mathematics, science, and engineering to the analysis of industrial engineering problems, Criterion 3(a)
OUTCOME 5: An ability to identify, formulate, and solve engineering problems, Criterion 3(e)

OUTCOME 7: An ability to communicate effectively both in writing and orally, Criterion 3(g)

OUTCOME 10: A knowledge of contemporary issues, Criterion 3(j)

ABET category content as estimated by the faculty member who prepared this course description:

Professional Component: 2 Credits of Engineering Topics

Prepared by: Dr. Victor Zaloom

Link: http://dept.lamar.edu/industrial/Zaloom/Eng_Econ/INEN2273_Spring_2006.htm

Last Update 04/11/06

CHEM 1411 - General Chemistry
Spring 2006 Semester
(Required)

2006-2008 Catalog Data: CHEM 1411: General Chemistry. Credit 4. Mathematics based review of chemical laws and theory for science, engineering and preprofessional majors. Prerequisite: High school chemistry or CHEM 1375 with grade of "C" or better; and MATH 1314 or two years of high school algebra and SAT math scores of 500 or better.

Textbook: Chemistry, The Central Science by Brown, LeMay & Bursten, 10th ed. 2006 (Prentice Hall)

Coordinator: Dr. Kenneth L. Dorris

Course Objectives: Preparation for CHEM 1412

Chapters:

1. Introduction & Appendix A: Mathematical Operations
2. Atoms, Molecules, and Ions
3. Stoichiometry: calculations with Chemical Formulas and Equations
4. Aqueous Reactions and Solutions Stoichiometry
5. Thermochemistry
6. Electronic Structure of Atoms
7. Periodic Properties of the Elements
8. Basic Concepts of Chemical Bonding
9. Molecular Geometry and Bonding Theories

Laboratory Manual: Chem 1411 Laboratory Manual. Lamar University. Neidig / Spencer / Gillette / Griswold. Brooks / Cole Laboratory Series

Experiments:

1. Safety Briefing and review of Lab Handbook
2. Measuring the volume of liquids
3. Identifying a liquid using Physical Properties
4. Empirical Formula of an Oxide
5. Writing and balancing Chemical Equations
6. Observing Signs of Chemical Reactions
7. Balancing Oxidation-Reduction Equations
8. pH, Acids and Bases
9. Standardizing a Sodium Hydroxide Solution
10. Titrating the Acetic Acid in Vinegar
11. Estimating a Heat of Neutralization
12. Lewis Structures

Schedule: Three 50-minute or two 75-minute lectures per week. Three one-hour exams and 2 ½ hour comprehensive final. Grade based entirely on Four Exams and Laboratory.

Contribution to professional component:

Math and basic science	4.0 (units)
Engineering Topics	0.0 (units)
Does this course contain significant design experience?	No

Prepared by: Dr. Kenneth L. Dorris April 2006

MATH 2318 – Linear Algebra I
Spring 2006 Semester
(Required)

Catalog Data 2006-2008: MATH 2318: A first course in linear algebra, including vector and matrix arithmetic, solutions of linear systems and the Eigenvalue-Eigenvector problem, elementary vector spaces, and linear transformation theory. Prerequisite: MATH 2413 (MATH 2376) or current enrollment in MATH 2413 (MATH 2376).

Textbook: Elementary Linear Algebra with Applications, 3rd edition, by Richard Hill

Coordinator: Dr. Jennifer Daniel

Course Objective:

1. To solve systems of linear equations by using elementary equation operations or by looking at the associated matrix equation and using elementary row operations,
2. To find the sum, difference, or product of two appropriate size matrices.
3. To find the inverse of an invertible square matrix.
4. To find the LU decomposition of a matrix and use this decomposition to solve a linear system.
5. To define vector space and to use this definition to determine whether a set with two operations is in fact a vector space.
6. To ascertain whether a subset of a vector space is a subspace.
7. To determine if a set of vectors is a linearly independent set, a spanning set, and/or a basis for a vector space.
8. To find the column space, row space, or null space of a matrix.
9. To determine the coordinates of a vector with respect to an ordered basis and to find a change of basis matrix from one basis to another.
10. To ascertain whether a map between vector spaces is a linear transformation and find the matrix associated with a linear transformation.
11. To use the least squares method to find the closest solution to an inconsistent system,
12. To use the Gram-Schmidt process to find an orthogonal or orthonormal basis for a vector space.
13. To determine the determinant of a square matrix and work with the properties of determinants.
14. To find eigenvalues and eigenvectors of a matrix.

Prerequisites by Topic:

Topics:

1. Introduction to Linear Systems and Matrices
   Gaussian Elimination
2. The Algebra of Matrices
   Project on Matrix Multiplication
3. Inverses and Elementary Matrices
4. Gaussian Elimination as a Matrix factorization
5. Transposes, Symmetry, and Band Matrices
6. I11 Conditioned Systems
   Project on Ill Conditioned Systems

7. Vectors in 2 and 3 Space
8. Euclidean n Space
9. Subspaces, Span, Null Spaces
10. Linear Independence
11. Basis and Dimension
12. The Fundamental Subspaces of a Matrix; Rank
13. Coordinates and Change of Basis
14. Matrices and Linear Transformations
15. Relationships Involving Inner
16. Least Spares and Orthogonal Projections
17. Orthogonal Bases and Gram-Schmidt
18. Orthogonal Matrices, QR Decompositions, and Least Squares (Revisited)

    Project on Least Squares
19. A Brief Introduction to Determinants
20. Eigenvalues and Eigenvectors
21. Diagonalization
22. Symmetric Matrices
23. Application Difference Equations
24. Quadratic Forms
25. Solving the Eigenvalue Problem Numerically

    Project on Direct Iteration

Schedule: Three 50-minute or 75-minute lectures per week. Three 50-minute exams and a 2-hour final.

Contribution to professional component:

Math and basic science	3.0 (units)
Engineering Topics	0.0 (units)
Does this course contain significant design experience?	No

Prepared by: Dr. Jennifer Daniel April 2006

MATH 2413 - Calculus and Analytic Geometry I
Spring 2006 Semester
(Required)

Catalog Data 2006-2008:	MATH 2413: Calculus and Analytic Geometry I. Credit 4. Functions, limits, derivatives of algebraic, trigonometric, exponential and logarithmic functions, curve sketching, related rates, maximum and minimum problems, definite and indefinite integrals with applications. Prerequisite: MATH 2312 or its equivalent.
Textbook:	James Stewart, Calculus (Early Transcendentals), 5th edition, Brooks/Cole; Harris and Lopez, Discovering Calculus with Maple, 2nd edition
Coordinator:	Michael Laidacker, Associate Professor of Mathematics
Course Objective:	MATH 2413 is the first in a series of three calculus courses. The main goal of this course is to introduce the derivative and integral, along with the basic applications of each.
Prerequisites by Topic:	Four years of high school mathematics

Topics:

1. Exponential Functions
2. Logarithm Functions
3. Tangent and velocity problems
4. Limit of a function
5. Calculating limits using limit laws
6. Precise definition of a limit
7. Continuity
8. Limits at infinity; horizontal asymptotes
9. Tangents, velocities, and rates of change
10. Derivatives
11. The derivative as a function
12. Derivatives of Polynomials and Exponentials
13. Product and Quotient Rules
14. Derivatives of Trigonometric Functions
15. The Chain Rule
16. Implicit differentiation
17. Higher Derivatives
18. Derivatives of Logarithmic Functions
19. Hyperbolic Functions
20. Related rates
21. Linear approximations and differentials
22. Maximum and minimum values
23. The mean value theorem
24 How derivatives affect the shape of a graph
25. Indeterminate forms and L'Hospital's rule
26. Optimization problems

27. Newton's method
29. Antiderivatives
29. Areas and distances
30. The definite integral
31. The fundamental theorem of calculus
32. Indefinite integrals and the net change theorem
33. The Substitution Rule
34. Areas between curves
35. Volumes
36. Volumes by cylindrical shells
37. Work

Laboratory projects:

8 lab sessions: Getting started, functions and limits, differentiation, application of the derivative, integration, applications of the definite integral, logarithmic, exponential, inverse trig and hyperbolic functions

Schedule: Three 50-minute lectures per week. One 50-minute lab. Four 50-minute exams and a 2-hour final.

Contribution to professional component:

Math and basic science	4.0 (units)
Engineering Topics	0.0 (units)
Does this course contain significant design experience?	No

Prepared by: Dr. Michael Laidacker April 2006

MATH 2414 - Calculus & Analytical Geometry II
Spring 2006 Semester
(Required)

Catalog Data 2006-2008: MATH 2414: Calculus and Analytic Geometry II. Credit 4. Methods of integration, polar coordinates, parametric equations and vectors. Prerequisite: MATH 2413 or its equivalent.

Textbook: James Stewart, Calculus (Early Transcendentals), 5th edition, Brooks/Cole Harris and Lopez, Discovering Calculus with Maple, 2nd edition

Coordinator: Michael Laidacker, Associate Professor of Mathematics

Course Objective: This is the second course in the calculus series. It is designed to introduce students to different methods of integration and other topics.

Prerequisites by Topic: MATH 2413 or its equivalent

Topics:

1. Integration by parts
2. Trigonometric integrals
3. Trigonometric substitution
4. Integration of rational functions by partial fractions
5. Strategy for integration
6. Using tables of integrals
7. Approximate integration
8. Improper integrals
9. Arc length
10. Area of a surface of revolution
11. Applications to physics and engineering
12. Curves defined by parametric equations
13 Calculus with parametric curves
14. Polar coordinates
15. Areas and lengths in polar coordinates
16. Sequences
17. Series
18. The integral test and sum estimates
19. The comparison test
20. Alternating series
21. Absolute convergence, ratio, and root tests
22. Strategy for testing series
23. Power series
24. Representation of functions as power series
25. Taylor and Maclaurin series
26. The binomial series
27. Three-dimensional coordinate systems
28. Vectors
29. The dot product

30. The cross product
31. Equations of lines and planes
32. Cylinders and quadric surfaces
33. Cylindrical and spherical coordinates

Laboratory projects:

3 laboratory sessions involving techniques of integration, parameterized curves and polar plots and sequences and series

Schedule: Three 50-minute lectures per week. One 50-minute lab. Four 50-minute exams and a 2-hour final.

Contribution to professional component:

Math and basic science	4.0 (units)
Engineering Topics	0.0 (units)
Does this course contain significant design experience?	No

Prepared by: Michael Laidacker April 2006

MATH 2415 - Calculus & Analytic Geometry III
Spring 2006 Semester
(Required)

Catalog Data 2006-2008: MATH 2415: Calculus and Analytic Geometry III. Credit 4. Sequences, series, functions of several variables, vector analysis, partial derivatives, multiple integrals and differential equations. Prerequisite: MATH 2414 or its equivalent.

Textbook: James Stewart, Calculus (Early Transcendentals), 5th edition, Brooks//Cole

Coordinator: Michael Laidacker, Associate Professor of Mathematics

Course Objective: The course is the last of a series of three four-hour calculus courses. The basic goal of the course is to introduce the student to series, multiple-variable calculus, vectors and differential equations.

Prerequisites by Topic: Second course in calculus

Topics:

1. Vector functions and space curves
2. Derivatives and integrals of vector functions
3. Arc length and curvature
4. Motion in space; velocity and acceleration
5. Functions of Several Variables
6. Limits and Continuity
7. Partial Derivatives
8. Tangent planes and linear approximations
9. The Chain Rule
10. Directional derivatives and the Gradient Vector
11. Maximum and minimum values
12. Lagrange Multipliers
13. Double integrals over Rectangles
14. Iterated integrals
15. Double integrals over general regions
16. Double integrals in polar coordinates
17. Applications of double integrals
18. Surface area
19. Triple integrals
20. Triple integrals in cylindrical and spherical coordinates
21. Change of variables in multiple integrals
22. Vector fields
23. Line integrals
24. The fundamental theorem for line integrals
25. Green's Theorem
26. Curl and Divergence
27. Parametric surfaces and their areas

28. Surface integrals
29. Stoke's Theorem
30. The Divergence Theorem

Schedule: Three 50-minute lectures per week. One 50-minute lab. Four 50-minute exams and a 2-hour final.

Contribution to professional component:

Math and basic science	4.0 (units)
Engineering Topics	0.0 (units)
Does this course contain significant design experience?	No

Prepared by: Michael Laidacker April 2006

MATH 3301 – Ordinary Differential Equations
Spring 2006 Semester
(Required)

Catalog Data 2006-2008: MATH 3301: First order equations: modeling and population dynamics, stability, existence and uniqueness theorem for nonlinear equations, Euler's method. Second order equations: nonlinear equations via reductions methods, variation of parameters, forced mechanical vibrations, resonance and beat. Laplace Transform: general forcing functions, the convolution integral. Systems of ODE's: eigenvalues and phase plane analysis. Prerequisite: Grade of C or better in MATH 2414.

Textbook: *Elementary Differential Equations*, Boyes & DiPrima, 8th ed.

Coordinator: Dr. Paul Dawkins

Course Objective: Learn 1st and 2nd order differential equation solution techniques, Laplace Transforms and systems of differential equations.

Prerequisites by Topic: "C" or better in Math 2414

Topics:

1. Basic Models/Direction Fields
2. Classification of Differential Equations
3. Linear Equation
4. Separable Equations
5. Linear & Nonlinear Equations
6. Modeling w/Linear Equations
7. Pop. Dynamics/ Equilibrium Point
8. Euler's Method
9. Homogeneous Equations
10. Complex Roots
11. Repeated Roots; Reduction
12. Linear Homogeneous Equations
13. Lin. Independence & Wronskian
14. Undetermined Coefficients
15. Variations of Parameters
16. Mech. & Electrical Vibrations
17. Forced Mech. Vibrations
18. Def. Laplace Transform
19. Step Functions
20. Initial Value Problems
21. Dif. Equations w/Forcing Functions
22. Impulse Functions
23. The Convolution Integral
24. Systems of Differential Equations
25. Eigenvalues and Eigenvectors

26. Basic Theory of Systems
27. Homogeneous Linear Systems/Phase
28. Complex Eigenvalues/Phase Plane
29. Repeated Eigenvalues/Phase Plane

Schedule: Three 50-minute or 75-minute lectures per week. Varies by instructor - three or four 50-minute exams on average and a 2-hour final.

Contribution to professional component:

Math and basic science	3.0 (units)
Engineering Topics	0.0 (units)
Does this course contain significant design experience?	No

Prepared by: Dr. Paul Dawkins April 2006

MATH 3370 – Introduction to the Theory of Statistical Inference
Spring 2006 Semester
(Required)

Catalog Data 2006-2008:	MATH 3370: Introduction to the Theory of Statistics Inference. Credit 3 A calculus-based introduction to statistics. Probability, special probability distribution, nature of statistical methods, sampling theory, estimation, testing hypotheses. Prerequisite: MATH 2414 or 2377
Textbook:	Wackerly, Mendenhall, Scheaffer, Mathematical Statistics with Applications, 5th edition
Coordinator:	Paul C. Chiou, Professor of Mathematics
Course Objective:	Math 3370 is a calculus-based introduction to statistics, its main goal being to introduce the student to statistics, statistical methods, and probability.
Prerequisites by Topic:	MATH 2414 or 2377 content

Topics:

1. Characterizing a Set of Measurements
2. A Review of Set Notations
3. A Probabilistic Model for an Experiment
4. Calculating the Probability of an Event
5. Tools for Counting Sample Points
6. Conditional Probability and the Independence of Events
7. Two Laws of Probability
8. Calculating the Probability of an Event
9. Numerical Events and Random Variables
10. The Probability Distribution of a Discrete Random Variable
11. The Expected Value of a Random Variable or a Function of a Random Variable
12. The Binomial Probability Distribution
13. The Geometric Probability Distribution
14. The Hypergeometric Probability Distribution
15. The Poisson Probability Distribution
16. Moments and Moment-generating Functions
17. The Probability Distribution of a Continuous Random Variable
18. The Expected Value of a Continuous Random Variable
19. The Uniform Probability Distribution
20. The Normal Probability Distribution
21. The Gamma-type Probability Distribution
22. Other Expected Values
23. Method of Transformations
24. Method of Moment-generating Functions
25. Sampling Distributions Related to the Normal Distribution
26. The Central Limit Theorem
27. The Normal Approximation to the Binomial Distribution
28. Some Properties of Point Estimators

29. Evaluating the Goodness of a Point Estimator
30. Confidence Intervals
31. Large-sample Confidence Intervals
32. Selecting the Sample Size
33. Small-sample Confidence Intervals for Mean
34. A Confidence Interval for Variance
35. Elements of a Statistical Test
36. Common Large-sample Tests
37 Calculating Type II Error Probabilities and Finding the Sample Size for the Z Test
38. Another Way to Report the Results of a Statistical Test

Schedule: Three 50-minute lectures per week. Three 75-minute exams and a 2-hour final.

Contribution to professional component:

Math and basic science	3.0 (units)
Engineering Topics	0.0 (units)
Does this course contain significant design experience?	No

Prepared by: Paul C. Chiou April 2006

PHYS 2425 - Calculus Based Physics I
Spring Semester 2006
(Required)

Catalog Data 2006-2008: PHYS 2425: Calculus Based Physics I. Credit 4. Mechanics, vibrations, heat. Prerequisite: Registration in or credit for MATH 2414 and permission of department head.

