2016 Academic Program Review of Graduate Programs

for

The Department of Electrical and Computer Engineering

April 11-12, 2016

College Station, Texas
Word of Welcome

from Miroslav Begovic, ECE Department Head and
Jose Silva-Martinez, ECE Director of Graduate Studies

As Department Head and Director of Graduate Studies for the Texas A&M Department of Electrical and Computer Engineering, we extend a heartfelt welcome to Texas A&M University on behalf of our colleagues and our students. We thank you for your service as external reviewers of our Electrical and Computer Engineering (ECE) graduate programs. We are pleased to have been able to prepare for this opportunity by conducting our own assessment of these programs while looking for opportunities to continually improve. We realize that a strong and highly reputed graduate program is essential to maintaining an excellent department and improving our academic recognition. As we strive to further improve our graduate program, the peer assessment process becomes increasingly important. We are grateful for your review as a means of helping us improve our programs.

The self study that follows was prepared for this review and reflects an evaluation of the graduate programs within the ECE department. It includes a brief history of the department and overview. We also briefed the recommendations of the 2008 review panel and the actions taken by our department during the last few years. We are also presenting details on the research and education activities of the graduate programs, plans for continual assessment and improvement, and a strategic vision for the future.

We look forward to your input and eagerly await your recommendations about how we might further improve our programs as we strive for greater excellence. We realize this is a time consuming task and thank you again for your service and support. We will be glad to answer any questions and provide more information should you require it.

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I. Introduction

A. Charge to the Review Team

Please examine the department and its programs and make recommendations that will help in planning improvements. Your resources are a self-study report prepared by the department, copies of materials from the program’s last review, information you gain through personal interactions while visiting Texas A&M University, copies of strategic plans and goal-setting documents at the department, college, and/or university level, and any additional information requested by you or by the department. Within the broad charge of recommending ways the department can continue to improve are some specific questions that we would like you to address:

1) Based on the data / information provided in the self-study report or gathered by the external review team, what are the department’s overall strengths and weaknesses?

2) How well do the department’s strategic goals align with those of its college and with those of Texas A&M University?

3) How would you compare this department with its peers?

4) What improvements (including student learning and faculty development) has the department made since the previous program review?

5) With only current resources or a modest infusion of new ones, what specific recommendations could improve the department’s performance, marginally or significantly?

The ECE Department goal is to offer the best possible education to our student body, improve our research skills, increase graduate programs visibility, and move forward in national and international rankings. We believe that your comments and suggestions will significantly contribute towards the achievement of department goals.

B. Outline of the report.

This self-report is divided into five chapters complemented with four appendices. Chapter II presents a brief history of the Department of Electrical Engineering followed by a description of our recent developments. We also included a summary of the findings and recommendations of the 2008 graduate program review panel. Chapter III gives an overview of the ECE Department graduate programs. Detailed information on faculty and department organization are provided. The organization of the department is described as well as various departmental committees. Fiscal information is detailed at the end of this chapter. The graduate program is fully described in Chapter IV. The ECE Department encompasses seven research groups. Details on the research areas and organization are given in this Chapter IV. The educational programs are described as well as the degree requirements. After the details of the ECE graduate program are presented, Chapter V describes our mission, outcomes and assessment plan. The department vision is then described as well as our contributions toward the achievement of the COE mission. Appendix A
provides a list of faculty. The Graduate Student Handbook, Fall 2015 is included in Appendix B. A full description of degree requirements, list of graduate courses, recommended courses, qualifying examination and financial aid is provided. The syllabi of the 400-600-700 level courses is provided in Appendix C. Finally, two-page faculty CVs are provided in Appendix D.
II. Brief History of the Department

The electrical engineering curriculum at Texas A&M had its beginning in the Fall of 1903. The department was called Physics and Electrical Engineering. The first two degrees in electrical engineering were awarded on June 13, 1905. In the fall of 1909, Electrical Engineering was made a separate department from Physics. Electrical engineering courses proved to be popular and the department expanded. In 1913–1914, the enrollment was 153, which represented almost half the total students in engineering and about 17% of the total enrollment of Texas A&M. Enrollment in the Electrical Engineering Department continued to climb steadily after World War I, from 152 in 1918–1919 to 406 in 1925–1926.

Following World War II, the department and university entered into another phase, developing graduate courses and research. Starting in 1961, different areas of specialization were introduced such as electromagnetic fields, communications and electronic circuits, and digital systems. In 1967 control theory came into prominence as analog and digital computers introduced a new era in communication. Since the early seventies, the department has had a tremendous growth in research and educational opportunities. This has led to the establishment of eight disciplines and a graduate program offering rich educational and research experiences.

In 1963, the Electric Power Institute (EPI) was founded by Prof. John Denison in collaboration with Dean Fred Benson. The motivation was to provide a mechanism to maintain the electric power teaching program and develop a research program in the area at a time when most universities were greatly de-emphasizing power. In 1998, EPI changed its name to Electrical Power & Power Electronics Institute (EPPEI) to better reflect the activities of power system and power electronics groups.

In 1997, the department of Electrical Engineering jointly with the Department of Computer Science began to offer degrees in Computer Engineering. The Computer Engineering program became such a prominent part of the department that in 2005, the department changed its name to Electrical and Computer Engineering. In 1998, the department received a $5.1 million gift from Texas Instruments to support the development of research and education in the area of analog and mixed signals. As a result, in 1999 the Analog and Mixed Signal Center was formally created. The mission of the Analog & Mixed-Signal Center is to contribute to the advancement of the state-of-the-art in the area of analog mixed-signal integrated circuits and systems. The center plays a key role in the education and training of highly qualified engineers for design and manufacturability of analog and mixed-signal integrated systems.

In 2003, the department started a satellite program in ECE in Doha, Qatar. Several permanent faculty have been hired for this program as well as a number of our College Station faculty who have temporarily relocated to help run the Texas A&M at Qatar program (TAMUQ). Currently, the Qatar program offers undergraduate degrees identical to the program in College Station with specializations available in Power and Telecommunications and Signal Processing. In the near
future, TAMUQ will begin to offer graduate programs in Electrical Engineering as well.

A. Recent Developments

Over the last 10 years, the ECE Department has experienced a period of significant growth. This is a result of the faculty investment program initiated by former President Robert Gates and supported by current president Michael K. Young under the umbrella of the 25/25 program. The main thrust of these programs is to consolidate resources throughout the university and promote interdisciplinary research across different disciplines, colleges and departments. President Young and COE have allocated a number of new faculty positions to those programs that were viewed as high priority for the future success of the University. The Department of Electrical and Computer Engineering was allocated 15 new positions since 2005, most of them used to attract young research-focused faculty members. We also hired world class researchers to replace the retirements and one decease. We hired Prof. P. R. Kumar who is a member of the National Academy of Engineering, Prof. P. Rentzepis member of the National Academy of Sciences and Prof. N. Duffield who spent 18 years in AT&T as distinguish member of their technical staff.

The ECE department has been very collegial, only 8 faculty resigned during the last 10 years. Out of these 8, one of them resigned because he was not promoted and his wife resigned too; another faculty member returned back to China for personal reasons and another one joined Northeastern University as Department Head. During this period of time, 30 assistant professors were promoted to associate professors and 14 associate professors were successfully promoted to full professors. These statistics demonstrate that Department of ECEN atmosphere is very positive and helps to excel faculty strengths and scientific productivity.

Our mission is to create new knowledge and challenge young minds by participation in the process of discovery and invention. Our target is to educate electrical and computer engineers with a solid background of fundamentals, stretching their imaginations to prepare them for future technological challenges. The research groups were recently expanded to cover emerging areas with emphasis on multidisciplinary research. Significant resources have been allocated in areas such as biomedical, genomic and signal processing as well as emerging initiatives in computer engineering such as computer communications and big data. Two new hires in the computer engineering group emphasizes the use and development of advanced algorithms for biomedical applications. The Device Science and Nanotechnology program encompasses a wide range of research topics from electro-optics to quantum computing. Major efforts constitute the programs on power and energy ranging from energy harvesting for body networks till smart grid. Solar cells and power electronic converters for utility interface of solar-pv/wind/fuel-cell/battery-energy storage power systems are active areas of research. Current research projects include communication networks, wireless networks, sensor networks, data storage systems, aircraft control, intelligent vehicular systems and robotics. Faculty joint appointments with the departments of health sciences, biomedical engineering, chemical engineering, computer sciences, materials science and the Department of Agri Life demonstrate that multi-disciplinary research is
becoming a common practice in the Electrical and Computer Engineering Department. The 2015 scientific productivity of the vibrant department of ECE includes around 4 peer review journals per faculty, over 4 conference papers per faculty, and 71 Editorship commitments. During the period 2011-2014, the faculty scientific activities deserved a total of 93 national/international awards. It is expected that when the young faculty settle down the research productivity of the department will increase.

The current department enrollment is about 1,200 undergraduate, 311 PhD, 240 MS and 185 MEN students pursuing degrees in electrical and computer engineering. Last year 40 PhD, 40 MS and 102 MEN students graduated from our department. The graduate student enrollment increased from 552 in year 2010 up to 736 in year 2015, which is an increase of 33% in this 5 year period. The student grow is mainly in the master of engineering (MS without thesis) programs. In year 2012, for instance, the enrollment of incoming graduate students was: MEN=4, MS=78 and PhD=67. Last year enrollment was: MEN=60, MS=117 and PhD=59. We find the growing distribution in the MS and MEN programs is reasonable. MEN students do not require to find a research advisor; advising fo these students is provided by the graduate office, graduate advisor and graduate studies committee members. MS students have to find an advisor and usually they demand departmental space; increase in this program during the last 4 years is 66%. Our statistics show that salary offers are very similar for MS and MEN students, making very attractive the last program since it is usually completed in less than 2 years. PhD hiring during the last few years is fluctuating between 59 and 67 incoming students. This PhD hiring corresponds to close to one student per active research faculty per year. It is very unlikely that this rate will change in near future since PhD hiring is usually coming with long term commitments in both funding and physical space.

Continuous efforts are devoted to attract domestic talent; the department is using all resources available for that end. The TA matching program where department gives the faculty one semester TA for every 3 semesters of RA is being successfully used in the past. We currently use up to 10 TA positions as a recruiting tool for incoming domestic students. Currently, the 87 domestic students enrolled in the graduate program represents 11.8% of the graduate body, and the enrollment of female students (125) represents the 17% of the graduate program. Students from underrepresented groups (29) reaches the 3.9% of the total enrollment this year, but it has been over 5% during the previous years, then it is expected to reach that level in fall 2016.
According to US news and World Report Ranking the electrical engineering and computer engineering programs are ranked 11 and 13, respectively, among the public institutions, and 19 and 21 when public and private institutions are included. The College of Engineering and Department of ECE are committed to improve our department to move forward in the national and international rankings and significant efforts are devoted towards this goal. We believe that the quality of our program strongly depends on the quality of our students, and then we are making all possible efforts in attracting top domestic and international talent. Currently, the average of GRE-quantitative score of the incoming students is fluctuating between 163-165 (in the new scale) which is competitive with the top 10 schools whose GRE-Q scores, according to US news reports, fluctuate between 163-166. The quality of the research carried out by our graduates deserved over 40 international awards during the last five years.

Before providing the details of our program we would like to include the summary of the findings and recommendations of the 2008 graduate program review panel. The entire evaluation document will be available during the evaluation and can be (e)mailed if requested.

B. 2008 Graduate Programs Review.

The Department of Electrical and Computer Engineering was evaluated in 2008 by a Peer Review Team composed of Professor Sanjit K. Mitra, Professor Janak H. Patel, Professor Clifford Pollock and Professor H. Vincent Poor. The comments and suggestions made in their report were well thought out and quite constructive and valuable. The entire report is available but only the most relevant recommendations are briefed here. We also describe the actions taken during the last few years to overcome these concerns.

Department-Wide Qualifying Examination. One of the major suggestions of the review team is that the department needed to overhaul its preliminary examination format and adopt a format that is consistent across the department—making it possible for students to take the exam by the end of their first year. The Departmental Qualifying Exam was established and is currently administered two times per year. The qualifying examination is based on a set of nine fundamental undergraduate courses. The exam consists of two questions from each of these courses, and each question is designed to be completed in 30 minutes. Each student is required to answer any 6 of the 18 questions on the exam. This ensures that each student has at least some proficiency outside of their main focus area, but does not require students to study extensively outside of their area of expertise. This format was designed to encourage students not to spend more than one month preparing for the exam. Incoming PhD students holding a master’s degree are required to take the exam within one year of starting the program. Students entering the program with a previous degree outside of electrical or computer engineering or coming in with bachelor’s degree are allowed an extra year to prepare for exam. They are then required to take the exam by the end of the second year. Those students that fail the examination will be given a second opportunity to retake the exam which must be taken the next time the exam is offered. Those that fail the examination twice will be removed from the PhD program. Details are provided in Appendix B.
Quality of PhD Applicants. The peer review team mentioned the need for the improvement of the quality of the application pool of prospective graduate students. It is our opinion that the quality of our applicant pool has in fact significantly improved over the last few years. Throughout the last few years the department would typically receive between 2000–2,400 applications to its graduate programs. This increase in demand has allowed us to become much more selective in terms of who we admit to our programs. Total selection percentage has been hovering around 10.5% (e.g., in Fall 2015 we received around 2,256 applications and the total of new graduate students was 236). As a result of selecting a higher quality pool from our applicant base, the average GRE-Quantitative of our program is 163, which is considered to be competitive with top peer departments. The ECE Department is striving toward a GRE-Q average of 166, which we believe will move us up in the rankings. The selection process also considers the prestige of the schools as well as GPA, GRA verbal scores and letters of recommendation. The graduate office makes a prescreening of students based on GRE-Q, GRE-V, and GPA scores, which are then routed to the research group leaders for further selection. It is our goal to attract the top talent from the best schools.

Departmental Funding of First-Year Students. It is highly desirable to find departmental funding for the first year for incoming PhD students. This allows students adequate time to get a full picture of all possible research opportunities before they select an advisor. This is becoming even more important in light of the qualifying exam that has to be taken during the first year for PhD students with MS degree and 2nd year for direct PhD students. Many faculty members are not reluctant to support a new PhD student under an RA during their first year when they are primarily taking courses and preparing for the qualifying exam. While the department does not have the resources to solve this problem, we have made an effort to provide more TA positions. Although we funded around 65–70 TA positions per semester in the 2015–2016 calendar year, that is not enough to completely solve the problem. However, it is a step in the right direction. It should be pointed out, that the funding of first year PhD students can never be completely supported through TA positions. Most of our incoming PhD students are international and must pass the required English Language Proficiency Examination to serve as a TA. The incoming international students usually pass the ELPE sections during the first two semesters of their graduate program. Hence, there needs to be other mechanisms to support some of our incoming PhD students.

We are using the TA positions of basic courses as a recruiting tool for attracting domestic talent. During the first year of the program most of the TAs for sophomore courses were domestic; e.g. in 2015 we supported 10 domestic students through TAs. Available teaching assistantship positions are used to support graduate students, but these are clearly not enough; we accepted 59 PhD and 114 MS students last fall semester.

Mentoring of New Hires. Regarding the mentoring of new faculty hires, the department does not have a formal program but rather primarily relies on the group structure of the department. Although some faculty member’s interests may span several areas, each professor is administratively assigned to a home group. It is the responsibility of the senior faculty in that
group to make sure that our new young faculty members are getting the mentoring that is needed. The Department Head has been meeting with all assistant professors regularly to make sure that they are getting adequate guidance and support. It is our view that the large number of prestigious awards won by our junior faculty over the last years is evidence that our junior faculty are indeed getting the guidance necessary to succeed. The fact that only four faculty (including junior and senior faculty) were not promoted during the last 10 years indicate that the young faculty is properly mentored.

**Department Priority on Teaching.** The review team made a comment in their report about the apparent emphasis of research over teaching activities within the department. We have stressed that research, service and teaching are equally important for our department. The following additional actions have been taken in order to provide greater visibility to our emphasis on teaching: 1) The department head has made a concerted effort to highlight teaching performance in his annual review of all faculty. 2) The department has instituted a teaching award which is currently being administered by the Staff and Faculty Internal Awards Committee. These awards consist of $5,000 cash of which one or two will be offered each year.

**Strategic Hiring.** Since the visit of the program review team, we have hired 25 new faculty members, all of them in strategic areas such as energy, biomedical engineering and genomics, nanotechnology and optoelectronics. Those areas are mentioned in our strategic hiring plan. The Faculty Recruitment and Hiring Committee identifies and recommends the best candidates to fill available faculty, professor of practice and lecture positions. Also, the hiring committee advises Department Head Miroslav Begovic on hiring areas and identification of the best candidates for the available faculty positions.

**Review of Course Offerings and Contents.** The program review team asked that the department institute some methodology to maintain oversight of the graduate curriculum as well as course content. The Associate Department Head Steven Wright is currently requesting a two-year teaching plan which will estimate the graduate courses to be offered for the next two academic years. This will encourage the groups to plan a more coherent sequence of course offerings, and it will also help graduate students to more effectively plan their academic careers. The Graduate Student Committee (GSC) reviews the syllabi of new courses and requires the approval of the related group for new course offerings. It is understandable that young faculty will want to offer new courses that help them to boost their research and train students in specific areas. Those courses, however, should also serve to achieve group education and research goals. The GSC should encourage the various groups to perform a review of the content of all graduate courses once every five years.

**Social Activities for Graduate Students.** Apparently some number of students mentioned to the review team the need for more opportunities to interact with other graduate students outside of their own groups. We currently organize seminars and other social activities both at the department and group levels. The Seminars and Distinguished Speaker Committee screens nominations from the faculty and recruits distinguished researchers to give lectures for the
enrichment of the intellectual environment in the department. The ECE Department organized a series of 5 lectures during the summer 2015 devoted to improving communication skills, helping students write successful IEEE journal articles, helping them to learn good practices for internships and establishing good job interview skills. Each seminar was attended by over 100 graduate students. The Department of ECE also organized Graduate Student Awards, where the top senior PhD, Junior PhD and MS students were recognized. The dinner was attended by more than 350 graduate students. Social events included a welcome reception and other group gatherings.
III. Overview of the Department

A. Faculty

Faculty Profiles

As of Fall 2015, the ECE Department faculty consisted of 40 full professors, 24 associate professors, eight assistant professors, and three non-tenure track instructors. These numbers include Professors Begovic, Enjeti, Howze, Watson, Butler-Perry and Weichold who all hold full time administrative positions but does not include Professor Baird who is a part time professor. Professors Baird, Kumar and Russell are members of the National Academy of Engineering and Professor Rentzepis is member of the National and Foreign Academies of Sciences; 38 Fellow grades are held by our professors in prestigious professional societies; 32 held the grade of IEEE Fellow. Two ECE faculty members are recipients of the Presidential Early CAREER Award for Scientists and Engineers (PECASE), 21 are recipients of the National Science Foundation (NSF) CAREER Award. Two are recipients of the Office of Naval Research (ONR) Young Investigator Award and the Air Force Office of Scientific Research (AFOSR) Young Investigator Award. In addition, all professors have held numerous editorships of peer-reviewed journals and have won several national and international level awards. We also have the unique honor wherein one of our former faculty members (1978-1984), Jack Kilby, received the 2000 Nobel Prize in Physics. Included in the above count are seven holders of endowed chairs (Chang, Dougherty, Georghiades, Kumar, Russell, Sanchez-Sinencio and Singh) and 13 holders of endowed professorships (Begovic, Bhattacharyya, Datta, Ehsani, Enjeti, Kezunovic, Miller, Nguyen, Reddy, Rentzepis, Silva-Martinez, Toliyat, and Wright). Racial, gender and nationality statistics of the faculty are shown in Table 1.

Table 1 – Faculty Profile

<table>
<thead>
<tr>
<th>Rank</th>
<th>Ethnicity</th>
<th>Gender</th>
<th>Citizenship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Professors</td>
<td>40 Asian / Pacific Islander</td>
<td>33 Male</td>
<td>66 US Citizen / Perm. Res.</td>
</tr>
<tr>
<td>Associate Professors</td>
<td>24 Caucasian</td>
<td>34 Female</td>
<td>9 Non-US Citizen / Perm. Res.</td>
</tr>
<tr>
<td>Assistant Professors</td>
<td>8 Hispanic</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Lecturers</td>
<td>3 African American</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

For administrative purposes, the faculty in the ECE Department are divided into seven groups based on their area of specialization. Each group has a designated leader who coordinates the teaching assignments for the group, coordinates the screening process for incoming graduate students and represents the group in a variety of ways to the department and to outside contacts.
Interdisciplinary research activities are encouraged; hence, many faculty have affiliations with two or more groups. A complete list of the faculty and their home group affiliations is given in Appendix A. The seven groups and their leaders are listed here in Table 2.

Table 2 – ECE Groups and Their Leaders

<table>
<thead>
<tr>
<th>Group</th>
<th>Group Leader</th>
<th># of Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog &amp; Mixed Signal</td>
<td>K. Entesari</td>
<td>6</td>
</tr>
<tr>
<td>Biomedical Imaging &amp; Genomic Signal Processing</td>
<td>J. Ji</td>
<td>11</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>J. Hu</td>
<td>16</td>
</tr>
<tr>
<td>E&amp;M and Microwaves</td>
<td>R. Nevels</td>
<td>6</td>
</tr>
<tr>
<td>Electric Power &amp; Power Electronics</td>
<td>H. Toliyat</td>
<td>7</td>
</tr>
<tr>
<td>Solid State Electronics, Photonics &amp; Nano-Engineering</td>
<td>O. Eknoyan</td>
<td>15</td>
</tr>
<tr>
<td>Telecommunications, Controls &amp; Signal Processing</td>
<td>S. Battachayya</td>
<td>11</td>
</tr>
</tbody>
</table>

Faculty Hiring and Turnover

Table 3 shows the turnover of faculty over the last several years. Hiring of faculty according to the reinvestment program began in the 2003–2004 academic year. As a result, the size of the ECE faculty has grown during the 2005–2015 period from 57 to roughly 72.

Table 3 – Faculty Hiring and Turnover

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Hired</th>
<th>Resigned</th>
<th>Retired</th>
<th>Deceased</th>
<th>Total Inc/Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-2006</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2006-2007</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>2007-2008</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>2008-2009</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>-2</td>
</tr>
<tr>
<td>2009-2010</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2010-2011</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>-3</td>
</tr>
<tr>
<td>2011-2012</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2012-2013</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2013-2014</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2014-2015</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>8</td>
<td>4</td>
<td>1</td>
<td>15</td>
</tr>
</tbody>
</table>

Note that over the 10 years reported in Table 3, the department lost only 13 faculty members (eight resigned, four retired and one is deceased). This is a remarkably low number (an average of 1.3 per year) for the size of this department. This statistic clearly shows that a great
majority of the faculty are satisfied with their positions and are not seeking other opportunities.

Tenure and Promotion

The tenure and promotion committee (T&P) consists of nine faculty members of the ECE Department: Seven hold the rank of professor, and two hold the rank of associate professor. Some of the members are appointed by the Department Head while others are elected by the faculty. Each member serves in the T&P committee for two years. Upon reviewing and discussing each package, the T&P committee members vote (via secret ballot) on each case. The T&P committee will also provide written feedback to the Department Head regarding each case under consideration. This feedback should reflect both the majority and minority opinions of the T&P committee. Based on the input from the Department T&P committee as well as his own review of the package, the Department Head will provide a written recommendation for the case. At this point, the candidate can choose to withdraw the package or have it sent up to the college level. Assuming the package is to go forward, the DH recommendation and the Departmental T&P vote will be forwarded to the College T&P committee. The College T&P committee, which consists of one representative from each department, will review, discuss, and vote on each case. Similar to the process at the department level, the result of this College T&P vote is forwarded to the Dean of the College of Engineering who will ultimately make a decision on whether or not the package should move forward. After the Dean reviews and makes a recommendation, the package then goes through the Faculty Senate, the Provost and ultimately to the Coordinating Board for approval.

In addition to yearly evaluations by the Department Head, faculty members in the ECE Department go through several formal review processes throughout their careers. For junior faculty who have not previously held a tenure track appointment, the first formal review is held after their third year. At this point, the faculty will submit a package similar to that prepared when applying for tenure. This package is reviewed by the departmental T&P Committee. This committee will then provide written feedback to the candidate regarding how he or she is progressing. The Department Head will also provide his feedback at the same time. At this time, the Department Head will make a recommendation to the Dean regarding continued employment of the faculty member. While termination at this point is extremely rare, there have been cases where the faculty member was clearly not progressing adequately and after receiving such feedback, chose to resign.

After five years, the junior faculty member is required to submit an application package for tenure and promotion to associate professor. This package is evaluated during the sixth year and a decision is made towards the end of the sixth year. Packages for tenure and/or promotion are first reviewed by the departmental T&P Committee. Exceptional candidates may also apply for tenure and promotion to Associate Professor before the mandatory time frame.

The process for promotion to professor proceeds in a similar manner as described above for tenure and promotion to associate professor. However, in this case, the promotion package is revised and voted on only by the T&P members that hold the rank of professor. There is no mandatory timetable. A candidate can prepare a package any time they feel they are qualified.
Finally, in cases where a faculty member has been hired after previously holding a tenure track position at another university, the timetable for tenure and/or promotion is typically adjusted to account for the previous service. That timetable is usually negotiated during the hiring process.

Table 4 shows a recent history of the tenure and promotion process for the ECE Department. Over the last 10 years, 30 faculty were given tenure. During the same 10-year span, 14 faculty members were promoted from the rank of associate professor to the rank of professor. There have only been four cases in the last ten years where a faculty member initiated the tenure or promotion process and did not successfully complete it. In 2008, one faculty member submitted a mandatory package for tenure and promotion to associate professor, which was denied at the College level. He withdrew his package and submitted a resignation letter. Also in 2008, one faculty member submitted a preliminary package for consideration for promotion to professor. The department Tenure and Promotion Committee recommended he not prepare a formal package. He withdrew his package. Two more packages were withdrawn, one in 2009 and another one in 2010. Hence, in ten years the ECE Department has had only four cases where a faculty member withdrew his/her promotion package or it was denied due to an impending negative tenure decision.

Table 4 – Results of ECE Department Tenure and Promotion Process

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Promoted to Associate Professor with Tenure</th>
<th>Tenure Only</th>
<th>Promoted to Professor</th>
<th>Withdrew from Process or Denied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept. 2005</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sept. 2006</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sept. 2007</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Sept. 2008</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Sept. 2009</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Sept. 2010</td>
<td>5</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Sept. 2011</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sept. 2012</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sept. 2013</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sept. 2014</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Sept. 2015</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>0</strong></td>
<td><strong>14</strong></td>
<td><strong>4</strong></td>
</tr>
</tbody>
</table>

Teaching Load

The nominal teaching load of tenure track faculty is three courses per year. A new faculty member is typically given a reduced teaching load of two courses per year for the first two years. In addition, faculty can buy out of courses using the following formula:
- Buyout of 1 course in a 2-course semester – 25% salary for semester
- Buyout of 2 courses in a 2-course semester – 50% salary for semester
- Buyout of 1 course in a 1-course semester – 35% salary for semester

As a university policy, every member is required to comply with a minimum work load requirement for the Fall and Spring semesters and the Department Head and Associate Department Head are responsible for assigning and monitoring the workloads of the faculty.

**B. Administrative Organization**

*Administrators*

The department administration consists of the Department Head, Associate Department Head, Undergraduate Student Advisor and the Graduate Student Advisor. In addition, several faculty committees oversee various aspects of the department. Details of these committee functions and their composition are provided in the Faculty Committees section.

*Support Staff*

The department employs approximately 28 full time staff to provide various types of support. Currently there are two staff members that provide advising to undergraduate students and two more that provide advising and support to graduate students. Four staff members provide business and accounting support, two permanent staff members provide IT support, and two professors provide non-teaching GANT appointments. Six staff members provide teaching laboratory support, eight staff members provide secretarial support to faculty, and four staff members provide administrative support to the department or the Department Head.

*Faculty Committees*

The ECE department has grown during the last few years and is demanding more support from faculty at different levels. Response to rapid growth includes mentoring of young faculty, course offerings, hiring new faculty, etc. The effort has been diversified. Traditional committees have been restructured and new ones have been created to respond to the challenges of the 25/25 initiative.

*Tenure and Promotion Committee*

The Tenure and Promotion (T&P) Committee makes recommendations on tenure and promotion decisions, and its membership is partly elected and partly appointed by the Department Head. The T&P Committee is composed of seven professors and two associate professors. T&P members that hold the rank of associate professor do not participate in the evaluation of associate professor packages. This committee also assists with the hiring of faculty. All faculty candidates who are invited for on-campus interviews meet with representatives from the T&P Committee, and the Committee forwards its input to the Department Head.
Committee Members: Z. Xiong (Committee Chair); A. Datta, M. Ehsani, A. Karsilayan, T. Liu, C. Madsen, R. Nevels, W. Shi and J. Silva-Martinez

Faculty Advisory Committee
The Faculty Advisory Committee (FAC) discusses main department initiatives and provides recommendations to the Department Head. This committee also evaluates the most relevant initiatives proposed by other committees and faculty and suggests assessment tools to effectively measure the outcomes of department activities. This committee membership consists of five full professors, one associate professor and one assistant professor, the Department Head, Associate Department Head, undergraduate student advisor and graduate student advisor. The members of this committee are elected across the department and each serves a two-year term.

Committee Members: Aniruddha Datta (Committee Chair), Ex Officio Members: M. Begovic, Department Head, A. Karsilayan, Director of Undergraduate Program, J. Silva-Martinez, Director of Graduate Program, and S. Wright, Associate Department Head, S. Bhattacharyya, K. Chang, A. Datta, A. Han, K. Narayanan, P. Rentzepis and P. Yu.