Textbook: Halliday/ Resnick/ Walker: *Fundamentals of Physics* (sixth edition)

Coordinator: Dr. Chris Nelson, Visiting Assistant Professor of Physics

Course Objectives:

1. To develop communication skills on written work. Diagrams, formulas, numeric and unit consistence will be expected.
2. To develop quantitative laboratory techniques and data analysis skills.
3. The ability to measure, to analyze, and to discuss laboratory phenomena will be cultivated.
4. To develop personal confidence.

Topics:

Unit I: Particle Dynamics (vector acceleration)
Unit II: Energy, Momentum (work; impulse)
Unit III: Rotational Dynamics; Fluids
Unit IV: Waves; Thermal Physics

Laboratory projects:

1. Motion in one dimension with constant acceleration (1 week)
2. Motion in two dimensions with constant acceleration (1 week)
3. Application of Newton's laws of motion (1 week)
4. Measuring the coefficient of kinetic friction (1 week)
5. Kinetic energy, potential energy and force (1 week)
6. Conservation of linear momentum (1 week)
7. Elastic collisions between bodies of unequal mass (1 week)
8. Conservation of momentum and reference frames (1 week)
9. Rolling objects (1 week)
10. Angular momentum (1 week)
11. Simple harmonic motion (1 week)
12. The physical pendulum (1 week)
13. Clement and Desormes' experiment (1 week)
14. Application of Bernoulli's equation (1 week)

Schedule: Three 50-minute lectures per week. One 3-hour lab. Four 50-minute exams and a 2-hour final.

Contribution to professional component:

Math and basic science 4.0 (units)
Engineering Topics 0.0 (units)
Does this course contain significant design experience? No

Prepared by: Dr. Joe Pizzo April 2006

PHYS 2426 - Calculus Based Physics II
Spring 2006 Semester
(Required)

Catalog Data 2006-2008: PHYS 2426: Calculus Based Physics II. Credit 4. Electricity, magnetism, sound waves, optics. Prerequisite: PHYS 2425 and registration or credit for MATH 2414.

Textbook: Halliday/ Resnick/ Walker: *Fundamentals of Physics* (sixth edition)

Coordinator: Dr. Joe Pizzo, Professor of Physics

Course Objectives: Designed for Physics and Engineering majors to develop understanding in electricity, magnetism, and waves using calculus. This course covers the standard topics in the second half of standard texts including: *University Physics* by Harris Benson, *University Physics*, by Sears, Zemansky and Young, *Fundamentals of Physics* by Halliday and Resnick, and *Physics* by Tipler.

Prerequisites by topic:

1. Completed one semester of calculus-based physics covering mechanics and heat.
2. Completed or enrolled in a third semester of calculus.

Topics:		Weeks:
1.	Electric fields and forces	2.0
2.	Electric potential	1.5
3.	Capacitors and resistors	2.0
4.	D.C. circuits	1.5
5.	Magnetic fields and forces	1.5
6.	Electromagnetic induction	0.5
7.	Wave production and propagation	0.5
8.	Wave effects	1.5
9.	Sound	0.5
10.	Light	1.0
11.	Optical systems	2.0
12.	Interference and diffraction	0.5

Laboratory projects:

1. Electric fields and equipotentials
2. Capacitors
3. Resistors
4. Resistor-Capacitor circuits
5. The charge-to-mass ratio of an electron
6. Solenoids
7. Index of Refraction

8. Lenses
9. Double slit interference
10. The diffraction grating
11. Wave Speed of Mechanical Waves

Schedule: Two 75-minute lectures per week. One 3-hour lab. Four 75-minute exams and an optional 2-hour final.

Contribution to professional component:

Math and basic science	4.0 (units)
Engineering Topics	0.0 (units)
Does this course contain significant design experience?	No

Prepared by: Dr. Joe Pizzo April 2006

PHYS 3350 - Waves and Modern Physics
Spring 2006 Semester
(Required)

Catalog Data 2006-2008: PHYS 3350: Waves Optics and Modern Physics. 3 Credits. Conservation Laws; special relativity; photon theory of light; matter waves; elements of quantum mechanics; atomic and molecular structure, X-rays, statistical physics; solid state physics and elements of astrophysics. Prerequisites: PHYS 2426 or PHYS 1401-1402 and MATH 2415.

Textbook: Kenneth Krane, Modern Physics, Wiley 1996

Coordinator: Cristian Bahrim, Asst. Professor of Physics

Course Objectives: Designed for Physics, Electrical Engineering, and Chemistry majors to develop an understanding of relativity, quantum theory, and applications in atomic, molecular, solid state, astrophysics and nuclear physics.

Prerequisites by topic:
1. Completion of two semesters of General Physics
2. Completion of three semesters of Calculus.

Topics:		Weeks:
1.	The Special Theory of Relativity	2
2.	The Particlelike Properties of Electromagnetic Radiation	1
3.	The Wavelike Properties of Particles	1
4.	The Schrödinger Equation	2
5.	The Rutherford-Bohr Model of the Atom	1
6.	The Hydrogen Atom in Wave Mechanics	2
7.	Many-electron Atoms	2
8.	Molecular Structure	1
9.	Statistical Physics	1
10.	Solid State Physics	1
11.	Nuclear Structure, Nuclear Reactions and Applications	1

Laboratory Projects: This course involves no laboratory component.

Schedule: Three 50-minute lectures per week. Four 50-minute exams and a 2-hour final.

Contribution to professional component:

Math and basic science	3.0 (units)
Engineering Topics	0.0 (units)
Does this course contain significant design experience?	No

Prepared by: Dr. Cristian Bahrim April 2006

C. Faculty Resumes

Name and Academic Rank: Harley Ross Myler, Professor & Chair
Mitchell Endowed Chair

Degrees: Ph.D., Electrical Engineering, New Mexico State University, 1985.
M.S., Electrical Engineering, New Mexico State University, 1981.
B.Sc., Chemistry (double-major in EE), Virginia Military Institute, 1975.

Number of years service on this faculty: 5 years – September 2001.

Other related experience-teaching, industrial, etc.

1997-2001 Professor, University of Central Florida
1991-1997 Associate Professor, University of Central Florida
1986-1991 Assistant Professor, University of Central Florida
1985-1986 Adjunct Professor, Florida Institute of Technology
1984-1985 Instructor, New Mexico State University
President, I-Math Associates, Orlando, FL.
Staff Engineer, Martin Marietta Orlando Aerospace, Orlando, FL.
Digital Systems Engineer, Space Communications Company, Las Cruces, NM.
Digital Systems Engineer, General Instrument Corporation, El Paso, TX.
CPT, US Army Air Defense Artillery, Missile Systems Officer.

Consulting, Patents, Etc.:

Method for Measuring and Analyzing Digital Video Quality, 2003, U.S. Patent #6577764.
Trophorometer, 1991, U.S. Patent #5,094,521.
Automated Knowledge Generation©1989, University of Central Florida.
UCFImage©1998, University of Central Florida.
SimANNs©1989, ANNview© 1991, parsimANNs© 1991, University of Central Florida.

States in which registered: Texas (#94458) and Florida (#94001152).

Principal publications of last five years:

Myler, H. R., Bagasrawala, S. A., Narayana, N. V. "OFDM and GSM Protocol Optimization on a Software Defined Radio Parallel Processing Architecture," *International Engineering Consortium Annual Review of Communications*, Volume 58, September 2005.

Guo, J., Van Dyke-Lewis, M. and **Myler, H. R.**, "Gabor Difference Analysis of Digital Video Quality," *IEEE Transactions on Broadcasting*, 50:3, September 2004, pp. 302-311.

Myler, H. R., Guo, J., and Van Dyke-Lewis, M. "No-Reference Digital Video Quality Analysis," *International Engineering Consortium Annual Review of Communications*, Volume 57, September 2004.

Myler, H. R., "Early Electrical Engineering Concepts Engagement in a Freshman Level Introductory Course," Gulf Southwest Section ASEE Annual Conference, Texas Tech University, Lubbock Texas, March 2004.

Osmanovic, N., Hrustemovic, N. and **Myler, H. R.**, "A Testbed for Auralization of Graphic Art," IEEE Region V 2003 Annual Technical Conference, New Orleans, Louisiana, April 2003.

Scientific and professional societies of which a member:

Institute of Electrical and Electronics Engineers (Region 5 East Area Chair)
American Society of Engineering Educators
Electrical & Computer Engineering Department Heads Association
Southwest Electrical & Computer Engineering Department Heads Association

Honors and awards:

Tau Beta Pi (engineering), Eta Kappa Nu (electrical engineering)
Outstanding Participation, IEEE, National Engineers Week, 1993.
Educator of the Year, UCF Department of Electrical & Computer Engineering, 1993.
Researcher of the Year, UCF Department of Computer Engineering, 1988, 1989, 1990, 1992.
Academy Member, Klipsch School of Electrical & Computer Engineering, New Mexico State University.

Institutional and Professional service in the last five years:

Council of Instructional Departments, President, 2003-2004
Council on Scholarships and Fellowships Advisement, 2002-present
Honors Council/Honors Faculty, 2001-present
Minimal Core Coalition, Chair, 2004-present
Mathematics Curriculum Development Committee, 2003-2003
College of Engineering Strategic Planning Committee, 2001-2002
College of Engineering Long Range Planning, 2001-2002
Patent Committee, 2001-present
IEEE Beaumont Section Chair 2001-2005

Professional and development activities in the last five years:

Accreditation Board of Engineering and Technology (ABET) EAC 2000 Workshop, Electrical & Computer Engineering Department Heads Association, New Orleans, LA, March 2005.

Thirty-eighth Annual Summer Seminar on Academic Administration: The New Administrator in Higher Education: Building Leadership Capacity, Texas A&M University, College Station, TX, July 2005.

Agents of Change workshop on Achieving Diversity in Electrical and Computer Engineering Research and Education, National Science Foundation, Washington, D.C., June 2003.

Name and Academic Rank: Wendell C. Bean, Professor

Degrees: Ph.D., Electrical Engineering, University of Pittsburgh 1961
M.S., Electrical Engineering, University of Pittsburgh 1958
B.A., Mathematics, Lamar University 1955
B.Sc., Electrical Engineering, Lamar University 1955

Number of years service on this faculty: 38 years – September 1968

Other related experience-teaching, industrial, etc.

A. Industrial
(a) Engineering Trainee – Distribution transformer design. Westinghouse Electric Corp. Transformer Division, Sharon, PA, Summer 1954
(b) Engineer Work assignments in Westinghouse research and development laboratories in Pittsburgh, PA area, Summer and Fall 1955.
(c) Engineer Thermal and hydraulic design and analysis of U.S. Naval vessel nuclear reactor propulsion plants, 1956 – 1961

B. Teaching
Senior Engineer and full-time Faculty member of the Bettis Reactor Engineering School, a six month intensive postgraduate school for U.S. Naval officers assigned to Chief of the Naval Reactors Branch, Admiral H.G. Rickover. Bettis Atomic Power Laboratory, Westinghouse Elec., West Mifflin, PA., 1961 1967.

C. Full Time Research
Near the end of the six years of teaching naval officers, I received a National Institutes of Health fellowship to study and work with researchers in the area of cardiovascular control mechanisms in humans at the University of Michigan's medical school in Ann Arbor. As an NIH Special Research Fellow I studied, and did research with a cardiovascular physiologist on the role of the carotid artery baroreceptors in the auto-regulation of systemic blood pressure. 1967-1968.

Consulting, Patents, Etc.:

Gulf States Utilities Company in Beaumont, TX; My nuclear engineering background allowed me to be useful to the Gulf States Utilities Company (now Entergy-Texas) as a consultant. I helped with video based nuclear fundamentals courses (with graded homework and written exams), which were developed by companies that specialized in nuclear plant education and training of engineering and other staff personnel, in accordance with the Nuclear Regulatory Commission requirements. 1970-1978

States in which registered: Texas

Principal publications of last five years:

"Simulation of Distillation Tower Pump Failures with HYSYS Dynamic Models" (with Patrick Lo, Daniel Chen); *Control – For the Process Industries,* Putnam Publish, October 2000

Scientific and professional societies of which a member:

Texas Society of Professional Engineers
National Society of Professional Engineers
Institute of Electrical and Electronics Engineers
Sigma Xi Research Society
Eta Kappa Nu Honor Society
Tau Beta Pi Honor Society

Honors and awards:

High honors graduate, Lamar University, B.A., B.S., 1955
Honors Convocation, University of Pittsburgh, 1961
Nominee for Eta Kappa Nu Outstanding Young Electrical Engineer in Nation, 1962
Outstanding Engineering Educator, IEEE Region 5, 1996
IEEE Third Millennium Medal, 2000

Institutional and Professional service in the last five years:

(a) Academic advisor for about 45 junior and senior level electrical engineering majors and about 30 sophomores advanced from provisional ELEN classification (about 1½ hr./week)

(b) University Councils/Committees (about 1 ½ hrs./week)
1) Athletic Council
2) Distinguished Faculty Lecture Committee
3) Fisher Lecture Series Committee
4) Committee on Student Honesty

(c) Evaluation of graduate student applications for graduate study in ELEN. (about 1 hr./week

Professional and development activities in the last five years:

(a) Tau Beta Pi Engineering Honor Society – Serve as chief advisor and principal contact with TBP national office for reports (eligibility lists, new member elections, initiation schedules and other required communications with national) (about 1 to 2 hrs/week
(b) Eta Kappa Nu Electrical Engineering Honor Society Assist with HKN initiation ceremonies and attend post-ceremony dinners honoring new members.
(c) Developed a new course for non-ELEN majors, "Fundamentals of Electrical Engineering" designed to prepare them for the ELEN portion of the Fundamentals of Engineering Exam as an initial requirement for P.E. registration. Usual enrollments are over 30 students so far since the first offering in Summer I of 2005.

Name and Academic Rank: Bernard J. Maxum, Professor of Electrical Engineering

Degrees: Ph.D., Electrical Engineering, University of California, Berkeley, 1963
M.S., Electrical Engineering, University of Southern California, Los Angeles, 1957
B.Sc., Electrical Engineering, University of Washington, Seattle, 1955

Number of years service on this faculty: Fourteen years – Professor, August 1992

Other related experience-teaching, industrial, etc.:

Teaching
Community College (4yrs)
University (4 yrs)

Industrial
Managed research and development, Rockwell International Space Systems Division, Seal Beach, CA, 13 years

Industrial research laboratories: Hughes Aircraft Co., Cornell Aeronautical, GTE: R & D Project Manager, Section head, Principal Engineer, 15 years.

Other
Principal Investigator on research grant, WorldCom Corp., Dallas, TX, 2000-2005
Expert Witness, Superior Court, Beaumont, TX, 1999
Southern Avionics Corporation, non-directional beacons, 1994
NDE Corporation, El Toro, CA, on nondestructive testing of composite materials, 1985
Two patents on microwave phase shifter, 1958

Consulting, Patents, Etc.: None

States in which registered: California, Electrical Engineering
California, Mechanical Engineering

Principal publications of last five years:

- Tao Xu and B. Maxum, "Improved transmission performance by hybrid optical amplification in DWDM systems", **Op. Eng. J.**, **42**(3) 882-885 (2003).
- Ronie George and Bernard Maxum, "Two-stage all-fiber soliton-effect optical pulse compressor", **Op. Eng. J., 43**(7) 1665-1669 (2004)
- **Book:** Bernard Maxum, *Field Mathematics for Electromagnetics, Photonics, and Materials Science: A Guide for the Scientist and Engineer,* SPIE Press, ISBN 0-8194-5523-7 (2005)

Scientific and professional societies of which a member:

Institute of Electrical and Electronic Engineers, Treasurer, President, Program Chmn
Texas Association of College Teachers (TACT)
American Society of Engineering Educators
American Institute of Aeronautics and Astronautics
American Institute of Physics
Scientific Research Society of America
National Energy Research Association

Honors and awards:

Hughes Fellowship, Ford Foundation Fellowship
Tau Beta Pi. Eta Kappa Nu

Institutional and Professional service in the last five years:

- Serving 4th year on the Faculty Senate
  - Served on the Distinguished Faculty Lecturer Committee
  - Served on the Budget and Compensation Committee
  - Served on the faculty Development and Research committee
- Serving 3rd year on the University Core Curriculum Committee
- Serving 4th year as the EE Dept. Library Representative
- Served as a McNair Scholarship mentor
- Served as a representative at the Texas Legislative Day in Austin for Lamar's TACT organization to discuss issues of concern to our faculty. Talked to seven legislators.
- Presented a talk "Tensors for Undergraduates—Surely You're Joking, Dr. Maxum" at the Lamar Math Seminar in November 2004.
- Serving as manuscript reviewer for Optical Engineering Journal.

Professional and development activities in the last five years

Grants Received and Research Projects:

- Research in Conjunction with the next Generation Communications Systems, MCI, Principal Investigator: B. J. Maxum, P.I., $260K (ongoing).
- Research Enhancement Grant: (Internally funded by the School of Graduate Studies and Research, Lamar University), "Research into Soliton Propagation in WDM Systems": B. Maxum, P.I., (completed).
- Research Enhancement Grant: (Internally funded by the School of Graduate Studies and Research, Lamar University), "On the Establishment of a Photonics Laboratory": B. Maxum, P.I., (completed).
- M&I—Lamar Advanced Engineering Studies, M&I Electric, $8,318 (completed).
- Proposal under evaluation: "Educational Innovations in Photonics/Optics…", submitted to the National Science Foundation, DUE, CCLI Program, May 2006 $250K.

Thesis students and undergraduate research supervised in the last five years:

- Four doctoral
- Ten Masters with thesis option
- Six undergraduate EEs on the "Design of optical laboratories

Name and Academic Rank: G. N. Reddy, Associate Professor

Degrees: Ph.D., EEG Signal Processing, Indian Institute of Technology, Madras, India, 1982.
M.S., Biomedical Eng, Indian Institute of Technology, Madras, India, 1976
M.Sc., Eng. Electronics, PSGCT, Coimbatore, India, 1974
B.E., Electrical Eng, JNT University, Hyderabad, India, 1972

Number of years service on this faculty:
16years – Sept. 1, 1990
1990-1995: Assistant professor;
1996-present: Associate Professor.

Other related experience-teaching, industrial, etc.:
Michigan Tech University, Houghton, MI Assistant Professor 1984 - 1989
LSU Medical Center, Shreveport, LA Post-doctoral Fellow 1981 - 1983
Yale University, New Haven, CT Post-doctoral Fellow 1979 - 1980

Consulting, Patents, Etc.:
Have consulted and worked for U.S. Army, Picatinny Arsenal, NJ for over 5 years, Artificial neural networks, 1989-1994.
Have consulted for Southern Avionics, Navigational Guidance Systems, 1993-94.
Have consulted for North Star Steel Texas, Neuro-controllers, 1994-95.

States in which registered: None

Principal publications of last five years:
0. Nearly 60 publications prior to 2000.
1. Reddy, G. N and Wendell C. Bean. A Time Delay Neural Net Simulator To detect Time-Domain signals, IEEE-Fuzzy 2000, San Antonio, Texas May, 2000.
2. G. N. Reddy, Manish Jain and Leo Pius. The Genetic Algorithms -- A Tutorial, Artificial & Computational Intelligence (ACI), September 25-27, 2002, Tokyo, Japan.
3. G. N. Reddy and Anirban Bhattacharjee. Genetic Algorithms for Physical VLSI Design, The 4th IASTED International Conference on MODELLING, SIMULATION, AND OPTIMIZATION (MSO-2004), August 17-19, 2004. Kauai, Hawaii.
4. G. N. Reddy, Manish Jain, Parikshith Ginna, Sudheer Baddam. OnlineEducator 2.0: A Complete IT-Platform to Create, Administer, Analyze, and Transmit Online Exams, IASTED International Conference on "Computers and Advanced Technology in Education", CATE-2004, Kauai, Hawaii, August 16-18, 2004.

Scientific and professional societies of which a member:
IEEE

Honors and awards:
Funded research grants awarded 1990 through 2005 (1-12):
1. Back-propagation Neural Net Based Speech Recognition System, U.S. Army, Res Fellowship, $14,200, 6/89-8/89.
2. A Tool Set for Modular Construction of a Speaker Independent Isolated-word, U.S. Army Res Fellowship, $9,200, 6/90-7/90.

3. Development of a Computer Model for Time-Delay Neural Network (TDNN), U.S. Army: STAS, $24,500, 5/90-4/91.
4. Case Studies on Time-Delay Neural Network for Real-Time Speech Recognition, U.S. Army, Res Fellowship, $17,200, 5/91-8/91.
5. Preliminary Studies on Word-Spotting Using Artificial Neural Networks for Continuous Speech Recognition, U.S. Army, Res Fellowship, $13,000, 6/92-8/92.
6. Preliminary Studies on Phonetic Recognition Using Artificial Neural Networks, U.S. Army, Res Fellowship, $10,500, 5/92-7/92.
7. AMOCO Equipment Grant, AMOCO, $8,000, Fall 1992.
8., A Robust Target Tracking System Using Artificial Neural Networks, Res Enh Grant LU, $5,000, 9/92-8/93.
9. Development of Advanced Navigational Guidance System, Southern Avionics Grant, $22,000, 9/93-8/94.
10. A Human-Like Image Recognition System, Res Enh Grant LU, $5,000, 9/94-8/95.
11. Laying Head Temperature control Using Neural Networks -- Phase I, North Star Steel Texas, $18,656, 9/94-12/95.
12. G. N. Reddy et.al. Fuel Cell Electric Vehicle Development: Phase I, Green Foundation, 1-1-06 to 12-31-07, $10,000.

Institutional and Professional service in the last five years:

1. Have conducted four workshops on Borland C++ Builder 5.0
2. Have conducted three workshops on Turbo C++
3. Have conducted one workshop PSPICE
4. Have conducted one workshop MicroCap 6.0
5. Have served on university student's grievances committee
6. Have served on college tenure committee as a member and as the chair.
7. Have served on college promotion committee as a member and as the chair.
8. Have participated in IEEE activities (as advisor and as a guest lecturer)
9. Have advised senior projects students.
10. Have served as the supervising professor for four MS thesis students & one doctoral thesis student.

Professional and development activities in the last five years:

1. Have attended two seminars on WebCT teaching tools.
2. Have attended IEEE seminars.
3. Have arranged for 8 plant trips on advanced industrial automation process control.
4. Have arranged 7 guest lectures on Six-Sigma, Industrial Automation & Process Control, and Instrumentation.

Specific programs to improve teaching and professional competence:

a. have taken steps to keep the topics up-to-date:
Most of the subject topics are being linked with state-of-the-art Web-references.

b. Have taken measures to improve project management & testing
Online testing & project management methods are successfully used in all of the courses.

c. Have taken measures to improve and ease of access to the supplemental class materials by putting all course materials, for each and every course that was taught, on the WebCT.

Name and Academic Rank: Selahattin Sayil, Assistant Professor

Degrees: Ph.D., Electrical and Comp. Eng., Vanderbilt University, TN, 2000.
M.Sc., Electrical and Comp. Eng., Pennsylvania State Un., PA, 1996.
B.Sc., Electronics, Gazi University, Ankara, TURKEY, 1990.

Number of years service on this faculty: 3 years – July 16, 2003

Other related experience-teaching, industrial, etc.:

Assistant Professor and Department Chair, Pamukkale University, Denizli TURKEY, September 2000-May 2003.
Teaching Assistant, Vanderbilt University, Nashville, TN, June 1999-May 2000.
Research Assistant, Vanderbilt University, Nashville, TN, May 1997-Feb. 1998

Consulting, Patents, Etc.: None

States in which registered: None

Principal publications of last five years:

Sayil, S., "Optical Contactless Probing: An All-Silicon, Fully Optical Approach," IEEE Design and Test of Computers, vol. 23, no. 2, pp. 138-146, Mar/Apr, 2006.

Sayil, S., Anita, M. "Time-Efficient Estimation of Crosstalk in Multi-Line Circuits", "Electronic Journal of Student Research, Lamar Univ.", Volume III, 2006.

Sayil, S., Kerns, D.V., Kerns, Sherra E. "Comparison of Contactless Measurement and Testing Techniques to a new All-Silicon Optical Test and Characterization Method" IEEE Tr. on I&M, Vol. 54, No. 5, pp. 2082-2089, October 2005.

Sayil, S, Kerns, D.V., Kerns, Sherra E., "A Survey of Contactless Measurement and Testing Techniques", IEEE Potentials, Feb/March 2005 issue.

Sayil, S., "Evaluation of Existing Test Sets for Crosstalk Test Coverage using VHDL Hardware Description Language", Research Enhancement Grant Report (August 2005).

Sayil, S., "A New Accurate and Time-Efficient Method for Cross-talk Noise Estimation on Multi-line Circuits", Research Enhancement Grant Report (August 2004).

Sayil, S., Kerns, D.V., Kerns, Sherra E. "All-Silicon Optical Contactless Testing of Integrated Circuits" International Journal of Electronics Vol.89, no. 7 July 2002 p.537-547.

Sayil, S. " A Combine Algorithm for a CMAC Network", PAU Journal of Engineering Science, Turkey, September 2001 issue.

Sayil, S., Kerns, D.V., Kerns, Sherra E., "All-Silicon Optical Technology For Contactless Testing Of Integrated Circuits", International Conference on Electrical and Electronics Engineering ELECO'01, 7-11 Nov, Bursa, Turkey.

Sayil, S. Lee, K.Y. "An Hybrid Neighborhood Training and Maximum Error Algorithm for CMAC", 2002 World Congress on Computational Intelligence", U.S.A., 5, 31 2002.

Scientific and professional societies of which a member:

Member of IEEE
IEEE Circuits and Systems (CAS) Society

Honors and awards:

Took a nationwide selection examination in Turkey for Undergraduate study and ranked among the first 4% in Math+Science score among 600,000 students taking the exam.
Graduated 1st in rank among the graduates of Electronics Dept in Gazi Univ., Turkey 1990.
Won a nationwide selection examination in Turkey towards graduate study in the U.S. and obtained scholarship which secured entrance to a graduate program in Electrical Engineering.
Tuition waiver awarded by Vanderbilt University (1997-1998).
A New Time-Efficient Method for Precise Estimation of Cross-talk Noise on Multi-line Circuits", Lamar Research Enhancement Grant – Fall 2003, PI, $5,000.
"Evaluation of Existing Test Sets for Crosstalk Test Coverage using VHDL Hardware Description Language", Lamar Research Enhancement Grant – Spring 2004, PI, $5,000.
"Modeling the Impact of Cross-Coupling Noise on Wire Delay for Today's Microchip Technologies", Lamar Research Enhancement Grant – Spring 2006, PI, $5,000.
Who's Who in America 2006.
Who's Who in America 2006 in Science and Engineering.

Institutional and Professional service in the last five years:

Served as Lamar IEEE Student Advisor
Served as the Interchanging Cultures advisor at Lamar.
Served as Thesis advisor for 3 Master's students
Served as Department Library Representative
Served on University Merit/Professor Award Committee
Thesis Committee Member
Non thesis Committee Member
Prepared EE Graduate Comprehensive Exam and Graded students.
Represented Lamar EE in High School Career Days.

Professional and development activities in the last five years:

Attended NSF Educational Grant workshop on Successful Grant Writing at Lamar
Attended NSF Educational Grant workshop on CCLI Grants at Las Vegas.
Developed Signal Integrity Research Laboratory
Created a new elective/graduate course named "CMOS Digital IC Design".
Created two new Graduate level courses named "VLSI Testing" and "VLSI Interconnects".
Offered six Independent Study courses.
Wrote 14 educational/research grant proposals to NSF, NASA, SRC and other organizations and collaborated for 3 proposals.
Reviewed Manuscripts for 3 different academic journals.
Served as Book reviewer on the subject of Microelectronics Design.

Name and Academic Rank: Ruhai Wang, Assistant Professor

Degrees: Ph.D., Electrical Engineering, New Mexico State University, Las Cruces, NM, 2001
M.S., Telecommunications, Roosevelt University, Chicago, IL, 1997
B.Sc., Telecommunications, Tianjin Institute of Post & Telecom., China, 1991

Number of years service on this faculty: 4 years; Assistant Professor since July 16, 2002

Other related experience-teaching, industrial, etc.:
Assistant Engineer, China Telecom., Gansu, China, 1992-1994

Consulting, Patents, Etc.: None

States in which registered: None

Principal publications of last five years:

- **R. Wang**, S. Horan, B. Tian, and S. Bonasu, "Optimal acknowledgement frequency for maximum throughput over asymmetric space-Internet links," ***IEEE Transactions*** *on Aerospace and Electronic Systems*, vol. 42, No. 4, October 2006 (to appear).
- **R. Wang**, S. Horan, and R. Chandrasekaran, "An experimental investigation of cross-layer optimal packet size in space Internet," special issue on cross-layer protocols for satellite communication network of *International Journal of Satellite Communications and Networking*, 2006 (to appear).
- Y. Xiao, H. Chen, B. Sun, **R. Wang**, and S. Sethi, "MAC security and security overhead analysis in the IEEE 802.15.4 wireless sensor networks," special issue on wireless network security of ***EURASIP Journal*** *on Wireless Communications and Networking*, 2006 (to appear).
- **R. Wang**, B. Gutha, S. Horan, Y. Xiao, and Bo Sun, "Which transmission mechanism is best for space Internet: window-based, rate-based, or a hybrid of the two?" ***IEEE Wireless Communications,*** vol. 12, No. 6, December 2005, pp. 42-49.
- Rufa Wang and **R. Wang**, "Experimental study of channel delay impact on throughput performance of TCP and its extensions in space," *Journal of Zhejiang University SCIENCE*, vol. 6A, No. 10, October 2005, pp. 1015-1020.
- **R. Wang** and S. Horan, "The Impact of Van Jacobson Header Compression on TCP/IP throughput performance over lossy space channels," ***IEEE Transactions*** *on Aerospace and Electronic Systems*, vol. 41, No. 2, April 2005, pp. 681-692.
- S. Horan and **R. Wang**, "Design of a space channel simulator using virtual instruments software," ***IEEE Transactions*** *on Instrumentation and Measurement*, vol. 51. No. 5, October 2002, pp. 912-916.
- **R. Wang**, "The behavior of TCP and its extensions in space," Ph.D. Thesis, New Mexico State University, August 2001.
- **R. Wang**, Bhanu Gutha and Bo Sun, "Comparative analysis of rate-based and window-based transmission mechanisms over space Internet links," In *Proc. of IEEE GLOBECOM 2005*, St. Louis, MS.
- **R. Wang** and S. Horan, "Performance of Space Communication Protocol Standards (SCPS) over ACTS satellite links," In *Proc. of IEEE GLOBECOM 2005*, St. Louis, MS.
- **R. Wang** and S. Horan, "Performance evaluation of TCP and its extensions over lossy links in a small satellite environment," In *Proc. of IEEE International Conference on Communications (ICC*), Seoul, Korea, May 2005.
- **R. Wang**, S. Singh, S. Bonasu and G. Fan, "An experimental evaluation of a novel

acknowledgment scheme over GEO-satellite links," In *Proc. of IEEE Wireless Communication and Network Conference (WCNC)*, New Orleans, March 2005.

- **R. Wang** and S. Bonasu, "Analysis of optimal ACK frequency over asymmetric GEO-space links," In *Proceedings of IEEE GLOBECOM 2004*, Dallas, TX, 2004.

Scientific and professional societies of which a member:

- IEEE Communication Society
- IEEE Personal Communications (TCPC) Technical Committee
- IEEE Computer Communications (TCCC) Technical Committee
- IEEE Satellite and Space Communications (TCSSC) Technical Committee

Honors and awards:

- MS Degree with Honors, Roosevelt University, 1997
- Who is Who among American Colleges and Universities, 1998

Institutional and Professional service in the last five years:

- *Co-chair, the 5th Annual Lamar Student Research Conference* 2004
- Served as a committee member of College Selection Committee for University Professor and University Merit Award
- Served as a committee member of Lamar University Academic Information Technology Committee

Professional and development activities in the last five years:

Conference Chair

- *IEEE International Conference on Communications 2007 (ICC 2007*) *Wireless Communications Symposium* (co-chair)

Technical Committee Member

- *Technical Committee of Satellite and Space Communications (TCSSC)*
- *Technical Committee of Personal Communications (TCPC)*
- *Technical Committee of Computer Communications (TCCC)*
- *IEEE GLOBECOM 2006 Satellite and Space Communication Symposium*
- *3rd International Conference on Wireless and Optical Communications Networks* (*WOCN) 2006*
- *1st First International Workshop on Wireless Softswitch and Mesh Networks (SMN) 2006*
- *1st International Symposium on Wireless Pervasive Computing 2006*

Session Chair

- *IEEE GLOBECOM 2004, 2005*
- *IEEE ICC 2005*
- *IEEE ICCCN 2004*

Reviewer

- *IEEE Transactions on Aerospace and Electronic Systems*
- *IEEE Wireless Communication Magazine*
- *IEEE Communication Letters*
- *Wiley Journal of Wireless Communications and Mobile Computing*
- *Computer Networks Journal*
- *International Journal of High Performance Computing and Networking*
- *IEEE GLOBECOM 2004, 2005, 2006*
- *IEEE International Conference on Communications (ICC) 2005*

Name and Academic Rank: Cristian Bahrim, Assistant Professor

Degrees:
University of Paris, Orsay (France), 1992-1997, *"Atomic collisions and interactions"* Ph.D. 1997.
University of Bucharest (Romania), 1987-1991, major in Physics with the specialization in *"Optics, Spectroscopy, Plasma and Lasers"*, degrees B.S., M.S. 1991.

Number of years service on this faculty:

Since Spring 2005	Joint-appointment in the Dept. of Electrical Engineering at Lamar University.
Since Fall 2004	Assistant Professor of Physics, Lamar University.
2002–2004	Visiting Assistant Professor of Physics, Lamar University.
2001–2002	Adjunct Assistant Professor, Lamar University.

Other related experience-teaching, industrial, etc.:

1999-2001	Postdoctoral Research Associate at Kansas State University.
1998	Adjunct instructor of physics at Kansas State University.
1991-1997	Research Assistant, Institute of Atomic Physics, Romania.