25/25 Growth Committee
The College of Engineering is enrolled in the 25/25 program, which means it plans to see the college grow from 12,000 students in 2012 to 25,000 students by year 2015. It is expected that the ECE Department will increase its enrollment (around 1500 undergraduate students and 1,200 graduate students). The 25/25 Growth Committee makes recommendations to make this growth as smooth as possible. Issues regarding enrollment and needs regarding classrooms and laboratories are carefully analyzed. The members of this committee are appointed by the Department Head.

Committee Members: Arum Han (Committee Chair) and Ex Officio Member: A. Karsilayan, Director of Undergraduate Program. The appointed members are J. Hu, S. Khatri, Scott Miller, K. Narayanan, Bob Nevels and Z. Xiong

Undergraduate Studies Committee
This committee is responsible for all matters assuring the quality of our undergraduate education. The Undergraduate Studies Committee makes recommendations regarding the undergraduate electrical engineering curriculum. Changes to the undergraduate curriculum are voted on by the committee. If approved by the committee and Department Head, the changes are then sent to the College of Engineering Undergraduate Committee and the University Curriculum Committee for final approval. The importance and relevance of stack courses are evaluated and approved in this committee. The set of stack courses are for eligible undergraduate (senior level) and graduate students. The graduate version of these courses can also be taken by the undergraduate students, who receive credit if enrolled in the graduate program after finalizing their
undergraduate education.

Committee Members: A. Karsilayan (Committee Chair), Ex Officio Member–S. Wright (Associate Department Head), Ex Officio Member–A. Sprintson (ABET), U. Braga-Neto, I-H. Hou, S. Hoyos, K. Michalski, S. Savari, C. Su and H. Toliyat.

Graduate Studies Committee

The Graduate Studies Committee is responsible for admission of graduate students, maintaining academic standards, ensuring the continued excellence of student research and dealing with other issues that may arise in the discharge of these functions. Appeals regarding graduate students under probation and students who fail qualifying examinations are solved by this committee. Pertinence of new courses and emerging programs are discussed and voted on by this committee. The committee consists of one member from each focus area who is typically appointed at the recommendation of the Advisory Committee and the approval of the graduate coordinator and Department Head.

Committee Members: J. Silva-Martinez (Chair of the Committee), O. Eknoyan, J. Ji, T. Liu, M. Ehsani, R. Nevels, P. Li and X. Qian.

Graduate Curriculum and Assessment Committee

This recently created committee works closely with the graduate student advisor on revising the graduate curriculum and makes recommendations to improve the quality of the program. This committee is responsible for identifying and recommending emerging areas of research of which the department should be aware. The need to participate in emerging multi-disciplinary programs is evaluated by this committee. This committee defines the best assessment tools to measure the effectiveness of curriculum initiatives. The members of this committee are appointed by the Department Head and Faculty Advisory Committee.

Committee Members: J.-F. Chamberland (Committee Chair), Ex Officio Member—J. Silva-Martinez—and appointed members—N. Duffield, G. Huff, C. Madsen, R. Righetti, E. Sanchez-Sinencio, and L. Xie.

Seminars and Distinguished Speaker Committee

This committee screens nominations from the faculty and recruits distinguished researchers to give lectures for the enrichment of the intellectual environment in the department. The number of distinguished lectures given through this series varies from year-to-year but is typically on the order of six.

Committee Members: S. Shakkottai (Committee Chair), S. Bhattacharyya, K. Entesari, J. Hu, G. Huang, J. Ji, J. Kameoka, S. Khatri, L. Kish, M. Lu, X. Qian, Y. Shen, H. Toliyat, and J. Zou.
Faculty Professional Recognition and External Awards Committee

This committee solicits nominations for various faculty awards and makes recommendations to the Department Head for these awards. This committee also encourages faculty to apply for various external grant-funded awards and opportunities for recognition, including IEEE promotions, NSF CAREER awards, PECASE, etc. This committee also provides support by preparing application packages for national academies.

Committee Members: S. Cui (Committee Chair), S. Bhattacharyya, E. Dougherty, P. R. Kumar, P. Rentzepis, D. Russell, and E. Sanchez-Sinencio

Chair and Professorship Committee

This committee consists of faculty in the department who are holders of endowed chairs or professorships. This committee makes recommendations to the Department Head for recipients of chairs and professorships and also serves as the faculty advisory committee providing input to the Department Head on a variety of issues.


IT and Web-Based Learning Committee

This committee closely interacts with the Dwight Look College of Engineering to inform the ECE Department on the development of information and teaching technologies that help to improve the quality of the graduate program. This committee advises the department on the adoption of new technologies, innovative teaching tools, and technologies devoted to distance education. Committee members are appointed by the Department Head.

Committee Members: P. Gratz (Committee Chair), P. Cantrell, S. Shakkottai, W. Shi, A. Sprintson and X. Zhang

Faculty Recruitment and Hiring Committee

This committee helps identify and recommend the best candidates to fill available faculty, professor of practice and lecture positions. This committee advertises the available openings and evaluates the credentials of applicants for both tenure and non-tenure positions and makes recommendations to the tenure and promotion committee. Members of this committee are appointed by the faculty advisory committee and Department Head. The Associate Department Head serves as chair for this committee.
Committee Members: S. Wright (Committee Chair), N. Duffield, M. Kezunovic, P. Li, K. Narayanan, S. Palermo, H. Wang and L. Xie

Staff and Faculty Internal Awards Committee
This committee solicits nominations for various faculty and staff TAMU awards and makes recommendations to the ECE Department Head for these awards. These members are appointed by Department Head and Graduate Advisory Committee.

Committee Members: S. Miller (Committee Chair), Ex Officio Member: D. Hanson, and appointed members, U. Braga-Neto, G. Choi, O. Eknoyan, P. Hemmer, J. Kameoka, W. Shi, P. Yu and J. Zou

Former Students and External Relations Committee
This ad-hoc committee interacts with our former students to foster interaction between corporations and the ECE Department. This committee makes recommendations to the Department Head to increase the visibility of the ECE Department. As part of the strategic plan to improve the quality of the graduate program, we are seeking funds for a multi-million dollar endowment to attract top talent to our graduate program and support them during part of their research program. These funds will also be used to support other department initiatives such as the improvement of teaching facilities and laboratory updates. This committee recommends strategies to achieve these goals.

Committee Members: Department Head Miroslav Begovic and Committee Chair, P. Cantrell, with appointed members: R. Harris, G. Huff, M. Kezunovic, P. R. Kumar, S. Palermo, P. Rentzepis, D. Russell and M. Weichold.

C. Fiscal Information

Budget Information
Table 5 shows the gold plate budget for the ECE department over the past five fiscal years. Research funding is illustrated for the same time period in Table 6. Research funding comes in the form of contracts, grants and gifts. In Table 6, contract and grant expenditures are listed under Direct Research Expenditures while Gifts are listed separately. In the case of gifts, the broad areas for their use can be specified, but no deliverables are promised. A portion of each contract or grant is withheld by the Texas Engineering Experiment Station (TEES) as overhead. The current overhead rate is 48.5% of the direct costs of the project. Some portion of that overhead is returned to the department and is listed in Table 6 as “TEES Overhead Return.” During the last 3 years, the total external funding for the department fluctuates between $18M and $20.88M.
Table 5 – TAMU Funding for the ECE Department

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Faculty and Staff Salaries</td>
<td>7,929,225.00</td>
<td>7,819,775.00</td>
<td>7,768,167.00</td>
<td>7,921,699.00</td>
<td>8,780,146.00</td>
</tr>
<tr>
<td>Operating Expenses</td>
<td>215,452.00</td>
<td>215,452.00</td>
<td>215,452.00</td>
<td>215,452.00</td>
<td>215,452.00</td>
</tr>
<tr>
<td>GA Salaries</td>
<td>688,610.26</td>
<td>638,821.04</td>
<td>650,843.07</td>
<td>710,947.62</td>
<td>829,940.01</td>
</tr>
<tr>
<td>Total Operating &amp; Salaries</td>
<td>8,833,287.26</td>
<td>8,674,048.04</td>
<td>8,634,462.07</td>
<td>8,848,098.62</td>
<td>9,825,538.01</td>
</tr>
</tbody>
</table>

Table 6 – External Funding for the ECE Department

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Direct Research Expenditures</td>
<td>14,575,045.36</td>
<td>16,173,652.13</td>
<td>15,793,770.25</td>
<td>18,182,692.45</td>
<td>16,003,216.14</td>
</tr>
<tr>
<td>TEES Overhead Return</td>
<td>1,667,020.44</td>
<td>1,687,983.85</td>
<td>1,726,245.11</td>
<td>1,824,596.77</td>
<td>1,765,303.29</td>
</tr>
<tr>
<td>Gifts</td>
<td>928,398.51</td>
<td>870,203.00</td>
<td>885,190.00</td>
<td>873,058.36</td>
<td>309,015.00</td>
</tr>
<tr>
<td>Total External Funding</td>
<td>17,170,464.31</td>
<td>18,731,838.98</td>
<td>18,405,205.36</td>
<td>20,880,347.58</td>
<td>18,077,534.43</td>
</tr>
</tbody>
</table>

Faculty Salaries

Table 7 shows statistics of faculty salaries broken down by rank. Faculty salaries are set by the Department Head. Each faculty member must submit a yearly activity report to the Department Head. After reviewing these reports and meeting with each faculty individually to discuss these reports, the Department Head determines the amount of each faculty member’s raise in salary for the next academic year.

Table 7 – Faculty Salaries by Rank

<table>
<thead>
<tr>
<th>Monthly Salaries ($)</th>
<th>Professors</th>
<th>Associate Profs.</th>
<th>Assistant Profs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>20,176</td>
<td>11,200</td>
<td>9,961</td>
</tr>
<tr>
<td>Low</td>
<td>9,665</td>
<td>8,886</td>
<td>8,972</td>
</tr>
<tr>
<td>Median</td>
<td>13,088</td>
<td>10,030</td>
<td>9,409</td>
</tr>
<tr>
<td>Average</td>
<td>13,727</td>
<td>10,012</td>
<td>9,407</td>
</tr>
</tbody>
</table>
IV. Graduate Program

A. Research

Currently the Department of Electrical and Computer Engineering is composed of seven research groups. A brief description of these groups follows.

**Analog and Mixed Signal Group.** The mission of the Analog & Mixed-Signal Center is to contribute to the advancement of the state-of-the-art in the area of analog mixed-signal circuits and systems. The center will play a key role in the education and training of highly qualified engineers for design and manufacturability of analog and mixed-signal integrated systems. Analog and mixed-signal research areas in the Analog and Mixed Signal Center include high speed electrical and optical I/O interfaces, clock recovery systems, RF transceivers, cognitive radio systems spectral scanning, harvesting circuits, RF MEMS, active and passive sensors, mm-wave circuits, robust signal processing, low-voltage, high-performance analog circuit design; analog mixed-mode fault diagnosis of integrated circuits, power management, and bio-medical circuits and systems.

A central focus in the VLSI design program is the practical implementation of concepts on silicon. In the VLSI design-related research projects, emphasis is placed upon experimentally verifying research concepts on silicon. This experience is positively reflected in the job opportunities available to graduates of the program. Although a modern internal solid-state laboratory is actively supported by the Electrical Engineering Department, all fabrication of research projects in the VLSI design program is directed to external foundries. Several foundries are available for this purpose, but the major source is the NSF supported MOSIS program which offers quick and predictable turn-around and a reasonably broad spectrum of basic processes. Our laboratory has access to advanced fabrication technologies thanks to and through collaboration programs established with Texas Instruments, Qualcomm, TSMC, NXP, Hewlett Packard, Sandia National Laboratories and Tower-Jazz. The Analog and Mixed Signal Center’s website is at http://amsc.tamu.edu/

**Biomedical Imaging, Sensing and Genomic Signal Processing.** The Biomedical Imaging, Sensing and Genomic Signal Processing group brings together faculty members from a number of different disciplines to focus on the acquisition and analysis of biomedical images and signals.
genomic signal processing, and nano/micro systems for bio/medical applications. A set of core courses provides the student with a background in medical imaging instrumentation, image processing and analysis, genomic signal processing, and biosensing; furthermore, elective courses are available in all areas. Laboratories have been established in magnetic resonance imaging, ultrasound imaging, genomic signal processing, and integrated micro/nano/bio systems.

The Magnetic Resonance Systems Laboratory houses several experimental MRI systems devoted to the development of MRI and MRS instrumentation and applications. The facility consists of separate teaching and research laboratories. The Genomic Signal Processing (GSP) Laboratory focuses on the engineering discipline that studies the processing of genomic signals. Owing to the major role played in genomics by transcriptional signaling and related pathway modeling, it is only natural that the theory of signal processing should be utilized in both structural and functional understanding. The aim of GSP is to integrate the theory and methods of signal processing with the global understanding of functional genomics, with special emphasis on genomic regulation. Hence, GSP encompasses various methodologies concerning expression profiles: detection, prediction, classification, control, and statistical and dynamical modeling of gene networks. GSP is a fundamental discipline that brings to genomics the structural model-based analysis and synthesis that form the basis of mathematically rigorous engineering. The NanoBio Systems Laboratory works on developing micro and nanofluidic-based systems with integrated analysis techniques that enable fast and accurate analysis at low cost and portable settings. Micro and nanofabrication of silicon, glass, and polymer are being used to develop miniaturized systems for cellular and molecular analysis. This lab is particularly interested in developing systems that can analyze and control various physiological properties of individual cells in an array format. Cancer cells and neuronal cells are of particular interest. The lab is also utilizing the unique properties of micro and nano scale fluidic phenomena to develop novel systems and interface those systems with biological systems. The research laboratory includes a microfluidic experimental station, fluidic simulation station, and various polymer micro and nanofabrication equipment for the fabrication and characterization of miniaturized micro and nano systems for biological analysis. The Biomedical Imaging, Sensing and Genomic Signal Processing group’s website is at https://engineering.tamu.edu/electrical/research/biomedical-imaging-sensing-genomic-signal-processing

**Computer Engineering and Systems Group.** The computer engineering and systems group’s primary goal is to provide the highest quality education for students pursuing graduate degrees in
the computer engineering research field. TAMU’s computer engineering program offers research opportunities in the areas of computer communications and networks, data science, multimedia, storage systems, parallel and distributed computing and architecture, fault-tolerant computing and design for testing, computer aided design and testing tools, very-large-scale integration (VLSI) design and technologies, high-speed networks and architecture, intelligent systems and controls, and real-time systems and their architecture.

Research in the VLSI circuits and systems area is focused on electronic design automation (EDA) of digital and analog circuits as well as VLSI design. Current research projects cover all strategically important areas, including logic synthesis, layout synthesis, modeling, simulation, low power, reliability, testing, design for manufacturability, hardware/software co-design, application specific integrated circuits (ASICs), system-on-silicon (SOC), and hardware acceleration of EDA algorithms. Research in computer aided design and synthesis is focused on optimization for energy-efficient VLSI circuits, design for testability, on-chip communication fabrics, dynamic power management, adaptive circuit design, interactions between physical design and system-level design, and heuristics for large scale combinatorial optimization. Research in the computer architecture area is focused on security, power, reliability and performance of the future chip-multiprocessor (CMP) and multiprocessor system-on-chip (MPSoC) designs as well as computer arithmetic. The computer networks area is focused on network protocols, routing algorithms, quality of service (QOS), security, survivability, support for multimedia, network coding, wireless communication networks and wireless sensor networks. Research in the systems area is focused on fault-tolerant systems, storage and file systems, computer architecture, and multiprocessors on a chip. The Computer Engineering Systems Group website can be found at https://engineering.tamu.edu/electrical/research/computer-engineering-systems-group

Electromagnetics and Microwaves Group. Research activities in electromagnetics and microwaves span a broad spectrum of applications. In particular, the theoretical and experimental aspects of antennas, electromagnetic theory, electromagnetic wave scattering, active and passive microwave and millimeter wave circuits, linear and nonlinear optical or microwave guiding systems, and microstrip antennas. Research activities cover a broad spectrum of applications from space to medicine. In particular, The Electromagnetics and Microwave Lab (EML) research
focuses on both the theoretical and experimental aspects of antennas, electromagnetic theory, electromagnetic wave scattering, active and passive microwave and millimeter wave circuits, microwave wireless communications, wavelet technology, phased array antennas, and microstrip antennas. Significant progress has been made at the EML in active antennas and power combining, microwave integrated circuits and antennas, microwave power transmission, magnetic resonance imaging, Green's functions and numerical methods, ground penetration radar, and wavelet techniques.

The EML emphasizes both basic and applied research, theoretical, and experimental work. Various courses have been developed to train our students. Our measurement capability has improved dramatically thanks to equipment grants from the NSF, NASA, HP, Texas Engineering Experimental Station, and the Permanent University Fund. Over $1 million has been spent on a vector network analyzer operating up to 100 GHz, the antenna measurement anechoic chamber, circuit etching facility, computers, and other general measurement equipment. The EML website can be found at http://ece.tamu.edu/~eml/.

**Electric Power Systems & Power Electronics.** Faculty expertise from both power systems and power electronics is frequently combined in research activities. Power systems research is performed in the areas of analysis, reliability, monitoring, control and protection of power systems. Some of the faculty also have a strong interest in control systems, digital signal processing, data communications, and intelligent system applications. Power electronics research is performed in the areas of motor drives, power electronic converters, utility interface issues, active filters, and electric and hybrid vehicle. Some of the faculty also have strong interest in power quality and diagnostics of electrical machines. Two major efforts constitute the program: Power Systems and Power Electronics

The Electric Power & Power Electronics Institute (EPPEI) is aimed at developing a partnership with industry where EPPEI faculty and students provide a variety of targeted services with tangible benefits; furthermore, industry provides funding for this joint effort. The Electric Power Institute
was formed in 1964 with a mission to foster research interactions between Texas A&M University and the power industry. After a 30-year history of successful service to the industry and a name update, the Electric Power & Power Electronics Institute (EPPEI) is the result of significant change due to the recent restructuring in the industry. With a new annual membership concept introduced in 1998, EPPEI is moving towards new forms of interaction with the industry. Research laboratories include electric machines and power electronics (EMPE), power electronics and a clean power research laboratory, power electronics and a motor drives laboratory, a power engineering laboratory, power system automation laboratory, power system control and protection laboratory, renewable energy, and an advanced power electronics research laboratory. This research group also houses the TEES Smart Grid Center. It’s website can be found at http://eppe.tamu.edu/index.htm

**Device Science and Nanotechnology.** The device science and nanotechnology program encompasses a wide range of research topics from electro-optics to quantum computing. The electro-optics program incorporates a range of technologies that make use of optical and electronic phenomena. Research areas of primary interest include fiber optics, integrated optics and semiconductor lasers. This group houses the Aggie fab facilities, devoted to the fabrication of advanced semiconductor devices and sensors. The Henry F. Taylor Nanofabrication Facility has its roots in the fabrication facilities developed over the years within the Solid State Group of the Electrical and Computer Engineering Department. The Nanofabrication Facility is located on the 7th floor of the Jack E. Brown Building and has over 4000 square feet of Class 100/1000 cleanroom space. The ECE department is currently building, operating, and maintaining the facility in conjunction with key faculty within the department who have chosen to partner in this effort through cost-sharing. The goal is for the facility to become a University-wide shared facility. The College of Engineering, through the Permanent University Fund, has provided for the acquisition of four new pieces of equipment: a reactive ion etcher, a plasma-enhanced chemical vapor deposition system, an electron beam evaporation system and a Karl Suss MA6 mask aligner. The AggieFab is a shared nano/micro fabrication facility located on the 7th floor of the Jack E. Brown Building and has over 4,000 square feet of ISO 14644-1 Class System ISO 5 and ISO 6 (Class 100/1000) cleanroom space. The facility is currently going through major upgrades, and additional information will be posted on their website as those upgrades become available. The Functional Thin Film Group is led by Professor Haiyan Wang in the Department of Electrical and Computer Engineering and is also affiliated with the Department of Materials Science and Engineering. Their research focuses on heteroepitaxial oxide thin films for magnetic and spintronic devices, new types of layered structures for room-temperature
multiferroism, high temperature superconductors and the flux-pinning mechanisms, lithium-ion thin film batteries and solid oxide fuel cells, microstructural characterization with in-situ TEM and atomic-scale scanning transmission electron microscopy and nanostructured nitrides and metals for nanoindentation and radiation laboratory. The Henry F. Taylor Nanofabrication Facility website can be found at http://www.ece.tamu.edu/~cmadsen/AggieFab/AggieFab_AboutUs.htm, and Professor Haiyan Wang’s Functional Thin Film Group website is at https://sites.google.com/site/haiyanwanggroup/.

**Information Science and Systems.** The ISS group research pertains to the acquisition, representation, protection, communication and extraction of information. Within this context, there are several research projects that include both fundamental research as well as applied research. Typical applications are in wireless networks, sensor networks, peer-to-peer networks, data storage systems, aircraft control, intelligent vehicular systems and robotics. Several research efforts in the group are relevant to the development of wireless standards such as 3G Cellular LTE, IEEE 802.16, Wi-Max, Wi-Gig, etc. This group provides an opportunity for students to acquire a wide variety of skills pertaining to ISS. Several of our faculty members have won prestigious national awards and have been recognized both internally and externally for their various contributions to research and education in engineering.

Research activities in the Information Science and Systems program are focused on advancing the state of the art in areas including information theory, coding theory, data compression, detection and estimation, receiver signal processing, networking coding and network information theory, multimedia security, secrecy systems, optimization techniques, robust control, adaptive control and control of multi-agent systems. Current research projects include both fundamental research in the above areas as well as applied research. Typical applications are in communication networks, wireless networks, sensor networks, data storage systems, aircraft control, intelligent vehicular systems and robotics.

Current research areas in the ISS group include coding theory, cognitive radio, data compression, data storage, detection and estimation, information theory, multimedia security, secrecy systems, networking/network coding, optimization techniques, queueing and delay-sensitive communication, sensor networks, statistical signal processing and wireless communications. Research areas in controls include adaptive control, control of multiple agents and robust control. The Information Sciences and Systems group website can be found at http://iss.ece.tamu.edu/.
Research Laboratories

Research in the department is conducted through research institutes, centers, and laboratories. The use of the terms “institute” and “center” at Texas A&M are restricted. The establishment of institutes and centers is a complicated process and requires the approval of the Board of Regents. Currently there is one institute in the department, the Electric Power and Power Electronic Institute, and two centers, the Smart Grid Center and the Analog and Mixed Signal Center. In addition, there are numerous labs in the department, which range from that of a single faculty member and a few students to a dozen faculty and more than 60 students. A complete list of the various research labs by focus group is provided in Table 8. Further details on any of these labs can be found by visiting the department website at http://engineering.tamu.edu/electrical.

Table 8 – Research Labs in the ECE Department

<table>
<thead>
<tr>
<th>Group</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMS</td>
<td>Analog and Mixed Signal Laboratory</td>
</tr>
<tr>
<td>BIO/IM/GSP</td>
<td>Genomic Signal Processing Laboratory</td>
</tr>
<tr>
<td></td>
<td>Magnetic Resonance Systems Laboratory</td>
</tr>
<tr>
<td></td>
<td>NanoBio Systems Laboratory</td>
</tr>
<tr>
<td></td>
<td>Sensing, Imaging and Communication Systems Laboratory</td>
</tr>
<tr>
<td></td>
<td>Ultrasound Imaging Laboratory</td>
</tr>
<tr>
<td>CEEN</td>
<td>Multimedia Laboratory</td>
</tr>
<tr>
<td></td>
<td>Multimedia Communication and Networking Laboratory</td>
</tr>
<tr>
<td></td>
<td>Parallel &amp; High Performance Laboratory</td>
</tr>
<tr>
<td></td>
<td>Reliability and Testing Laboratory</td>
</tr>
<tr>
<td></td>
<td>Storage Systems Laboratory</td>
</tr>
<tr>
<td></td>
<td>VLSI Computer-Aided Design (CAD) Laboratory</td>
</tr>
<tr>
<td>EM</td>
<td>Electro-Magnetics and Microwaves Laboratory</td>
</tr>
<tr>
<td></td>
<td>Sensing, Imaging and Communications Systems Laboratory</td>
</tr>
<tr>
<td>EPPE</td>
<td>Advanced Electric Machines and Power Electronics (EMPE) Laboratory</td>
</tr>
<tr>
<td></td>
<td>Downed Conductor Test Facility</td>
</tr>
<tr>
<td></td>
<td>Electric Machines and Power Laboratory</td>
</tr>
<tr>
<td></td>
<td>Electronics Laboratory</td>
</tr>
<tr>
<td></td>
<td>Fuel Cell Power Conditioning Laboratory</td>
</tr>
<tr>
<td></td>
<td>Power Electronics and Clean Power Research Laboratory</td>
</tr>
<tr>
<td></td>
<td>Power Electronics, Motor Drives and Advanced Vehicle Systems Laboratory</td>
</tr>
<tr>
<td></td>
<td>Power Engineering Laboratory</td>
</tr>
</tbody>
</table>
Power Quality Laboratory
Power System Automation Laboratory
Power System Control and Protection Laboratory
Smoke Detector Test Facility

**DS/Nano**
- Electro-optics Laboratory
- Fiber Optics Laboratory
- Fluctuation and Noise Exploitation Laboratory
- Functional Thin Film Laboratory
- Nanofabrication Cleanroom Facility
- Semiconductor Laboratory Sensing, Imaging and Communications Systems Laboratory
- VLSI Laboratory

**ISS**
- Control Engineering Laboratory
- Digital Signal Processing Laboratory
- Multimedia Laboratory
- Wireless Communications Laboratory (WCL)

**Publication Statistics**

The publication activity of the ECE Department faculty is shown in Table 9. Also shown is the number of editorial positions held within the department. Given the number of faculty in the department, which has ranged from around 58 at the beginning of the 2008-2009 time period shown here to 72 at the end (2013-2014), it can be seen that a majority of the faculty in the department are holding editorial positions as well as other professional service activities, which brings high visibility to the program. The average peer publication rate is 3.7 journal papers per faculty.

<table>
<thead>
<tr>
<th>Academic Year</th>
<th># of Refereed Journal Publications</th>
<th># of Conference Publications</th>
<th># of Editor/Assoc. Editorships</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008-2009</td>
<td>272</td>
<td>368</td>
<td>56</td>
</tr>
<tr>
<td>2009-2010</td>
<td>241</td>
<td>324</td>
<td>31</td>
</tr>
<tr>
<td>2010-2011</td>
<td>240</td>
<td>289</td>
<td>50</td>
</tr>
<tr>
<td>2011-2012</td>
<td>257</td>
<td>272</td>
<td>51</td>
</tr>
<tr>
<td>2012-2013</td>
<td>307</td>
<td>307</td>
<td>57</td>
</tr>
<tr>
<td>2013-2014</td>
<td>272</td>
<td>296</td>
<td>71</td>
</tr>
</tbody>
</table>
Sources of Funding

Funding for research efforts in the department comes from a variety of sources. Table 10 shows a submitted proposal history over the past 10 years along with the success ratio. For year 2014, we submitted 2.5 formal proposals per faculty with a success rate of 28.2%. Table 11 shows the distribution of the sources of research funding for the department. Table 11 also shows that a significant part of our research funding comes from federal government agencies, which includes sources such as NSF, NIH, DoE and various DoD agencies. Foreign funding is quite significant and mainly comes from the Qatar Foundation. Private industry contributes a significant amount as well. Total external research funding was shown previously in Table 6 in Section III-C. The proposals submission success during the last five years on record (2010-2015) has fluctuated between 28% and 42%.

### Table 10 - Ten Year Proposal History

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Formal Proposals</th>
<th>Informal Proposals</th>
<th>Total Proposals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount</td>
<td>Submit Count</td>
<td>Award Count</td>
</tr>
<tr>
<td>2006</td>
<td>34,042,928.44</td>
<td>120</td>
<td>35</td>
</tr>
<tr>
<td>2007</td>
<td>61,112,590.40</td>
<td>190</td>
<td>63</td>
</tr>
<tr>
<td>2008</td>
<td>45,685,566.30</td>
<td>164</td>
<td>19</td>
</tr>
<tr>
<td>2009</td>
<td>107,469,768.60</td>
<td>254</td>
<td>62</td>
</tr>
<tr>
<td>2010</td>
<td>126,234,960.85</td>
<td>260</td>
<td>55</td>
</tr>
<tr>
<td>2011</td>
<td>94,955,230.05</td>
<td>228</td>
<td>61</td>
</tr>
<tr>
<td>2012</td>
<td>88,440,492.52</td>
<td>196</td>
<td>61</td>
</tr>
<tr>
<td>2013</td>
<td>69,773,902.61</td>
<td>153</td>
<td>50</td>
</tr>
<tr>
<td>2014</td>
<td>77,902,434.46</td>
<td>181</td>
<td>51</td>
</tr>
<tr>
<td>2015</td>
<td>75,608,328.73</td>
<td>224</td>
<td>47</td>
</tr>
</tbody>
</table>

### Table 11 – Source of Awards

<table>
<thead>
<tr>
<th>Funding Source</th>
<th>Fiscal Year 2014</th>
<th>Fiscal Year 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Award Amount</td>
<td>% of Total</td>
</tr>
<tr>
<td>Federal</td>
<td>6,172,990.00</td>
<td>49.27%</td>
</tr>
<tr>
<td>Federal Flow-through</td>
<td>1,827,432.00</td>
<td>14.59%</td>
</tr>
<tr>
<td>Foreign</td>
<td>2,365,257.60</td>
<td>18.88%</td>
</tr>
<tr>
<td>Non-Profit Organization</td>
<td>203,083.00</td>
<td>1.62%</td>
</tr>
<tr>
<td>Private</td>
<td>1,078,777.00</td>
<td>8.61%</td>
</tr>
<tr>
<td>Private University</td>
<td>88,495.65</td>
<td>0.71%</td>
</tr>
<tr>
<td>State Agency – Non-TX</td>
<td>230,000.00</td>
<td>1.84%</td>
</tr>
<tr>
<td>State Agency TX</td>
<td>563,299.00</td>
<td>4.50%</td>
</tr>
<tr>
<td>Total</td>
<td>12,529,334.25</td>
<td>100%</td>
</tr>
</tbody>
</table>
B. Education Programs

Degrees Offered/Program Requirements

The department offers degree programs in both electrical engineering and computer engineering. In both cases, there are three different degree programs: Doctor of Philosophy (PhD), Master of Science (MS) and Master of Engineering (MEN). The MS programs are a research-oriented master’s degree and require the completion of a master’s thesis while the MEN programs are our non-thesis master’s degrees and consist primarily of coursework. The following paragraphs give an overview of the degree requirements for each degree program. Full details are provided in Appendix A in the Graduate Student Handbook which is provided to all incoming students at orientation or when they check in with the graduate office upon arriving on campus.