Consulting, Patents, Etc.: None

States in which registered: None

Principal publications of last five years:

Papers in peer-review journals:

(1) *"In search of a new molecule",* Hunt J.F. and Bahrim C., ***International Journal of Scholarly Academic Intellectual Diversity*, vol. 8**, no.1 (2006) (http://www.nationalforum.com).

(2) "*Disalignment rate coefficient of neon excited atoms due to helium atom collisions at low temperatures*.", Seo M., Shimamura T., Furutani T., Hasuo M., Bahrim C., and Fujimoto T., ***Journal of Physics B,* vol. 36,** pp. 1885 (2003).

(3) "*Near-threshold photodetachment of heavy alkali-metal anions*.", Bahrim C., Thumm U., Khuskivadze A.A. and Fabrikant I.I., ***Physical Review A,* vol. 66**, 052712 (2002).

(4) *"Boundary Conditions for the Pauli Equation: Application to Photodetachment of Cs^-.",* Bahrim C., Fabrikant I.I. and Thumm U., ***Physical Review Letters* vol. 87**, 123003 (2001); **vol. 88**, 109904 (2002).

(5) *"Angle-differential and momentum-transfer cross sections in e^- + Rb, Cs, and Fr collisions at low energies. $^3F^o$ shape resonances in Rb^-, Cs^- and Fr^- ions*.", Bahrim C. and Thumm U., ***Physical Review A,* vol. 64**, 022716 (2001).

(6) "*$^3S^e$ and $^1S^o$ scattering lengths for e- + Rb, Cs and Fr collisions*.", Bahrim C., Thumm U., and Fabrikant I.I., ***Journal of Physics B,* vol. 34**, pp. L195-L201 (2001).

(7) "*Negative ion resonances in cross sections for electron-heavy alkali atom scattering.*", Bahrim C., Thumm U. and Fabrikant I.I., ***Physical Review A*, vol. 63**, 042710 (2001).

Contributions to books:

(8) "*A modern optics laboratory for undergraduate students",* Cristian Bahrim.
(will appear in the ***Innovations 2006 – World Innovations in Engineering Education and Research*** of the **International Network for Engineering Education and Research**, iNEER).

(9) *"Experimental-based learning in optics as a way to reach academic performances"*, Cristian Bahrim (will appear in the **National Forum of Educational Administration and Supervision Journal**, **vol. 23**, no. 3 (2006-2007), p. 66).

Selected conferences:

(10) **109th Conference of Texas Academy of Science (March 2006)** - Proceeding.
"Quantum phenomena in atomic collisions …", Hunt J.F. and Bahrim C., CJ_86.
"Stellar Evolution: the origin and fate of the stars…", Seaman J. and Bahrim C., CJ_87.
"Spectroscopic analysis of atomic emission spectra", Young J. and Bahrim C., CJ_89.
"Disalignment and disorientation of Neon atoms...", Khadilkar V. and Bahrim C., P_57.

(11) **Sigma Xi Conference 2005, Seattle, Washington (Nov. 2005)**, "*Could two rare gas atoms form a molecule? He-Ne system as a test case*", Hunt J.F. and Bahrim C.

(12) **55th Gordon Electronic Conference, Minneapolis, Minnesota, 2002**
"*Photodetachment of Rb^-, Cs^- and Fr^-: A new boundary-corrected Pauli equation approach.*", Thumm U., Bahrim C., and Fabrikant I.I., Bulletin of the American Physical Society **47**, No. 7, pp. 16, GPT9.
"*Resonances in low-energy electron scattering on atomic Rb, Cs, and Fr.*", Thumm U., Bahrim C., and Fabrikant I., Bulletin of the American Physical Society **47**, No. 7, pp. 16, GPT8.

(13) **DAMOP 2002, Williamsburg, Virginia, 2002**
"*Photodetachment of Rb^-, Cs^- and Fr^- within a new boundary-corrected Pauli equation approach*", Bahrim C., Fabrikant I.I and Thumm U., Bulletin of the American Physical Society **47**, No. 3, pp. 28.
"*Electron scattering by Rb, Cs, and Fr targets at low energies*", Bahrim C., Thumm U. and Fabrikant I.I., Bulletin of the American Physical Society **47**, No. 3, pp. 39.

(14) **EPAS, 2nd Conference on the Elementary Processes in Atomic Systems, Gdansk, Poland, 2002** "*Near-threshold photodetachment of heavy alkali-metal anions*", Fabrikant I.I., Bahrim C., Khuskivadze A.A. and Thumm U., Proceedings, pp. 62.

(15) **Fano Memorial Symposium, ITAMP, Cambridge, Massachusetts, 2002** "*Near-threshold photodetachment of heavy alkali-metal anions*", Fabrikant I.I., Bahrim C., Khuskivadze A.A. and Thumm U., Proceedings, pp. 82.

Scientific and professional societies of which a member:
Reviewer at the Journal of Physics of the Institute of Physics (IoP), England.
Member of the American Physical Society.

Honors and awards:

a. Outstanding McNair Mentor (December 2005).
b. Research Enhancement Grant Award (April 2005).
c. Selected in Marquis® *"Who's Who in America"* 2000 – 2006.
d. Selected in Marquis® *"Who's Who in Science and Engineering"* 2006.
e. Selected in Marquis® "*Who's Who in the World"* 2006-2007.
f. Selected in Marquis® *"Who's Who in Education"* 2006-2007.
g. Selected in Marquis® *"Who's Who in Science"* 2001.
h. French Government Scholarship for Ph.D. in physics (Sep. 1991 – Aug. 1996).

Professional and development activities in the last five years:
I have created an undergraduate optics laboratory associated to a senior level Optics course (which includes experiments on spectroscopy and interferometry) in Lamar University.

D. Employer Survey

Lamar University Department of Electrical Engineering Employer Survey

Survey taken by: _____

Person called: _____ Company: _____

How many (if any) LUEE graduates are employed that graduated in the last three years? _____

General job performance of the LUEE grad(s):

Discussion Pertaining to Program Outcomes
We want our graduates to have the following skills and capabilities as outcomes of our program:

- apply knowledge of the physical sciences, mathematics, and engineering fundamentals to the solution of electrical engineering problems.
- design and conduct experiments in electrical engineering, and to analyze and interpret the data generated by those experiments.
- design components, devices, and systems to meet specific needs in electrical engineering.
- work effectively on multi-disciplinary teams involving people from diverse backgrounds.
- identify and define problems in electrical and computer engineering, and to generate and evaluate solutions to those problems.
- understand the professional and ethical responsibilities incumbent upon the practicing electrical engineer.
- communicate effectively, both orally and in writing, in the field of electrical engineering.
- understand the role and impact of electrical engineering in a broader societal and global context.
- recognize and respond to the need for life-long learning for a successful career in electrical engineering.
- develop an understanding of contemporary technical and professional issues in the practice of electrical engineering.
- use the techniques, skills, and tools of modern engineering, including the use of computer-based technologies such as programming, use of engineering and business applications, and the use of electronic media, effectively in the practice of electrical engineering.

Comments:

Discussion Pertaining to Program Objectives

Prepared for successful and productive engineering careers, with emphasis on technical competency and with attention to teamwork and effective communication.

Prepared for the successful pursuit of graduate studies and for life-long learning in electrical engineering and related fields.

Endowed with a sense of professionalism with encouragement of professional ethics, professional licensing, and active participation in the affairs of the profession.

Comments:

General comments, suggestions to improve program, etc.

E. Alumni Survey

LAMAR UNIVERSITY
ELECTRICAL ENGINEERING

Alumni Questionnaire

This questionnaire will help LUEE in our accreditation process by assessing the effectiveness of our BSEE program. If you had no opportunity to assess the effectiveness of your education in an area, please mark N/A.

Ability to **apply** knowledge of mathematics, science, and engineering:

O N/A O well prepared O prepared O not prepared

Ability to **design** and **conduct** experiments, as well as to **analyze** and **interpret** data:

O N/A O well prepared O prepared O not prepared

Ability to **design** a system, component, or process to meet desired needs:

O N/A O well prepared O prepared O not prepared

Ability to **function** on multi-disciplinary team:

O N/A O well prepared O prepared O not prepared

Ability to identify, formulate, and solve engineering problems:

O N/A O well prepared O prepared O not prepared

An understanding of professional and ethical responsibility:

O N/A O well prepared O prepared O not prepared

Ability to communicate effectively:

O N/A O well prepared O prepared O not prepared

An **ability** to use the techniques, skills, and modern engineering tools necessary for engineering practice:

O N/A O well prepared O prepared O not prepared

For any of the above that you marked "not prepared", could you please comment on why you were not prepared? What could have been done to prepare you? If you felt "prepared" but not "well prepared", what could have been done to better prepare you?

Did you receive a broad education **that enabled you to understand** the impact of engineering solutions in a global and societal context? Have you encountered issues in your work that you wish had been addressed when you were a student?

Did you develop a **recognition** of the need for, and an ability to engage in, life-long learning? Can you comment on where you feel this understanding took place (courses, self-awareness, interaction with other students)?

Was **knowledge** of contemporary issues developed? Were you surprised or well-prepared for what you encountered in the workplace? If not prepared, how might you have been better prepared?

Has your company given you OJT (On the Job Training)? If so, were you well prepared to receive the training? If not, what would have helped you be prepared?

Has your company sent you to training courses or held in-house training seminars and workshops? If so, were you well prepared to receive the training? If not, what would have helped you be prepared?

Can you comment on the IEEE? Are you currently a member, if so, has it enhanced your career in any way? If you were a student member and are not now a member, why did you not continue membership?

Can you comment on professional registration (PE)? Have you taken the FE or EIT exam? Is registration important to your job function?

Final comments:

APPENDIX II

INSTITUTIONAL PROFILE

Engineering Accreditation Commission
Accreditation Board for Engineering and Technology
111 Market Place, Suite 1050
Baltimore, Maryland 21202-4012
Phone: 410-347-7700
Fax: 410-625-2238
e-mail: eac@abet.org
www: http://www.abet.org/

Table of Contents

Appendix II - Institutional Profile

A. Background Information Relative to the Institution

1. General Information

a. Name and address of the institution:

Lamar University
P. O. Box 10001
Beaumont, Texas 77710

b. Name and title of the chief executive officer of the institution:

Dr. James Simmons, President, Lamar University

c. Name and official position of the person submitting the completed questionnaire:

Dr. Jack R. Hopper, P.E., Dean, College of Engineering

2. Type of Control

State

3. Regional or Institutional Accreditation

Lamar University is now accredited by the following organizations. Dates of initial [if known] and most recent accreditation actions are listed below.

The Commission on Colleges of the Southern Association of Colleges and Schools-[1955] 1998
American Assembly for Collegiate Schools of Business-[1980] 2002
American Chemical Society-2004
American Speech-Language-Hearing Association-Speech, 2005; Audiology in progress 2006
Computing Accreditation Commission-[2002] 2002
Council for Education of the Deaf-1999
National Association of Schools of Music-[1970] 2005
National Council for the Accreditation of Teacher Education-[1966] in progress 2006, visit fall 2006
National League for Nursing Accrediting Commission-Graduate [2004] 2005
National League for Nursing Accrediting Commission-Undergraduate & Associate [1984] 2001 (reaffirmed 2003)
Council on Social Work Education-[1980] 2004

4. Faculty and Students

The faculty and student count for the entire institution is given in Table II-1 on page 25.

5. Mission

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Lamar University Mission Statement

Lamar University is a comprehensive public institution educating a diverse student body, preparing students for leadership and lifelong learning in a multicultural world, and enhancing the future of Southeast Texas, the state, the nation and the world through teaching, research and creative activity, and service.

6. Institutional Support Units

UNIVERSITY COMPUTER CENTER

The Information Technologies Division manages the Central Computing Department located in the Cherry Engineering Building. The facility consists of an HP Alpha Server ES45 running the existing Sungard SCT Plus administrative software applications for Lamar University and two Dell Power Edge Servers for their web interfaces, an Alpha Server DS25 running Open VMS for student, faculty, and staff email and personal web page accounts, an Alpha Server DS20 running True 64 for academic applications, list serves, and programming languages, and the Lamar Departmental Web Server running Windows Server 2003. The facility houses four IBM 550 pSeries servers running AIX for the new administrative software solution with projected "Go Live" date of April 2009. The facility houses two SUN Sun Fire 440 servers running Solaris for Lamar's new MyLamar Portal software solution combined with a SUN Sun Fire 420 server running Solaris for the new student email server. The facility maintains an Alpha Server 2100 for the Library, two Dell Power Edge servers for Recruitment, four Dell Power Edge and Power Vault servers for University Advancement, two Dell Power Edge and Power Vault servers for Nursing, four Dell Power Edge and Power Vault servers for DVVN, a Dell server for Finance, a Dell server for Geology, a Dell Power Edge 4400 and a SUN Sun Fire v40Z for WebCT, and a Dell server for Photo ID. Central Computing Department also maintains an Alpha Server ES40 running Open VMS for the Disaster Recovery solution for the current administrative applications. Central Computing Department provides scanning services to campus faculty. There are three 600 lpm printers for supporting student and faculty use. All equipment and software in Central Computing Department is covered by a protected facility environment and maintenance agreements to insure the latest versions and maximum machine uptime are being offered to students and faculty. All computer systems are connected to the University's fiber optic backbone using gigabit Ethernet. The University offers dial-up and VPN connectivity to campus network services such as the Internet for off campus access and wireless access on campus for students and faculty. The Microcomputer Support & Services Department is responsible for the maintenance and support of microcomputers owned by the University. Their help desk is reachable by phone or via the web. Installation of PC hardware and software, repairs of PC's, and advising faculty and staff on hardware and software purchases are some of the functions performed by Microcomputer Support & Services.

The Information Technologies Division keeps the Central Computing service window open from 7:30 AM – 8:00 PM Monday through Friday. The administrative computers and their applications are available to students and faculty Monday through Friday from 6:00 AM to 8:30 PM. The applications are taken off-line at 8:30 PM for nightly batch processing and made available at 6:00 AM. The administrative computers and applications are unavailable on Saturday from 12:00 PM – 4:30 PM for full backups, and remain available until taken off line for Monday nightly job stream. Students and faculty have access to campus network services 24 hours a day, seven days a week while on campus or from off campus.

COLLEGE SERVICES

The College of Engineering computer lab in Cherry 1000-1002 is open 8:00 AM -10:00 PM, Monday through Friday and from noon to 6:00 PM on Saturday. The lab is available for general student use when classes are not scheduled. The computer facility in Cherry 2200 is available for general student use from 8:00 AM – 6:00 PM, Monday through Friday. The labs are monitored periodically for support by the lab technician or student assistant. Each of the programs in the College of Engineering oversees their own computer labs.

Lab monitors are available to assist in opening, closing, and maintaining the labs. The Industrial Engineering technician also serves to assist students with computer problems for the College of Engineering facilities.

UNIVERSITY PAYMENT FOR COMPUTER SERVICES

All students attending Lamar University pay a computer use fee, which entitles them to an account on the Academic Computer Center computers, MyLamar Portal, an email account, a personal web page, Internet access, dialup and VPN remote access, wireless access, and microcomputer virus protection. The monies obtained through the computer use fees are used to maintain and upgrade microcomputers in campus labs and in part to maintain the campus backbone network. New student and faculty accounts are automatically generated and may be obtained either online from MyLamar Portal, or from SIS Online under Personal Info menu option, or by presenting a valid Lamar University ID at Central Computing service window located in the Cherry Engineering Building. Accounts remain active as long as a student is enrolled or a faculty member is employed unless the Computer Use Policy is violated.

COLLEGE OF ENGINEERING RESOURCES FOR COURSES AND EQUIPMENT

A College of Engineering course use fee is assessed as part of tuition to specific courses in each program. This fee is $70.00 per student with a maximum of two (2) course fees per semester. These fees are available to maintain and upgrade equipment, supplies and support required for the course. Specific accounts for each department are available through the online Financial Records System (FRS) to maintain records of expenditures for each course with a fee. Large capital purchases of hardware and equipment are obtained through the use of the Higher Education Assistance Funds (HEAF) provided to Lamar University by the State of Texas. These funds are distributed to each of the Colleges through the office of the Provost and Vice President for Academic Affairs.

LIBRARY

The approximate number of acquisitions in the past three years and the total number of books and bound periodicals are shown in the table below.

LIBRARY ACQUISITIONS & RESOURCES

Acquisitions & Resources	Acquisitions during the last three (3) years		Current Collection Resources	
	Books	**Periodicals**	**Books**	**Periodicals**
Entire Institution Library	**14,668**	**4564**	**470,363**	**128,269**
In the following fields (included above)				
Engineering	2,968	654	33,427	18,342
Chemistry	356	435	8,517	12,224
Mathematics	502	182	9,124	5,114
Physics	334	333	6,969	9,358
Other Specialty Areas	--	--	--	--

The library expenditures for the past three years and the amounts allotted for library services in the field of engineering are shown in the table below.