Doctor of Philosophy

Students who already have a master’s degree upon entering the PhD program are required to complete 18 hours of “classroom” work and a total of 64 credit hours. We also offer what is referred to as a “direct PhD” whereby a student can enter the PhD program directly upon completion of their bachelor’s degree. In that case, the student is required to complete 42 hours of “classroom” work and 96 hours overall. Details of restrictions on the use of undergraduate courses, directed studies, seminars, etc. are provided in Appendix B. PhD students are required to pass a qualifying examination which consists of a written 3-hour departmental exam, a preliminary examination which consists of an oral examination and a final defense of their dissertation. The qualifying examination is administered by the ECE Department through the Graduate School office while the preliminary and final examinations are administered by the student’s supervisory committee. Details of the examinations are provided in the next section.

Master of Science

The MS program requires a total of 32 credit hours of which 24 hours must be “classroom” work. The remaining eight hours are generally covered by research, internship, or directed studies hours. The MS student is also required to conduct research and defend a thesis based on that research. There is no comprehensive examination for the MS degree programs.

Master of Engineering

The MEN degree is a purely coursework degree. The degree program requires 30 credit hours of which 27 must be traditional “classroom” work. The remaining three hours can be filled with additional coursework or with directed studies, internship, or seminar hours. Details are given in Appendix B.

Student Supervisory Committees and Examinations

For the MS and PhD degrees, the student, with the advice and consent of his/her supervisor,
will form a supervisory committee. That committee will consist of at least four faculty members. At least two committee members are to be from within the student’s focus area; one is to be from within the department but outside of the focus area, and one committee member is to be from outside of the department. Here, focus area refers to the seven administrative groups in the department. For example, a student who is conducting research within the Analog and Mixed Signal (AMS) area would have two committee members from the AMS group, one member from within the department but outside of the AMS group, and one outside the department. It is understood that many faculty members have interests that may span several groups. Hence, for the purposes of committee assignments, each faculty member is considered to have one primary group affiliation. One exception to the above committee structure requirements is that MS students in the computer engineering program are allowed to have a committee consisting of only three members (two from within the CE group and one from outside the department).

The qualifying examination is administered twice a year. This year the qualifying examination was offered the Friday before the beginning of the Spring semester (January 15, 2016), and the next one will be applied on June 8, 2016. Incoming 64-hour PhD students are required to take the exam within one year of starting the program, while incoming direct 96-hour PhD students are required to take the exam within two years of starting the program. Students entering the program with a previous degree outside of electrical or computer engineering are allowed an extra year with the approval of their advisor and will be required to take the exam by the end of the second year. Those students that fail the examination are given a second chance to retake the exam which must be taken at the next scheduled session in which the exam is offered. Those that fail the examination twice will be removed from the PhD program. They can complete the requirements of the MS or MEN programs if the GSC committee allows them to.

The preliminary examination for PhD students consists of an oral examination based on student research. It is required that 96-hour PhD students schedule their preliminary examination by the end of the second year in the program. PhD students who did not previously obtain a master’s degree (i.e, direct PhDs) are allowed an extra year before they must schedule their exam. Typically, students will give an oral presentation on a topic related to their proposed area of research. In many cases, students will have made some initial progress in their research and will present a summary of their progress during the oral exam, but this is not necessary. The supervisory committee will question the candidate in order to determine if the student has the required background necessary to perform research in the proposed field. Often the committee will also provide follow-up questions on fundamentals in related areas. After the oral examination is completed, each committee member will cast a pass/fail vote. The student is determined to have passed the preliminary examination if no more than one failing vote is cast.

PhD candidates must also provide a written proposal for their dissertation that is not to exceed 10 pages. The student’s supervisory committee must approve this proposal. Often this is done in conjunction with the oral preliminary examination, but this can be done later for those who take the preliminary exam early in their program.

Finally, at the end of the program, the PhD candidate must defend his or her dissertation in
an oral examination. Typically, this exam is made open to faculty and graduate students if the committee agrees. Each committee member must also approve the written dissertation.

Similar to the PhD students, MS students must provide a research proposal which is approved by the supervisory committee and then defend their thesis in an oral examination. Committee members must also approve the written thesis. No preliminary or qualifying exam is required for the MS degree.

National Rankings

Table 12 shows a history of graduate program rankings as compiled by the US News & World Report. In that table, the entry “NR” means that the program did not make the ranking in that year. Rankings among both public institutions and among all schools are shown in the table.

Table 12 – US News & World Report Graduate Program Rankings

<table>
<thead>
<tr>
<th>Year Results Released</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>20</td>
<td>22</td>
<td>#</td>
<td>21</td>
<td>19</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>Public</td>
<td>12</td>
<td>14</td>
<td>#</td>
<td>13</td>
<td>12</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>CE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>20</td>
<td>NR</td>
<td>23</td>
<td>18</td>
<td>16</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Public</td>
<td>13</td>
<td>NR</td>
<td>14</td>
<td>11</td>
<td>11</td>
<td>13</td>
<td>13</td>
</tr>
</tbody>
</table>

## In 2011, U.S. News made a big mistake and miscalculated all rankings except for the overall standings and Electrical Engineering.

Graduation Rates

Table 13 shows the number of graduates for each program by semester for the past 5 years. The number of PhD students who graduated at the end of the fall 2015 semester is significantly smaller than in previous years. The PhD enrollment, however, is quite stable as shown in Table 15. We do not expect this decrease in fall 2015 to be a trend. It is expected that the number of graduates at the end of the spring 2016 semester will significantly increase.

C. Student Profiles

Graduate Student Cross Sections

As with most engineering programs throughout the country, our graduate program is largely composed of international students. While the department is aggressively recruiting domestic students for the graduate program, and the numbers do seem to be slowly decreasing, we are currently attracting domestic talent through faculty RA offerings, 10 TAs specifically devoted to incoming domestic students, merit and diversity fellowships as well as GEM fellowships. Over 100 domestic student applications have received for fall 2016. Top Hispanic and African-American students are currently consider for COE diversity fellowships.
Table 13 – Number of Graduates by Program and by Semester

<table>
<thead>
<tr>
<th>Semester</th>
<th>Electrical Engineering</th>
<th>Computer Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MEN</td>
<td>MS</td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>14</td>
<td>66</td>
</tr>
<tr>
<td>Summer</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Spring</td>
<td>19</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>82</td>
</tr>
<tr>
<td>2014</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>21</td>
<td>10</td>
</tr>
<tr>
<td>Summer</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Spring</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>28</td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>17</td>
<td>4</td>
</tr>
<tr>
<td>Summer</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Spring</td>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>14</td>
</tr>
<tr>
<td>2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>Summer</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Spring</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
<td>37</td>
</tr>
<tr>
<td>2011</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>Summer</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Spring</td>
<td>27</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>48</td>
<td>39</td>
</tr>
</tbody>
</table>

Table 14 below shows statistics of the composition of our graduate student body over the last five years based on 12th class day rosters. Tables 15-16 show a more detailed cross-section of our incoming graduate classes over the last three years. While our graduate student body remains largely dominated by students from India and China, the steady increase during the last three years in the percentage of students from the USA category shows that we are increasing the recruitment of domestic talent. Top domestic students are attracted through a number of TAs and RAs from faculty as well as merit, diversity and GEM fellowships. The percentage in the category of “others” show that we are building a more internationally diverse student body.
Table 14 – Composition of Graduate Students in the ECE Department

<table>
<thead>
<tr>
<th>Semester</th>
<th>Domestic (% of total)</th>
<th>Female (% of total)</th>
<th>Minority (% of total)</th>
<th>Total Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2010</td>
<td>119 (21%)</td>
<td>83 (15%)</td>
<td>48 (40%)</td>
<td>552</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>107 (19%)</td>
<td>67 (12%)</td>
<td>48 (45%)</td>
<td>543</td>
</tr>
<tr>
<td>Fall 2012</td>
<td>106 (19%)</td>
<td>76 (13%)</td>
<td>51 (48%)</td>
<td>562</td>
</tr>
<tr>
<td>Fall 2013</td>
<td>97 (15%)</td>
<td>86 (14%)</td>
<td>45 (46%)</td>
<td>622</td>
</tr>
<tr>
<td>Fall 2014</td>
<td>89 (12%)</td>
<td>116 (16%)</td>
<td>38 (43%)</td>
<td>724</td>
</tr>
<tr>
<td>Fall 2015</td>
<td>87 (11.8%)</td>
<td>125 (17%)</td>
<td>29 (33%)</td>
<td>736</td>
</tr>
</tbody>
</table>

Table 15 – New Graduate Students by Degree Program and Group

<table>
<thead>
<tr>
<th>Area</th>
<th>Fall 2015</th>
<th>Fall 2014</th>
<th>Fall 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MEN</td>
<td>MS</td>
<td>PhD</td>
</tr>
<tr>
<td>AMS</td>
<td>0</td>
<td>24</td>
<td>5</td>
</tr>
<tr>
<td>Bio/GSP</td>
<td>6</td>
<td>25</td>
<td>6</td>
</tr>
<tr>
<td>CEEN</td>
<td>3</td>
<td>26</td>
<td>8</td>
</tr>
<tr>
<td>EM</td>
<td>0</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>EPPE</td>
<td>9</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>SS/Nano</td>
<td>3</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>ISS</td>
<td>2</td>
<td>36</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>132</td>
<td>28</td>
</tr>
</tbody>
</table>

Table 16 New Graduate Students by Nationality

<table>
<thead>
<tr>
<th>Country</th>
<th>Fall 2015</th>
<th>Fall 2014</th>
<th>Fall 2013</th>
<th>Fall 2012</th>
<th>Fall 2011</th>
<th>Fall 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>247 (43.7%)</td>
<td>261 (44.5%)</td>
<td>344 (55.4%)</td>
<td>268 (52%)</td>
<td>244 (51.2%)</td>
<td>31 (22%)</td>
</tr>
<tr>
<td>India</td>
<td>150 (26.5%)</td>
<td>156 (26.6%)</td>
<td>136 (21.9%)</td>
<td>55 (10.8%)</td>
<td>80 (16.8%)</td>
<td>41 (29%)</td>
</tr>
<tr>
<td>USA</td>
<td>53 (9.4%)</td>
<td>50 (8.5%)</td>
<td>35 (5.6%)</td>
<td>62 (12.2%)</td>
<td>46 (9.6%)</td>
<td>21 (15%)</td>
</tr>
<tr>
<td>Korea</td>
<td>13 (2.3%)</td>
<td>20 (3.4%)</td>
<td>27 (4.3%)</td>
<td>23 (4.5%)</td>
<td>22 (4.6%)</td>
<td>5 (3%)</td>
</tr>
<tr>
<td>Taiwan</td>
<td>19 (3.3%)</td>
<td>18 (3.1%)</td>
<td>5 (0.8%)</td>
<td>9 (1.8%)</td>
<td>17 (3.6%)</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Others</td>
<td>83 (14.7%)</td>
<td>82 (14%)</td>
<td>74 (11.9%)</td>
<td>90 (17.8%)</td>
<td>68 (14.3%)</td>
<td>38 (27%)</td>
</tr>
</tbody>
</table>
**Standardized Test Scores**

Average GRE scores for incoming graduate students are shown in Table 17. During years 2012–2014, we listed the scores using both old (with a maximum of 800 points for GRE quantitative and verbal) and new (maximum set at 170 points for both GRE quantitative and verbal) GRE scores. 2015 GRE scores using the old scale are not included in the table because only 18 students took the test; average scores for these students were GRE(Q)=768, GRE(V)=487 and GRE(W)=3.25. The GRE(Q) scores of the international students are consistently high, while the GRE(Q) scores of domestic students are usually lower; e.g., for Fall 2015 domestic students GRE(Q)=160, but GRE(V)=156 and GRE(W)=4.0. In accordance with Table 17, the average of GRE(Q) was consistently maintained above 163, and our target is to uphold it above 166, while GRE(V) should be kept above 155.

<table>
<thead>
<tr>
<th>Semester</th>
<th>GRE (Q) Old/New</th>
<th>GRE (V) Old/New</th>
<th>GRE (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2011</td>
<td>776</td>
<td>555</td>
<td>4.4</td>
</tr>
<tr>
<td>Fall 2012</td>
<td>789/163</td>
<td>562/152</td>
<td>3.56</td>
</tr>
<tr>
<td>Fall 2013</td>
<td>791/165</td>
<td>574/153</td>
<td>3.4</td>
</tr>
<tr>
<td>Fall 2014</td>
<td>786/164</td>
<td>562/152</td>
<td>3.28</td>
</tr>
<tr>
<td>Fall 2015</td>
<td>NA/165</td>
<td>NA/152</td>
<td>3.35</td>
</tr>
</tbody>
</table>

**Graduate Student Applications**

The number of students that enter the program each year is roughly controlled by the number of admissions we grant. As seen in Table 18, over the past several years, we have seen a fairly consistent retention rate (students that show up versus students accepted) hovering around 35%. Hence, we typically admit about three times more students than we would like to see attend. We did have an anomaly in the Fall Semester of 2014 where the percentage of admitted students that actually attended rose inexplicably to 41.2%. This created a substantially larger class than intended. If this change in the retention rate continues, then we will have to dramatically reduce the number of admissions. Applications for the year 2015 are over 2,250. Unfortunately, we have had to turn away many very qualified applicants in order to keep the enrollment numbers to a manageable level. In Fall 2015, we received 2,074 applications, and extended 563 acceptance letters which represents an acceptance rate of 27.1%; only 190 students showed up leading to an overall student hiring rate of 9.1%.

It should be noted that a very positive trend can be seen from the data in Table 18. Although our selectivity has hovered around 33% over the last seven years (and somewhat higher in 2014), our retention rate is steadily increasing. That is, even though we are remaining just as careful about who we admit, we are able to convince more of those students that accept our invitation to visit based on their acceptance to attend our program. This seems to indicate that applicants are viewing
our program more favorably than in the past. It appears that our reputation is improving among applicants to the graduate program. This is also confirmed by the large volume of applications we are receiving every year.

Table 18 – Applications to the ECE Graduate Programs by Semester

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th></th>
<th></th>
<th>2011</th>
<th></th>
<th></th>
<th>2012</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spr</td>
<td>Sum</td>
<td>Fall</td>
<td>Spr</td>
<td>Sum</td>
<td>Fall</td>
<td>Spr</td>
<td>Sum</td>
<td>Fall</td>
</tr>
<tr>
<td>Denied</td>
<td>74</td>
<td>0</td>
<td>1598</td>
<td>65</td>
<td>0</td>
<td>1735</td>
<td>83</td>
<td>0</td>
<td>1485</td>
</tr>
<tr>
<td>Accepted</td>
<td>37</td>
<td>3</td>
<td>389</td>
<td>41</td>
<td>1</td>
<td>477</td>
<td>39</td>
<td>0</td>
<td>506</td>
</tr>
<tr>
<td>Total</td>
<td>111</td>
<td>3</td>
<td>1987</td>
<td>106</td>
<td>1</td>
<td>2212</td>
<td>122</td>
<td>0</td>
<td>1991</td>
</tr>
<tr>
<td>Selectivity (%)</td>
<td>66.7%</td>
<td>0.0%</td>
<td>80.4%</td>
<td>61.3%</td>
<td>0.0%</td>
<td>78.4%</td>
<td>68.0%</td>
<td>0.0%</td>
<td>74.6%</td>
</tr>
<tr>
<td>Attended</td>
<td>23</td>
<td>4</td>
<td>138</td>
<td>20</td>
<td>0</td>
<td>109</td>
<td>15</td>
<td>0</td>
<td>145</td>
</tr>
<tr>
<td>Retention Rate</td>
<td>39%</td>
<td></td>
<td></td>
<td>25%</td>
<td></td>
<td></td>
<td>29%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|                  | 2013  |       |       | 2014  |       |       | 2015  |       |       |
|                  | Spr   | Sum   | Fall  | Spr   | Sum   | Fall  | Spr   | Sum   | Fall  |
| Denied           | 62    | 0     | 1713  | 148   | 0     | 1660  | 160   | 1     | 1511  |
| Accepted         | 50    | 2     | 620   | 30    | 4     | 587   | 20    | 3     | 568   |
| Total            | 112   | 2     | 2333  | 178   | 4     | 2427  | 180   | 4     | 2079  |
| Selectivity (%)  | 55.4% | 0.0%  | 73.4% | 83.1% | 0.0%  | 73.9% | 88.9% | 25.0% | 72.7% |
| Attended         | 23    | 2     | 186   | 18    | 1     | 237   | 5     | 3     | 183   |
| Retention Rate   | 31.40%|       |       | 41.20%|       |       | 33.80%|       |       |

Financial Support

Graduate students find financial support in a variety of forms. Research assistants (RAs) are funded by individual faculty members through contracts, grants and gift monies. Teaching Assistants (TAs) are hired by the department to teach the laboratory component of undergraduate and graduate lab courses. Some students are also hired as Graduate Assistant–Non-Teaching (GANT) appointees. These students usually have responsibilities that are not research oriented and do not involve direct teaching of students. For example, the department webmaster is usually hired as a GANT or a student may be hired to help a professor develop new material for a course, which may be introduced in a future semester. Many of our graduate students are also given fellowships or one-time scholarships. These awards do not require any particular service (i.e., research or teaching) on the part of the student, but rather provide a stipend to support the student’s studies. Fellowships come in a variety of amounts and from a variety of sources. One-time scholarships are typically in the amount of $1,000, but they also qualify the student to pay the in-state tuition rate. Fellowships also qualify the student for in-state tuition. For out-of-state students, the tuition break they receive is on the order of $5,000 per year, and is much larger than the stipend itself. Tables 19 and 20 show the number of students supported via these various mechanisms for the past several years.
The enrollment in 2014 PhD and MS programs was 337 and 218, respectively, leading to a total enrollment of research oriented students of 555 students. The number of RAs, TAs, and GANTs offered (not considering the $1000 one-time fellowships) during the Spring 2015 period was 210. A few fellowships for domestic students only were awarded by the COE (merit, fellowships and GEM) thereby increasing the support provided to graduate students. Usually 3-5 fellowships per department are awarded every year. Eighteen fellowships (nine in the spring semester and nine in the fall semester) were offered in FY 2015; most of these fellowships are due to endowments and gifts given by various companies.

<table>
<thead>
<tr>
<th>Support</th>
<th>FY 2011</th>
<th>FY 2012</th>
<th>FY 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall10</td>
<td>Spring11</td>
<td>Sum11</td>
</tr>
<tr>
<td>RA</td>
<td>165</td>
<td>165</td>
<td>138</td>
</tr>
<tr>
<td>TA</td>
<td>45</td>
<td>47</td>
<td>8</td>
</tr>
<tr>
<td>GANT</td>
<td>3</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Support</th>
<th>FY 2014</th>
<th>FY 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall14</td>
<td>Spring14</td>
</tr>
<tr>
<td>RA</td>
<td>144</td>
<td>148</td>
</tr>
<tr>
<td>TA</td>
<td>65</td>
<td>59</td>
</tr>
<tr>
<td>GANT</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>One-Time Scholarships</td>
<td>136</td>
<td>96</td>
<td>71</td>
<td>81</td>
<td>86</td>
<td>72</td>
</tr>
<tr>
<td>Fellowships</td>
<td>7</td>
<td>15</td>
<td>21</td>
<td>23</td>
<td>13</td>
<td>18</td>
</tr>
</tbody>
</table>

Internships

It is common for many of our graduate students to spend one or more semesters working at various industry or government labs on an internship. These internships offer valuable work experience as well as a source of funding to support their studies. They also offer students a chance to get a good foot in the door towards a potential full time job when they graduate. We have seen a substantial increase in the number of internships taken over the past few years especially during the summer semesters, as shown in Table 21. This is a sign of a healthy job market in the electrical and computer engineering fields and a high demand for our students.

<table>
<thead>
<tr>
<th>Table 21 – Number of Graduate Students on Internships by Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Spring</td>
</tr>
<tr>
<td>Summer</td>
</tr>
<tr>
<td>Fall</td>
</tr>
</tbody>
</table>
V. Strategic Plan/Program Assessment

In order to provide continual assessment of our graduate programs, the department has established a mechanism by which the effectiveness of its programs will be measured. Based on the ECE Department mission, we have established a set of core outcomes, which should be achieved by our graduate programs. The mission statement, set of outcomes, measures, and the data collection procedures are described in the following sections.

A. Mission Statement

The mission of the Department of Electrical and Computer Engineering is threefold:
- To create new knowledge and challenge minds by participation in the process of research, discovery and invention.
- To educate electrical and computer engineers with a solid background of fundamentals stretching their imaginations and preparing them for an exciting future.
- To serve society through research, education and outreach activities.

This mission statement has been in place for a number of years and encompasses all aspects of the department, not just the graduate programs.

B. Outcomes

In order to help the department fulfill its mission, the graduate program seeks to achieve the following outcomes:

- **Outcome 1**: The graduate programs in Electrical and Computer Engineering should attract top quality students.
- **Outcome 2**: The graduate programs in Electrical and Computer Engineering should produce graduate students capable of performing quality research.
- **Outcome 3**: The graduate programs in Electrical and Computer Engineering should produce students in demand by both industry and academia.

The second outcome would not necessarily apply to our master of engineering programs as those are non-research oriented degree programs. However, many of our MEN students have the necessary tools to participate in research activities, even though they may have not yet had such experiences.

C. Measures

The extent to which the graduate program is achieving these outcomes will be measured using the following metrics:

- **Outcome 1 – Quality of Incoming Students**
  - GRE and GPA scores of incoming graduate students
  - Admission selectivity
  - Number of students receiving prestigious fellowships (e.g., NSF fellowships, Hertz
Fellowships, Graduate Merit and Diversity Fellowships)

- **Outcome 2 – Quality of Student Research**
  - Number of student publications in journals and conferences
  - Number of student research awards (e.g., best paper and conference awards)
  - Number of patents

- **Outcome 3 – Demand of Graduates**
  - Salaries of graduates (as compared to national averages)
  - Percentage of graduates employed in engineering positions upon graduation or soon thereafter
  - Number of graduates in faculty positions

D. Data Collection

Data collection is coordinated through the TAMU Office of Graduate Studies. Statistics regarding the measures associated with Outcome 1 have been collected for a number of years. Some are presented in this self-study; the average GRE-Quantitative score during the last 3 years has fluctuated between 163 and 165, which is quite competitive with the top ten graduate programs. The current graduate admission selectivity is less than 10%. Statistics regarding the measures associated with Outcomes 2 and 3 have been collected through our departmental statistics and the use of an exit interview. Starting with the Fall 2008 semester, any time a graduate student applies for graduation, they are asked to complete an exit survey which provides us with the measures specified. Last year’s GPA of graduate PhD students was 3.73. On average, the graduated PhD students co-authored 4.5 conference and 2.9 journal papers and filed 0.15 patents/year. Most of our graduate students alternate between 1 and 3 industrial internships, especially during the summer. If not mandatory, internships are highly desirable for MEN students since we do not offer graduate summer classes.

The average salary offer for our PhD graduates has been around $89,355, which includes the low salaries received by students that joined as faculty in developing countries. Annual faculty salaries in developing countries can be as low as $15,000 per year. Typical job offers from high technology industries is around $110,000. The job offers for MS and MEN graduates have been quite similar averaging around $86,500. There is no major difference between job offers for MS and MEN job offers; that explain why the MEN program is becoming very attractive. MEN students usually finish the program in less than 2 years; e.g., three long semesters and a summer internship.

The Graduate Studies Committee reviews the data collected and makes recommendations for improvements on a yearly basis. The data provided by the GSC is further evaluated and discussed during the annual faculty retreat meeting. All data is given to the TAMU assessment office to allow further evaluation of the quality of our academic program.

E. Strengths/Weaknesses of the Graduate Student Programs

The following list of strengths and weaknesses of the graduate student programs was compiled
by the Department Head and Graduate Studies Coordinator and are the result of multiple meetings with various committees, especially the graduate studies and faculty advisory committees.

**Program Strengths**

- The research groups of the electrical and computer engineering department are highly visible and have developed international recognition. The prestige of our research programs is evident from our advances in the following technologies: Analog and digital chip design, reliability and testing, big data, VLSI systems, multimedia communications, networking, storage, genomic signal processing, magnetic resonance, bio-chips, bio-imaging, image processing, electromagnetics, microwaves and antennas, electric machines, fuel cells, motor drives and advanced vehicle systems, power system control and protection, smoke detectors, power quality, clean power, smart grid, solid-state and nanotechnologies, thin film materials, sensors, fiber optics and optoelectronics, solid state devices, digital signal processing, telecommunications, cognitive radio systems, multimedia security, optimization and others. The department’s seven groups have international recognition, and the ECE Department’s international visibility is continuously increasing.

- Fundamental to a strong graduate program are high caliber students. We are able to attract a high number of very high quality students from the best programs throughout the world. These students make it possible to carry on top caliber research in ECE Department specialization areas, as demonstrated by the large number of journal and conference publications (272 refereed journal publications during academic year 2013-2014). As mentioned previously in this self-study, we have seen a significant increase in both the quantity and quality of applicants to our department in recent years. We view this as evidence that the reputation and visibility of our graduate programs are continuously increasing.

- Another aspect of a strong graduate program is a high quality faculty which includes 32 IEEE Fellows, 18 Endowed Professorships and Chairs, over 50 faculty with editorships and serving as editorial board members, along with over 40 Fellow grades in professional societies. We are particularly excited about the large number of young faculty (over 30), who have joined our department over the last 10 years. These new hires were recruited from top research programs throughout the country. Four of our junior faculty have been awarded prestigious NSF CAREER Awards in the last year (24 of our current faculty have earned CAREER Awards). In addition, it appears that we are experiencing a substantial increase in research funding. As our new faculty mature, we will continue to see more accomplishments and a higher worldwide reputation for our programs.

- The ECE department has experienced a very low turnover of faculty over the last 10 years. It is our belief that this is largely due to the attractive professional environment created by the Department, College, University and the community as a whole. Faculty in the ECE Department are provided with every opportunity to succeed and by in large are very happy with the professional and personal environment. This leads to stability in the faculty which is
a major benefit to the programs.

- One strength is our satellite program in Qatar. Currently four of our faculty have committed to two years in Qatar. This continuous flow of faculty from College Station to help teach courses and establish research programs has resulted in strong research programs with a broader outreach than is possible now. We currently have several Qatar students enrolled in our graduate program. In addition, this program provides researchers in the ECE Department with access to a large source of external funding, which may not be readily accessible to faculty in peer institutions. We already have several large research contracts funded by companies in Qatar foundations that support both the program in Qatar and also research efforts in College Station. In addition, the department has had several research grants funded by the Qatar National Research Foundation (QNRF). Access to these sources of funding has caused a non-trivial increase in department research funding, which will continue to have an impact in coming years.

Program Weaknesses

- Our programs suffer from a limited number of domestic students, and this is a national trend. The department, college, and university administration has put significant effort and resources into improving this situation. While we have seen some gradual improvement, we still have a long way to go in this respect. The ECE Department is currently sponsoring ten top domestic students through TA positions and three more with merit, diversity and GEM fellowships. A few more are sponsored from graduate research assistantships. The TAs for sophomore and junior courses have been used as an effective tool for recruiting domestic talent. The COE and departments are organizing several activities to recruit US students. The Expo event is usually organized in October and the graduate invitational event is usually organized in February. This year we attracted over 40 top potential graduate students from those events. Ten of these students have already confirmed that they will join our graduate program. We currently have received over 50 domestic graduate applications for Fall 2016. The ECE Department has implemented an automatic admission program. TAMU domestic students with a GPA over 3.6 are offered automatic admission to our MEN programs. The department bypasses many of the requirements, including letters of recommendation. Also, the department absorbs the application fees and GRE examination is waived. The second initiative towards the recruitment of TAMU students is the fast track program. The department has a set of “stack courses,” which senior undergraduates and first-year graduate students can take together. The instructor is the same but exams and projects can be more elaborated for the graduate students. If the instructor and TAMU Graduate Office approve it, top senior domestic students interested in the graduate program can take these courses as part of their undergraduate program, and if enrolled in the grad program, students can receive credit after an examination.

- Another issue is the limited amount of funds available for graduate fellowships. Currently, we have endowments that are sufficient to support about 18 graduate fellowships per year.
Industrial gifts allow us to support 10-12 graduate students every year. We use 40% of the fellowships that we have to recruit domestic students, but having more fellowship monies available would help our ability to attract more domestic and international talent. Ideally, for a program our size, we would like to have about 30 fellowships every year that will allow us to support up to 50% of the incoming PhD students. TA assistantships and other type of fellowships complement support for PhD graduates. The goal is to fund all our PhD students. As aforementioned, we are currently funding through RAs, TAs, GANs or fellowships around 50% of the research-oriented student body. We also offer around 75 competitive one-time $1000 fellowships that enable the recipient to receive the benefit of in-state tuition for one year.

Lack of research funding has also limited some of the research efforts in our program. While our funding levels compare favorably with other programs in the College, we do not currently have the level of funding that some peer programs experience.

- There has been a strong push over the last few years to increase our external research funding levels. Projections seem to indicate that the department may reach $20 M in external funding this year. If so, this represents positive progress, but there is still a need for further improvement. Furthermore, it would be helpful if the department had umbrella funding from large groups and/or centers which could provide funding to buffer individual faculty grants. Currently, there are big initiatives and our department is emphasizing large research programs in areas such as smart grid, genomics, image processing, big data, health and bio sciences, nanotechnologies and sensor devices, thin-film devices, photonics, cognitive radios and other related areas.

- Although the department has grown substantially over the last 10 years (adding 15 faculty) the operational budget of the department has not grown proportionally. This means that the department has limited funds for staff and teaching assistants. Currently, the department provides TAs for all courses with laboratories. For all 2-hour/weeklab sessions, one TA is provided for every 45 students. More TA resources are assigned for courses such as Magnetic Resonance Imaging and Microelectronic Devices where laboratories cannot allocate more than 5-10 students per session. TAs are also assigned to 3-credit courses with a 1-hour recitation session; the TA takes care of the recitation class, helps students during office hours, and grades a reduced number of assignments. 10-hour graders are assigned to courses with enrollment between 15 and 30 students; after that we add one hour for every three students enrolled in the class. The availability of enough graders serves two purposes: i) the number and difficulty of the assignments are not relaxed and assignments are graded in a timely manner and ii) the students receive support. Usually these positions are devoted to MS students.

Having more TA support would enable the faculty to be more productive; additional GANT positions will allow us to continuously update the laboratory experiments and laboratory manuals.
While space was adequate three years ago, as the faculty has grown, the size of the graduate student population is growing as well. The space is currently tight, especially space for wet labs and graduate student offices, mainly due to the reconstruction of the Engineering Education Complex (former Zachry Engineering Center). The expected date for completion is Spring 2018. The former building housed our laboratories, classrooms and around 50% of faculty and student offices. It new facility will house our educational labs space and enough classrooms when complete, but until then, we are limited in what we can do. We expect that as junior faculty settle down, they will take on more graduate students, and we will need more space for graduate offices and laboratories. New initiatives such as the expansion of the Smart Grid Center are also demanding more laboratory and student office space that needs to be satisfied. Currently the Magnetic Resonance Systems Laboratory is housed on the main campus at the old TI plant, now known as the University Services Building. The AggieFab laboratory is a shared nano/micro fabrication facility located on the 7th floor of the Jack E. Brown Building.

The lack of space for student offices and laboratories is drastically limiting the redirected growth of our programs. Faculty are reluctant to hire more PhD and MS students since those hires demand physical space, and we find their concern reasonable. The MEN program is still continuously growing since students use the common laboratories and do not demand research offices. The College of Engineering and department plans include the construction of a new building to house the ECE and Computer Science Departments. The project is on the Dean’s list of priorities, and that new building has an expected completion date of 2021.

F. Departmental Vision

As a result of the reinvestment program and continuous investment, the size of the department faculty has grown from about 50 to approximately 72 over the last 10 years. Of those 72 faculty, approximately 66 are actively involved in research activities. The remainder are, for the most part, in full time administrative positions. The recent hires are focused on key areas such as bio-informatics, nanodevices, and sensing devices. Most of these positions were filled with assistant professors from top schools; e.g. University of Illinois Urbana-Champaign, Yale University, New Haven, Boston University, Carnegie Mellon, and the University of Texas at Austin. We also hired world class senior faculty: P.R. Kumar (member of the National Academy of Engineering), Peter Rentzepis (National Academy of Sciences), and Nicholas Duffield (21 years of experience in AT&T). Based on a faculty of this size and stature, we believe the following goals to be realistic:

**Graduate Student Supervision** – Currently the average teaching load is 4.3 PhD students and 4.5 MS students per faculty. We would like to see an average load of 4 PhD students and 3 MS students per faculty member. The large number of assistant and associate faculty will provide a manageable research team that can achieve a fairly productive level of research. Of course, we understand that
there will be great variability in the target load of 4 PhD and 3 MS students per faculty. Some faculty will have many more students, and some will have less, but this seems to be a reasonable target number. These numbers can easily change as more physical space becomes available.

**Program Student Population** – Based on the above mentioned faculty load, the number of graduate students in the program would be maintained at about 300 PhD students and 250 MS students. Assuming that we also maintain approximately 250 MEN students as well, this would lead to a program size of about 800 students. This number is close to our current population (736), which means we need to be vigilant and carefully control the number of new students so we do not grow too far beyond the current population. Although transitional, the current lack of classrooms with adequate capacity and lack of optimal laboratories further limits our growth plans. Our projection for the learning distance master program, currently under development, would add around 150 off-campus students when it reaches steady state three or four years from now. Hence, we are expecting a total enrollment of 950 graduate students until new facilities and adequate resources become available.

**Funding** – Ideally, we would like each faculty member (on average) to provide RA support for four PhD students as well as funding to cover their summer salaries and to buy out of one course every other year as well as acquire adequate travel and equipment monies. Based on this model, the required level of external research funding for the department would be approximately $25 million per year. While this is an ambitious goal, we feel that it is achievable. Furthermore, this level of funding will generate a significant amount of revenue for the department through overhead on contracts and grants. This will enable the department to provide greater support to faculty and students through TAs, GANTs and fellowships. It will also enable the department to provide seed money to groups of researchers who have novel ideas for promising emerging research initiatives.

**Faculty Hiring** – It is anticipated that a number of new faculty will need to be hired each year as a result of occasional retirements and resignations as well as a result of the 25/25 growing plan. We will continue to hire faculty from top programs throughout the country as we have done for the past several years. We will also continue to focus on hiring those that in addition to their intellectual strength have the potential to generate funds for developing and sustaining their research programs. In addition, the new faculty must show outstanding teaching skills to build excellent educational programs by developing innovative teaching methodologies and undergraduate and graduate courses in emerging technologies. It is these human resources that are the key to our future success. As talented as our hired faculty are, the department must then assure that they have adequate resources and the proper professional environment to be productive.

**Prestige and External Visibility** – We believe that we have built one of the world’s top programs in Electrical and Computer Engineering. However, while we have a solid reputation throughout the world, we believe that our reputation does not yet reflect our recent growth and program
improvements. In order to improve our reputation among our peers and to move forward in the national and international rankings, it is imperative that our faculty and students participate in activities that will bring even more visibility and international recognition to our programs. Table 9 shows an average annual production for faculty (including the six faculty with full time administration positions) of 3.8 journals, 4.1 conferences and one editorial appointment to a peer reviewed journal. We are currently encouraging our faculty to compete for different awards and be promoted in their professional societies. 38 faculty members hold the rank of fellows in their professional societies. Although our faculty are continuously recognized, our young faculty need to be encouraged and supported in their participation in international conferences, professional service, and educational outreach activities. Furthermore, we need to be vigilant in helping our students to obtain high profile external funding such as NSF Fellowships upon entering the program and also to place them in academic positions after graduation among our peer educational institutions.

**College of Engineering Strategic Plan and Department of ECE Related Efforts.**

The mission of the Dwight Look College of Engineering is to serve Texas, the nation, and the global community by providing engineering graduates who are well grounded in engineering fundamentals, instilled with the highest standards of professional and ethical behavior, and prepared to meet the complex technical challenges of society. Engineering has been a part of Texas A&M University since its inception in 1876 as the Agricultural and Mechanical College of Texas. Today, the Dwight Look College of Engineering is the largest college on the Texas A&M campus with more than 350 faculty members and more than 15,000 engineering students in our 14 departments. The COE is consistently ranked among the nation's top public programs. We are also among the top universities in the number of national merit scholars, nationally recognized faculty, and funded research.

To achieve our mission the Dwight Look College is committed to: i) ensuring an academic environment conducive to our faculty members achieving the highest levels of academic and research excellence; ii) building upon our traditional partnerships with industry, engineering practitioners and former students, to enhance our impact on the profession of engineering; iii) encouraging excellence, innovation and cross-disciplinary initiatives in education and research; iv) providing national and international leadership in undergraduate and graduate engineering education; v) becoming the engineering college of choice for the increasingly diverse citizenry of the state; and vi) encouraging and supporting opportunities for our students to grow beyond their chosen disciplines by participation in ethics courses, leadership programs, study-abroad programs and research. Research conducted by higher education has made a significant impact on our health, safety and quality of life, and has contributed to the economic growth and development of our country.

The Dwight Look College of Engineering, through its affiliation with the Texas A&M
Engineering Experiment Station (TEES) and with partnerships with industry and other institutions of higher education, is committed to helping keep our country competitive by conducting practical research to address world problems. The College of Engineering and the University are currently going through a strategic planning process for the success of the 25/25 program. The ECE Department actively participates in some of these strategic plans and initiatives. A brief description of the five strategic areas we are most active in are provided below.

**Energy and the Environment.** Energy is–and always has been–a major research focus of Texas A&M Engineering. TAMU has a history of more than 100 years of research and development activities in the field of energy. COE researchers have expertise in traditional energy areas such as oil and gas, the electric power grid and nuclear energy, as well as in emerging renewable energy generation and distribution technologies and systems, and in energy efficiency. Among others, the main facilities include The Texas A&M Energy Institute, the Energy Systems Laboratory, the Turbomachinery Laboratory, the Crisman Institute for Petroleum Research, the Oran W. Nicks Low Speed Wind Tunnel, and the Energy Systems Laboratory's Continuous Commissioning.

The Texas A&M Energy Institute interdisciplinary research program focuses on the interacting themes of: i) Fossil and Non-Fossil based Technologies for Energy; ii) Materials, Catalysis, and Separations for Energy; iii) Multi-scale Energy Systems Engineering; and iv) Energy Economics, Law, Policy, and Societal Impact. The four interconnected themes are further classified into ten research areas, and 65 research topics. To enhance the synergy among different disciplines, the Texas A&M Energy Institute introduces annual multi-PI proposal calls and provides seed and matching funds for competitively selected group projects.

The Texas A&M Energy Institute external partnerships program focuses on establishing a vibrant interactive environment that brings together academia, government, and industry to discuss, address, and provide transformative solutions to energy challenges. World-class faculty and research teams from multiple disciplines (i.e., Texas A&M College of Agriculture and Life Sciences; College of Engineering; College of Geosciences; College of Sciences; Bush School of Government and Public Policy; Mays Business School; College of Liberal Arts; and School of Law) work together and form research collaborations with the best leaders and researchers in industry to address the complexity and challenges of important energy problems.

The groups of EPPE, CEN, DS/N and AMSC of the Department of ECE actively contribute towards these goals. The recent activities of the smart grid center housed by the ECE Department contributes toward this goal. Energy distribution, power electronics and motor control, big data analysis, power management, design of low-power digital and analog systems are some examples of the ECE Department research efforts.
The following represent areas of multidisciplinary research that the ECE Department has made inroads into. These institutes and centers represent opportunities to be a part of solving a host of problems through the specialized technologies that only ECE can bring to the table. Collaboration has been ongoing and will continue to be developed with the following organizations.

**Transportation and Infrastructure.** The reliability, resiliency and environmental impact of the nation’s transportation infrastructure are inexorably linked to its economy, security and quality of life. Numerous reports indicate that the condition of America's infrastructure is aging and failing. The Texas A&M Transportation Institute (TTI) researchers are addressing these concerns as well as the impacts that natural disasters such as Hurricane Katrina have made to the infrastructure. They are also addressing the consequences of failure and how to approach these consequences in a proactive manner. The TTI mission is to identify and solve transportation problems through research; to transfer technology and knowledge; and to develop diverse human resources to meet the transportation challenges of tomorrow.

The researchers of the Texas A&M Transportation Institute work on solving transportation problems as part of the Texas A&M System’s Transportation Institute (TTI), one of the finest higher education-affiliated transportation research agencies in the nation. TTI’s research saves lives, time, and state and national resources through strategies and products developed through its research program. It also helps prepare students for careers in transportation. Texas A&M Transportation Institute (TTI) develops solutions to the problems and challenges facing all modes of transportation and conducts over 600 research projects annually with over 200 sponsors at all levels of government and in the private sector. In the laboratory and the classroom, TTI researchers help prepare students for transportation careers.

The ECE Department considers the TTI initiative as an opportunity to strengthen and consolidate several related areas of research such as development of specific sensors and actuators, energy harvesting, low-power systems, efficient low-power wireless communication systems and big data.

**Healthcare and Quality of Life.** The mission of the National Center for Therapeutics Manufacturing is to provide therapeutics manufacturing education, training and outreach programs to support the development of an educated and skilled pharmaceutical workforce proficient in process development, production systems, standard operating procedures, and regulatory guidelines.

Improving the quality of life and protecting our environment continues to be a major focus in this area of research. Their live-saving work and expertise in health includes disease prevention and control; improving and maintaining a healthy environment; process safety; food safety and genomics. The National Center for Therapeutics Manufacturing (NCTM) is an interdisciplinary
education institution that provides multi-generational technical training and professional development programs for the biopharmaceutical and vaccine manufacturing industries. The NCTM is an interdisciplinary pharmaceutical workforce education institution and contract manufacturing organization known as Fujifilm Diosynth Biotechnologies Texas located in College Station, Texas. The NCTM’s workforce development mission is to provide multi-generational technical training and professional development programs to produce a highly-skilled workforce for the vital U.S. and global biopharmaceutical and vaccine manufacturing industries. Its well-appointed analytical and wet labs, cell culture suite, conference halls, simulation software training laboratory, and fully-equipped cGMP training suite offer unparalleled hands-on training with commercial-scale microbial and mammalian bioreactors, chromatography columns and skids, and analytical equipment utilized in bio-manufacturing operations.

The ECE Department actively participates in this COE initiative. The activities of the biomedical research thrust are correlated with COE defined areas of opportunity through research carried out by the Biomedical Imaging, Sensing and Genomic Signal Processing group, as well as the Electromagnetics and Microwaves Group through the magnetic resonance laboratory. The group of CEN research on wireless communication networks and wireless sensor networks contributes toward the development of portable health care systems. The AMSC group is devoted to the chip design of low-power data acquisition systems and digitizers. Research efforts of other groups (software and hardware) are also related to this initiative.

**Informatics and the Knowledge Economy.** TEES envisioned a center that would take a 'top-down' approach to research projects versus a typical 'bottom-up' approach, and on September 1, 1994, the Texas Center for Applied Technology (TCAT) was born. Unlike the traditional research center created to promote specific technology areas, TCAT pursues enterprising research projects that fulfill client needs while inserting new technologies into a society that promote economic growth and an improved quality of life.

TCAT hires world-class scientists and engineers to solve real problems for its customers. The TCAT team consists of 39 employees with experience in academia, military, and industry. Among their researchers, 24 hold advanced degrees. With offices in both College Station and San Antonio, they place employees where they are needed throughout the country. Computing and networking technology have transformed our society over the past two decades. The collection, transmission and management of data and information are critical components to this nation’s advancement in engineering and science, its national security and economic development. Key areas being addressed by their researchers and the ECE Department researchers through collaboration are reliable communication networks, cyber security, management of data and its conversion to information, and visualization, and human interfaces.

TCAT has the ability to cross interdisciplinary academic boundaries and to couple research strengths with experiences and successes of private industry, military, and other governmental
agencies. TCAT is a trusted government and industry partner. TCAT customers can count on real-world solutions to their toughest problems. Although long-term relationships are common at TCAT, they also partner with many customers on single projects. By tapping into the vast resources of the Texas A&M University System and its centers, TCAT quickly responds to the needs of their clients. Its highly specialized team and interdisciplinary research centers allow them to bring the right mix of talent, experience, and creativity to every project. In this way, TCAT and the right combination of ECE researchers can better assist organizations to stay on the forefront of technology, to plan for future projects, and to solve current problems. They help customers develop commercial products, build prototypes, and conduct real-time, real-scenario performance testing.

Several ongoing research activities carried on the computer engineering group and the information science and systems are aligned with this COE initiative.

**Homeland Security.** The Integrative Center for Homeland Security™ serves as the single integrated voice for all efforts in homeland security within The Texas A&M University System that lead to a safer and better prepared society. Texas A&M Engineering has the resources, facilities and capabilities to address a broad spectrum of Homeland Security needs. From basic and applied research conducted by one of the nation's premier engineering programs, to unique and comprehensive labs and facilities, and extensive world-renown training and exercises, Texas A&M Engineering delivers solutions for first responders, emergency and community management, and the public across the nation and around the globe.

The Integrative Center for Homeland Security (ICHSHS) serves as an umbrella organization, facilitator and coordinator for all homeland security activities in a diverse set of programmatic areas across the A&M System. These areas include, but are not limited to, emergency response; food and water security; network/data security and information technology; social/political issues and politics; management of biohazards; physical infrastructure and transportation; counter measures/basic research; detection/remote sensing; physical countermeasures; and health issues.

The overall objective for ICHS is to be an all-inclusive Center that promotes and portrays the story of all homeland security efforts and enhances collaboration within the Texas A&M University System in relation to five notable areas: i) research and policy, ii) education, iii) extension, iv) training, and v) response.

Collaborative research efforts in the ECE Department started several years ago with the design of very sensitive fiber optic sensing devices developed in the group of Device Science and Nanotechnology. This is an area that offers attractive research opportunities such as monitoring water quality, detection and manipulation of hazardous materials, monitoring of food quality, robotics and unmanned vehicles, data security, and many others research efforts that require multidisciplinary research and benefits from ECE Department researchers’ participation. This is
an area of opportunity that should definitely be further explored for the generation of aggressive multi-disciplinary research programs.
Appendices

A. List of ECE Faculty

B. Graduate Student Handbook

C. Course Syllabi

D. Faculty CVs
Appendix A – List of ECE Faculty

Texas A&M University

Department of Electrical and Computer Engineering

Fall 2015
## List of ECE Faculty

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<thead>
<tr>
<th>Name</th>
<th>Group</th>
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<tr>
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Appendix B – Graduate Student Handbook

Texas A&M University

Department of Electrical and Computer Engineering

Fall 2015
### People to contact

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Dr. M. Begovic</td>
<td>Department Head</td>
</tr>
<tr>
<td>Dr. S. Wright</td>
<td>Associate Dept. Head</td>
</tr>
<tr>
<td>Dr. J. Silva-Martinez</td>
<td>Director of ECE Graduate Programs</td>
</tr>
<tr>
<td>Ms. Tammy Carda</td>
<td>Senior Academic Advisor II</td>
</tr>
<tr>
<td>Ms. Melissa Sheldon</td>
<td>Program Coordinator</td>
</tr>
<tr>
<td>Ms. Anni Brunker</td>
<td>Payroll Administration</td>
</tr>
<tr>
<td>Ms. Yolanda D. Veals</td>
<td>Scholarship/Fellowship Administration</td>
</tr>
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</table>

### Graduate Student Representatives

Priyadharshini Sundararajan Venkatas and Ahmad Al Kawam
Graduate Studies Committee

Dr. J. Silva-Martinez:
Director of ECE Graduate Program, (Analog & Mixed Signals)

Dr. K. Entesari:
(Analog & Mixed Signals)

Dr. R. Nevels:
(Electromagnetics & Microwave)

Dr. J. Ji:
(Bio Medical Imaging and Genomic Signal Processing)

Dr. X. Qian:
(Bio Medical Imaging and Genomic Signal Processing)

Dr. O. Eknoyan:
(Device Science and Nanotechnology)

Dr. H. Toliyat:
(Electric Power and Power Electronics)

Dr. P. Li:
(Computer Engineering and Systems)

Dr. T. Liu:
(Information Science and Systems)
Specific Area Home Websites

Analog & Mixed Signals
http://engineering.tamu.edu/electrical/research/analog-mixed-signals

Biomedical Imaging, Sensing & Genomic Signal Processing
http://engineering.tamu.edu/electrical/research/biomedical-imaging-sensing-genomic-signal-processing

Computer Engineering & Systems Group
http://engineering.tamu.edu/electrical/research/computer-engineering-systems-group

Electromagnetics & Microwaves Group
http://engineering.tamu.edu/electrical/research/electromagnetics-microwaves-group

Electric Power Systems & Power Electronics
http://engineering.tamu.edu/electrical/research/electric-power-systems-power-electronics

Device Science and Nanotechnology
http://engineering.tamu.edu/electrical/research/device-science-and-nanotechnology

Information Science and Systems
http://engineering.tamu.edu/electrical/research/information-science-and-systems
Howdy Website (howdy.tamu.edu)

The Howdy website is used by the students to register for classes, pay bills, apply for financial aid, and to find other information regarding the university.

Home Tab

- Used for general information about events going on around the university
- Emergency notifications and updates are viewable here as well as a link to register for Code Maroon (i.e. The Emergency Notification System)

My Record Tab

- Register for classes, see what classes are available, and view restrictions/details about a class
- View unofficial transcript, order official transcript, view and print degree evaluations
- Links to optional services such as parking, athletics, or campus directory
- Allow access for non-student to view grades

My Finances Tab

- Access account to check balance, pay tuition, view refunds or pay any other outstanding bill
- Apply for loans, scholarships, and other forms of financial aid
- Allow access for non-students to view and/or pay tuition, or any other bills on the student’s account

Student Life Tab

- Register for parking, sporting events pass, or on-campus dining
- Get information on housing both on and off campus
- Get information as well as links for employment opportunities on and off campus
- Other helpful links such as the student recreation center or computing center
Requirements for Graduate Electrical Engineering Degrees
_in the Department of Electrical and Computer Engineering_

Master of Engineering (MEN) Degree

1. Total Number of Hours (30)

   - Classroom hours must be taken from courses within the College of Engineering and College of Science.
   - At least 18 classroom hours must be ECE courses.

3. Transfer hours allowed from another institution (6)
   - Transfer hours must be from a “peer institution.”
   - Transfer hours are subject to the approval of the GSC.

4. Undergraduate hours allowed (9)
   - Only 400 level undergraduate courses can be included on degree plan.

5. Seminar (681), Internship (684), Directed Studies (685) no more than (3) hours allowed (combined).
   - Research (691) hours are not allowed on a Master of Engineering (MEN) degree plan.

6. Final examination may be waived for any MEN student maintaining a GPR of at least 3.0. A petition to waive the final exam must be submitted through the Graduate Office.

7. A final project report is required to be submitted to the Graduate Office. A graded project from any ECE graduate course can be used to fulfill this requirement.

8. Composition of supervisory committee
   - The Graduate Coordinator will be the chair of all MEN committees. No other committee members are needed.
Requirements for Graduate Electrical Engineering Degrees

in the Department of Electrical and Computer Engineering

Master of Science Degree

1. Total Number of Hours (32)

   - Classroom hours must be taken from courses within the College of Engineering and
     College of Science.
   - At least 15 classroom hours must be ECE courses.

3. A minimum of 5 hours of research (691) must be included on the degree plan. A
   maximum of 8 research hours can be included.

4. Transfer hours allowed from another institution (6)
   - Transfer hours must be from a “peer institution.”
   - Transfer hours are subject to the approval of the GSC.

5. Undergraduate hours allowed (9)
   - Only 400 level undergraduate courses can be included on degree plan.

6. Seminar (681), Internship (684), Directed Studies (685): No more than (3) hours allowed
   (combined).

7. Final defense of thesis is required for all MS students.
   - A proposal must be filed.
   - A thesis proposal must be approved by the supervisory committee and submitted to
     the Graduate Office prior to the defense.
   - Date and location of the thesis defense must be scheduled through the Graduate
     Office so that official notification can be provided to OGAPS.
   - Thesis must be submitted to committee members at least two weeks before defense.
8. Composition of supervisory committee

- At least two members from within the ECE Department and within the student’s focus area.
- At least one member from within the ECE Department but outside the student’s focus area.
- At least one member from outside the ECE Department.
Requirements for Graduate Electrical Engineering Degrees
in the Department of Electrical and Computer Engineering

Doctor of Philosophy Degree

1. Total Number of Hours (64 or 96)
   • For students who already hold a Master’s degree, 64 total hours are required.
   • For “direct PhD” students, 96 hours are required.

2. A minimum of 18 (or 42) classroom hours (excludes 681, 684, 685, and 691).
   • 18 hours required for students with a previous Master’s degree and 42 for direct PhD students.
   • Classroom hours must be taken from courses within the College of Engineering and College of Science.
   • At least 4 (or 24) classroom hours must be ECE courses.

3. A maximum of 6 transfer hours allowed from another institution
   • Transfer hours must be from a “peer institution.”
   • Transfer hours are subject to the approval of the GSC.

4. Undergraduate hours allowed (9)
   • Only 400 level undergraduate courses can be included on degree plan.
   • If you used 400 level hours on your Master’s degree plan, then you must reduce the number of allowed undergraduate hours by that amount.

5. No more than 3 credit hours of Internship (684) are allowed.

6. No more than 2 credit hours of Directed Studies (685) are allowed.
   • Students working on a research project should enroll in Research (691) hours.

7. All PhD students are required to pass the Departmental Qualifying Examination
   • Incoming 64-hour PhD students are required to take the exam within one year of starting the program.
• Incoming direct 96-hour PhD students are required to take the exam within two years of starting the program.
• Students entering the program with a previous degree outside of Electrical or Computer Engineering are allowed, with the approval of their advisor, an extra year and will be required to take the exam by the end of the second year.
• Those students who fail the examination are given a second opportunity to retake the exam which must be taken at the next opportunity in which the exam is offered.
• Those that fail the examination twice will be removed from the PhD program.
• More details of the Qualifying Exam are given later in this handbook.

8. All PhD students are required to pass a preliminary examination.
   • PhD students are required to schedule their preliminary exam by the end of their 4th semester (excluding summers) or 6th semester for direct PhDs. Students who have not scheduled their preliminary exam by the appointed time will be blocked from further registration until they do so.
   • OGAPS must be officially notified of the exam schedule at least two weeks prior to the exam. This should be done through the Graduate Office.
   • Student must download the checklist and signature page from the OGAPS web site. The checklist must be signed by your advisor and Graduate Coordinator prior to the exam.
   • The preliminary exam consists of a written and an oral examination.
   • For students who have passed the departmental Qualifying Exam, the written portion of the preliminary exam can be waived subject to the approval of the student’s supervisory committee.
   • Students who fail the preliminary exam will have one opportunity to retake the exam within 6 months of the original exam date.

   • A dissertation proposal must be approved by the supervisory committee and submitted to the Graduate Office prior to the defense. Typically this proposal is submitted in conjunction with the preliminary exam, submitted one (1) week after the preliminary exam.
   • Date and location of the final defense must be scheduled through the Graduate Office so that official notification can be provided to OGAPS.
   • Dissertation must be submitted to committee members at least two weeks before defense.

10. Composition of supervisory committee
• At least two members from within the ECE Department and within the student’s focus area.
• At least one member from within the ECE Department but outside the student’s focus area.
• At least one member from outside the ECE Department.
Requirements for Graduate Computer Engineering Degrees
in the Department of Electrical & Computer Engineering

Master of Engineering (Non-Thesis Option)

1. Total number of hours (30)
   A minimum of 27 classroom hours (Excludes 681, 684, and 685) from
   College of Engineering
   College of Science
   College of Business (at most one course, and only from the ISYS Dept.)
   A minimum of 24 classroom hours from the
   Departments of Computer Science and Engineering and
   Electrical and Computer Engineering
   At least 13 of these 24 hours must be in Electrical & Computer Engineering
   Department.

2. Transfer hours allowed from another institution (6)
   Transfer hours must be from a peer institution
   Transfer hours are subject to approval of the Graduate Studies Committee.

3. Max undergraduate hours (6 hours/400 only)

4. One hour of seminar is allowed (ECE/CSCE 681) but is NOT required.

5. No more than 3 hours (in combination) of ECE 681, 684, and 685.

6. A report is required in at least one of the ECE or CSE courses.**

7. Students may petition for exemption from the final examination, maintain a
   GPR of at least 3.0, through the ECE Graduate Office.

8. Composition of committee
   The Graduate Coordinator will be the chair of all MEN committees. No other
   committee members are needed.

9. Additional course requirements are listed in D.

**A final project is required and to be submitted to the ECE Graduate Office. A graded
project from any ECE and CSCE graduate course can be used to fulfill this requirement.
The project requires a grade and the professor’s signature.
Requirements for Graduate Computer Engineering Degrees
in the Department of Electrical & Computer Engineering

Master of Science Degree (Thesis Option)

1. Total number of hours (32)
   A minimum of 24 classroom hours (Excludes 681, 684, 685, and 691).
   A minimum of 21 classroom hours from the College of Engineering and
   College of Science

2. Transfer hours allowed from another institution (6)
   Transfer hours must be from a peer institution
   Transfer hours are subject to approval of the Graduate Studies Committee.

3. Max undergraduate hours (6 hours/400 only)

4. Special problems, seminar, and research (681, 685, and 691)
   8 hours maximum of these courses
   4 hours minimum of 691
   1 hour of seminar (ECE/CSCE 681) is required
   No more than 3 hours (in combination) of ECE 681, 684, and 685.

5. Composition of committee (at least 3)
   At least 2 within Computer Engineering Group from ECE
   At least 1 not in the student's department

6. Final defense of thesis is required for all MS students.
   A thesis proposal must be approved by the supervisory committee and submitted
   to the ECE Graduate Office prior to the defense. Date and location of the thesis
   defense must be scheduled through the ECE Graduate Office so that official
   notification can be provided to OGS. Thesis must be submitted to committee
   members at least two weeks before defense.

7. Additional course requirements are listed in D.
**Requirements for Graduate Computer Engineering Degrees**

*in the Department of Electrical & Computer Engineering*

**Doctor of Philosophy Degree**

1. **Total number of hours (64 or 96)**
   For students who already hold a master’s degree, 64 total hours are required.
   For “direct PhD” students, 96 hours are required.
   A minimum of 18 (or 42) classroom hours (excludes 681, 684, 685, and 691).
   18 hours required for students with a previous master’s degree and 42 for direct PhD students.
   Classroom hours must be taken from courses within the College of Engineering and College of Science.