LIBRARY EXPENDITURES

Library Expenditures	2002-03	2003-04	2004-05
Total Library Materials	$ 781,827.33	828,379.04	835,580.39
Expenditures for the Engineering Unit (Total)	$ 165,080.63	177,463.03	176.114.55
Books	$ 24,115.02	26,146.78	20,419.71
Periodicals	$ 140,965.61	151,316.25	155,694.84
Other Engineering-Related Services	$ 215,507.75	233,738.03	194,735.34*

Location and arrangement of the engineering collections:

All engineering materials are housed in the Gray Library and are classified and arranged by the Library of Congress classification system. The Library has an integrated online computer system, Sirsi, which provides access to all materials in the collection. The building is centrally located on campus with reference materials and a reference computer lab on the first floor, and current journals and government documents on the second floor. Floors 3-6 are stack floors, and a media services unit, a hands-on classroom, and a computer lab are located on the 7th floor.

Engineering materials include monographs, journals, state and federal documents, and collections of codes, standards, and annual reports of corporations.

Reference services available to students and faculty:

There are four reference librarians and one documents/reference librarian who provide reference service. The reference desk is staffed at all hours when the library is open—a total of 95.5 hours each week. One of the reference librarians is responsible for collection development and liaison with engineering faculty and departments. Two paraprofessional staff also assist with the provision of reference service. The interlibrary loans unit provides rapid access to resources available in other libraries.

Database computer search capabilities available to students and faculty:

The Library subscribes to several electronic resources to facilitate the research of the undergraduates, graduates, and faculty of the College of Engineering. The following databases reference or provide full text for information sources pertinent to chemistry, engineering, mathematics, or physics:

- *ACS (American Chemical Society) Web Editions*: complete full text content for the most recent five years' worth of issues from thirty-six journals
- *Encyclopedia of Polymer Science and Technology*: a full text reference source
- *Engineering Village 2 (Compendex)*: indexes (with some full text) the content of over 5,000 journal, trade, and conference publications
- *IEEE Xplore*: indexes (with some full text) the content of most publications of the IEEE including journals, transactions, letters, magazines, conference proceedings, and standards
- *Kirk-Othmer Encyclopedia of Chemical Technology*: a full text reference book
- *Knovel Library (Life Sciences & Chemistry Collection)*: provides the full text of over 790 titles, including books, codes, conference papers and proceedings, databases/tables, dictionaries, encyclopedias, guidelines, handbooks, and manuals; also indexes the content
- *Mathematical Reviews (MathSciNet)*: indexes over 1,700 journals, magazines, books
- *Science Citation Index Expanded*: indexes over 5,900 journals
- *Science Direct*: indexes (with some full text) over 2,000 journals, plus numerous reference books, handbooks, and book series.

Furthermore, while not entirely dedicated to the sciences, the following databases contain some content significant to engineering research:

- *Academic Search Premier*
- *Dissertation Abstracts*
- *JSTOR (Arts and Sciences Collection I)*
- *Research Library*

The Library also offers mediated searching for *STN* (Science and Technology Network), which provides access to more than 200 databases including *Chemical Abstracts*, *Engineered Materials Abstracts*, and several patent databases. Results from *STN* searches are usually available within twenty-four hours, and may be e-mailed for the convenience of the student or faculty member who requested the search.

Students and faculty may access all of the electronic resources listed above (except *STN*) from computers either on or off campus via the Library's web site. Students and faculty may receive assistance using these resources from the librarians in the Reference Area on the first floor of the Gray Library. Materials not available in a full text format online are usually available in the Library's physical collection or from another library via our Interlibrary Loan service.

Process by which acquisitions of engineering-related materials are made:

The librarian who serves as the liaison to the College of Engineering coordinates book selection for each of the engineering departments. Each department has a library representative who assists in gathering and prioritizing requests. Before canceling journal subscriptions, the librarians conduct a careful evaluation in cooperation with the appropriate departmental book representatives. Librarians routinely check "core" lists and special bibliographies to ensure that limited resources are used as effectively as possible.

Hours when library facilities are available to engineering students, when reference service is available, and when stacks are open:

Library facilities are available to users 95.5 hours per week:

Monday – Thursday	7:30 a.m. – 12:00 p.m.
Friday	7:30 a.m. – 6:00 p.m.
Saturday	10:00 a.m. – 7:00 p.m.
Sunday	2:00 p.m. – 12 p.m.

Reference service is available 95.5 hours per week. Users have access to the stacks at all hours when the library is open. Access to the library's electronic resources is available literally 24/7.

A general access PC lab is located on the seventh floor of the library in the Media Services department. The lab contains one hundred and twenty IBM compatible computers with laser printers attached to every PC. Standard and oversize color ink jet and color laser prints are available, as well as CD and DVD duplication and scanners. The lab hours are the same as the general library hours, and assistance is available from support staff. The lab offers over two dozen general programs including word processing, spreadsheets, databases, programming languages, desktop publishing, statistical programs, and computer graphics programs.

The Media Services department also houses a video collection (DVD and tape), CDs, and records. A circulating equipment collection provides support for classroom instruction and can be scheduled by professors throughout the semester.

Professional library staff available and assigned primarily to the engineering unit:

The reference librarian who serves as the engineering library liaison works closely with engineering faculty and department chairs in collection development and in delivery of reference and library instruction service. As stated above, the librarian receives support from the other reference librarians, two support staff, and the interlibrary services unit. Engineering materials are ordered by the acquisitions staff, cataloged by cataloging staff, checked in (journals) and circulated by other support staff. These staff members are supervised by librarians who coordinate their efforts.

Seating capacity of the library:

The seating capacity of the library is 860. There are 220 study tables, 139 carrels, 17 group study rooms, two PC labs (all included in the 860 seat count), and a small auditorium that seats 48 individuals.

Self-assessment of limitations on the education of engineering students resulting from the current library facilities and improvements that would be most beneficial:

A recent report of holdings for chemical engineering and related fields was found sufficient to support a new doctoral program in that department. In partial support of the requirements for the new degree, the Library acquired subscriptions to two engineering-related databases: Knovel and Web of Science. The print journal collection is further supplemented by a number of full-text databases, which are listed separately. The continual rise in cost of journals often infringes upon the amount of money available for purchasing monographs, but the Library's participation in the statewide TexShare system affords patrons with a courier system that provides rapid access to items held by other participating libraries.

Other learning resources (e.g., maps, microfiche, audio and video tapes, discs, etc.).

The Lamar library contains over 570,700 volume equivalents of microform materials, 7902 maps, and 6,894 items of audio-visual materials. The microform materials cover a broad range of disciplines, but perhaps the most important to engineering is the back runs of many journals. The majority of maps are topographical. The audio-visual collection contains tapes (audio and video), films, slides, and records. Most of the A-V materials are instructional. There is a collection of PC software (discussed previously) available for student use in the Media Services computer lab.

B. Background Information Relative to the Engineering Unit

1. Engineering Educational Unit

An organizational chart showing the position of the engineering unit within the institution is shown in Table II-2a-1 and Table II-2a-2 on pages 26-27. The organization chart for the College of Engineering is shown in Table II-2b on page 28. The College of Engineering consists of the departments of Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering, and Mechanical Engineering. Service functions reporting to the dean include the advising center, recruiting and co-op office, and minority recruiting and retention. The Texas Centers for Technology Incubation (TCTI) is an umbrella research organization which reports to the dean. The organization chart for the TCTI is shown in Table II-2c on page 29. All engineering courses, programs and degrees are supervised by the above departments with engineering in their title.

Administrative Head

Chairs of the engineering education units are:

- College of Engineering – Jack Hopper, Ph.D., P.E., Dean
- Chemical Engineering – Kuyen Li, Ph.D., P.E., Chair
- Civil Engineering – Robert Yuan, Ph.D., P.E., Chair
- Electrical Engineering – Harley Myler, Ph.D., P.E., Chair
- Industrial Engineering – Victor Zaloom, Ph.D., P.E., Chair
- Mechanical Engineering – Malur Srinivasan, Ph.D., P.E., Chair

Directors of the service functions are:

- Advising Center – Becky Caddy, Coordinator
- Recruiting and Co-op – James L. Thomas, Ph.D., Director
- Minority Recruiting and Retention – Richard L. Price, Ph.D., Director

Directors and Assistant Directors of the Texas Centers for Technology Incubation (TCTI) are:

- Texas Centers for Technology Incubation (TCTI) – Jack Hopper, Ph.D., Director
- Texas Centers for Technology Incubation (TCTI) – Mary Givan, Assistant Director of Administration
- Texas Hazardous Waste Research Center (THWRC) – Jack Hopper, Ph.D., Director
- Texas Hazardous Waste Research Center (THWRC) – Thomas C. Ho, Ph.D., Assistant Director
- Texas Air Research Center (TARC) – George Talbert, Director
- Aldredge Air Quality Modeling Center (AAQMC) – Thomas C. Ho, Ph.D., Director
- Center for Fuel Cell & Energy Systems (CFCES) – David Cocke, Ph.D., Director
- Gulf Coast Hazardous Substance Research Center (GCHSRC) – Thomas C. Ho, Ph.D., Director
- Center for Transportation/Ports and Waterways (CTPW) – Victor Zaloom, Ph.D., Director
- Green Composite Research Center (GCRC) – Robert Yuan, Ph.D., Director
- Center of Process & Information Technology (CPIT) – Kuyen Li, Ph.D., Director
- Renewable Energy Center (REC) Ethanol/ETBE – George Talbert, Director

College of Engineering Mission Statement

Our mission is to provide an environment and infrastructure to support the educational objectives of the College of Engineering programs. The College establishes an interface to the University and the entities external to the University to provide and prepare engineering students to be leaders and problem-solvers. The College supports a foundation of strong theoretical emphasis, the development of practical engineering skills, experience in interpersonal communication and teamwork, and an emphasis on ethics, professional conduct and critical thinking. We offer strong and varied academic programs to a diverse student population that prepares our graduates for the challenges of lifelong learning.

2. Programs Offered and Degrees Granted

The full titles of all degrees in engineering--undergraduate, graduate, and professional--granted by the institution are given in Table II-3 (Parts 1 and 2) on pages 30 and 31**.**

Curriculum requirements for all day/evening/co-op programs are the same. The Co-op program requirements are in addition to the normal curriculum requirements except for an Industrial

Engineering co-op student who successfully completes three Career Development courses receives credit for one three credit hour elective.

3. Information Regarding Administrators

Current summary *curriculum vitae* for the College of Engineering administration are provided for the following:

JACK RUDD HOPPER

Education

Ph.D. (Ch.E.)	Louisiana State University - Baton Rouge	1969
M.Ch.E.	University of Delaware - Newark	1964
B.S. (Ch.E.)	Texas A&M University - College Station	1959
	Lee College - Baytown, Texas	1957

Experience

1. Jr. Research Engineer, Humble Oil and Refining Co. R&D, Baytown, Texas 1959-1960.
2. Assistant Research Engineer, Humble Oil R&D, Baytown, Texas 1960-1961.
3. Research Engineer, Esso Research and Engineering Co., Baytown, Texas 1964-1967.
4. Research Associate, Division of Engineering Research, L.S.U., Baton Rouge, Louisiana 1967- 1969.
5. Assistant Professor, Ch.E., Lamar University, 1969-1972.
6. Consulting Engineer, Jefferson Chemical Company, Summer, 1970.
7. Associate Professor, Ch.E., Lamar University, Beaumont, Texas, 1972-1975.
8. Acting Head, Chemical Engineering Department, Lamar University, September, 1974.
9. Head, Chemical Engineering Department, Lamar University, November, 1974-1999.
10. Professor of Chemical Engineering, Lamar University, September, 1975-.
11. Head, Chemical Engineering Department and Interim Head Industrial Engineering Department, Lamar University, 1980-1981.
12. Liaison for Hazardous Waste Alternatives Center Committee, Lamar University, February, 1984-June, 1987.
13. Director of Engineering Graduate Studies, Lamar University, September, 1989-September, 1999.
14. Director and Associate Director, Gulf Coast Hazardous Substance Research Center, Lamar University, June 1, 1995-1999.
15. Dean, College of Engineering; Director, Texas Hazardous Waste Research Center, September 1, 1999-.
16. Director, Texas Center for Technology Incubation, Fall 2004-.
17. Associate Provost for Research, May 1, 2006-.

Awards and Honors

- ASEE Gulf-Southwest Section Dow Outstanding Young Faculty Award, U.S. Naval Academy, June 21, 1971.
- Outstanding Alumni Award, Lee College, Baytown, Texas, February 1981.
- Elected Fellow of the American Institute of Chemical Engineers, August 1985.
- 2004 Engineer of the Year, Texas Society of Professional Engineers, Sabine Chapter.

List of Publications

1. Ho, T. C., Y. K. Lee, C. J. Lin, N. Kobayashi, and J. R. Hopper, "Mercury Emission Control from Combustion in Flue Gas Employing Semi-Fluidized Bed Activated Carbon Adsorption," *Journal of Chinese Institute of Chemical Engineers* 36, 77-84, 2005.
2. Ho, T. C., Y. K. Lee, H. W. Chu, C. J. Lin, and J. R. Hopper, "Modeling of Mercury Desorption from Activated Carbon at Elevated Temperatures under Fluidized/Fixed Bed Operations," *Powder Technology* 151, 54-60, 2005.
3. Lin, C. J., T. C. Ho, H. W. Chu, H. Yang, M. J. Mojica, N. Krishnarajanagar, P. Chiou, and J. R. Hopper, "A Comparative Study of US EPA 1996 and 1999 Emission Inventory in West Gulf Coast of Mexico Region, USA," *Journal of Environmental Management* 75, 315-323, 2005.
4. Lin, C. J., T. C. Ho, H. W. Chu, H. Yang, S. Chandru, N. Krishnarajanagar, P. Chiou, and J. R. Hopper, "Sensitivity of Ground-Level Ozone Formation to Emission Adjustments in Southeast Texas

Cities," *Journal of Environmental Management* 75, 303-313, 2005.

5. Ho, T. C., S. Shetty, T. H. Kim, C. J. Lin, H. W. Chu, and J. R. Hopper, " Comparison of the Performance of a Conventionally-Heated and a Microwave-Heated Fluidized Bed Mercury Desorber Employing a Mass Transfer-Based Kinetic Model," AIChE Annual Meeting held in Cincinnati, OH, October 30-November 4, 2005.

University Committees and Activities

1.	ASEE Campus Activity Coordinator and Chairman of Lamar's 50th Anniversary Program for College of Engineering	1972-1973
2.	Director of Cooperative Education for College of Engineering	1973-1974
3.	Cooperative Education Program Advisor for Chemical Engineering	1974-present
4.	Member of Council of Instructional Departments	1974-present
5.	Graduate Council	1978-1980,1980-1982
6.	Chemical Engineering Department ABET Report	Fall 1976
7.	Industrial Engineering Department ABET Report	Fall 1980
8.	President of Council of Instructional Departments	1980-1981
9.	President Sigma Xi Club	1982-1983
10.	University Curriculum Committee	1982-1984
11.	Coordinator for College of Engineering ABET Report	Spring 1983
12.	Chemical Engineering Department ABET Report	Fall 1982
13.	Chemical Engineering Department ABET Letter Report	Spring 1985
14.	Committee Liaison Hazardous Waste Alternatives Center Task Force Committee	1984-1985
15.	Chairman, Graduate Educational program Committee Southern Association of Colleges and School Accreditation Visit	1986-1988
16.	Search Committee for the Executive Vice-President for Academic and Student Affairs	1989-1990
17.	College of Engineering Representative on Graduate Council	1989-1991
18.	Evaluation Committee for the Dean of Engineering	1989-1990
19.	College of Engineering Report to the Coordinating Board for the Consultants Site Visit for Review of the Doctor of Engineering Program, September	1989
20.	Chemical Engineering Department ABET Letter Report	Fall 1990
21.	Search Committee for President, Lamar University, Beaumont Campus, August	1991
22.	Chemical Engineering Department ABET Report, May	1994
23.	Chair, Search Committee, for the Director of the Gulf Coast Hazardous Substance Research Center	1996
24.	Chemical Engineering Department ABET Programs Report, January	1998
25.	Chair, Search Committee for Executive Vice President for Academic Affairs	2000
26.	Chair, Search Committee for Dean, College of Business	2002
27.	Academic Master Planning Committee	2001-2003
28.	Chair, University Economic Development Committee	2004-

JAMES L. THOMAS

Associate Professor in Industrial Engineering
Director of Recruiting and Cooperative Education

Education
B.S., Industrial Engineering, Oklahoma State University, 1964
M.S., Industrial Engineering, Texas Technological College, 1969
Ph.D., Industrial Engineering, Texas Tech University, 1972
Service at Lamar University – 23 years, appointed 4/83

Related Experience
- Tool Design Engineer, Deere and Company, Des Moines, IA, 1964.
- Ordinance Officer and WSMR Project Engineer, U. S. Army, White Sands Missile Range, NM, 1964-1966.
- Industrial Engineer, Texas Instruments, Inc., Dallas, TX 1966-1967.
- Graduate Student, Part-time Instructor in Industrial Engineering, Texas Tech University, Lubbock, TX 1967-1971.
- Instructor, Assistant Professor, Associate Professor of Industrial Engineering, University of Nebraska, Lincoln, NE 1971-1977.
- Special Projects Engineer, Manager-Production Engineering, Manager-Tool and Process Engineering, Fisher Controls International, Inc., Marshalltown, IA 1977-1983.

Scientific and professional society memberships
Institute of Industrial Engineers (Senior Member); Alpha Pi Mu; Sigma Tau/Tau Beta Pi; and American Society of Engineering Education

Honors and awards
- Oklahoma State University: Pursuit of Excellence Scholarship, 1963; Outstanding Senior I.E. in Alpha Pi Mu, 1963.
- Texas Tech University: Research Assistantship, 1967; Part-time Instructor, 1968-1970; NDEA Fellowship, Alpha Pi Mu.
- Halliburton Distinguished Teaching Award, 1976.
- Ralph R. Teetor Award, Society of Automotive Engineers, 1976.
- Best Paper Award – ASEE Gulf-Southwest Section Annual Meeting, March 1983.
- Outstanding IE Faculty Award – Student Chapter AIIE, Spring Banquet, 1984.
- Blue Key National Honor Fraternity Faculty Member, 1986.
- AMOCO Teaching Excellence Award, October, 1992.

Subjects or courses taught this year by terms
Fall 2005: INEN 1101, 1 hour lecture, day, undergraduate
Spring 2006: INEN 1101, 1 hour lecture, day, undergraduate

REBECCA L. CADDY

Coordinator, Office of Advisement and Retention

2-Year Certification, Stenography, Port Arthur College, June 1969

Service at Lamar University – 10 years (1996- present)

Related Experience
Eleven years with Texaco in a variety of locations and positions - 8 of those years in employee relations. Took break to raise family and returned to work in 1992. Worked 6 months for a marine inspection company. Rehired by Texaco in the Public and Government Affairs Department and worked 3 years until local office closed. Had a total of 14 years of service with Texaco. Worked for Lamar University since February 1996. Hired as Administrative Assistant to the Department Chair of Industrial Engineering. Accepted current position August, 2002.

1969-1972	Secretary Texaco Refinery	Port Arthur, Texas
1972-1981	Confidential Clerk Employee Relations Texaco Asphalt Plant	Port Neches, Texas
1992-1992	Secretary Thibodeaux Marine Inspectors	Groves, Texas
1993-1996	Secretary Texaco Public & Government Affairs	Port Arthur, Texas
1996-2002	Administrative Assistant Industrial Engineering Lamar University	Beaumont, Texas
2002- present	Coordinator Advisement and Retention College of Engineering Lamar University	Beaumont, Texas

Honors & Awards
Lamar University's Distinguished Staff Award - October 2001.

Membership
Lamar University's Partners in Advising.

RICHARD L. PRICE, I

Associate Professor in Mathematics
Director of Minority Recruiting and Retention

B.S., Mathematics, Prairie View A&M University, Prairie View, TX, 1955
M.A., Mathematics, University of Texas, Austin, TX, 1958
Ph.D., Mathematics Education, Ohio State University, Columbus, OH, 1969
M.A.R., Yale Divinity School, New Haven, CT, 1972

Service at Lamar University – 36 years, appointed 8/70

Related Experience

- Mathematics teacher, Prairie View A&M University, Prairie View, TX 1956-1961; 1963-1966
- Mathematics teacher, Central State University, Wilberforce, Ohio 1966-1967
- Mathematics teacher, Riverside White Cross School of Nursing for Ohio Northern University, Riverside, OH 1967-1968
- Mathematics teacher, New Dimensions Program at Ohio State University, Columbus, OH 1968-1970
- Research Associate, Educational Research Information Center, Ohio State University, 1968-1970
- Visiting Professorship, Mathematics Department, Michigan State University, Lansing, MI, Summer 1970; Summer 1971
- Associate director of Minority Engineering, University of Bridgeport, 1971-1972
- Faculty Research Appointment at Argonne National Lab, Argonne, IL Summers 1973, 1974, 1976
- Director of Minority Recruiting and Retention, College of Engineering, Lamar University, Beaumont, TX 1978-2006
- Associate Professorship, Mathematics Department, Lamar University, Beaumont, TX 1970-1971; 1972-2006

Honors and awards

- South Park Independent School District, elected trustee, 1980-1983
- National Action Council for Minorities in Engineering (NACME) Retention Grant, 1982
- National Society of Black Engineers (NSBE) (local, regional and national levels)
- Golden Triangle-Texas Alliance for Minorities in Engineering (GT-TAME) Chairperson 1985

Membership in Professional Societies

- National Council of Teachers in Mathematics
- National Action Council for Minorities in Engineering
- National Association for Minority Engineering Program Administrators
- Texas Association of College Teachers
- National Society of Black Engineers
- National Association for the Advancement of Colored People

Courses taught this year by terms
Fall 2005: MATH 2415, MATH 2312, MATH 1316, 1 hour lecture, day, undergraduate
Spring 2006: MATH 2415, MATH 2312, MATH 1316, 1 hour lecture, day, undergraduate

4. Supporting Academic Departments

The personnel for the supporting academic departments that provide a required portion of the instruction for engineering students in the programs being evaluated are given in Table II-4 on page 32.

5. Engineering Finances

Support expenditures of the engineering unit for three most current fiscal years are given in Table II-5 on page 33.

a. Fiscal Year

The fiscal year begins on September 1 and ends August 31. Summer faculty salaries are not included in the fiscal year budget. Summer salaries are allocated at the end of the fall semester.

b. Expenditures for Support Functions

The supporting expenditures for the engineering educational unit are given in Table II-5 on page 33.

c. Categories of Expenditures of Operations

The data given in Table II-5 under Operations includes Lamar University categories of maintenance and operation, telephone, hourly wages (student assistants), and maintenance contracts for equipment.

6. Engineering Personnel and Policies

a. Personnel

The personnel, both full-time and part-time, for the entire engineering unit and for each program being evaluated are shown in Table II-6 on page 34-37.

b. Faculty Salaries, Benefits, and Other Policies

1. Promotion and tenure policy summary: Faculty promotion and/or tenure is initiated by the individual or department chair and recommended by a departmental committee. The recommendation proceeds to the department chair to the dean and subsequently to the EVPAA with recommendations at each state. The EVPAA recommends to the President who in turn recommends to the Board of Regents who makes the final decision. Detailed policy is in the Faculty Handbook, Chapter II.9 Promotion to Academic Rank beginning on page 23; and Chapter II.15.3 Tenure Policy beginning on page 33. The Faculty Handbook is available online at http://www.lamar.edu/pdfs/FacultyHandbook.pdf.

2. The budget process is initiated by the president who defines budget preparation guidelines. Departments prepare budget requests based on the University guidelines for salary administration and other budget categories. Salary increases are based on two components: equity adjustment and merit policies. The merit pay policy for each department is provided at www.lamar.edu/pdfs/FacSalMeritPlans.pdf.

The equity adjustment is based on a University policy developed by Arthur Anderson Human Capital Division consulting firm. This policy was developed in 2001-2002 academic year and identified an equity adjustment target for each faculty member employed during the 2001-2002 academic year and implementation began in the FY2003 fiscal year. These adjustments are administered by the University Administration each year until the targets are achieved and/or the employee leaves the University.

3. The benefits accorded faculty are detailed in the Faculty Handbook Chapter V. Benefits and Services beginning on page 98. Benefits consist of : a 6% employer contribution toward a retirement account, insurance and annuities, workers compensation, development leaves of absence with pay, leaves of absence without pay, sick leave, employee assistance plan (EAP), educational assistance plan, recreational sports program, bookstore discount, speech and hearing center services, and dental hygiene clinic services.

4. Faculty salary data for the institution, the engineering education unit, and each engineering program being evaluated is shown in Table II-7 on pages 38 and 39.

c. Faculty Workload

The policy for faculty workload is given in Chapter II Policies and Procedures, Section 34.1 Faculty Workloads on page 48 of the Faculty Handbook. The policy basically requires full-time faculty to teach 4 – 3 hour undergraduate lecture courses each semester. A 3 hour laboratory counts as 1.75 lecture hours, a 3 hour graduate course counts as 4.5 lecture hours, and certain other special conditions are enumerated.

d. Supervision of Part-time Faculty

Adjunct faculty are mentored by tenured/tenure track faculty in every course they teach. Adjunct faculty are provided a course syllabus with relevant outcomes and their progress is monitored by informal discussions with the adjunct faculty member and students enrolled in courses taught by adjunct faculty.

Department chairs formally review student online course evaluations for each faculty member and pay special attention to student evaluations of adjunct faculty.

7. Engineering Enrollment and Degree Data

Table II-8 on pages 40 and 41 provides enrollment and degree statistics for the engineering educational unit as a whole and for each program being evaluated for the current and preceding five (5) academic years.

8. Definition of Credit Unit

One semester credit hour represents one class hour or three laboratory hours per week. One academic year represents 28 weeks of classes.

9. Admission and Graduation Requirements, Basic Programs

A. Admission of Students

1. General criteria and procedures for admitting students to engineering programs.

   Provisional: For incoming freshman, the College of Engineering follows the admission rules established by the University. The requirements for unconditional admission are listed on page 24 in the University catalog. In general, students who have attained a high school diploma from an accredited high school, completed an appropriate number of college preparatory courses and who graduated from the top half of their graduating classes are automatically admitted. Students from the third and fourth quarters must meet additional SAT or ACT requirements listed on page 24 in the University catalog. To be in good academic standing, the student's overall academic grade point average must be at least 2.0. Any continuing or transfer student in good academic standing can be admitted to a provisional program.

   We have organized a provisional engineering program to provide proactive counseling to encourage students to meet the College of Engineering program standards. The academic performance standards for the College of Engineering require students to maintain a 2.25 GPA. Students under 2.25 GPA are placed on probation and students who fall under 2.0 GPA are suspended. The intent is to require counseling of students before they accumulate a grade point deficiency which would ultimately prohibit them from completing a degree in engineering.

   Professional: Students are advanced to the professional engineering programs when they have completed the provisional program with a minimum grade point average of 2.25.

2. A history of admission standards for freshmen showing admission standards for students enrolled in engineering programs directly from high school for the current and last five academic years entering the provisional engineering program during the Fall semester is shown in Table II-9 on page 42.

3. Advanced placement course credits are evaluated from programs not accredited by the EAC either at Lamar University or elsewhere as follows:

   Students are admitted to advanced standing only to the extent that they are able to show acceptable course credit on official transcripts or that they can successfully challenge courses by examination. Lamar University and College of Engineering policy recognize examinations of the CLEP Program and those administered by Lamar faculty subsequent to an application process approved by the relevant department chair.

Only engineering courses offered by accredited engineering programs are acceptable for transfer. Upper division engineering courses taken at institutions eligible for ABET accreditation and not accredited are not accepted in transfer. Lower division courses are accepted from Texas community colleges as part of an articulation agreement reached by representatives of every state engineering school and the community colleges. Courses from out of state community colleges are accepted on a similar basis. Courses in question are reviewed for course content. Courses from international universities are evaluated relative to standard references used by international admission officers. In each case mentioned above the University Admissions Officer evaluates each course as directly equivalent or non-equivalent to a Lamar University course (based on previous input from faculty or department chairs – if previous input is not available, the course is listed as non-equivalent). Credit for non-equivalent courses is decided by the appropriate department. Documentation of this credit is retained in the student's records. Direct equivalent credit for a non-equivalent course may be approved by the department advisor.

4. Special admission requirements for entry into the upper division or professional programs in the College of Engineering are as follows:

   The general requirements for entering the professional engineering program are discussed in 1. above. These requirements are the same for each engineering discipline. Quantitatively, all students enrolled in a professional curriculum have met these admission criteria. We also require that students earn 45 hours in the program after they are admitted.

   The following courses are required for admission to these departments:

   Electrical Engineering: ELEN 2311 (Circuits I) and ELEN 2107 (Circuits Lab)

   Chemical Engineering: CHEN 2374 (Thermodynamics) and usually CHEN 3340 (Process Analysis)

5. Admission requirements for transfer students from other institutions to the College of Engineering follow:

   Students transferring to Lamar from another institution must have a minimum GPA of 2.0. Only courses for which a "C" or better is earned are eligible for transfer. Students enter the provisional engineering program and apply for the professional program when they meet the requirements.

6. A history of the number of students transferring to the engineering program for the current and last five academic years is shown in Table II-10 on page 42.

B. Requirements for Graduation

1. Each engineering program has a degree plan that is used by the department, college and university records office to verify that graduation requirements are met. College policy requires that any degree plan with transfer or substitution credit be approved by the dean. Substitutions require a separate form showing the course requirement and the proposed

substitution. Department chairs are responsible for degree plans in their program. The dean reviews courses transferred, courses proposed for substitution, and compliance with College policy regarding GPA and hours earned in the professional program. The department chair and/or the Director of the Advisement Center is responsible for checking to see that the ABET transferred or substituted course contains the same material, or the material is provided in courses beyond the normal curriculum requirement. The degree plans are then forwarded to the records office where they are again checked to see that all degree requirements listed in the catalog are met. This latter check involves a course by course check from the transcript to degree plan.

2. Lamar University offers academic courses in the following delivery methods: Telecourse, Interactive Video, Off-Campus and Online. The College of Engineering has a very limited number of courses offered online. Only one required engineering course is offered by an alternative mode. Beginning in 2005, Industrial Management, INEN 4315, is offered in both the lecture mode and the online mode via the Internet each fall semester.

   Online courses are offered with the same content, faculty and rigor as on campus instruction and accessed via the Internet using WebCT. The Center for Distance Education requires an application for the course to be approved prior to the first time it is offered. Online courses conform to Lamar University, Texas State University System, Texas Higher Education Coordinating Board and Southern Association of Colleges and Schools procedures.

3. The GPA required for graduation in all programs is 2.0 on a 4.0 scale.

10. Non-academic Support Units

Engineering Advising Office

Provisional engineering majors are advised by the Coordinator of Engineering Advisement and Retention. All pre-engineering students, as well as transfer students, receive one-on-one advisement in the Engineering Advisement Center. Students are required to meet their advisor at least twice a year.

The Advisement Center maintains a system to obtain and report statistical student information by major and classification, including retention data.

Engineering Cooperative Education

A Cooperative (Co-op) Education Program, in which the student spends alternate semesters at work and at study, is offered to qualified students in the College of Engineering. It is administered through the Engineering Cooperative Education office. Internships for work periods in summer terms only are also offered. Programs are available for engineering and industrial technology students. Students must meet the eligibility requirements of the program which include a minimum 2.5 overall grade point average and be at least a sophomore student in their respective engineering program. To remain in the program, the student must maintain at

least a 2.5 overall GPA and perform in a manner satisfactory to the employer and Lamar University. During each co-op work term, the student is enrolled in a three semester hour Career Development course and is considered a full time student at Lamar University. The Career Development course taken is an engineering course but is not part of the engineering degree plan. An Industrial Engineering co-op student who successfully completes three Career Development courses receives credit for one three credit hour elective.

Minority Engineering and Retention

The Minority Engineering program focuses on recruiting and mentoring traditionally underrepresented African, Hispanic and Native American students. Through scholarships, internships, tutoring and networking opportunities, the program seeks to keep open dialogue with the students it sponsors and help ensure their academic and professional success.

The Minority Recruiting and Retention Program partners with the National Action Council for Minorities in Engineering (NACME) and other organizations and companies such as NSBE (National Society of Black Engineers), TAME (Texas Alliance for Minorities in Engineering) and Eastman Chemical to provide scholarships and intern opportunities for eligible students.

Before an academic challenge becomes an obstacle, the director of the Minority Recruiting and Retention Program keeps an open door – whether to tutor students, help them apply for scholarships, or deal with financial and unexpected contingencies.

The program encourages students to join professional associations such as NSBE which has a local chapter at Lamar University, and TAME which hosts GT-TAME sponsored activities through Lamar University. Students have the opportunity to travel to regional and national meetings and network with company representatives at career fairs. Through such affiliations, students gain friendships, form study groups, and begin professional networking that proves valuable upon graduation.

Appendix II

C. Tabular Data for Engineering Unit

Tables II-1 through II-10 provide information about Lamar University and the College of Engineering.

Table II-1. Faculty and Student Count for Institution
School Year: Fall 2005
LAMAR UNIVERSITY

	HEAD COUNT		FTE (see Note 2)	TOTAL STUDENT CREDIT HOURS
	FT	PT		
Tenure Track Faculty	246	21	274.0	
Other Teaching Faculty (excluding student assistants)	75	113	139.1	
Student Teaching Assistants		18	6.2	
Undergraduate Students	6709	2973	7353.6	110,304
Graduate Students	575	338	576.1	8,642
Professional Degree Students	0	0	0	0

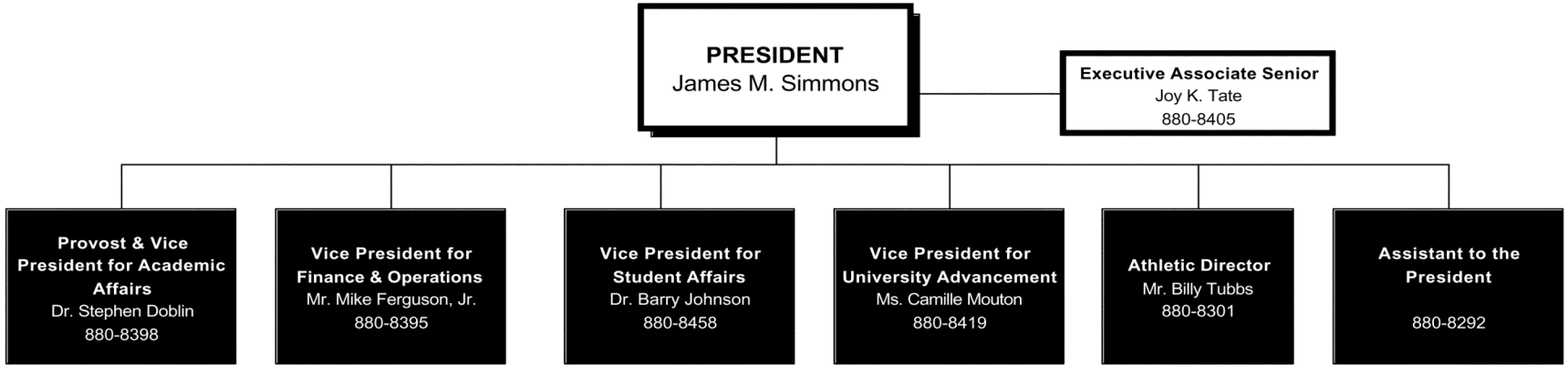
1. Fall 2005 data.