2. **Max undergraduate hours (8 hours / 2 courses 400 only)**

3. **Three hours of seminar (ECE/CSCE 681) are required.**
   At most 3 hours of ECE 684
   No more than 2 credit hours of Directed Studies (685) are allowed.
   Students working on a research project should enroll in Research (691) hours.

4. **A maximum of 6 transfer hours allowed from another institution.**
   Transfer hours must be from a “peer institution”.
   Transfer hours are subject to the approval of the Graduate Studies Committee.

5. **Composition of committee (at least 4)**
   At least 2 within Computer Engineering Group from ECE
   At least 1 not in the student’s department
   At least 1 not in CE Group, but in ECE department

6. **All PhD students are required to pass the Departmental Qualifying Examination**
   - Incoming PhD students are required to take the exam within one year of starting the program.
   - Students entering the program with a previous degree outside of Electrical or Computer Engineering are allowed, with the approval of their advisor, an extra year and will be required to take the exam by the end of the second year.
   - Those students that fail the examination are given a second opportunity to retake the exam which must be taken at the next opportunity in which the exam is offered.
   - Those that fail the examination twice will be removed from the PhD program.
7. All PHD students are required to pass a preliminary examination.
   - PHD students are required to schedule their prelim exam by the end of their 4th semester (excluding summers) or 6th semester for direct PhDs. Students who have not scheduled their prelim by the appointed time will be blocked from further registration until they do so.
   - OGS must be officially notified of the exam schedule at least 2 weeks prior to the exam. This should be done through the Graduate Office.
   - Student must download the checklist and signature page from the OGS website. The checklist must be signed by your advisor and Graduate Coordinator prior to the exam.
   - The prelim exam consists of a written and an oral examination.
   - For students who have passed the departmental Qualifying Exam, the written portion of the prelim exam can be waived subject to the approval of the student’s supervisory committee.
   - Students who fail the prelim exam will have one opportunity to retake the exam within 6 months of the original exam date.

8. Final defense of dissertation is required for all PhD students.
   - A dissertation proposal must be approved by the supervisory committee and submitted to the Graduate Office prior to the defense. Typically this proposal is submitted in conjunction with the preliminary exam, submitted one (1) week afterwards.
   - Date and location of the final defense must be scheduled through the Graduate Office so that official notification can be provided to OGS.
   - Dissertation must be submitted to committee members at least two weeks before defense.

   Composition of committee (at least 4)
   At least 2 within Computer Engineering Group from ECE
   At least 1 not in the student’s department
   At least 1 not in CE Group, but in ECE department

9. Additional course requirements are listed in D.
Degree Plans

Degree plans consist of:

- Degree program (e.g., Master of Science in Electrical Engineering)
- A list of courses to be taken to fulfill the degree requirements.
- A list of faculty who will form the supervisory committee.

Degree plans must be submitted during the second semester (excluding summers).

- MEN/MS students should file a degree plan prior to the pre-registration period, starting your second (2nd) semester.
- PhD students should file a degree plan within one year from the date they started the program.
- Students who have not filed a degree plan by the deadlines indicated above will be blocked from registering for future semesters.
- The block will not be removed until the degree plan has been submitted.

Degree plan approval:

- Must be approved by all committee members, the Graduate Coordinator (or the Department Head), and the Office of Graduate and Professional Studies (OGAPS).
- Course changes can be made to the degree plan through petition which must be approved by all committee members.
- Changes of committee members must be approved by all members of the committee (both incoming and outgoing).

Office of Graduate and Professional Studies (OGAPS): The degree plan and petition can be found on the OGAPS website: [http://ogs.tamu.edu/incoming-students/student-forms-and-information/](http://ogs.tamu.edu/incoming-students/student-forms-and-information/)
Miscellaneous Requirements

Internships

If an internship is taken, you will receive graduate credit for 684 hours which needs to be on your degree plan and approved by your advisor.

- A report of your activities and an evaluation by your supervisor must be submitted before a course grade will be submitted.
- Internships can be taken after nine-months on campus if this is your 1st semester in the US.

Directed Studies

- Enrollment in directed studies (685) requires approval of the instructor in whose section you are enrolling.

- A 685 request form must be submitted to the Graduate Office prior to enrollment. This form will describe the scope of the project and will indicate the basis on which a grade will be assigned. It must be signed by both the student and the instructor.

<table>
<thead>
<tr>
<th>Electrical Engineering Foundation Courses</th>
<th>Computer Engineering Foundation Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 214, Electrical Circuit Theory</td>
<td></td>
</tr>
<tr>
<td>ECE 248 Intro to Digital Systems Design</td>
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<tr>
<td>ECE 314 Signals and Systems</td>
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<tr>
<td>ECE 325 Electronics</td>
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<tr>
<td>ECE 322 Electric and Magnetic Fields</td>
<td>CSCE 211 Data Structures &amp; Implementations</td>
</tr>
<tr>
<td>Two additional courses from one of the following areas of specialization:</td>
<td>CSCE 311 Analysis of Algorithms</td>
</tr>
<tr>
<td>- Electronics</td>
<td></td>
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<tr>
<td>- Power</td>
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<tr>
<td>- Electro-physics, electro-optics, microwaves</td>
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<tr>
<td>- Communications, Control, Signal Processing</td>
<td></td>
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<tr>
<td></td>
<td>ECE 350 (or CSCE 321) Computer Architecture</td>
</tr>
</tbody>
</table>
Foundation Courses

- Required of students with non-electrical or computer engineering undergraduate degrees.
- Do not count towards graduate degree requirements.
- Specific foundation courses required should be determined in consultation with your advisor.

- **Preregistration** - All students currently enrolled MUST pre-register for future semesters during the pre-registration periods (in order to ensure sufficient enrollment).

Restricted Courses

- STAT 651 and STAT 652 (statistics courses) are for non-science majors and are not allowed on EE or CE degree plans.
- Business courses will not be allowed on ECE or CEEN degree plans (exception: MEN students in CEEN can include one course from the ISYS department).
- ELI registration does not count towards A&M hours.
- Traditionally no courses from Engineering Technology will be allowed because of the non-calculus based curriculum.
- Additional restrictions which apply to CE majors:
  - CSCE 601 and 602 may not be taken for credit.
  - Credit for both CSCE 614 and ECE 651 is not allowed. CSCE 614 is only allowed in special circumstances with the advisor’s approval.
  - Credit for CSCE 619 and CSCE 612 may not be allowed in addition to ECE 602. Please check with your advisor.

- **Change of Degree Programs**
  - If you have received financial support from the department (through either an RA, TA, GANT, fellowship or scholarship), you may not switch to the MEN program from the MS or PhD program.
  - If you are in the MEN program, you may switch to the MS or PhD program with the approval of a supervising professor. Also, a transfer to the PhD program requires a minimum GPR of 3.6.
• **Change of Focus Area**
  - You may not change your focus area during your first semester.
  - After your first semester, you may change focus areas with the approval of both groups.
Financial Aid

- Many forms of financial aid are available to graduate students in the ECE department:
  - Research Assistantship (RA)
    - Offered by individual faculty members.
    - Pay rate varies from $1,200–$1,700 per month for MS students and $1,350-$2,100 per month for PhD students (for 20 hours per week).
    - Usually pays tuition and other fees.
  - Teaching Assistantship (TA)
    - Offered through the department.
    - Pays $1350/month for MS students and $1,450/month for PhD students (for 20 hours per week).
    - Tuition paid for PhDs only.
    - Apply through the ECE website at:
      - https://records.ece.tamu.edu/TASchApp/TAapplication/TAapp.php
  - Graduate Assistant Non-Teaching (GANT) – Offered through a variety of sources.
  - Fellowships – Offered through OGS, the College of Engineering, the Department, and individual faculty.
  - One-Time Scholarships
    - $1,000 - offered on a competitive basis through the department.
    - Qualifies student to pay in-state tuition rate.
      - Awarded at beginning of Fall semester to incoming students.
      - Apply through the ECE website at:

- Assistantships (RA, TA, GANT) require up to 20 hours per week of service.
- Those receiving financial aid will be required to maintain full time status:
  - 9 semester hours during Fall/Spring
  - 6 hours during 10-week summer session
  - 3 hours during each 5-week summer session (Cannot combine course work from 10 week and 5 week in the summer session)

- TAs should make requests for continued funding by filling out the application each semester.
- RAs should check with funding source on number of hours to register for.
• If you received funding from the department, you cannot change your status to the Master Engineering Program from the Master of Science or PhD program.

• Students in non-degree status or probationary status are NOT eligible for financial aid.
**Probation**

- A Grade Point Ratio (GPR) equal to or better than 3.0 is required to maintain good academic standing. For purposes of probationary action, GPR is measured in three different ways:
  - Semester GPR,
  - Cumulative GPR,
  - Degree Plan GPR.

- A student will be placed on probation and blocked from pre-registration if any of the three indicated GPRs falls below 3.0. The student will be allowed to register once they have signed an acknowledgement letter stating that they understand the terms of the probation.

- One semester is allowed to correct the GPR deficiency and bring it back up to 3.0 or better.

- If a student’s GPR deficiency is not corrected after one semester, the Graduate Studies Committee (GSC) will meet to discuss the case and may recommend a dismissal from the graduate program.

- A student being removed from the graduate program will be notified by the Graduate Office of such action. They will have 30 days from the date of notification to file an appeal to the Graduate Studies Committee. If the student does not appeal the decision or the GSC does not uphold the appeal, the GSC will then request the removal of the student from the program.

- A student who is on probation will not be allowed to obtain or retain any type of departmental financial support.
Analog and Mixed-Signal
Area Leader: Dr. K. Entesari

Recommended Courses

**Fall**
(Undergraduate courses)
- ECEN 454 Digital Integrated Circuit Design
- ECEN 457 Operational Amplifiers

(Graduate courses)
- ECEN 620 Network Theory
- ECEN 704 VLSI Circuit Design
- ECEN 622 Active Network Synthesis (2nd year)
- ECEN 665 Integrated CMOS RF Circuits and Systems (2nd year)

**Spring**
(Graduate courses)
- ECEN 607 Advanced Analog Circuit Design Techniques
- ECEN 610 Mixed Signal Interfaces
- ECEN 625 Millimeter-Wave Integrated Circuits
- ECEN 650 High Frequency GaAs/SiGe Analog IC Design
- ECEN 651 Microprogrammed Control of Digital Systems
- ECEN 654 Very Large Scale Integrated Systems Design
- ECEN 671 Solid State Devices
- ECEN 720 High Speed Links Circuits and Systems
Other courses that may be taken:
ECEN 458 Active Filter Analysis and Design
ECEN 609 Adaptive Control
ECEN 606 Nonlinear Control Systems
ECEN 639 Microwave Circuits
ECEN 644 Discrete –Time Systems
ECEN 680 Testing and Diagnosis of Digital Systems

Master of Engineering:
(Undergraduate/graduate courses)
ECEN 607 Advanced Analog Circuit Design Techniques
ECEN 610 Mixed Signal Interfaces
ECEN 620 Network Theory
ECEN 665 Integrated CMOS RF Circuits and Systems
ECEN 704 VLSI Circuit Design

At least two from the following:
ECEN 457 Operational Amplifiers
ECEN 622 Active Network Synthesis
ECEN 625 Millimeter-Wave Integrated Circuits
ECEN 650 High Frequency GaAs/SiGe Analog IC Design
ECEN 654 Very Large Scale Integrated Systems Design
ECEN 671 Solid State Devices
ECEN 720 High Speed Links Circuits and Systems
ECEN 689 (Special Topics)
Biomedical Imaging & Genomic Signal Processing
Area Leader: Dr. J. Ji

Recommended Courses

**Master of Science:**

*(Undergraduate)*

- ECEN 410 Introduction to medical Imaging
- ECEN 411 Introduction to magnetic Resonance Imaging and Magnetic Resonance Spectroscopy
- ECEN 412 Ultrasound Imaging
- ECEN 414 Biosensors
- ECEN 419 Genomic Signal Processing
- ECEN 444 Digital Signal Processing
- ECEN 447 Digital Image Processing
- ECEN 448 Real-Time Digital Signal Processing
- ECEN 451 Antenna Engineering
- ECEN 452 Ultra High Frequency Techniques
- ECEN 463 Magnetic Resonance Engineering (Stacked with 763)

*(Graduate)*

- ECEN 601 Linear Network Analysis
- ECEN 617 Advanced Signal Processing for Medical Imaging
- ECEN 634 Morphological Methods in Image and Signal Processing
- ECEN 635 Electromagnetic Theory
- ECEN 636 Phased Arrays
ECEN 637 Numerical Methods in Electromagnetics
ECEN 642 Digital Image Processing
ECEN 644 Discrete-Time Systems
ECEN 645 Pattern Recognition by Neural Networks
ECEN 648 Principles of Magnetic Resonance Imaging
ECEN 649 Pattern Recognition
ECEN 660 BioMems & Lab-on-a-Chip
ECEN 661 Modulation Theory
ECEN 662 Estimation and Detection Theory
ECEN 663 Data Compression with Applications to Speech and Video
ECEN 669 Engineering Applications in Genomics
ECEN 678 Statistical Optics
ECEN 760 Introduction to Probabilistic Graphical Models
ECEN 761 Biosensors Lab
ECEN 762 Ultrasound Imaging
ECEN 763 Magnetic Resonance Engineering (Stacked with 463)

**Master of Engineering:**

MEN students must take at least five ECEN courses chosen from the list above or from 689 courses in the biomedical imaging area.

Two of these five must be chosen from the following courses:

**(Undergraduate/graduate courses)**

ECEN 444 Digital Signal Processing
ECEN 447 Digital Image Processing
ECEN 448 Real-Time Digital Signal Processing
ECEN 634 Morphological Methods in Image and Signal Processing
ECEN 642 Digital Image Processing
ECEN 646 Statistical Communication Theory

New courses are being added in the bio/gsp area. Please check the webpage ece.tamu.edu/~MRSL/bio area for updates.
Computer Engineering & Systems Group

Area Leader: Dr. Jiang Hu

Recommended first-level graduate courses

ECEN (undergraduate courses)
    454, 468

CSCE (undergraduate courses)
    410

ECEN (graduate courses)
    602, 621, 651, 653, 654, 687, 754

CSCE (graduate courses)
    614, 629, 662

Foundation Courses (no graduate credit)

ECEN 214    Electrical Circuit Theory
ECEN 248    Introduction to Digital Systems Design
ECEN 314    Signals & Systems
ECEN 325    Electronics
ECEN 350    Computer Architecture and Design
ECEN 423    Computer and Wireless Communications Networks
CSCE 211  Data Structures and Their Implementations
CSCE 311  Analysis of Algorithms

Tentative List of Courses for CE ME Students

(MUST TAKE AT LEAST 6 COURSES OUT OF THE LIST BELOW)

Hardware/VLSI:
ECEN 449 Microprocessor System Design
ECEN 454 Digital Integrated Circuit Design
ECEN 468 Advanced Logic Design
ECEN 618 Resilient Computer Systems
ECEN 654 VLSI Systems Design
ECEN 680 Test and Diagnosis of Digital Systems
ECEN 687 Introduction to VLSI Design Automation
ECEN 699 Advances in VLSI Logic Synthesis
ECEN 751 Advanced Computational Methods for Integrated System Design
ECEN 752 Advances in VLSI Circuit Design

Networks:
ECEN 602 Computer Comm. and Networking
ECEN 619 Internet Protocols and Modeling
ECEN 621 Mobile Wireless Networks
ECEN 627 Multimedia Systems and Networks
CSCE 663 Real-time Systems
CSCE 665 Advanced Networking and Security
CSCE 664 Wireless and Mobile Systems
ECEN 689 Special Topics Courses

Communication Networks

Computer Architecture:
ECEN 651 Microprogrammed Control of Digital Syst. (not CSCE 614)
ECEN 653 Computer Arithmetic Unit Design
ECEN 676 Advanced Computer Architecture
CSCE 605 Compiler Design

Systems and Software:
CSCE 410 Operating Systems
CSCE 606 Software Engineering
CSCE 629 Analysis of Algorithms
CSCE 662 Distributed Processing Systems
CSCE 670 Information Retrieval and Storage

Networking & Systems Theory:
ECEN 434/754 Optimization for Electrical & Computer Engineering Applications
ECEN 663 Data Compression with Applications to Speech and Video
ECEN 750 Design and Analysis of Communication Networks
ECEN 753 Theory and Applications of Network Coding
ECEN 755 Stochastic Systems
ECEN 689 Special Topics Courses

Game Theory
Queueing Theory
Tentative List of Courses for Graduate CE Students

Hardware/VLSI:
ECEN 454 Digital Integrated Circuit Design
ECEN 468 Advanced Logic Design
ECEN 618 Resilient Computer Systems
ECEN 624 IC Design Tools
ECEN 652 Switching Theory
ECEN 654 VLSI Systems Design
ECEN 680 Test and Diagnosis of Digital Systems
ECEN 687 Introduction to VLSI Design Automation
ECEN 699 Advances in VLSI Logic Synthesis
ECEN 751 Advanced Computational Methods for Integrated System Design
ECEN 752 Advances in VLSI Circuit Design
CSCE 661 Integrated Systems Design Automation

Networks:
ECEN 602 Computer Comm. and Networking
ECEN 619 Internet Protocols and Modeling
ECEN 621 Mobile Wireless Networks
ECEN 627 Multimedia Systems and Networks
CSCE 663 Real-time Systems
CSCE 665 Advanced Networking and Security
CSCE 664 Wireless and Mobile Systems
ECEN 689 Special Topics Courses
Communication Networks

Computer Architecture:
ECEN 623 Parallel Geometric Computing
ECEN 651 Microprogrammed Control of Digital Syst. (not CSCE 614)
ECEN 653 Computer Arithmetic Unit Design
ECEN 659 Parallel/Distributed Numerical Algorithms and Applications
ECEN 676 Advanced Computer Architecture
CSCE 605 Compiler Design

Systems and Software:
CSCE 410 Operating Systems
CSCE 606 Software Engineering
CSCE 629 Analysis of Algorithms
CSCE 662 Distributed Processing Systems
CSCE 670 Information Retrieval and Storage

Networking & Systems Theory:
ECEN 434/754 Optimization for Electrical & Computer Engineering Applications
ECEN 663 Data Compression with Applications to Speech and Video
ECEN 750 Design and Analysis of Communication Networks
ECEN 753 Theory and Applications of Network Coding
ECEN 755 Stochastic Systems
ECEN 689 Special Topics Courses

Game Theory
Queueing Theory

Math / Stat:
MATH 415 Modern Algebra I
MATH 416 Modern Algebra II
MATH 446 Principles of Analysis
MATH 447 Topics in Analysis II
STAT 601 Statistical Analysis
MATH 606 Theory of Probability I
MATH 607 Real Variables I
MATH 608 Real Variables II
MATH 652 Optimization II

English:
ENGL 301 Technical Writing (no graduate credit)
Electromagnetics & Microwaves
Area Leader: Dr. R. Nevels

Recommended Courses for Master of Science and Master of Engineering

(Undergraduate courses)
ECEN 351 Applied Electromagnetic Theory
ECEN 451 Antenna Engineering
ECEN 452 Ultra High Frequency Techniques
ECEN 453 Microwave Solid-State Circuits and Systems
ECEN 480 RF and Microwave Wireless Systems

(Graduate courses)
ECEN 626 Antenna Theory and Technique
ECEN 635 Electromagnetic Theory
ECEN 636 Phased Arrays
ECEN 637 Numerical Methods in Electromagnetics
ECEN 638 Antennas and Propagation
ECEN 639 Microwave Circuits
ECEN 641 Microwave Solid State Integrated Circuits
ECEN 730 CMOS RFIC Engineering
ECEN 735 Electromagnetic Field Theory
Electric Power & Power Electronics

Area Leader: Dr. H. Toliyat

Recommended Courses

Master of Science:

(Undergraduate courses)
ECEN 415 Physical and Economical Operations of Sustainable Energy Systems
ECEN 459 Power System Fault Analysis and Protection
ECEN 460 Power System Operation and Control
ECEN 438 Power Electronics
ECEN 441 Electronic Motor Drives
ECEN 442 DSP Based Electromechanical Motion Control

(Graduate courses)
ECEN 611 General Theory of Electromechanical Motion Devices
ECEN 612 Computer Aided Design of Electromechanical Motion Devices
ECEN 613 Rectifier and Inverter Circuits
ECEN 614 Power Systems State Estimation
ECEN 615 Methods of Electric Power Systems Analysis
ECEN 616 Power System Electromagnetic Transients
ECEN 630 Analysis of Power Electronics Systems
ECEN 632 Motor Drive Dynamics
ECEN 643 Electric Power System Reliability
ECEN 666 Power System Faults and Protective Relaying  
ECEN 667 Power System Stability  
ECEN 668 High Voltage Direct Current (HVDC) Transmission  
ECEN 677 Control of Electric Power Systems  
ECEN 679 Computer Relays for Electric Power Systems  
ECEN 686 Electric and Hybrid Vehicles  
ECEN 689 Special Topics  
ECEN 710 Switching Power Supplies  
ECEN 711 Sustainable Energy & Vehicle Engineering  
ECEN 712 Power Electronics for Photovoltaic Energy Systems  
ECEN 715 Physical and Economical Operations of Sustainable Energy Systems

**Master of Engineering:**

15 credit hours to be taken in the Electric Power and Power Electronics courses that are listed above.
Device Science and Nanotechnology

Area Leader: Dr. O. Eknoyan

Recommended Courses

Master of Science:

(Undergraduate courses in Solid State)
ECEN 370 Electronic Properties of Materials
ECEN 472 Microelectronic Circuit Fabrication
ECEN 473 Microelectronic Device Design

(Graduate courses in Solid State)
ECEN 656 Physical Electronics
ECEN 658 Low Noise Electronic Design
ECEN 671 Solid State Devices
ECEN 673 Fundamentals of Microelectronics
ECEN 770 Organic Semiconductor
ECEN 771 Fluctuations & Noise Electronics
ECEN 772 Introduction to Microelectromechanical Devices and Systems

(Undergraduate courses in Electro-optics)
ECEN 462 Optical Communication Systems
ECEN 464 Optical Engineering
(Graduate courses in Electro-optics)

ECEN 631 Fiber-Optic Devices
ECEN 657 Quantum Electronics
ECEN 670 Fiber-Optic Networks
ECEN 672 Semiconductor Lasers and Photodetectors
ECEN 675 Integrated Optoelectronics
ECEN 678 Statistical Optics

Non-ECEN

PHYS 408 Thermodynamics and Statistical Mechanics
PHYS 412 Quantum Mechanics I
PHYS 606 Quantum Mechanics
PHYS 617 Physics of Solid State
STAT 601 Statistical Analysis
MATH 601 Methods of Applied Mathematics I
MATH 602 Methods and Applications of Partial Differential Equations

Master of Engineering- Solid State:

(Undergraduate courses in Solid State)
ECEN 472 Microelectronic Circuit Fabrication
ECEN 473 Microelectronic Device Design

(Graduate courses in Solid State)
ECEN 656 Physical Electronics
ECEN 658 Low Noise Electronic Design
ECEN 671 Solid State Devices
ECEN 673 Fundamentals of Microelectronics
ECEN 770 Organic Semiconductor

ECEN 772 Introduction to Microelectromechanical Devices and Systems

Non-ECEN
MATH 601 Methods of Applied Mathematics I
MATH 602 Methods and Applications of Partial Differential Equations

Master of Engineering –Electro-optics:

(Undergraduate courses in Electro-optics)
ECEN 462 Optical Communication Systems
ECEN 464 Optical Engineering

(Graduate courses in Electro-optics)
ECEN 601 Linear Network Analysis
ECEN 602 Computer Communication and Networking
ECEN 631 Fiber-Optic Devices
ECEN 657 Quantum Electronics
ECEN 670 Fiber-Optic Networks
ECEN 672 Semiconductor Lasers and Photodetectors
ECEN 675 Integrated Optoelectronics
ECEN 678 Statistical Optics

Non-ECEN
PHYS 412 Quantum Mechanics I
PHYS 606 Quantum Mechanics
STAT 601 Statistical Analysis
MATH 417 Numerical Analysis I
MATH 601 Methods of Applied Mathematics I
MATH 602 Methods and Applications of Partial Differential Equations
MATH 610 Numerical Methods in Partial Differential Equations

Alternatives:
ECEN 639 Microwave Circuits
ECEN 689 Special Topics
Information Science and Systems
Area Leader: Dr. S. Battacharyya

Recommended first-level graduate courses

ECEN (undergraduate courses)
410, 412, 419, 420, 421, 444, 447, 448, 455, 478

ECEN (graduate courses)
601, 604, 605, 629, 642, 644, 646, 647, 649, 655, 661, 662, 663, 683

Foundation Courses (no graduate credit)

ECEN 214 Electrical Circuit Theory
ECEN 248 Introduction to Digital Systems Design
ECEN 303 Random Signals & Systems
ECEN 314 Signals and Systems
ECEN 325 Electronics
ENGL 301 Technical Writing

Tentative List of Courses for Graduate ISS Students

Communications/Information Theory

ECEN 601 Linear Network Analysis – (a better title is Mathematical Methods in Communications and Signal Processing)
ECEN 604 Channel Coding for Communications Systems
ECEN 646 Statistical Communication Theory (Probability and Random Processes)
ECEN 629 Convex Optimization for Electrical Engineering
ECEN 646 Statistical Communication Theory (Probability and Random Processes)
ECEN 647 Information Theory
ECEN 655 Advanced Topics in Channel Coding
ECEN 661 Modulation Theory (a better title is Digital Communications)
ECEN 663 Data Compression with Applications to Speech & Video
ECEN 683 Wireless Communications Systems
ECEN 689 Special Topics – change from year to year
ECEN 760 Introduction to Probabilistic Graphical Models

**Signal and Image Processing:**
ECEN 601 Linear Network Analysis
ECEN 629 Convex Optimization for Electrical Engineering
ECEN 642 Digital Image Processing
ECEN 644 Discrete-Time Systems
ECEN 646 Statistical Communication Theory (Probability and Random Processes)
ECEN 649 Pattern Recognition
ECEN 662 Estimation and Detection Theory
ECEN 663 Data Compression with Applications to Speech & Video
ECEN 760 Introduction to Probabilistic Graphical Models

**Controls:**
ECEN 601 Linear Network Analysis
ECEN 605 Linear Control Systems
ECEN 606 Nonlinear Control Systems
ECEN 608 Modern Control
ECEN 609 Adaptive Control
ECEN 628 Linear System Theory
ECEN 633 Optimum Control Systems

**Genomics:**
ECEN 669 Engineering Applications in Genomics

**Networks:**
ECEN 423 Computer and Wireless Communication Network
ECEN 602 Computer Communications and Networking
ECEN 619 Internet Protocols and Modeling
ECEN 621 Mobile Wireless Networks
ECEN 689 Special Topics – changes from year to year

**MATH / STAT/MEEN/NUEN:**
MATH 415 Modern Algebra I
MATH 416 Modern Algebra II
MATH 446 Principles of Analysis
MATH 447 Principles of Analysis II
STAT 601 Statistical Analysis
MATH 606 Theory of Probability I
MATH 607 Real Variables I
MATH 608 Real Variables II
MATH 619 Applied Probability
MATH 651 Optimization I
MATH 652 Optimization II
MATH 653 Algebra I
MATH 654 Algebra II
MEEN 641 Quantitative Feedback Theory
MEEN 651 Control System Design
MEEN 652 Multivariable Control System Design
MEEN 674 Modern Control
MATH 601 Methods of Applied Mathematics I
NUEN 689 (Special Topics)

**Hardware/VLSI:**
ECEN 449 Microprocessor System Design
ECEN 454 Digital Integrated Circuit Design
ECEN 468 Advanced Logic Design

You may want to talk to professors in the Computer Engineering department about courses that will suit your background and interests
PhD Qualifying Examination
Department of Electrical and Computer Engineering

PhD Qualifying Examination

The Departmental Qualifying Exam is based on material covered in a set of nine fundamental undergraduate courses in Electrical and Computer Engineering.

ECEN 214 – Electrical Circuit Theory
ECEN 248 – Introduction to Digital Systems Design
CSCE 221 – Data Structures and Algorithms
ECEN 303 – Random Signals and Systems
ECEN 314 – Signals and Systems
ECEN 322 – Electric and Magnetic Fields
ECEN 325 – Electronics
ECEN 350 – Computer Architecture and Design
ECEN 370 – Electronic Properties of Materials

Any student that has graduated from either of the undergraduate programs in our department should have taken at least 8 of these courses. Students who have degrees from peer programs should have taken courses similar to many of these.

Exam Format: The exam will consist of two questions from each of the areas listed above. Each question should be designed to be completed in 20-25 minutes. Each student will be required to answer any 6 of the 18 questions on the exam. This would insure that each student has at least some proficiency outside of their main focus area, but does not require students to study extensively outside of their area of expertise. The exam will be closed book, in-class, and time limited to 3 hours.

Exam Syllabus – Included at the end of this document is an exam syllabus explicitly outlining the material that might be tested for each of the courses listed above. Hence the students will have an explicit list of topics to prepare for rather than a general “material from course xxx” type statement.
Timing: The exam will be offered twice a year, once in mid January shortly before the start of the spring semester, and once in mid-June. In both cases, the exam date would be about one month after the end of finals. This would tend to encourage students not to spend more than one month preparing for the exam. Incoming PHD students would be required to take the exam within one year of starting the program. Students entering the program with a previous degree outside of Electrical or Computer Engineering will be allowed, with the approval of their advisor, an extra year and will be required to take the exam by the end of the second year. Those students that fail the examination will be given a second opportunity to retake the exam which must be taken at the next opportunity in which the exam is offered. Those that fail the examination twice will be removed from the PHD program.

Grading: The faculty who composed each problem will grade their perspective problems in the written exams. Once grading is completed, the GSC will meet to determine passing thresholds for the examination. The GSC may elect to normalize grades from each problem in order to maintain fairness across the various problems. Results of the exam will be available within four weeks of the date of the exam. Appeals regarding the results of the exam by either students or faculty must be submitted in writing to the Graduate Office and will be handled by the GSC.
PhD Qualifying Examination

Electric Circuit Analysis – ECEN 214

1. Basic Circuit Theory
   a. Ideal Voltage/Current Sources
   b. Circuit elements and governing equations: Resistors, capacitors, inductors
   c. Kirchhoff’s Laws

2. Basic Circuit Analysis
   a. Node-Voltage method
   b. Mesh-current method
   c. Source transformation
   d. Thevenin/Norton equivalent circuits
   e. Maximum power transfer
   f. Superposition

3. DC Transient Circuit Analysis
   a. Natural response of an RL circuit
   b. Natural response of an RC circuit
   c. Step response of an RL circuit
   d. Step response of an RC circuit
1. **Logic gates and Boolean Algebra**
   a. Theorems of Boolean Algebra
   b. Variables, literals, minterms, maxterms, cubes
   c. Two-level logic minimization
   d. Incompletely specified logic functions
   e. Canonical representations of logic functions

2. **Combinational Logic**
   a. Shannon's Expansion Theorem
   b. Multi-level logic optimization
   c. Timing analysis
   d. Special circuits – MUXes, Decoders, Encoders, PLAs, FPGAs, CPLDs,

3. **Arithmetic Circuits**
   a. Addition
   b. Subtraction and 2's complement
   c. Multiplication
   d. Division
   e. Arithmetic Sums-of-products
   f. Floating point arithmetic

4. **Sequential Design**
   a. Latches, Flip-flops, Registers
   b. Counters
   c. State machines
   d. Incomplete specification and non-determinism

5. **MOS based Logic Circuits**
   a. Basic MOS based realization of logic elements
   b. Circuit design styles
   c. Design of gates and memory elements
PhD Qualifying Examination
Data Structures and Algorithms – CSE 221

1. Data Structures
   a. Stacks
   b. Queues
   c. Linked lists
   d. The tree abstract data type and data structures for representing trees
   e. Properties of binary trees
   f. Binary search trees
   g. AVL trees
   h. Red-black trees
   i. The priority queue abstract data type
   j. The heap data structure
   k. Hash tables
   l. Data structure of graphs
      i. The edge list
      ii. The adjacency list
      iii. The adjacency matrix

2. Algorithms
   a. Sorting
      i. Merge-sort
      ii. Quick-sort
   b. The Huffman coding algorithm
   c. Solving the longest common subsequence problem using dynamic programming
   d. Basic algorithms on trees
      i. Pre-order traversal
      ii. Post-order traversal
   e. Graph traversal
      i. Depth-first search
      ii. Breadth-first search
   f. Topological order and sorting of directed acyclic graphs
   g. Shortest paths: Dijkstra’s algorithm
   h. Minimum spanning trees
      i. Kruskal’s algorithm
      ii. Prim’s algorithm

3. Complexity Analysis
   a. Asymptotic notations: the “big-Oh” notation
   b. Asymptotic analysis using the big-Oh notation
PhD Qualifying Examination
Probability and Random Variables – ECEN 303

1. **Discrete Probability**
   a. Joint/Conditional probabilities
   b. Independence
   c. Bayes’ theorem
   d. Discrete random variables

2. **Continuous Random Variables**
   a. Cumulative distribution functions (CDFs) and probability density functions (PDFs)
   b. Gaussian random variables, standardized Gaussian integrals
   c. Conditional distribution and density functions
   d. Expected values, moments and conditional expected values
   e. Transformations of random variables
   f. Characteristic functions and moment generating functions
   g. Chernoff Bounds

3. **Multiple random variables**
   a. Joint and conditional CDFs and PDFs
   b. Independence
   c. Jointly Gaussian random variables
   d. Transformations of multiple random variables
   e. Random sequences – definitions of convergence modes and relationships between various modes
   f. Law of large numbers
   g. Central limit theorem
PhD Qualifying Examination
Signals and Systems Syllabus – ECEN 314

1. Signals
   a. Mathematical description and pictorial representation of commonly used continuous-time
      signals and discrete time signals such as rectangular signal, unit step, dirac-delta, ramp,
      sinusoidal, complex exponential signals, sinc
   b. Even and odd signals, periodic signals
   c. Transformations of the independent variable – shift in time, scaling of the time axis
   d. Signal energy, power, auto-correlation, cross correlation, sifting property of the impulse

2. Basic properties of systems
   a. Systems with and without memory, linearity, invertibility, causality, stability, time
      invariance.

3. Linear Time – Invariant Systems
   a. Impulse response of a system
   b. Convolution in discrete-time and continuous-time
   c. Properties of LTI systems – commutative property, distributive property, associative
      property, invertibility, causality, stability
   d. LTI systems described by differential (or, difference) equations
   e. Block diagram representation of systems represented by differential (or, difference)
      equations
   f. Eigen functions of LTI systems

4. Fourier series representation of periodic signals
   a. Determination of trigonometric and complex exponential Fourier series for
      continuous time and discrete time periodic signals
   b. Convergence of the Fourier series
   c. Properties of the FS – linearity, shifting in time, scaling of the time axis,
      multiplication, conjugation, conjugate symmetry, Parseval’s identity (See also
      section of properties of the Fourier Transform)

5. Continuous-time and discrete-time Fourier transform
   a. Development of the Fourier transform of an aperiodic signal
   b. Dirichlet conditions, convergence of the Fourier transform
   c. Computing the Fourier transform from the definition
   d. Memorize Fourier transform of basic signals such as rectangular signal, sinc,
      delta, exponential signal
e. Properties of the Fourier transform – linearity, time shift, frequency shift, scaling of the time axis and frequency axis, conjugation and symmetry, time reversal, differentiation and integration, duality, Parseval’s relation. Be conversant in using the properties of Fourier transforms to compute the FT of signals that can be obtained from simpler signals through a series of the above operations.

f. Convolution and multiplication property

g. Inverse Fourier transform – be able to compute this from definition as well as from looking up the transform for elementary signals. Be able to use partial fraction expansions to compute the Inverse Fourier transform.

h. Magnitude and phase representation of the Fourier transform and frequency response of LTI systems

6. Applications of the Frequency domain analysis of signals and systems

   b. Sampling – Nyquist theorem, effects of aliasing, ideal reconstruction of the signal from its samples
   c. Modulation – Amplitude modulation, Hilbert transform, DSB and SSB carrier modulation

7. Laplace Transforms

   a. Definition, region of convergence, inverse Laplace transform
   b. Pole-Zero plot
   c. Properties of the Laplace transform – linearity, time shift, frequency shift, scaling of the time axis and frequency axis, conjugation and symmetry, time reversal, differentiation and integration, duality, Parseval’s relation, initial and final value theorems
   d. Solving differential equations using Laplace transforms

8. Z-transforms

   a. Definition of direct z-transform, region of convergence (ROC), inverse z-transform using partial fraction expansion
   b. Pole-zero plot
   c. Properties of Z-transform – linearity, time shift, z-scaling, time reversal, conjugation, z-differentiation, convolution, stability and its relation to causality and ROC
   d. Transfer function of discrete-time systems and analysis of systems described by constant coefficient difference equations
PhD Qualifying Examination
Electric and Magnetic Fields Syllabus (ECEN 322)

1. **Vector Analysis**
   a. Rectangular, cylindrical and spherical coordinate systems
   b. Gradient of scalar fields
   c. Divergence of vector fields
   d. Curl of vector fields
   e. Divergence theorem
   f. Stokes’ theorem

2. **Maxwell’s Equations and Fields**
   a. Static and dynamic
   b. Time-varying, static, and time-harmonic fields
   c. Boundary conditions
   d. Poisson and Laplace’s equations
   e. Continuity equation
   f. Constitutive relations
   g. Current relations

3. **Wave Equations and Waves**
   a. Time-varying and time-harmonic wave equations
   b. Helmholtz’s equations
   c. Plane electromagnetic waves in lossless and lossy media
   d. Parameters and properties of plane waves propagating in media (fields, velocity, propagation constant, etc.)
   e. Material properties (loss, skin depth, etc.)
   f. Poynting vector
   g. Instantaneous and average power flow
   h. Normal and oblique incidence of plane waves at boundaries
   i. Reflection and transmission coefficients
   j. Standing waves and voltage standing wave ratio (VSWR)
   k. Incident, reflected and transmitted waves

4. **Transmission Lines**
   a. Transmission-line equations
   b. Transmission-line equivalent circuit
   c. Wave propagation on transmission lines
   d. Transmission-line parameters (resistance, inductance, conductance and capacitance per unit length; characteristic impedance, propagation constant, wavelength, velocity, dispersion, distortion, etc.)
   e. Input impedance of transmission lines
f. Open- and short-circuited transmission lines

g. Reflection coefficient, voltage standing wave ratio (VSWR)

5. **Smith Chart**
   a. Construction of Smith chart
   b. Determination of reflection coefficient, VSWR, input impedance/admittance, and maximum/minimum voltage locations using Smith chart
   c. Design single-stub impedance matching network using Smith chart
PhD Qualifying Examination
Electronic Circuits Syllabus – ECEN 325

1. Linear circuit analysis
   a. Magnitude and phase bode plots
   b. Phase and magnitude margin
   c. Root locus and stability
   d. Basics on feedback theory and properties

2. Operational Amplifiers
   a. Basic linear circuits employing operational amplifiers
   b. Instrumentation amplifier – differential and common mode gain, and CMRR
   c. 1st and second order filters – lowpass, bandpass and highpass
   d. OPAMP finite parameters – input and output impedance, finite DC gain and their effects
   e. Open loop and closed loop parameters – gain, input impedance and output impedance

3. Diodes
   a. Basic non-linear model
   b. Linear models and Taylor series expansions
   c. Rectifiers, peak detectors and other non-linear applications
   d. AC-to-DC conversion – half and full wave rectifiers and filters, ripple

4. Bipolar Junction Transistor
   a. Basic non-linear model
   b. Linear models and Taylor series expansions – Hybrid and T models
   c. DC and AC analysis
   d. Basic configurations- common-emitter, common-base and common-collector
   e. Input and output impedance, and voltage and power gain
   f. High-frequency transistor model – effects of the transistor and coupling capacitors
   g. Amplifier’s linearity

5. CMOS Transistors
   a. Basic non-linear model
   b. Linear models and Taylor series expansions – Hybrid and T models
   c. DC and AC analysis
   d. Basic configurations- common-source, common-gate and common-drain
   e. Input and output impedance, and voltage and power gain
   f. High-frequency transistor model – effects of the transistor and coupling capacitors
   g. Amplifier’s linearity
PhD Qualifying Examination
Computer Organization and Design - ECEN 350

1. Instruction Set Architectures
   a. Representing Instructions on the computer
   b. Arithmetical and Logical Instructions
   c. Memory access instructions
   d. Control flow instructions
   e. Function call instructions

2. Computer Arithmetic
   a. Signed and unsigned numbers
   b. Floating point numbers
   c. Addition and subtraction
   d. Multiplication and Division
   e. Floating point operations

3. Translating and starting a program
   a. Compilers, compiler optimization
   b. Object code generation
   c. Assemblers
   d. Linking
   e. Run-time execution environment

4. Performance evaluation
   a. CPU performance and its factors
   b. Performance metrics
   c. Performance factors
   d. Comparing performance
   e. SPEC benchmarks

5. Datapath and Control, and ALU design
   a. Single-cycle implementation
   b. Multi-cycle implementation
   c. Microprogramming

6. Pipelining
   a. Pipelined datapath
   b. Pipelined control
   c. Pipeline hazards
      ii. Structural
      iii. Control
iv. Data hazards
v. Hazard detection and resolution

7. Memory Hierarchy
   a. Overview of SRAM and DRAM design
   b. Basic of caches
   c. Framework for memory hierarchy
   d. Measuring memory performance

8. Peripherals and disk storage
1. **The Free Electron Model in Metals**
   a. Density of States and Fermi-Dirac distribution
   b. The work function, Thermionic emission
   c. The Schottky effect
   d. Field emission
   e. The photoelectric effect

2. **Band Models of Solids**
   a. The Kronig-Penney model
   b. Energy-momentum (E-k) diagram
   c. The effective mass, group velocity, concept of holes
   d. Divalent and trivalent metals

3. **Semiconductors**
   a. Characteristic properties of intrinsic and extrinsic semiconductors
   b. Measurement of semiconductor properties: Mobility, Conductivity, Energy gap, Carrier lifetime

4. **Principles of Semiconductor Devices**
   a. The pn junction under equilibrium and under voltage bias
   b. Junction capacitance
   c. Metal-Semiconductor junction: I-V characteristics and junction capacitance

5. **Properties of Dielectric materials**
   a. Macroscopic approach
   b. Microscopic approach
Scheduling the Exam: Unlike the qualifying exam, the PhD prelim exam must be scheduled individually by each student through the Graduate Office.

Exam Format: The prelim exam has two parts. During the oral part of the prelim exam, the student is expected to make an oral presentation on the thesis topic to the student’s thesis committee. This exam will be held at the time of the prelim exam. Each student is expected to submit a written thesis proposal to the thesis committee before the prelim exam. The PhD thesis proposal should be approved by the student’s thesis committee within one week of the prelim exam. It is the student’s responsibility to turn in an approved copy of the Ph.D. thesis proposal to the Graduate Office.

Exam Syllabus – There is no set syllabus for the PhD prelim exam.

Timing: PhD students who already have a Master’s degree should take the exam within 2 years of beginning their graduate program. PhD students who only hold a Bachelor’s degree when they start their PhD program should take the exam within 3 years of beginning their graduate program. If a student started in a Master’s program and then converted to the PhD program, the student should take the prelim exam within 2 years after switching to the PhD program.

Grading: Each member of the thesis committee will provide a PASS/FAIL vote. The student is deemed to pass or fail the exam depending on whether the majority of the votes are pass or fail, respectively.

Note: The PhD prelim exam is similar to what is called the proposal exam in some universities.
Appendix C – Graduate Courses

Texas A&M University

Department of Electrical and Computer Engineering

Graduate Courses

Spring 2016
# Graduate Courses by Area

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Area of Specialization</th>
</tr>
</thead>
<tbody>
<tr>
<td>681</td>
<td>Seminar</td>
<td>All Areas</td>
</tr>
<tr>
<td>684</td>
<td>Professional Internship</td>
<td>All Areas</td>
</tr>
<tr>
<td>685</td>
<td>Directed Studies</td>
<td>All Areas</td>
</tr>
<tr>
<td>689</td>
<td>Special Topics</td>
<td>All Areas</td>
</tr>
<tr>
<td>691</td>
<td>Research</td>
<td>All Areas</td>
</tr>
<tr>
<td>607</td>
<td>Advanced Analog Circuit Design Techniques</td>
<td>Analog &amp; Mixed Signals</td>
</tr>
<tr>
<td>610</td>
<td>Data Converters</td>
<td>Analog &amp; Mixed Signals</td>
</tr>
<tr>
<td>620</td>
<td>Network Theory</td>
<td>Analog &amp; Mixed Signals</td>
</tr>
<tr>
<td>622</td>
<td>Active Network Synthesis</td>
<td>Analog &amp; Mixed Signals</td>
</tr>
<tr>
<td>625</td>
<td>Millimeter-Wave Integrated Circuits</td>
<td>Analog &amp; Mixed Signals</td>
</tr>
<tr>
<td>650</td>
<td>High Frequency GaAs/SiGe Analog IC Design</td>
<td>Analog &amp; Mixed Signals</td>
</tr>
<tr>
<td>665</td>
<td>Integrated CMOS RF Circuits and Systems</td>
<td>Analog &amp; Mixed Signals</td>
</tr>
<tr>
<td>698</td>
<td>Analog To Digital Converters</td>
<td>Analog &amp; Mixed Signals</td>
</tr>
<tr>
<td>720</td>
<td>High-Speed Links and Circuits and Systems</td>
<td>Analog &amp; Mixed Signals</td>
</tr>
<tr>
<td>617</td>
<td>Advanced Signal Processing for Medical Imaging</td>
<td>Biomedical Imaging &amp; Genomic Signal Processing</td>
</tr>
<tr>
<td>634</td>
<td>Morphological Methods in Image and Signal Processing</td>
<td>Biomedical Imaging &amp; Genomic Signal Processing</td>
</tr>
<tr>
<td>648</td>
<td>Principles of Magnetic Resonance Imaging</td>
<td>Biomedical Imaging &amp; Genomic Signal Processing</td>
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<tr>
<td>660</td>
<td>BioMems and Lab-on-a-Chip</td>
<td>Biomedical Imaging &amp; Genomic Signal Processing</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Department</td>
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<tr>
<td>669</td>
<td>Engineering Applications in Genomics</td>
<td>Biomedical Imaging &amp; Genomic Signal Processing</td>
</tr>
<tr>
<td>760</td>
<td>Introduction to Probabilistic Graphical Models</td>
<td>Biomedical Imaging &amp; Genomic Signal Processing</td>
</tr>
<tr>
<td>761</td>
<td>Biosensors lab</td>
<td>Biomedical Imaging &amp; Genomic Signal Processing</td>
</tr>
<tr>
<td>762</td>
<td>Ultrasound Imaging</td>
<td>Biomedical Imaging &amp; Genomic Signal Processing</td>
</tr>
<tr>
<td>763</td>
<td>Magnetic Resonance Engineering</td>
<td>Biomedical Imaging &amp; Genomic Signal Processing</td>
</tr>
<tr>
<td>602</td>
<td>Computer Communication and Networking</td>
<td>Computer Engineering &amp; Systems</td>
</tr>
<tr>
<td>618</td>
<td>Resilient Computer Systems</td>
<td>Computer Engineering &amp; Systems</td>
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<tr>
<td>619</td>
<td>Internet Protocols and Modeling</td>
<td>Computer Engineering &amp; Systems</td>
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<td>Mobile Wireless Networks</td>
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<td>623</td>
<td>Parallel Geometric Computing</td>
<td>Computer Engineering &amp; Systems</td>
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<tr>
<td>624</td>
<td>IC Design Tools</td>
<td>Computer Engineering &amp; Systems</td>
</tr>
<tr>
<td>627</td>
<td>Multimedia Systems and Networks</td>
<td>Computer Engineering &amp; Systems</td>
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<tr>
<td>651</td>
<td>Microprogrammed Controls of Digital Systems</td>
<td>Computer Engineering &amp; Systems</td>
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<tr>
<td>652</td>
<td>Switching Theory</td>
<td>Computer Engineering &amp; Systems</td>
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<tr>
<td>653</td>
<td>Compute Arithmetic Unit Design</td>
<td>Computer Engineering &amp; Systems</td>
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<tr>
<td>654</td>
<td>Very Large Scale Integrated Systems Design</td>
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<tr>
<td>659</td>
<td>Parallel/Distributed Numerical Algorithms</td>
<td>Computer Engineering &amp; Systems</td>
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<tr>
<td>670</td>
<td>Fiber Optic Networks</td>
<td>Computer Engineering &amp; Systems</td>
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<tr>
<td>676</td>
<td>Advanced Computer Architecture</td>
<td>Computer Engineering &amp; Systems</td>
</tr>
<tr>
<td>680</td>
<td>Testing and Diagnosis of Digital Systems</td>
<td>Computer Engineering &amp; Systems</td>
</tr>
<tr>
<td>687</td>
<td>VLSI Physical Design Automation</td>
<td>Computer Engineering &amp; Systems</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Department</td>
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<tr>
<td>699</td>
<td>Advances in VLSI Logic Synthesis</td>
<td>Computer Engineering &amp; Systems</td>
</tr>
<tr>
<td>750</td>
<td>Design and Analysis of Communication Networks</td>
<td>Computer Engineering &amp; Systems</td>
</tr>
<tr>
<td>751</td>
<td>Computational Methods for Integrated System Design</td>
<td>Computer Engineering &amp; Systems</td>
</tr>
<tr>
<td>752</td>
<td>Advances in VLSI Circuit Design</td>
<td>Computer Engineering &amp; Systems</td>
</tr>
<tr>
<td>753</td>
<td>Theory and Applications of Network Coding</td>
<td>Computer Engineering &amp; Systems</td>
</tr>
<tr>
<td>605</td>
<td>Linear Control Systems</td>
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<td>Nonlinear Control Systems</td>
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<td>Modern Control</td>
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<td>609</td>
<td>Adaptive Control</td>
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<tr>
<td>628</td>
<td>Linear System Theory</td>
<td>Control Systems</td>
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<td>633</td>
<td>Optimum Control Systems</td>
<td>Control Systems</td>
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<tr>
<td>611</td>
<td>General Theory of Electromechanical Motion Devices</td>
<td>Electric Power and Power Electronics</td>
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<td>612</td>
<td>Computer Aided Design of Electromechanical Motion Devices</td>
<td>Electric Power and Power Electronics</td>
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<tr>
<td>613</td>
<td>Rectifier and Inverter Circuits</td>
<td>Electric Power and Power Electronics</td>
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<tr>
<td>614</td>
<td>Power Systems State Estimation</td>
<td>Electric Power and Power Electronics</td>
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<tr>
<td>615</td>
<td>Methods of Electric Power Systems Analysis</td>
<td>Electric Power and Power Electronics</td>
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<tr>
<td>616</td>
<td>Power System Electromagnetic Transients</td>
<td>Electric Power and Power Electronics</td>
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<tr>
<td>630</td>
<td>Analysis of Power Electronic Systems</td>
<td>Electric Power and Power Electronics</td>
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<tr>
<td>632</td>
<td>Motor Drive Dynamics</td>
<td>Electric Power and Power Electronics</td>
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<td>Electric Power System Reliability</td>
<td>Electric Power and Power Electronics</td>
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<tr>
<td>666</td>
<td>Power System Faults and Protective Relaying</td>
<td>Electric Power and Power Electronics</td>
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<tr>
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770  Organic Semiconductor  Information Science and Systems
771  Fluctuations & Noise Electronics  Information Science and Systems
772  Introduction to Microelectromechanical Devices and Systems  Information Science and Systems
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601  Linear Network Analysis  Information Science and Systems
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Graduate Course Descriptions

600. Experimental Optics. (3-2). Credit 4.

Hardware, electronic interfaces, and experimental techniques for optics including optical mechanics, component mounting techniques, passive optical components, interferometers and precision alignment, basic electronics including op amps, active optical elements such as acousto-optics, servos in optics, laser intensity stabilization, lock-in amplifier and frequency stabilization. Prerequisite: Approval of instructor.

601. Linear Network Analysis. (3-0). Credit 3.

Signal theory treatment of continuous and discrete signals and systems; vector spaces, projection and sampling theories, Fourier, Laplace and Z Transforms.


Computer communication and computer networks; use of the International Standards Organization (ISO) seven-layer Open Systems Interconnection model as basis for systematic approach; operational networks to be included in the study of each layer; homework assignments to make use of a campus computer network. Prerequisite: ECEN 646 or equivalent probability background.


Basic functions; short-time Fourier transform; Gabor transform; linear time-scale/time-frequency analysis; time-frequency resolution; Wigner-Ville distribution; Ambiguity function; wavelet series; multi-rate filter bank; orthogonality and biorthogonality; subband coding and pattern recognition.

604. Channel Coding for Communications Systems. (3-0). Credit 3.

Channel coding for error control, finite field algebra, block codes, cyclic codes; BCH codes; and convolutional codes; Trellis coded modulation, including ungerboeck codes and coset codes; performance on gaussian and rayleigh channels; applications to communications systems. Prerequisite: Approval of instructor and graduate classification.

605. Linear Control Systems. (3-3). Credit 4.

Application of state variable and complex frequency domain techniques to analysis and synthesis of multivariable control systems. Prerequisite: ECEN 420 or equivalent.

Techniques available to analyze and synthesize nonlinear and discontinuous control systems. Modern stability theory, time-varying systems, DF, DIFD, Lyapunov Theory, adaptive control, identification and design principles for using these concepts; examples from a variety of electronic and electromechanical systems. Prerequisite: ECEN 605.


Design of analog circuits using conventional and non-conventional voltage techniques, including floating gate, bulk driven and enhanced wide swing structures. Prerequisite: ECEN 474 or approval of instructor.

608. Modern Control. (3-0). Credit 3.

Vector Norms; Induced Operator Norms; Lp stability; the small gain theorem; performance/robustness trade-offs; L1 and Hoo optimal P control as operator norm minimization; H2 optimal control. Prerequisite: ECEN 605 or equivalent. Cross-listed with MEEN 674.


Basic principles of parameter identification and parameter adaptive control; robustness and examples of instability; development of a unified approach to the design of robust adaptive schemes. Prerequisite: ECEN 605 or approval of instructor. Cross-listed with MEEN 675.


Analog-to-digital and digital-to-analog converter architectures including Nyquist rate and oversampled converters; definition of basic data converter specifications and figures of merit; background and foreground calibration techniques to improve performance of data converters; low-power (green topologies) data converters design; state of the art mixed-signal interfaces such as transmitters and receivers front-ends in wireless and wireline communications transceivers; introduction to calibration techniques for digitally-assisted transceivers. Prerequisite: ECEN 474 or approval of instructor.

611. General Theory of Electromechanical Motion Devices. (3-0). Credit 3.

Winding function theory; inductances of an ideal doubly cylindrical machine; inductances of salient-pole machines, reference frame and transformation theory; dynamic equations of electric machines; steady-state behavior of electric machines. Prerequisite: Approval of instructor or graduate classification.

Magnetic circuits and field distribution of electric machines; main flux path calculation; calculation of magnetizing and leakage inductance; calculation of electric machine losses; principle of design of various electric machines; finite element design of electromechanical motion devices. Prerequisite: Approval of instructor or graduate classification.


Analysis/design of single phase, three phase rectifiers; phase control and PWM rectifiers; line harmonics; power factor; harmonic standards; passive and active correction methods; inverters; PWM methods; effect of blanking time; zero voltage switching and multilevel inverter; application of these systems in UPS and AC motor drives. Prerequisite: ECEN 438 or approval of instructor.


The large electric power system state estimation problem; issues of network observability; bad measurements detection/identification; sparse matrix vector techniques for computational efficiency. Prerequisite: ECEN 460.


Digital computer methods for solution of the load flow problem; load flow approximations; equivalents; optimal load flow. Prerequisite: ECEN 460 or approval of instructor.


Modeling of power system components for electromagnetic transient studies; digital computer methods for computation of transients. Prerequisites: ECEN 459 and ECEN 460.

617. Advanced Signal Processing for Medical Imaging. (3-0). Credit 3.

This is a graduate-level course covering several advanced signal processing topics in medical imaging: multi-dimensional signal sampling and reconstruction, bio-signal generation and optimal detection, Fourier imaging, Radon transform-based tomographic imaging, multi-channel signal processing, as well as constrained reconstruction, rapid imaging, image segmentation, registration and analysis. Prerequisite: Approval of the instructor.


Impact of reliability on computer and network systems design; stochastic models of reliability and availability in fault-tolerant systems; hardware, software and system interaction, system design for testability, isolation and recovery. Prerequisite: ECEN 350 or CSCE 410.

Wide spectrum of Internet protocols that make it work; analytical capabilities to evaluate the performance of complex Internet protocols; aspects of the Internet protocols, including principles, design and implementation, and performance modeling and analysis; core components of Internet protocols such as transport (TCP, UDP), network and routing (IP, RIP, OSPF, EGP, BGP-4, etc.) Prerequisite: Approval of instructor.


Development and application of advanced topics in circuit analysis and synthesis in both the continuous and discrete time and frequency domains. Prerequisite: ECEN 326 or equivalent.

621. Mobile Wireless Networks. (3-0). Credit 3.

Foundations of advanced mobile wireless networks, how they are designed, and how well they perform. Topics include fundamentals on mobile wireless networks, TCP/IP over wireless links, fading-channel modeling, CDMA, OFDM, MIMO, error control, IEEE 802.11 protocols, cross-layer optimization, wireless QoS, mobile multicast, VANETs, wireless-sensor networks, wireless networks security. Prerequisites: Basic-level "Computer Networks" class or consent of instructor.

622. Active Network Synthesis. (3-0). Credit 3.

Methods of analyzing and synthesizing active networks; sensitivity analysis, methods of rational fraction approximation, OP AMP modeling and stability. Prerequisite: ECEN 457 or equivalent.


Parallel computer architectures and algorithms for solving geometric problems raised in VLSI design, pattern recognition and graphics; advanced research results in computational geometry including convexity, proximity, intersection, geometric searching and optimization problems. Prerequisite: CSCE 311 or ECEN 350.

624. IC Design Tools. (3-0). Credit 3.

Use of several CAD tools, not covered in other classes, oriented towards the solution of more advanced IC design task; the underlying theoretical principles, problem solved and basic solution methods. Prerequisite: Approval of instructor.

Course Descriptions/Electrical and Computer Engineering 401

Applications of millimeter-wave integrated circuits for wireless transceiver; principles of operation, modeling, design and fabrication of the most common millimeter-wave CMOS, SiGe and RF MEMS circuits. Prerequisite: Graduate classification; approval of instructor.


Applied electromagnetics and physical layer concepts for modern communication systems; topics include: advanced antenna theory and analytical techniques (e.g., variational and perturbational); full-wave tools for complex radiating structures and fading environments; reconfigurable antennas and device integration; multiple antenna techniques; and fabrication, measurement, and calibration methods. Prerequisite: Approval of instructor.

627. Multimedia Systems and Networks. (3-0). Credit 3.

Research topics in multimedia storage and delivery; real-time scheduling (processor, disk, network); guaranteed service, statistical guarantees, best-effort, IP-Multicast audio/video compression standard, multicast applications, congestion control. Prerequisite: ECEN 602 or CSCE 619.

628. Linear System Theory. (3-0). Credit 3.

Application of functional analysis and geometric concepts to the analysis and synthesis of control systems. Prerequisite: ECEN 605.