2. For student teaching assistants, 1 FTE equals 20 hours per week of work (or service). For undergraduate and graduate students, 1 FTE equals 15 credit-hours per term of institutional course work, meaning all courses--engineering, humanities and social sciences, etc. For faculty members, 1 FTE equals a Lamar University full-time load.

Table II-2 Organization Charts

Table II-2a-1

LAMAR UNIVERSITY



- **Associate Vice President for Academic Affairs**
- **Academic Colleges**
- **Library**
- **Division of Continuing & Distance Education**
- **Institutional Research & Reporting**
- **Academic Services**
  Registrar, Admissions Recruiting
- **Center for General Studies, Retention, Undecided, Advising**
- **Graduate Studies & Research**
- **Developmental Studies**
- **Texas Academy of Leadership in the Humanities**
- **Honors Program**

- **Facilities Management**
  Campus Services, Energy Management, Facilities Planning, Maintenance and Operations, Property Management
- **Finance**
  Accounting, Budget, Contracts and Grants, Payroll, Purchasing Student Financial Aid, Cash Management Cashiering, Investments
- **Human Resources**
- **Information Technology**
  Academic Computing Services, Administrative Systems, Central Computing, Data, Voice & Video Networking, Microcomputer Support and Services.
- **Internal Services**
  Print Shop, Quick Copy, Supply Center
- **Mail Center**
- **Risk Management**
- **University Police**
  Parking

- **Student Development**
- **Residential Services**
  Housing, Food Services
- **Bookstore**
- **Setzer Student Center**
- **Learning Skills & Student Support Services**
- **Health Center & Student Psychological Services**
- **Career Development & Placement**
- **Recreational Sports**
- **University Press**
- **Student Government**
- **Montagne Center**

- **Advancement Services**
- **Alumni Affairs**
- **Dvelopment**
- **Public Relations**
- **University Reception Center**

- **Athletic Programs and Development**

Revised: 04/2005

Table II-2a-2

ACADEMIC AFFAIRS

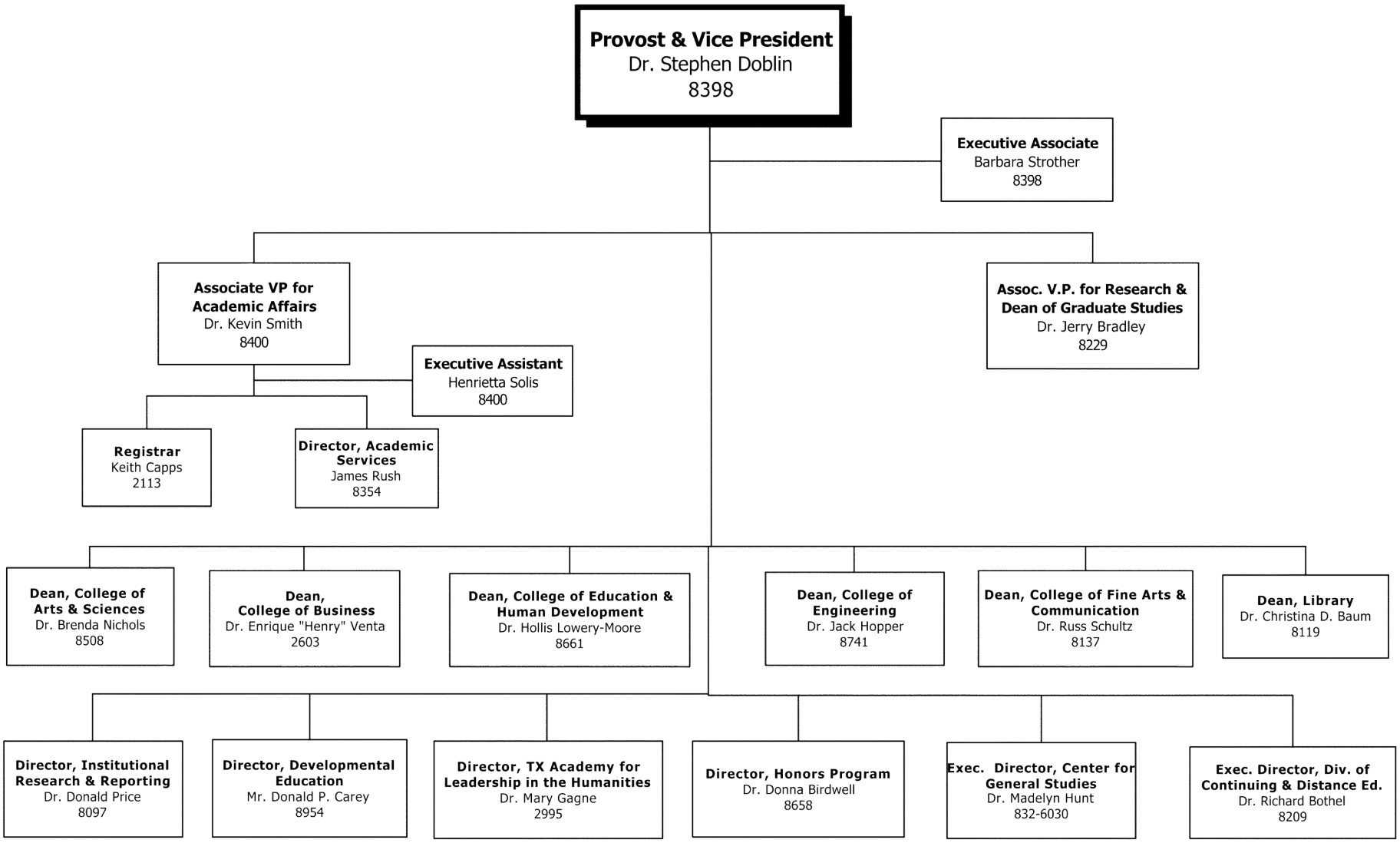


Table II-2b

COLLEGE OF ENGINEERING

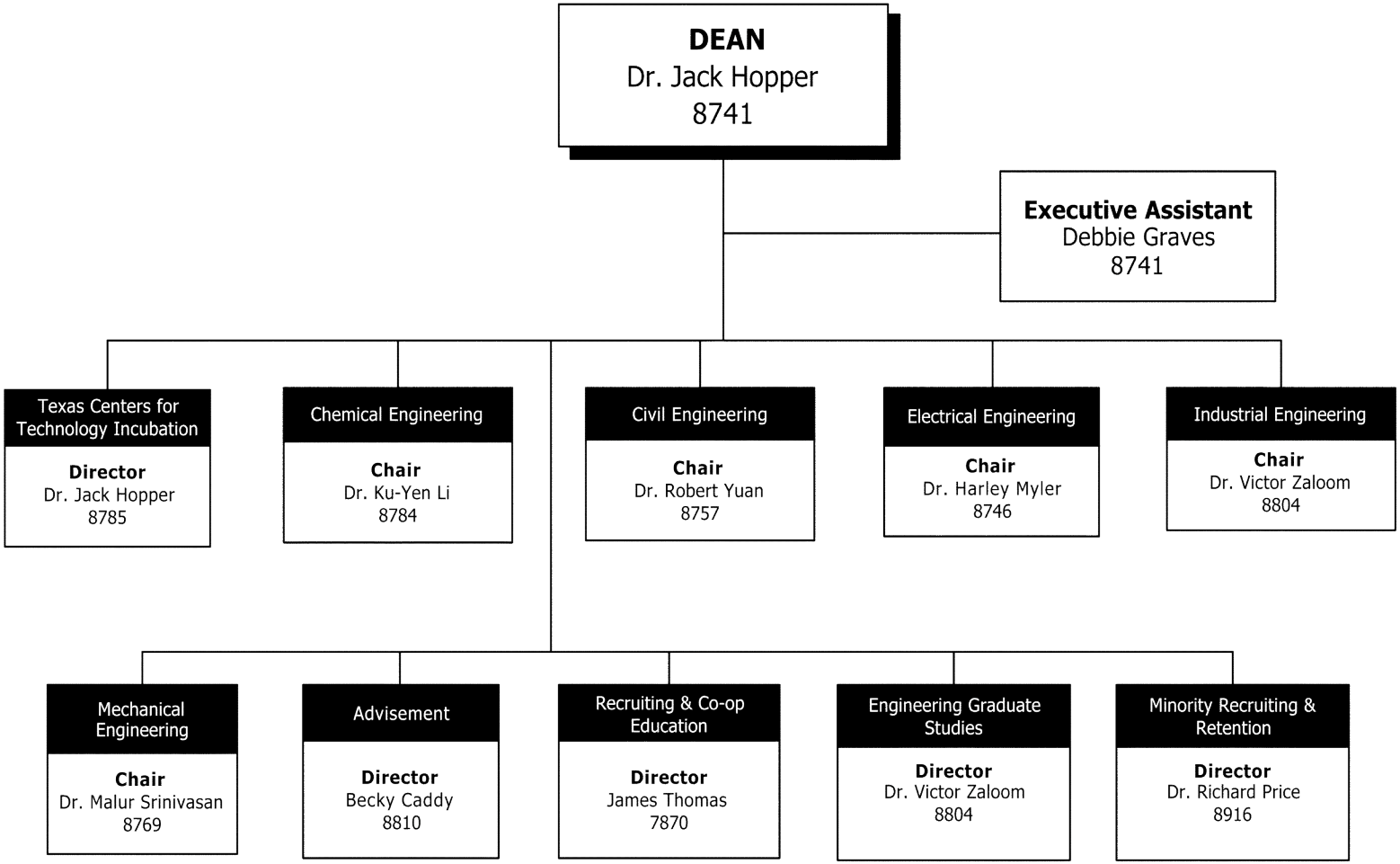


Table II-2c

Texas Centers for Technology Incubation (TCTI)

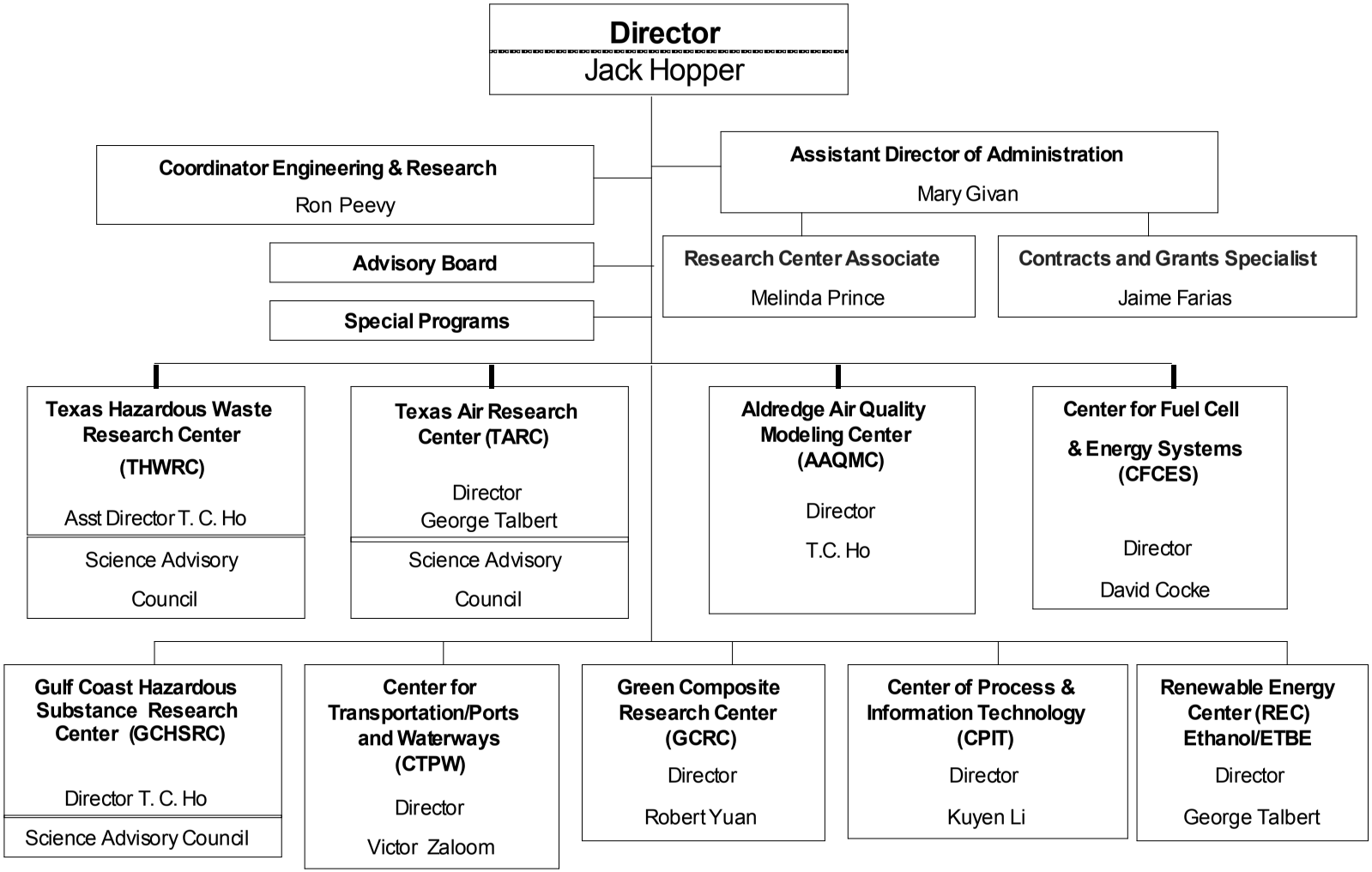


Table II-3 (Part 1). Engineering Programs Offered

Program Title[1]	Modes Offered[2]				Nominal Years to Complete	Administrative Head	Administrative Unit or Units (e.g. Dept.) Exercising Budgetary Control	Submitted for Evaluation[3]		Offered, Not Submitted for Evaluation[4]	
	Day	Co-op	Off Campus	Alternative Mode				Now Accred.	Not Now Accred.	Now Accred.	Not Now Accred.
1. Bachelor of Science in Chemical Engineering	X	X			4	Dr. Kuyen Li	Department of Chemical Engineering	X			
2. Bachelor of Science in Civil Engineering	X	X			4	Dr. Robert Yuan	Department of Civil Engineering	X			
3. Bachelor of Science in Electrical Engineering	X	X			4	Dr. Harley Myler	Department of Electrical Engineering	X			
4. Bachelor of Science in Industrial Engineering	X	X			4	Dr. Victor Zaloom	Department of Industrial Engineering	X			
5. Bachelor of Science in Mechanical Engineering	X	X			4	Dr. Malur Srinivasan	Department of Mechanical Engineering	X			
6. Bachelor of Science in Industrial Technology	X	X			4	Dr. Victor Zaloom	Department of Industrial Engineering				X
7. Master of Engineering Science	X				1-2	All Engineering	Engineering Department				X
8. Master of Science in Environmental Engineering	X				1-2	Dr. Robert Yuan	Department of Civil Engineering				X
9. Master of Science in Environmental Studies	X				1-2	Dr. Robert Yuan	Department of Civil Engineering				X
10. Master of Engineering	X				1-2	All Engineering	Engineering Department				X
11. Master of Engineering Management	X				1-2	Dr. Victor Zaloom	Department of Industrial Engineering				X
12. Doctor of Engineering	X				3	All Engineering	Engineering Department				X
13. Doctor of Philosophy in Chemical Engineering	X				3-5	Dr. Kuyen Li	Department of Chemical Engineering				X

Table II-3 (Part 2). Degrees Awarded and Transcript Designations

Program Title[1]	Modes Offered[2]				Name of Degree Awarded[3]	Designation on Transcript[4]
	Day	Co-op	Off Campus	Alternative Mode		
B.S.Ch.E.	X	X			Bachelor of Science in Chemical Engineering	Degree: Bachelor of Science Major: Chemical Engineering
B.S.C.E.	X	X			Bachelor of Science in Civil Engineering	Degree: Bachelor of Science Major: Civil Engineering
B.S.E.E.	X	X			Bachelor of Science in Electrical Engineering	Degree: Bachelor of Science Major: Electrical Engineering
B.S.I.E.	X	X			Bachelor of Science in Industrial Engineering	Degree: Bachelor of Science Major: Industrial Engineering
B.S.M.E.	X	X			Bachelor of Science in Mechanical Engineering	Degree: Bachelor of Science Major: Mechanical Engineering
B.S.I.T.	X	X			Bachelor of Science in Industrial Technology	Degree: Bachelor of Science Major: Industrial Technology
M.E.	X				Master of Engineering	Degree: Master of Engineering
M.E.S.	X				Master of Engineering Science	Degree: Master of Engineering Science
M.E.M.	X				Master of Engineering Management	Degree: Master of Engineering Management
M.S.E.E.	X				Master of Science in Environmental Engineering	Degree: Master of Science in Environmental Engineering
M.S.E.S	X				Master of Science in Environmental Studies	Degree: Master of Science in Environmental Studies
D.E.	X				Doctor of Engineering	Degree: Doctor of Engineering
Ph.D.Ch.E	X				Doctor of Philosophy in Chemical Engineering	Degree: Doctor of Philosophy in Chemical Engineering

Table II-4. Supporting Academic Departments
For Academic Year: 2005

Department or Unit	Full-time Faculty Head Count[1]	Part-time Faculty Head Count[2]	FTE Faculty[3]	Teaching Assistants	
				Head Count	FTE
Math	13	6	15.5	0	0
Physics	7	0	7.00	0	0
Chemistry	12	0	12.00	0	0
English	35	9	40.70	3	1.5
Political Science	10	6	11.75	0	0
History	12	6	13.80	0	0
Social Sciences	13	8	16.25	0	0
Fine Arts	27	19	35.20	0	0
Communications	11	1	13.90	0	0
Kinesiology	11	10	18.80	2	1.0

Fall 2005 data.