Introduction of convex optimization including convex set, convex functions, convex optimization problems, KKT conditions and duality, unconstrained optimization, and interior-point methods for constrained optimization; specific application examples in communication/information theory, signal processing, circuit design, and networking, which are based on state-of-art research papers. Prerequisites: Linear Algebra (familiar with operations over vectors and matrices).


Analysis and control of semiconductor switching power converters using specialized methods such as Fourier series, state-space averaging, time domain transfer functions, sliding mode, quadrometrics and other discontinuous orthogonal functions; application of the above techniques in practice; selected research publications. Prerequisite: Approval of instructor.

Fiber optic waveguides; directional couplers; polarization; poincare sphere fractional wave devices; PM fiber; interferometric devices and sensors fiber gyroscope; faraday effect devices; multiplexing techniques. Prerequisite: Approval of instructor.

632. Motor Drive Dynamics. (3-0). Credit 3.

Mathematical analysis of adjustable speed motor drive dynamics; direct torque control in dc and ac machines; the theory of field orientation and vector control in high performance ac motor drives; motion control strategies based on the above theories; microcomputer, signal and power circuit implementation concepts. Prerequisite: Approval of instructor.


Variational approach to the development of algorithms for the solution of optimum control problems; necessary and sufficient conditions, numerical methods, and analysis and comparison of optimal control results to classical theory. Prerequisite: ECEN 605.


Image analysis and signal processing; feature extraction based upon geometrical shape; morphological filtering for image analysis; computer simulation of filter types. Prerequisites: ECEN 447 and ECEN 601.

635. Electromagnetic Theory. (3-0). Credit 3.

Maxwell's equations, boundary conditions, Poynting's theorem, electromagnetic potentials, Green's functions, Helmholtz's equation, field equivalence theorems; applications to problems involving transmission scattering and diffraction of electromagnetic waves. Prerequisites: ECEN 322; ECEN 351 or equivalent.

636. Phased Arrays. (3-0). Credit 3.

Theory and application of phased array antennas, radiators and sensors; spatial and spectral domain analysis of phased arrays including element-by-element, infinite array and Fourier methods; applications will include phased arrays, adaptive arrays, and synthesis array antennas; for use in radar, imaging and biomedical treatment and diagnosis. Prerequisite: ECEN 322 or equivalent.


Numerical techniques for solving antenna, scattering and microwave circuits problems; finite difference and finite element differential equation methods with emphasis on the method of
moments integral equation technique. Prerequisites: ECEN 351 or ECEN 635; CSCE 203 or equivalent.


Application of Maxwell's equations to determine electromagnetic fields of antennas; radiation, directional arrays, impedance characteristics, aperture antennas. Prerequisite: ECEN 351.

639. Microwave Circuits. (3-0). Credit 3.

Introduction to high frequency systems and circuits; provides background information needed to understand fundamentals of microwave integrated circuits; includes usage of S-parameters, Smith Charts, stability considerations in designing microwave circuits; utilizes CAD program "Super Compact" demonstrating design synthesis optimization and analysis of monolithic devices and circuits. Prerequisite: Graduate classification.

640. Thin Film Science and Technology. (3-0). Credit 3.

The course focuses on the thin film technology in semiconductor industry. Topics include the basic growth mechanisms for thin films (growth models, lattice matching epitaxy and domain matching epitaxy), the instrumental aspects of different growth techniques and advanced topics related to various applications. Prerequisites: Graduate standing.


Microwave two-terminal and three-terminal solid-state devices; waveguide and microstrip solid-state circuits; theory and design of microwave mixers, detectors, modulators, switches, phase shifters, oscillators and amplifiers. Prerequisite: ECEN 351.


Digital Image Processing techniques; stresses filtering, transmission and coding; fast transform techniques; convolution and deconvolution of model noise. Prerequisites: ECEN 447 and ECEN 601.


Design and application of mathematical models for estimating various measures of reliability in electric power systems. Prerequisite: ECEN 460 or approval of instructor.


Linear discrete time systems analysis using time domain and transform approaches; digital filter design techniques with digital computer implementations. Prerequisite: ECEN 601.
645. Pattern Recognition by Neural Networks. (3-0). Credit 3.

Feedforward and feedback paradigms; training algorithms; supervised and unsupervised learning; associative networks; self-clustering networks; stability and convergence; comparison with statistical pattern recognition. Prerequisite: ECEN 649 or approval of instructor.

646. Statistical Communication Theory. (3-0). Credit 3.

Concepts of probability and random process theory necessary for advanced study of communications, stochastic control and other electrical engineering problems involving uncertainty; applications to elementary detection and estimation problems. Prerequisite: Registration in ECEN 601 or approval of instructor.

647. Information Theory. (3-0). Credit 3.

Definition of information; coding of information for transmission over a noisy channel including additive gaussian noise channels and waveform channels; minimum rates at which sources can be encoded; maximum rates at which information can be transmitted over noisy channels. Prerequisite: ECEN 646 or equivalent probability background.


Introduction to the theory and design of magnetic resonance imaging systems; fundamental physical and mathematical introduction to image acquisition and reconstruction using magnetic resonance; overview of imaging system design, including magnets, imaging gradients and radio-frequency systems, contrast mechanisms, resolution. Prerequisite: ECEN 314 or ECEN 322 or approval of instructor.


Introduction to the underlying principles of classification, and computer recognition of imagery and robotic applications. Prerequisites: MATH 601 and/or STAT 601 and approval of instructor.

650. High Frequency GaAs/SiGe Analog IC Design. (3-0). Credit 4.

High frequency integrated circuit design using non-conventional technologies such as GaAs and SiGe, with the emphasis on wireless and broadband communication circuits. Device operation, basic building blocks and typical applications. Prerequisite: ECEN 474 or approval of instructor.

Hardware and software concepts involved in the design and construction of microprocessor-based digital systems; microprocessor architecture; bussing; interfacing; data input/output; memories; and software development for operation and testing; design projects with microprocessors and related components. Prerequisites: ECEN 350 and ECEN 449 or approval of instructor.

652. Switching Theory. (3-0). Credit 3.

Digital systems design; introduction to switching algebras, overview of integrated circuit technologies, analysis and synthesis of combinational circuits, special properties of selected switching functions, sequential circuits, fundamental mode analysis, pulse mode analysis, and sequential credit synthesis. Prerequisite: Graduate classification.


Digital computer arithmetic unit design, control and memory; microprocessor arithmetic logic unit (ALU) design. High-speed addition, subtraction, multiplication and division algorithms and implementations; design and simulation with integrated circuit components and VLSI circuits. Prerequisite: ECEN 651.


Design and fabrication of microelectronic circuits such as registers, selectors, PLAs, sequential and micoprogrammed machines via large scale integrated circuitry with emphasis on high-level, structured design methods for VLSI systems. Students design small to medium scale integrated circuits for fabrication by industry. Prerequisites: ECEN 454 or equivalent undergraduate VLSI course.

655. Advanced Topics in Channel Coding. (3-0). Credit 3.

Advanced topics in Channel Coding including turbo codes, low density parity check codes, iterative decoding and applications of iterative decoding principles. Prerequisite: ECEN 604 or graduate classification.

656. Physical Electronics. (3-0). Credit 3.

Elementary quantum theory; statistical mechanics; Lattice dynamics; semiconductor theory; dielectrics; magnetic materials; quantum electronics; introduction to quantum devices, such as the laser. Prerequisite: Graduate classification or approval of instructor.
657. Quantum Electronics. (3-0). Credit 3.

Application of principles of quantum mechanics to problems in optics including emission, absorption and amplification of light; optical resonators and lasers; optical modulation; nonlinear optics; photodetectors and optical receivers. Prerequisites: PHYS 412 and PHYS 606 or approval of instructor.


Low-noise design; surveying the subject of handling electronic noise from theory to measurement, design, research and developments. Prerequisite: Approval of instructor.


A unified treatment of parallel and distributed numerical algorithms; parallel and distributed computation models, parallel computation or arithmetic expressions; fast algorithms for numerical linear algebra, partial differential equations and nonlinear optimization. Prerequisite: MATH 304 or equivalent. Cross-listed with CSCE 659.


Introduction to lab-on-a-chip technology; microfabrication techniques commonly used in BioMems device fabrication; microfluidics miniaturized systems for chemical and biomedical applications such as separation, diagnosis tools, implantable devices, drug delivery, and microsystems for cellular studies and tissue engineering; will gain a broad perspective in the area of miniaturized systems for biomedical and chemical applications. Prerequisite: Approval of instructor.


Optimum receiver principles and signal selection for communication systems with and without coding; system implementation, and waveform communication using realistic channel models. Prerequisite: ECEN 646.


Probabilistic signal detection theory and parameter estimation theory; Neyman-Pearson, UMP, and locally optimal tests; discrete time Markov processes and the Kalman and Wiener filters; bayesian, maximum likelihood and conditional mean estimation methods. Prerequisite: ECEN 646.

663. Data Compression with Applications to Speech and Video. (3-0). Credit 3.

Characterization and representation of waveforms; digital coding of waveforms including PCM, delta modulation, DPCM, tree/trellis coding, runlength coding, sub-band coding and
transform coding; rate distortion theoretic performance bounds. Prerequisites: ECEN 601 and ECEN 646.

664. Nanotechnology Fabrication. (3-0). Credit 3.

Cutting edge nanostructure fabrication techniques for both top-down and bottom up approaches. Prerequisite: Instructor approval.


Introduction to wireless communication systems at the theoretical, algorithmic and circuit levels; emphasis on simulation at the architecture, transistor levels of the communication systems; focus on circuits implementable on CMOS and BiCMOS technologies. Prerequisites: ECEN 453, ECEN 456, ECEN 474.


Calculation of power system currents and voltages during faults; protective relaying principles, application and response to system faults. Prerequisite: ECEN 460 or approval of instructor.


Steady-state, dynamic and transient stability of power systems; solution techniques; effect of generator control systems. Prerequisite: ECEN 460 or approval of instructor.


Overview of HVDC systems; comparison of AC and DC power transmission; study of six-pulse and twelve-pulse power converters; analysis and control of HVDC systems; harmonics and power factor effects; system faults and misoperations; state of the art and future developments in HVDC technology; inspection trips. Prerequisite: Approval of instructor.

669. Engineering Applications in Genomics. (3-0). Credit 3.

Tutorial introduction to the current engineering research in genomics. The necessary Molecular Biology background is presented and techniques from signal processing and control are used to (i) unearth intergene relationships (ii) model genetic regulatory networks and (iii) alter their dynamic behavior. Prerequisite: ECEN 605 or approval of instructor.

670. Fiber Optic Networks. (3-0). Credit 3.

Components, topologies and architecture for communication networks based on the optical fiber transmission medium; examples based on recent publications in technical literature. Prerequisite: Graduate classification.

Development of mathematical analysis and systematic modeling of solid state devices; relationships of measurable electrical characteristics to morphology and material properties of solid state devices, p-n junction, bipolar and unipolar transistors. Prerequisite: ECEN 656 or approval of instructor.

672. Semiconductor Lasers and Photodetectors. (3-0). Credit 3.

III-V compound semiconductor material, spontaneous and stimulated emission in lasers; optical wave guiding, rate equation solutions, quantum noise and spectral linewidth properties of lasers; principle and structure of photodetectors; III-V compound material technology. Prerequisite: ECEN 370.


Microelectronic systems and fabrication technologies; methods of engineering analysis and device characterization. Junction diodes, Schottky diodes, bipolar transistors, junction and MOS field-effect devices, solar cells, light emitting diodes, charge coupled devices, magnetic bubbles, liquid crystal displays and other newly developed devices and circuits. Prerequisite: Graduate classification or approval of instructor.

674. Introduction to Quantum Computing. (3-0). Credit 3.

Introduces the quantum mechanics, quantum gates, quantum circuits and quantum hardware of potential quantum computers; algorithms, potential uses, complexity classes, and evaluation of coherence of these devices. Prerequisites: MATH 304, PHYS 208. Cross-listed with PHYS 674.

675. Integrated Optoelectronics. (3-0). Credit 3.

Light propagation and interactions in anisotropic media; electrooptic and acoustooptic effects; passive and active guided-wave devices; fabrication and characterization. Prerequisite: ECEN 464 or equivalent.


Design of advanced computers for parallel processing; emphasis on the overall structure; interconnection networks; including single-stage and multi-stage structures; shared memory and message passing architectures; control-flow and demand-driven programming; multithreaded architectures; fine-grain and coarse-grain parallelism; SIMD and MIMD; processor designs for parallel operation. Prerequisite: ECEN 651 or CSCE 614 or approval of instructor. Cross-listed with CSCE 676.

Modeling, analysis and real-time control of electric power systems to meet the requirements of economic dispatch of voltage and power. Prerequisite: Approval of instructor.

678. Statistical Optics. (3-0). Credit 3.

Statistics of laser and thermal light; partial polarization; Jones and coherency matrices; Temporal coherence; spatial coherence; mutual coherence; optical noise; detection noise. Prerequisite: ECEN 464.


Real-time digital computer application to protective relaying; extensive overview of digital protection algorithms; latest technological advancements as microprocessor-based relays, fiber-optic communication systems, unconventional instrument transformers, dynamic testing tools and methodologies. Prerequisite: Approval of instructor.


The theory and techniques of testing VLSI-based circuits and systems, and design for testability. Prerequisites: ECEN 220 or ECEN 248 or equivalent; ECEN 350 or CSCE 321 or equivalent. Cross-listed with CSCE 680.


Reports and discussion of current research and of selected published technical articles. May not be taken for credit more than once in master's degree program nor twice in PhD program. Prerequisite: Graduate classification in electrical engineering.

682. Spread Spectrum and CDMA. (3-0). Credit 3.

Spread spectrum communication systems including direct-sequence; multicarrier, and frequency hopped spread spectrum, pseudo-random sequences, code acquisition and tracking; CDMA, multi-user detection; RAKE receivers, and CDMA standards. Prerequisite: ECEN 646, ECEN 661 or approval of instructor.


Wireless applications, modulation formats, wireless channel models and simulation techniques, digital communication over wireless channels, multiple access techniques, wireless standards. Prerequisite: ECEN 646 or approval of instructor.
684. Professional Internship. Credit 1 to 4.

Engineering research and design experience at industrial facilities away from the Texas A&M campus; design projects supervised by faculty coordinators and personnel at these locations; projects selected to match student's area of specialization. Prerequisites: Graduate classification and one semester of coursework completed.

685. Directed Studies. Credit 1 to 12 each semester.

Research problems of limited scope designed primarily to develop research technique.

686. Electric and Hybrid Vehicles. (3-0). Credit 3.

Fundamental concepts of electric and hybrid-electric vehicles introduced, component requirements and system design methodologies discussed; vehicle system analysis and simulation methods presented. Prerequisite: Graduate classification or approval of instructor.

687. VLSI Physical Design Automation. (3-0). Credit 3.

The course is on algorithms for VLSI physical design automation, which include partitioning, floor planning, placement, and routing. Technical papers on the above topics will be chosen from premier CAD, conference proceedings, journals and presented in class. Prerequisite: ECEN 248, CSCE 311 knowledge in logic design and computer algorithms.

688. IC MEMS and Sensor Fabrication. (3-3). Credit 4.

Fundamental unit processes for the fabrication of silicon IC's and extension of these processes to the specialized micro-machining operations used for MEMS and sensor fabrication; basic process operations used in the laboratory to build simple IC structures; devices then characterized. Prerequisite: ECEN 325, ECEN 370, or approval of instructor.

689. Special Topics in... Credit 1 to 4.

Advanced topics of current interest in electrical engineering. May be repeated for credit. Prerequisite: Approval of instructor.

691. Research. Credit 1 or more each semester.

Research for thesis or dissertation.


Introduction to advances in nanobiotechnology; includes fabrication of micro or nano structures, molecular manipulation, medical diagnostic and treatment options, nano scale
machines such as molecular motors for drug delivery. Prerequisite: Graduate classification; approval of instructor.


Rate equations and modeling of rare-earth transitions. Spontaneous stimulated emission. Pump requirement for erbium-doped fiber. Erbium-doped fiber design and simulation using commercial dispersion compensation issues, polarization effects, self-phase modulation, cross-phase modulation. Raman and Brillouin effects in optical fibers. Prerequisite: ECEN 370 or approval of instructor.


The data conversion metrics to evaluate performance is presented, the design and classification of data converters are introduced, discussion on practical applications are given. Prerequisite: Advanced analog or approval of instructor.


Logic representation, manipulation, and optimization; combinational and sequential logic; Boolean function representation schemes; exact and heuristic two-level logic minimization; multi-valued logic representation and manipulation; multi-level logic representation and minimization; testing; technology mapping. Prerequisites: Approval of instructor and graduate classification.

710. Switching Power Supplies. (3-0). Credit 3.

This course deals with operating principles of switching power supplies. Analysis and in-depth design of several types of switching regulators including buck, boost, forward, flyback, half and full bridge switching regulator analysis will be examined. Elements of transformer and magnetic design will be introduced. State space analysis and feedback loop stabilization principles will be explored. Application of these in the industry will be explained. Prerequisites: ECEN 438 or equivalent, approval of instructor.


Forms of sustainable and unsustainable energy resources and the basic system engineering limits of each; specific problems of sustainable transportation energy on the bases of vehicle and power engineering; issues related to energy efficiency, life cycle analysis, global warming, pollution, economic and social considerations. Prerequisite: Graduate classification in engineering.

Sustainable energy sources such as photovoltaic, fuel cell, wind, and others require power electronics to perform energy conversion and conditioning in order to convert their native form of electrical generation to a format compatible with the ac utility grid; exploration of the salient electrical characteristics of solar photovoltaic sources, the requirements for grid-connection and the power electronic circuits and controls needed to perform the interconnection and control. Prerequisite: ECEN 438 or instructor approval.


System and circuit design of high-speed electrical and optical link systems; includes channel properties, communication techniques, and circuit design of drivers, receivers, equalizers, and synchronization systems; project consists of link design with a statistical bit error rate simulator and interface circuit design. Prerequisite: ECEN 474.

730. CMOS RFIC Engineering. (3-0). Credit 3.

Introduction to CMOS radio-frequency integrated circuits (RFICs) and wireless systems and networks; theory, analysis and design of RFICs using CMOS technologies; CMOS fundamentals (device, principle, models); scattering parameters, transmission lines, distributed structures, lumped elements, impedance matching, RFIC layout, processing, test, amplifiers, oscillators, mixers; CAD programs for CMOS RFIC design. Prerequisites: ECEN 322 and graduate classification.

750. Design and Analysis of Communication Networks. (3-0). Credit 3.

Analytical approach to understanding resource allocation on the Internet; study the system in a global sense, and use a deterministic approach to study congestion control protocols; study individual queues and routers, and use a stochastic approach to understanding system performance. Prerequisite: ECEN 646 or some probability background.

751. Computational Methods for Integrated System Design. (3-0). Credit 3

Integrated circuit design in a computational standpoint; VLSI circuit simulation, interconnect modeling and analysis, design and analysis of IC subsystems, parallel computing techniques for complex system design. Prerequisite(s): ECEN 454, ECEN 474 or equivalent.

752. Advances in VLSI Circuit Design. (3-0). Credit 3

Gate and wire delays, CMOS transistors, DC and AC characteristics, VLSI fabrication, Static, Dynamic, Pass-gate and PLA implementation styles, SOI and GaAs technology, DRAM, SRAM and FLASH memory design, leakage and dynamic power, sub-threshold computation, clocking, transmission lines, packaging, off-chip IO, process variation and compensation, radiation tolerance. Prerequisite(s): Graduate classification or Instructor approval.
753. Theory and Applications of Network Coding


760. Introduction to Probabilistic Graphical Models. (3-0).

Credit 3. Broad overview of various probabilistic graphical models, including Bayesian networks, Markov networks, conditional random fields, and factor graphs; relevant inference and learning algorithms, as well as their application in various science and engineering problems will be introduced throughout the course. Prerequisites: Undergraduate level probability theory; basic programming skill in any programming language (C, C++, Python, Matlab, etc.).


Biosensors Lab is a hands on experience in basic concepts of biosensing and how to make miniaturized biosensors; various application examples associated with these sensing principles. Prerequisite: Approval of instructor.

762. Ultrasound Imaging. (3-0). Credit 3.

Covers mathematical analysis of wave propagation, scattering of ultrasound in biological tissues, electronic transducer arrays for the beam forming, models of the received signals and signal processing methods for medical ultrasound imaging of tissues. Research papers related to fundamental ultrasound imaging concepts are discussed throughout the course. Prerequisite: Approval of instructor.


Design, construction and application of instrumentation for MR Imaging; fundamentals of the architecture if an MR spectrometer and the gradient subsystem used for image localization; emphasis on the radiofrequency sensors and systems used for signal generation and reception. Prerequisite(s): ECEN 410, or ECEN 411, BMEN 420, or equivalent, or approval of instructor. Cross-listed with BMEN 627.


Organic semiconductors are new semiconducting materials with huge application potentials; designed to help students understand the material properties of organic semiconductors and the operation principles of organic electronic devices; gain broad knowledge in organic semiconductors, from the structure-property relationship to the design and optimization of organic devices and systems. Prerequisite: Approval of instructor.
771. Fluctuations and Noise Electronics. (3-0). Credit 3.

This course is introducing the students to the research of Noise and Fluctuations. Noise and Fluctuations in electronics and other systems include virtually all scientific fields, including secure and non-secure communications, microprocessors, quantum information, mesoscopic systems, chemical sensing, corrosion diagnostics, neuro- and membrane-biology, biomedicine, etc. Prerequisite: Approval of Instructor.

772. Introduction to Microelectromechanical Devices and Systems. (3-0). Credit 3.

The goal of this course is to provide the students with a broad overview of the past and current developments in the emerging area of MEMS (microelectromechanical systems). The first part of this course will discuss the fundamental working principles, designs and fabrication techniques. The second part will consist of several special topics, discussing the latest important applications in different fields. Prerequisite: Consent of instructor.

773. Introduction to Nanophotonics. (3-0). Credit 3.

Photonic bandgap optical circuitry, photonic crystal fiber; Visible to infrared semiconductor quantum lasers; Semiconductor quantum dots. Plasmonic field enhancement, plasmonic optical circuitry, sub-wavelength optical lithography, negative refractive index and sub-wavelength optical imaging. Nano-structure characterization techniques, atomic force microscopy, near-field optical microscopy, scanning and transmission electron microscopy. Prerequisite: Basic Physics, ECEN 370 or equivalent, ECEN 322 or equivalent.
Eligible Undergraduate Course Descriptions


Discussion of some well-known and major contributions that electrical and computer engineers have made to society; development of the integrated circuit, advanced vehicle research, magnetic resonance imaging, communication and others.


Resistive circuits: circuit laws, network reduction, nodal analysis, mesh analysis; energy storage elements; sinusoidal steady state; AC energy systems; magnetically coupled circuits; the ideal transformer; resonance; introduction to computer applications in circuit analysis. Prerequisites: PHYS 208; MATH 308 or registration therein; admission to upper level in an engineering major.


Fundamentals of electric circuit analysis and introduction to electronics for engineering majors other than electrical and computer engineering. Prerequisites: PHYS 208; admission to upper level in an engineering major. Corequisite: MATH 308.


Combinational and sequential digital system design techniques; design of practical digital systems. Prerequisite: CSCE 110 or equivalent. For students other than electrical engineering majors.


Provide mathematical foundations from discrete mathematics for analyzing computer algorithms, for both correctness and performance; introduction to models of computation, including finite state machines and Turing machines. Prerequisite: MATH 151. Cross-listed with CSCE 222.

Combinational and sequential digital system design techniques; design of practical digital systems. Prerequisite: Admission to upper level in an engineering major.


Problems of limited scope approved on an individual basis intended to promote independent study. Prerequisite: Approval of department head.

289. Special Topics in... Credit 1 to 4.

Selected topics in an identified area of electrical engineering. May be repeated for credit. Prerequisite: Approval of instructor.


Research conducted under the direction of faculty member in electrical engineering. May be repeated 3 times for credit. Prerequisites: Freshman or sophomore classification and approval of instructor.


Concepts of probability and random variables necessary for study of signals and systems involving uncertainty; applications to elementary problems in detection, signal processing and communication. Prerequisites: MATH 308; junior or senior classification.

314. Signals and Systems. (3-0). Credit 3.

Introduction to the continuous-time and discrete-time signals and systems; time domain characterization of linear time-invariant systems; Fourier analysis; filtering; sampling; modulation techniques for communication systems. Prerequisites: ECEN 214; MATH 308.

322. Electric and Magnetic Fields. (3-1). Credit 3.

Vector analysis, Maxwell’s equations, wave propagation in unbounded regions, reflection and refraction of waves, transmission line theory; introduction to waveguides and antennas. Prerequisites: ECEN 214; PHYS 208; junior or senior classification.

Introduction to electronic systems; linear circuits; operational amplifiers and applications; diodes, field effect transistors, bipolar transistors; amplifiers and nonlinear circuits. Prerequisite: ECEN 314 or registration therein.


Basic circuits used in electronic systems; differential and multistage amplifiers; output stages and power amplifiers; frequency response, feedback circuits, stability and oscillators, analog integrated circuits, active filters. Prerequisites: ECEN 314 and 325.


Introduction to magnetic circuits, transformers, electromechanical energy conversion devices such as dc, induction and synchronous motors; equivalent circuits, performance characteristics and power electronic control. Prerequisite: ECEN 214.


Computer architecture and design; use of register transfer languages and simulation tools to describe and simulate computer operation; central processing unit organization, microprogramming, input/output and memory system architectures. Prerequisite: ECEN 248. Cross-listed with CSCE 350.


Guided waves; applications of Maxwell’s equations and electromagnetic wave phenomena to radiation, antenna design and optics; numerical techniques in electromagnetics. Prerequisite: ECEN 322.


Introduction to basic physical properties of solid materials; some solid state physics employed, but major emphasis is on engineering applications based on semiconducting, magnetic, dielectric and superconducting phenomena. Prerequisite: PHYS 222.

403. Electrical Design Laboratory I. (2-2). Credit 3.

Application of design process and project engineering as practiced in industry; team approach to the design process; development of a project proposal; proposed project implemented in
ECEN 404. Prerequisites: ECEN 214, ECEN 314, ECEN 325; ENGL 210, ENGL 241 or ENGL 301 or COMM 203 or COMM 205; senior classification.

404. Electrical Design Laboratory II. (2-3). Credit 3.

Continuation of ECEN 403; application of the design process and project engineering as practiced in industry; team approach to the design process; completion of project based on proposal from ECEN 403; includes testing, evaluation and report writing. Prerequisites: ECEN 403, senior classification and approval of project.

405. Electrical Design Laboratory. (1-6). Credit 3.

Introduction to the design process and project engineering as practiced in industry; student teams apply the design process by developing a project from proposal through test and evaluation. Prerequisites: ENGL 210 or 301, completion of selected major field courses, senior classification and project approval.

410. Introduction to Medical Imaging. (3-0). Credit 3.

Introduction to the physics and the engineering principles of medical imaging systems; focus on magnetic resonance imaging, x-ray computer tomography, ultrasonography, optical imaging and nuclear medicine; includes system structure, source generation, energy tissue interaction, image formation and clinical examples. Prerequisites: MATH 222 or MATH 251 or MATH 253; junior or senior classification.


Introduction to the basic physics of magnetic resonance, the principles of MR imaging and spectroscopy, the major contrast mechanisms in MRI and MR imaging system hardware; development of pulse sequences for different imaging methods, including flow and spectroscopic imaging; will build RF coils. Prerequisites: Junior or senior classification; MATH 251, PHYS 208.

412. Ultrasound Imaging. (3-0). Credit 3.

Mathematical analysis of wave propagation, scattering of ultrasound in biological tissues, electronic transducer arrays for the beam forming, models of the received signals and signal processing methods for medical ultrasound imaging of tissues; includes discussions of research related to fundamental ultrasound imaging concepts. Prerequisites: ECEN 314 or approval of instructor; junior or senior classification.

Hands-on lab experience in the development of miniaturized biosensors; includes microfluidic devices for biosensing. Prerequisite: Senior classification or approval of instructor.


Fundamentals of molecular biology; application of engineering principles to systems biology; topics include unearthing intergene relationships, carrying out gene-based classification of disease, modeling genetic regulatory networks, and altering their dynamic behavior. Prerequisite: ECEN 314, junior or senior classification or approval of instructor.

420. Linear Control Systems. (3-0). Credit 3.

Application of state variable and frequency domain techniques to modeling, analysis and synthesis of single input, single output linear control systems. Prerequisites: ECEN 314; MATH 308.


Feedback systems in which a digital computer is used to implement the control law; Z-transform and time domain methods serve as a basis for control systems design. Effects of computer word length and sampling rate. Prerequisite: ECEN 420 or equivalent.

422. Control Engineering and Design Methodology. (2-3). Credit 3.

Modeling, specifications, rating and operating principles of sensors, actuators and other control system components; experiments on conceptual design, simulation and physical implementation of control systems. Prerequisite: ECEN 420 or equivalent.


Electric power conditioning and control; characteristics of solid state power switches; analysis and experiments with AC power controllers, controlled rectifiers, DC choppers and DC-AC converters; applications to power supplies, airborne and spaceborne power systems. Prerequisite: Junior or senior classification in electrical engineering or approval of instructor.

440. Introduction to Thin Film Science and Technology. (3-0). Credit 3.
The course focuses on the thin film technology in semiconductor industry; topics include the basic growth mechanisms for thin films (growth models, lattice matching epitaxy and domain matching epitaxy), the instrumental aspects of different growth techniques and advanced topics related to various applications. Prerequisites: Junior or senior classification; admission to upper level in College of Engineering.


Application of semiconductor switching power converters to adjustable speed DC and AC motor drives; steady state theory and analysis of electric motion control in industrial, robotic and traction systems; laboratory experiments in power electronic motor drives and their control. Prerequisite: Junior or senior classification in electrical engineering.