1. the number of full-time faculty members (tenure track plus other teaching faculty, as classified in Table II-1) exclusive of teaching assistants.
2. the number of part-time, adjunct, or visiting teaching faculty members, exclusive of teaching assistants.
3. the sum of column 1 plus FTE** of column 2.

** For student teaching assistants, 1 FTE equals 20 hours per week of work (or service). For faculty members, 1 FTE equals a Lamar University full-time load.

Table II-5. Support Expenditures
College of Engineering

Fiscal Year	1 (prior to previous year) FY04	2 (previous year) FY05	3 (current year) FY06	4 (year of visit) FY07
Expenditure Category				
Operations[1] (not including staff)	345,128.39	314,897.95	498,873.00	
Travel[2]	55,551.67	48,153.25	67,307.00	
Equipment[3]	461,421.11	388,576.12	127,522.55	
Institutional Funds	256,961.50	263,373.56	98,894.00	
Grants and Gifts[4]	204,459.61	125,202.56	28,628.55	
Graduate Teaching Assistants	29,999.98	41,822.67	24,452.00	
Part-time Assistance[5] (other than teaching)	70,217.79	77,751.58	54,222.00	

Notes:

1. General operating expenses.
2. Institutionally sponsored (HEAF and course fees).
3. Major equipment, including equipment used for research.
4. Including special (not part of institution's annual appropriation) non-recurring equipment purchase programs.
5. Represents student assistants. Graduate teaching and research assistants or permanent part-time personnel are not included.

Table II-6. Personnel and Students
College of Engineering

Year[1]: 2005

	HEAD COUNT		FTE[2]	RATIO TO FACULTY[3]
	FT	PT		
Administrative[4]	3	0	2.75	
Faculty (tenure-track)	0	0	0	
Other Faculty (excluding student Assistants)	0	0	0	
Student Teaching Assistants	0	0	0	N/A
Student Research Assistants	0	0	0	N/A
Technicians/Specialists	1	0	.25	N/A
Office/Clerical Employees	2	1	2.50	N/A
Others[5]	0	6	6.00	N/A
Undergraduate Student Enrollment[6]	621	175	657.1	N/A
Graduate Student Enrollment	202	73	181.7	N/A

Notes:

1. Fall 2005 data.
2. For student teaching assistants, 1 FTE equals 20 hours per week of work (or service). For undergraduate and graduate students, 1 FTE equals 15 semester or quarter credit hours per term of institutional course work, meaning all courses--engineering, humanities and social sciences, etc. For faculty members, 1 FTE equals a Lamar University full-time load.
3. FTE in each category is divided by total FTE Faculty.
4. Joint administrative/faculty positions or other combined assignments are allocated to each category according to the fraction of the appointment assigned to that category.
5. Student Assistants.
6. Includes freshman and sophomores.

Table II-6. Personnel and Students

Chemical Engineering

Year[1]: 2005

	HEAD COUNT		FTE[2]	RATIO TO FACULTY[3]
	FT	PT		
Administrative[4]	4	0	1.0	
Faculty (tenure-track)	11	0	8.0	
Other Faculty (excluding student Assistants)	0	3	.75	
Student Teaching Assistants	0	2	2.0	.23
Student Research Assistants	0	18	18.0	2.06
Technicians/Specialists	1	0	1.0	.11
Office/Clerical Employees	1	0	1.0	.11
Others[5]	0	2	2.0	.23

Undergraduate Student Enrollment[6]	111	20	114.7	13.1
Graduate Student Enrollment	44	25	42.9	4.9

Table II-6. Personnel and Students

Civil Engineering

Year[1]: 2005

	HEAD COUNT		FTE[2]	RATIO TO FACULTY[3]
	FT	PT		
Administrative[4]	1	0	.5	
Faculty (tenure-track)	5	0	4.5	
Other Faculty (excluding student Assistants)	1	2	2.0	
Student Teaching Assistants	0	0	0	0
Student Research Assistants	0	20	20	3.08
Technicians/Specialists	1	0	1.0	.15
Office/Clerical Employees	1	0	1.0	.15
Others[5]	0	0	0	0

Undergraduate Student Enrollment[6]	84	22	89.4	13.75
Graduate Student Enrollment	64	15	61.0	9.38

Table II-6. Personnel and Students

Electrical Engineering

Year[1]: 2005

	HEAD COUNT		FTE[2]	RATIO TO FACULTY[3]
	FT	PT		
Administrative[4]	1	0	.5	
Faculty (tenure-track)	6	0	5.5	
Other Faculty (excluding student Assistants)	0	0	0	
Student Teaching Assistants	0	0	0	0
Student Research Assistants	0	9	4.5	.82
Technicians/Specialists	1	0	1.0	.18
Office/Clerical Employees	1	0	1.0	.18
Others[5]	0	0	0	0
Undergraduate Student Enrollment[6]	148	23	150.1	27.29
Graduate Student Enrollment	25	4	18.4	3.35

Table II-6. Personnel and Students

Industrial Engineering

Year[1]: 2005

	HEAD COUNT		FTE[2]	RATIO TO FACULTY[3]
	FT	PT		
Administrative[4]	1	0	.5	
Faculty (tenure-track)	6	0	4.75	
Other Faculty (excluding student Assistants)	0	3	1.0	
Student Teaching Assistants	0	6	6.0	1.04
Student Research Assistants	0	2	2.0	.35
Technicians/Specialists	1	1	1.75	.30
Office/Clerical Employees	1	0	1.0	.17
Others[5]	0	1	1.0	.17
Undergraduate Student Enrollment[6]	108	80	122.5	21.30
Graduate Student Enrollment	39	9	31.3	5.44

Table II-6. Personnel and Students

Mechanical Engineering

Year[1]: 2005

	HEAD COUNT		FTE[2]	RATIO TO FACULTY[3]
	FT	PT		
Administrative[4]	1	0	.5	
Faculty (tenure-track)	5	0	4.5	
Other Faculty (excluding student Assistants)	0	0	0	
Student Teaching Assistants	0	1	2.0	.44
Student Research Assistants	0	0	0	0
Technicians/Specialists	1	0	1.0	.22
Office/Clerical Employees	1	0	1.0	.22
Others[5]	0	0	0	0

Undergraduate Student Enrollment[6]	159	29	158.9	35.31
Graduate Student Enrollment	30	20	28.1	6.24

Table II-7. Faculty Salary Data

(Optional Table)

Academic Year 2005

1. Lamar University

	Professor	Associate	Assistant	Instructor
Number	105	83	94	4
High	130,254	94,094	80,000	76,194
Mean	75,371	60,192	51,517	52,434
Low	19,500	29,182	27,730	34,974

2. College of Engineering

	Professor	Associate	Assistant	Instructor
Number	16	10	7	
High	130,254	82,836	70,000	
Mean	99,172	72,395	64,919	
Low	81,090	64,494	59,238	

4. Average Percent Salary Raises Given to Continuing Faculty Members for the Past Six (6) Years.

Merit Increases

Unit	2001	2002	2003	2004	2005	2006
Institution as a Whole	N/A	N/A	N/A	4%	4%	2%
Engineering Education Unit as a Whole	N/A	N/A	N/A	4%	4%	2%

Equity Increases

Unit	2001	2002	2003	2004	2005	2006
Institution as a Whole	N/A	N/A	4.5%	2.4%	2.1%	2.0%
Engineering Education Unit as a Whole	N/A	N/A	5.2%	3.5%	3.0%	2.2%

Lamar University has 221 faculty members in the salary equity pool; the College of Engineering has 20.

TABLE II-7 (Continued)

4. Each Program Submitted for Evaluation

Program		Professor	Associate	Assistant	Instructor
Chemical	Number	6	2	3	
	High	130,254	77,718	70,000	
	Mean	108,870	74,251	66,064	
	Low	87,976	70,784	63,500	
Civil	Number	2	3	1	
	High	103,570	82,556	56,700	
	Mean	100,632	77,558	56,700	
	Low	97,694	64,494	56,700	
Electrical	Number	3	1	2	
	High	103,858	72,422	67,490	
	Mean	97,490	72,422	67,004	
	Low	85,536	72,422	66,518	
Industrial	Number	2	3	1	
	High	116,748	82,836	63,000	
	Mean	107,470	75,476	63,000	
	Low	98,192	65,394	63,000	
Mechanical	Number	3	1	1	
	High	105,174	64,682	59,238	
	Mean	89,618	64,682	59,238	
	Low	81,090	64,682	59,238	
	Number				
	High				
	Mean				
	Low				
	Number				
	High				
	Mean				
	Low				

Table II-8. Engineering Enrollment and Degree Data

Engineering education unit as a whole includes undecided:

Year	AY	FT/PT	Enrollment Year					Total UG	Total Grad	Degrees Conferred			
			1st	2nd	3rd	4th	5th			BS	MS	PhD	Other
Current	2005	FT	209	125	115	170	2	621	202				
	2006	PT	35	34	36	63	7	175	73	0	0	0	0
1	2004	FT	235	144	98	194	6	677	242	96	161	4	0
	2005	PT	26	34	32	54	15	161	130	0	0	0	0
2	2003	FT	255	130	98	146	5	634	255	79	119	3	0
	2004	PT	39	44	40	49	11	183	75	0	0	0	0
3	2002	FT	220	103	74	129	1	527	256	80	92	5	0
	2003	PT	39	33	50	36	12	170	63	0	0	0	0
4	2001	FT	173	97	70	113	1	454	150	70	74	0	0
	2002	PT	42	38	32	37	19	168	40	0	0	0	0
5	2000	FT	155	61	62	106	5	389	125	72	86	9	0
	2001	PT	38	32	29	36	17	152	42	0	1	0	0

Program: Chemical Engineering

Year	AY	FT/PT	Enrollment Year					Total UG	Total Grad	Degrees Conferred			
			1st	2nd	3rd	4th	5th			BS	MS	PhD	Other
Current	2005	FT	32	25	19	35	0	111	44				
	2006	PT	2	3	6	7	2	20	25	0	0	0	0
1	2004	FT	31	30	10	45	0	116	68	19	39	1	0
	2005	PT	3	0	2	9	3	17	32	0	0	0	0
2	2003	FT	35	22	13	32	1	103	63	12	31	1	0
	2004	PT	1	0	3	13	2	19	24	0	0	0	0
3	2002	FT	38	14	13	35	1	101	62	24	27	1	0
	2003	PT	3	2	8	7	3	23	20	0	0	0	0
4	2001	FT	38	25	18	24	0	105	31	18	15	0	0
	2002	PT	2	4	3	15	1	25	19	0	0	0	0
5	2000	FT	36	17	7	27	1	88	21	15	7	2	0
	2001	PT	3	4	4	11	2	24	10	0	0	0	0

Program: Civil Engineering

Year	AY	FT/PT	Enrollment Year					Total UG	Total Grad	Degrees Conferred			
			1st	2nd	3rd	4th	5th			BS	MS	PhD	Other
Current	2005	FT	31	13	16	24	0	84	64				
	2006	PT	2	3	7	10	0	22	15	0	0	0	0
1	2004	FT	30	19	12	21	0	82	57	9	25	2	0
	2005	PT	0	6	3	4	2	15	19	0	0	0	0
2	2003	FT	32	18	15	12	2	79	49	7	35	0	0
	2004	PT	4	7	2	4	0	17	12	0	0	0	0
3	2002	FT	26	8	11	11	0	56	53	8	4	1	0
	2003	PT	3	3	1	4	1	12	9	0	0	0	0
4	2001	FT	20	11	9	14	0	54	38	9	27	0	0
	2002	PT	2	0	6	1	1	10	2	0	0	0	0
5	2000	FT	15	6	9	16	0	46	35	10	33	0	0
	2001	PT	3	6	3	1	3	16	6	0	0	0	0

Program: Electrical Engineering

Year	AY	FT/PT	Enrollment Year					Total UG	Total Grad	Degrees Conferred			
			1st	2nd	3rd	4th	5th			BS	MS	PhD	Other
Current	2005	FT	45	37	26	39	1	148	25				
	2006	PT	6	5	6	6	0	23	4	0	0	0	0
1	2004	FT	57	41	23	52	1	174	25	24	24	0	0
	2005	PT	7	4	7	3	1	22	24	0	0	0	0
2	2003	FT	63	24	31	31	0	149	45	15	19	2	0
	2004	PT	7	8	4	8	0	27	12	0	0	0	0
3	2002	FT	53	32	20	29	0	134	42	13	21	1	0
	2003	PT	2	7	4	8	0	21	13	0	0	0	0
4	2001	FT	34	23	11	30	0	98	25	15	6	0	0
	2002	PT	2	4	6	10	0	22	4	0	0	0	0
5	2000	FT	28	16	20	29	0	93	16	13	5	3	0
	2001	PT	3	3	6	2	0	14	4	0	0	0	0

Program: Industrial Engineering

Year	AY	FT/PT	Year					Total UG	Total Grad	Degrees Conferred			
			1st	2nd	3rd	4th	5th			BS	MS	PhD	Other
Current	2005	FT	33	26	22	27	0	108	39				
	2006	PT	20	14	14	29	3	80	9	0	0	0	0
1	2004	FT	30	21	22	36	0	109	48	24	40	0	0
	2005	PT	11	20	19	29	3	82	23	0	0	0	0
2	2003	FT	39	32	28	33	1	133	58	34	23	0	0
	2004	PT	25	25	26	19	1	96	14	0	0	0	0
3	2002	FT	36	22	17	24	0	99	63	22	26	0	0
	2003	PT	22	17	25	13	1	78	8	0	0	0	0
4	2001	FT	27	16	16	24	0	83	36	19	20	0	0
	2002	PT	25	26	13	8	1	73	8	0	0	0	0
5	2000	FT	11	8	12	12	1	44	35	15	29	3	0
	2001	PT	12	14	11	15	0	52	13	0	0	0	0

Program: Mechanical Engineering

Year	AY	FT/PT	Enrollment Year					Total UG	Total Grad	Degrees Conferred			
			1st	2nd	3rd	4th	5th			BS	MS	PhD	Other
Current	2005	FT	59	23	31	45	1	159	30				
	2006	PT	4	9	3	11	2	29	20	0	0	0	0
1	2004	FT	63	32	32	41	1	169	44	20	33	1	0
	2005	PT	2	4	0	9	0	15	32	0	0	0	0
2	2003	FT	58	30	11	38	1	138	40	11	11	0	0
	2004	PT	2	4	5	5	1	17	13	0	0	0	0
3	2002	FT	39	15	12	29	0	95	36	13	14	2	0
	2003	PT	4	3	11	3	0	21	12	0	0	0	0
4	2001	FT	18	15	14	21	1	69	19	9	6	0	0
	2002	PT	3	3	4	3	1	14	6	0	0	0	0
5	2000	FT	26	10	10	22	3	71	18	19	12	1	0
	2001	PT	5	4	5	7	1	22	7	0	0	0	0

Table II-9. History of Admissions Standards for Freshmen

Academic Year	Composite ACT		Composite SAT		Percentile Rank in High School		Number of New Students Enrolled
	MIN	AVG	MIN	AVG	MIN	AVG	
2000	17	22	710	1058			89
2001	16	20	720	1003			94
2002	16	20	630	1061			125
2003	13	19	690	1037			132
2004	12	17	670	1043			138
2005	16	19	580	1033			127

Table II-10. History of Transfer Engineering Students

Academic Year	Number of Transfer Students Enrolled
2000	36
2001	39
2002	32
2003	26
2004	40
2005	30