442. DSP Based Electromechanical Motion Control. (2-3). Credit 3.

Overview of energy conversion and basic concepts on electromechanical motion devices; different control strategies including the solid-state drive topologies; for every electromechanical motion device, its DSP control implementation discussed and implemented in the lab. Prerequisites: ECEN 314 or approval of instructor; junior or senior classification.


Digital signal processing; discrete-time signals and systems, linear shift-invariant systems, the discrete Fourier transform and fast Fourier transform algorithm, and design of finite impulse response and infinite impulse response digital filters. Prerequisite: ECEN 314.


Improvement of pictorial information using spatial and frequency domain techniques; two-dimensional discrete Fourier transform; image filtering, enhancement, restoration, compression; image processing project. Prerequisites: ECEN 314; junior or senior classification.


Features and architectures of digital signal processing (DSP) chips; fundamental compromises amongst computational accuracy, speed and cost; real-time implementation of filtering, audio, image and video processing algorithms; rapid prototyping via MATLAB/Simulink. Prerequisites: ECEN 444; junior or senior classification.

Introduction to microprocessors; 16/32 bit single board computer hardware and software designs; chip select equations for memory board design, serial and parallel I/O interfacing; ROM, static and dynamic RAM circuits for no wait-state design; assembly language programming, stack models, subroutines and I/O processing. Prerequisite: ECEN 248.


Hardware and software aspects of interfacing microcomputers and minicomputers to memory; peripheral and communication devices. Prerequisites: ECEN 248 and ECEN 449.


Introduction to antenna theory and design; includes antenna performance parameters, analysis of radiation from sources using Maxwell’s equations, theory and design of wire antennas, arrays and frequency independent antennas; computer methods for antenna design. Prerequisite: ECEN 322.


Introduction to theory and practice of ultra high frequency radio wave generation, transmission and radiation; application of Maxwell’s equations to transmission of electrical energy in wave guides. Prerequisites: ECEN 322; ECEN 351 or registration therein.


Microwave solid-state devices and circuits; theory and design of various types of active circuits; applications of these devices and circuits in radar, communication and surveillance systems. Prerequisite: ECEN 322.


Analysis and design of digital devices and integrated circuits using MOS and bipolar technologies and computer aided simulation. Prerequisites: ECEN 214 and ECEN 248.


Digital transmission of information through stochastic channels; analog-to-dialog conversion, entropy and information, Huffman coding; signal detection, the matched-filter receiver, probability of error; baseband and passband modulation, signal space representation of signals, PAM, QAM, PSK, FSK; block coding, convolutional coding; synchronization;
communication through fading channels; spread-spectrum signaling; simulation of digital communication systems. Prerequisite: ECEN 314.


Frequency domain and time domain response of linear systems; analog modulation methods including amplitude modulation, frequency modulation and phase modulation; signal and noise modeling using probabilistic descriptions; narrowband random processes and the performance of analog modulation techniques in the presence of noise; design of communication links. Prerequisite: ECEN 314.


Analysis of basic operational amplifier and operational transconductance amplifier (OTA) circuits; noise analysis in Op amp and OTA circuits; nonlinear OTA and Op amp circuits; instrumentation amplifiers; transducer circuits; function generators; oscillators and D/A converters and basics of switched-capacitor circuits. Prerequisite: ECEN 326.


Systematic analysis and design for active RC filters; continuous-time; switched-capacitor circuits; filter approximations; synthesis techniques; sensitivity; practical considerations for monolithic integrated filters; experimental and computer-simulation verification. Prerequisite: ECEN 325.


General considerations in transmission and distribution of electrical energy as related to power systems; calculation of electric transmission line constants; general theory of symmetrical components and application to analysis of power systems during fault conditions. Prerequisite: ECEN 215 or ECEN 314.


Load flow studies; power system transient stability studies; economic system loading and automatic load flow control. Prerequisite: ECEN 215 or ECEN 314.

Principles of optical communication systems; characteristics of optical fibers, lasers and photodetectors for use in communication systems; design of fiber-optic digital systems and other optical communication systems. Prerequisites: ECEN 322 and ECEN 370.


Design, construction and application of instrumentation for MR imaging; fundamentals of the architecture of an MR spectrometer and the gradient subsystem used for image localization; emphasis on the radiofrequency sensors and systems used for signal generation and reception. Prerequisites: BMEN 420, ECEN 410, ECEN 411, or approval of instructor; junior or senior classification. Cross-listed with BMEN 427.


Ray optics; wave optics; propagation, reflection, refraction and diffraction of light; passive optical components, polarization, optical modulators, interferometers and lasers. Prerequisites: ECEN 322 and ECEN 370.


In-depth study of experimental optic techniques; opto-mechanical assemblies; passive optics; interferometers; opto-electronics; basic op-amp circuits; feedback and control of optics with electronics. Prerequisite: Junior or senior classification or approval of instructor.


Introduction to the design, modeling and verification of complex digital systems; modern design methodologies for logic design; development of tools for the design and testing of digital systems. Prerequisite: ECEN 248.


Introduction to advanced computer architectures including memory designs, pipeline techniques, and parallel structures such as vector computers and multiprocessors. Prerequisite: ECEN 350 or CSCE 321. Cross-listed with CSCE 469.


Fundamentals of MOS and bipolar microelectronic circuit fabrication; theory and practice of diffusion, oxidation, ion implantation, photolithography, etch; yield and reliability
considerations; statistical process control; integrated process design, simulation and characterization. Prerequisites: ECEN 325 and ECEN 370.


General processes for the fabrication of microelectronic devices and integrated circuits; a review of the electronic properties of semiconductors and carrier transport and recombination; analysis and characterization of p-n junctions, bipolar transistors, and MOS capacitors and transistors; design considerations for achieving optimum performance and practical structures are discussed. Prerequisites: ECEN 325, ECEN 370.

474. VLSI Circuit Design. (3-3). Credit 4.

Analysis and design of monolithic analog and digital integrated circuits using NMOS, CMOS and bipolar technologies; device modeling; CAD tools and computer-aided design; design methodologies for LSI and VLSI scale circuits; yield and economics; test and evaluation of integrated circuits. Prerequisite: ECEN 326.


Introduction to design and fabrication of microelectronic circuits; emphasis on very large scale integration (VLSI) digital systems; use of state-of-the art design methodologies and tools; design of small to medium scale integrated circuits for fabrication. Prerequisites: ECEN 248 and ECEN 325.

476. Neural Networks and Implementations. (3-3). Credit 4.

Analysis of neural network architectures; underlying principles, circuit implementations, and the application of neural networks to practical problems. Prerequisite: Senior classification.

478. Wireless Communications. (3-0). Credit 3.

Overview of wireless applications, models for wireless communication channels, modulation formats for wireless communications, multiple access techniques, wireless standards. Prerequisites: ECEN 455; junior or senior classification.

480. RF and Microwave Wireless Systems. (3-0). Credit 3.
Introduction to various RF and microwave system parameters, architectures and applications; theory, implementation, and design of RF and microwave systems for communications, radar, sensor, surveillance, navigation, medical and optical applications. Prerequisite: ECEN 322.

485. Directed Studies. Credit 1 to 6 each semester.

Problems of limited scope approved on an individual basis intended to promote independent study. Prerequisites: Senior classification; approval of department head.

489. Special Topics in... Credit 1 to 4.

Selected topics in an identified area of electrical engineering. May be repeated for credit. Prerequisite: Approval of instructor.

491. Research. Credit 1 to 4.

Research conducted under the direction of faculty member in electrical engineering. May be repeated 3 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded. Prerequisites: Junior or senior classification and approval of instructor.
Syllabi of Courses Offered during 2015
Course title and number 600 Experimental Optics
Term (e.g., Fall 200X) Fall 2015
Meeting times and location MW 12:40-1:30pm, ETB 1003
Lab session: MW 2-4 pm, F 1-4 pm CHEN 726

Course Description and Prerequisites
In-depth study of experimental optic techniques. Opto-mechanical assemblies; passive optics; interferometers; opto-electronics; basic op-amp circuits; feedback and control of optics with electronics.
Prerequisites: Good academic standing; Jr/Sr standing or approval of instructor.

Learning Outcomes or Course Objectives
During the course, students will learn to start from a collection of spare parts and build an opto-electronic servo system, designed to lock a narrowband optical filter to a laser. Along the way, the key concepts and experimental skills will be acquired by performing simpler optics and electronics tasks with gradually increasing complexity. Students will also demonstrate technical presentation skills by presenting a related topic to the class.

Name Philip Hemmer
Telephone number 979-845-932

Instructor Information
Email address hemmer@ece.tamu.edu
Office hours TBD
Office location WEB 235G

Textbook and/or Resource Material
Recommended text: Optics by Eugene Hecht, Addison Wesley Pub. Co.

Grading Policies
Tests 20%, Lab demonstrations 20%, Lab notebook 20 %, Presentations 20 %, Final
20% Grading scale: A = 90%+, B=80-89%, C=70-79%, D=60-69%, F=59% -
### Course Topics, Calendar of Activities, Major Assignment Dates

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic, Required Reading</th>
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<tbody>
<tr>
<td>1</td>
<td>Basic experimental techniques, keeping a lab book</td>
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<tr>
<td>2</td>
<td>Optical mechanics, component mounting techniques</td>
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<tr>
<td>3</td>
<td>Passive optical components, lenses, mirrors, etc</td>
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<tr>
<td>4</td>
<td>Interferometers and precision alignment</td>
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<tr>
<td>5</td>
<td>Basic electronics including op amps</td>
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<td>6</td>
<td>Active optical elements such as acousto optics</td>
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<td>7</td>
<td>Servos in optics</td>
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<tr>
<td>8</td>
<td>Laser intensity stabilization</td>
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<tr>
<td>9</td>
<td>Lock-in amplifiers and frequency stabilization</td>
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<tr>
<td>10</td>
<td>Technical presentations</td>
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<tr>
<td>11—14</td>
<td>Demonstrate skills learned</td>
</tr>
</tbody>
</table>

### Other Pertinent Course Information

For approved university-excused absences and make-up work policy, please refer to Student Rules (http://student-rules.tamu.edu/).

### Americans with Disabilities Act (ADA)

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit [http://disability.tamu.edu](http://disability.tamu.edu)

### Academic Integrity

*For additional information please visit: [http://www.tamu.edu/aggiehonor](http://www.tamu.edu/aggiehonor)*

“An Aggie does not lie, cheat, or steal, or tolerate those who do.”
GRADUATE COURSE 606, Spring, 2015, MW 9:10-10:25, WEB 049

TITLE: Nonlinear Control Systems (Focus: Nonlinear Stability, Stability Region, Fundamental Design Issues)

REQUIRED PREREQUISITE KNOWLEDGE: EE605, or mathematical maturity, computer programming.

INSTRUCTOR: G. Huang, WERC320E, phone: 845-7476.

OFFICE HOURS: 4:00-5:30 M. Feel free to come in at any time to discuss course related issues.

OBJECTIVES and YOUR RESPONSIBILITY to ACHIEVE THESE OBJECTIVES:

Learn techniques to analyze, interpret and design behaviors of dynamic nonlinear systems by attending classes, reading assigned materials, solving assigned problems, bonus problems and presenting the obtained the knowledge for classroom discussions. Through these techniques, one can see the fundamental design issues for both the "open loop" and “closed loop” behavior of the systems in the aspects of stability, stability boundaries, structural stability, and linearization effects.

You are responsible for each week's reading assignment and are to solve the assigned problems. Bonus problems and projects need to be turned in at the specified time. Presentations will be sought for the obtained knowledge through reading. Good presentations and discussions will be rewarded for extra credits.

Knowledge Sources:
1. H. Khalil, *Nonlinear Systems*, Third Ed., Prentice Hall, 2002. (Chapters 1-6, but will omit some sections and add other material as needed) {Or similar material can be found in Vidyasagar, Nonlinear System Analysis}
2. Matlab Manuals
3. Papers and books from different sources.
4. Class Notes and Classmates' Presentation
   http://huang1.ece.tamu.edu/~huang/ELEN606.htm

Assignment and Test Schedules
1. Introduction: overview and Mathematical Models of nonlinear systems (3 weeks, Jan. 19-Feb.
16) Read: 1.1-1.3, 2.1-2.7.
Discussion focus # 1: How NONLINEAR Systems differ from LINEAR Systems (Description of systems, analytical methods, design methods, etc.)?
Bonus Presentation #1 (due on Feb. 18): Examples to illustrate the key differences (the assigned reading and discussion focus.)

2. Lyapunov Stability and General Stability Issues (3 weeks, Feb. 18- March 9)
Read: 3.1.-3.5, 4.1-4.2 , Some of Chapter 6.

Discussion focus # 2: Why stability is an important issue in engineering? What is stability boundary and how to demonstrate it graphically? How matlab helps demonstrate?
Bonus Presentation #2: Examples to demonstrate the key Issues of the assigned reading on March 23.

3. Advanced Stability (3 weeks, March 23- April15)
Read: 4.3-4.8
Discussion Focus # 3: What are the major differences between time varying and time invariant systems? (Q: Suppose that a linear time-varying system whose eigenvalues are always on the left half plane for any time instant, can we conclude that the system is stable?)
Bonus Presentation #3: Examples to demonstrate the key issues of the assigned reading and focused discussion. (Due on April 15)

**Midterm on March 23. Closed Book (30%). Decision on Study Project is also due.**

4. Feedback Stabilizing Control Designs (2 weeks, April 15- April 29)
Read: 5.1-5.7
Discussion Focus # 4: What is absolute stability and how the concept helps on designing nonlinear controllers.
Bonus Presentation #4: Examples to demonstrate the key issues of the assigned reading and focused discussion. (due April 29)

5. Feedback Linearization (1 weeks , April 29)
Focused Discussion # 5: How feedback linearization works?
Bonus Presentation #5: Examples to demonstrate the key issues of the feedback linearization approach.

**Final Test (April 29, comprehensive, Closed book (30%). Final report on Study project is also due (30%)**

All tests will be closed books and notes.

The purpose of the study project is to develop the graduate students’ ability on paper searching, technical investigation, and creativity by summarizing and reporting on the obtained knowledge of a topic that is an interest to the student and which is also related to the course.
GRADING POLICY: Grade will be computed based on 2 tests + Problem Sets (10%) + study project + bonus problems + bonus presentations and discussions.
ECEN 607

Advanced Analog Circuits Design Techniques

Instructor: Edgar Sánchez-Sinencio
Office: 318-E, Wisenbaker Engineering Building
(WEB) Telephone/email: 845-7498/s-sanchez@tamu.edu
Office Hours: 4:00-5:00 p.m., Tuesday and Thursday
Prerequisites: ELEN 474/704 (or approval of instructor) Textbook: No, but ref 1 is highly recommended.
TA: Fernando Lavalle <fernando_lavalle@yahoo.com.mx>

References:

Objective: To design and test IC analog components, and building blocks in CMOS technology. To understand the relationships between devices, circuits and systems. Emphasize the design of practical amplifiers, small systems and their design parameter trade-offs. Discussion at the system level design. To identify practical applications. The lab will
provide layout and experimental practical experience.

GRADING POLICY
Laboratory 20%
Unannounced Quizzes 5%
Mid-Term Exams 35%
Homework 15%
Final Project 25% Oral Presentation using PowerPoint

This course requires that you are familiar with Bode Plots, stability of poles and zeros. Also conventional nodal analysis (writing nodal equations by inspection) as well as the uses of circuit simulators. SPECTRE, CADENCE, and MATLAB. You also need to become familiar in obtaining high quality plots from CADENCE. Homework’s and report should not include figures directly from CADENCE since they are difficult to read. *Exams could be given in a different class date.
ECEN 609-600 (Adaptive Control), Spring 2016

Class Time: 8:00 a.m.-8:50 a.m. MWF, 206 ENPH
Instructor: Dr. A. Datta  TelNo: (979)-845-5917  email: datta@ece.tamu.edu  Office: 212F WEB  Office Hours: 9:00 a.m.-10:00 a.m., MWF and by appointment

Americans with Disabilities Act (ADA) Policy Statement
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

Academic Integrity Statement
“An Aggie does not lie, cheat, or tolerate those who do.” Please refer to the following website for more details: http://www.tamu.edu/aggiehonor

Topics

• 1. Mathematical Preliminaries: Non-linear stability, Lyapunov Theory, Algebra, Optimization (6 hours)

• 2. Simple Adaptive Systems: one or two unknown parameters (6 hours)

• 3. Robustness Analysis: Instability Examples, Modifications (6 hours)

• 4. Robust Parameter Identification: A Unified Approach (6 hours)

• 5. Control of Known Plants: Model Reference, Pole Placement, Linear Quadratic (6 hours)

• 6. Robust Adaptive Control Schemes: The Certainty Equivalence Approach (9 hours)

• 7. Discrete-time Adaptive Control Schemes: similarity/differences with respect to continuous time schemes (3 hours)

• 8. Case Studies: Adaptive Control of Robotic Manipulators (3 hours)
Books and References

• 1. P. A. Ioannou and J. Sun, “Robust Adaptive Control” Prentice Hall, Upper Saddle River, NJ, 1996. (Text). This text is currently out of print; however, a new book (which I believe is an updated version of the earlier one) entitled, “Adaptive Control Tutorial,” by P. A. Ioannou and B. Fidan was published by SIAM in 2008. You may consider getting this new book. I will be lecturing from the earlier one. I have two copies of the earlier book which I can loan out to the students if needed. Also, an online version of the earlier copy is still available at http://www-bcf.usc.edu/~ioannou/RobustAdaptiveBook95pdf/Robust Adaptive Control.pdf


Student Evaluation

There will be homeworks assigned approximately once every 2 to 3 weeks. In addition, there will be an in-class midterm which will count towards 25% of the final grade, the homeworks accounting for the remaining 75%.

Midterm Date: Friday April 1st, 2016

The homeworks will involve some amount of computer simulations (mainly solving ordinary differential equations and plotting the results). You can use IMSL Routines, Matlab, etc. for this purpose. As part of the homework, there may be a design project involving a real-world system.
ECEN 610: MIXED-SIGNAL INTERFACES

Instructor: Sebastian Hoyos
Office: 315D, Wisenbaker Engineering Research Center (WERC)
Phone: 862-4253
Office Hours: TR 10:30am-noon
Email: hoyos@ece.tamu.edu
Website: http://ece.tamu.edu/~hoyos/

Prerequisites: ELEN 474 or approval of instructor


Technical reports on ADCs from a number of companies such as TI, MAXIM, National Semiconductors and ADI

Class notes and technical papers (JSSC, ISSCC, CICC and TCAS)

References:
Objectives: To discuss circuit architectures and design related issues for relevant analog-to-digital converters. Firstly, ADC parameters will be discussed, then S/H, Nyquist architectures and oversampled topologies will be covered. Relevant building blocks issues will be highlighted as well as effects on ADC performance of clock jitter, finite gain and frequency response of the active devices, component mismatch of relevant blocks and supply noise. Calibration techniques for both pipeline and sigma-delta architectures will be discussed as well. Most of the simulations will be done on CADENCE, Matlab, System view, and other dedicated software packages.

Grading policy:
Exams 55 %
Assignments (HWs and LABs) 35 %
Final Project 10 % Power Point presentation.

3 midterms; no final. Closed book exams and NO cheating pages.
No late homeworks!

A Grade 90
B 90 > Grade > 80
C 80 > Grade > 68
D 68 > Grade > 55
F 55 > Grade

Absences
Documented absence from exams will governed by applicable University Regulations If you are absent from an exam, you must immediately get in touch with me by email so we can deal with the missing grade.

Disabilities Act
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Room 126 of the Koldus Building or call 845-1637.

Academic Integrity
Academic Integrity Statement
ECEN 612 - Computer Aided Design of Electromechanical Motion Devices

Instructor: Dr. Hamid A. Toliyat
Room 237-C Wisenbaker Engineering Building
Tel: 862-3034
E-mail: toliyat@ece.tamu.edu

Prerequisite: Electric machines, electromagnetics and consent of professor

Description: Credit 4 (3 hours of lecture plus 3 hours of laboratory per week). It is the purpose of this course to present the theory and design of electromechanical motion devices. A scientific basis for the design of these devices will be introduced. Theories will be evolved from most fundamental concepts so that students can grasp the subject properly. Examples in a particular topic will be solved by standard steps. Equivalent circuits from the design equations will be developed. Computer aided design packages such as Finite element analysis as a tool for modeling electromechanical motion devices will be used throughout the course.

Course Time and Room: TR 11:10-12:25 p.m. ETB 1003
Office Hours: TR 3:00-4:00 p.m. or any other time by appointment

References:
5- Class notes and IEEE papers

Grading Policy
Homework: 30%
Exams: 20%
Labs: 50%
SYLLABUS

GRADUATE ELECTIVE COURSE  EE615

TITLE: Methods of Electrical Power Systems Analysis, Fall 2015.
INSTRUCTOR: G. Huang, WERC 320E, phone: 845-7476.
OFFICE HOUR: Tuesday 4:00-5:00. WEB: http://huang1.ece.tamu.edu/~huang/ELEN615.htm

TEXT:
1. Papers

2. Class Notes


TOPICS: (Power Flow Analysis with new flow control apparatuses, Viabilizing controls, Basics on Parallel/Distributed Computations, Optimal Power Flow Analysis, Flexible Transmission Systems)

<table>
<thead>
<tr>
<th>Week</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sept. 1</td>
<td>Introduction and Reviews (Q: what are the new issues?)</td>
</tr>
<tr>
<td>3. Sept. 15</td>
<td>Component Modeling (Q: How FACTs change the models? Y and Z matrices?)</td>
</tr>
<tr>
<td>4. Sept. 22</td>
<td>Y and Z Matrices</td>
</tr>
<tr>
<td>5. Sept. 29</td>
<td>Power Flow Formulation - PV, PQ and Slack buses (Q: What is transferring capability? Slack - bus independent power flow analysis? Transaction based power flow analysis?)</td>
</tr>
<tr>
<td>6. Oct. 6</td>
<td>Solution Techniques, basics on parallel/distributed computing</td>
</tr>
<tr>
<td>7. Oct. 13</td>
<td>G-S Power Flow Analysis (Q: How transferring capability relates to power flow analysis?)</td>
</tr>
<tr>
<td>8. Oct. 20</td>
<td>NR Power Flow Analysis</td>
</tr>
</tbody>
</table>

Midterm Exam in the week of Oct. 27

10. Nov. 3 | DC Load Flow (Q: Reliable enough for online transferring capability analysis? Flow gates? Loop flows? Responsibility evaluations?) |
11. Nov. 10 | Sensitivity and Viabilizing Controls; |
12. Nov. 17 | Voltage stability and stability monitoring |
13. Nov. 24 | Economic dispatch and Optimal Power Flow Analysis (out of town?) (Q: New meaning for deregulated systems?) |
14. Dec. 1  New issues (Bursty disappearance of wind, solar power? Line switching??) New State variable such as Steady State Frequency deviation??

15. Dec. 4  **Final Ex.**

GRADING POLICY:
Midterm ex. - Basics, Closed Book -30%
Final ex. - Comprehensive, Closed book -30%
Homeworks -10%
Study Report and project -15% (determine a topic before Oct 19, report due on Nov. 21)
Power flow program that incorporates some FACTs –15% (due on Nov. 14)
Advanced Signal Processing for Medial Imaging

This course covers several advanced signal processing topics commonly encountered in medical imaging systems and applications, with a focus on those associated with magnetic resonance imaging (MRI). After taking this course, the students will learn how signals carrying biological information are generated, detected and processed, how images are formed and processed from such signals, as well as how useful information are extracted from the images. The course starts with reviews of some fundamental signal processing topics such as multidimensional signal sampling and reconstruction, signal generation and optimal detection, and multichannel signal detection and reconstruction. This will be followed by discussions on Fourier imaging principles, projection slice theorem, Fourier transform, and Radon transform. Some image processing topics such as advanced image reconstruction (compressive sensing), fast imaging, image segmentation and image registration will also be discussed.

Prerequisite:
ELEN 444, or permission of the instructor.

Instructor: Jim Ji, WEB 309E, E-mail: jimji@tamu.edu
Office Hours: Monday 1-2 PM, WEB 309E or stop by any time when I am in the office. You can also email me or see me after class to make an appointment.

Lectures: MWF 3:00-3:50 PM, CE 136
URL: Grades and notes may be linked to secure website ecampus.tamu.edu. You’ll need neo id and password to access it.

Book References:

1. Prince & Links, Medical Imaging Signals and Systems, Prentice Hall, 2005
2. Liang & Lauterbur, Principles of Magnetic Resonance Imaging, SPIE/IEEE, 1999

On-line eook:
Basics of MRI: http://www.cis.rit.edu/htbooks/mri/ (Lots more on MRI on ISMRM education website http://www.ismrn.org/mr_sites.htm)
Hendee and Ritenour: Medical Imaging Physics (Search on http://libcat.tamu.edu, click
Electronic Resources)

Additional:

2. Semmlow, Biosignal and biomedical image processing : MATLAB-based applications, Marcel Dekker, 2004
5. Guy and Ffytche, An Introduction to the Principles of Medical Imaging, Imperial College Press, 2000

Journals:
IEEE Transactions on Medical Imaging
IEEE Engineering in Medicine and Biology
Magazine IEEE Transactions on Image Processing
(Many more on http://bi.tamu.edu/links-journalsliteratures.htm, most have online access)

Grading:
The final grade will be determined from the weightings

\[ \text{HW} = 40\% \]
\[ \text{Quizzes} = 10\% \]
\[ \text{Projects} = 50\% \]

Absence policy: Please contact instructor if you have to be absent from the class. If you miss a quiz due to absence without permission, you will not have an opportunity to make up the quiz.

Homework and Projects:
The project/hw will be assigned approximately every other Monday, which will typically be due in two weeks; and must be handed in at the beginning of the class, or submitted electronically. The lowest hw score will be dropped. NO LATE project/HW will be accepted except for those situations allowed by the A&M policy. There will be a 10- minute quiz on each Wednesday. You will have an opportunity to work on a final project to develop a medical image processing algorithm and present it to the class (final project).

Topics:

- Overview of medical imaging systems 1
- Review of some basic math and physics 3
  - a. Linear systems
  - b. Sampling and reconstruction
c. Singular value decomposition (svd)
d. Principle Component Analysis and Independent Component Analysis

• Projection-Slice-theorem
  a. Principle of tomographic imaging
  b. Random transform and backprojection
  c. X-Ray computer tomography (CT)
  d. Reconstruction using the conjugate-gradient method

• Fourier Imaging and MRI
  a. Signal generation, sampling and detection
  b. Image Reconstruction

• Multidimensional signal processing
  a. Sampling and reconstruction in multiple dimension Applications in medical imaging

• Multichannel and phased-array signal processing
  a. Sampling and reconstruction
  b. Parallel imaging in MRI and application in Ultrasound Imaging

• Compressive Sensing in imaging
  a. Data acquisition
  b. Image reconstruction
    • Linear Programming
    • Basis Pursuit
    • Other solvers

• Medical image analysis
  a. Image segmentation and clustering
  b. Genomic signal processing
  c. Image registration
  d. Texture analysis
    e. Quantitative analysis: model and model/data fitting
      • Linear and nonlinear model fitting
      • Flow measurement
      • Drug kinetics from imaging
      • Parametric mapping
  • Statistics in medicine and statistical testing (e.g., fMRI)
  • Large data and parallel computing
  • ImageJ Practical Experience

• Review and project presentation

Total hours: 45

Classroom Behavior: Please be courtesy to your classmates and instructor. Setting your cell phone and beeper to mute mode is required in class.

Students Needing Support Services:
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

“An Aggie does not lie, cheat, or steal or tolerate those who do.” Honor Council
Rules and Procedures on the web http://aggiehonor.tamu.edu/ Plagiarism will be penalized and reported to Aggie Honor Office
ECEN 620 Network Theory:  
IC Design for Broadband Communication Circuits  

Fall 2015  
Room and Schedule: ETB-1003, 11:30-12:20pm

Instructor: Jose Silva-Martinez  
Office: 318-B, Wisenbaker Engineering  
Building (WEB) Phone: 845-7477  
Office Hours: Monday and Wednesday 3-6pm  
Email: jsilva@ece.tamu.edu  
Website: TBA

Textbooks:  
Class notes and technical papers (JSSC, TCAS-I and TCAS-II)


References:

Objectives: To discuss circuit techniques for broadband analog integrated circuits for broadband communication systems. The PLL architectures will be studied, and design trade-offs will be further discussed Basic amplifiers, transimpedance amplifiers, limiting amplifiers, VGAs, phase and frequency detectors, loop filters, voltage controlled
oscillators and phase locked loops, Fast ADCs and channel equalization techniques will be studied. Frequency synthesizers, Clock and data recovery systems will be treated as well. Most of the simulations will be done on CADENCE, Matlab, System view, and other dedicated software packages.

Grading:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams</td>
<td>60%</td>
</tr>
<tr>
<td>Homeworks</td>
<td>20%</td>
</tr>
<tr>
<td>Final Project</td>
<td>20%</td>
</tr>
</tbody>
</table>

3 midterms; no final. Closed book exams with only 1 cheating page (single side letter size). No late homeworks!

A  Grade >  87.5
B  87.5 > Grade > 75
C  75 > Grade > 62.5
D  62.5 > Grade > 50
F  50 > Grade

Absences
Documented absence from exams will governed by applicable University Regulations If you are absent from an exam, you must immediately get in touch with me by email so we can deal with the missing grade.

Disabilities
Act
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Room 126 of the Koldus Building or call 845-1637.

Academic Integrity

Academic Integrity Statement
Course title and number: Electromagnetic Theory, ECEN 635-600
Term: Fall 2015
Meeting times and location: TR 11:10am-12:25pm, WEB 049

Catalog Description

Electromagnetic Theory. (3-0). Credit 3. Maxwell’s equations, boundary conditions, Poynting’s theorem, electromagnetic potentials, Green’s functions, Helmholtz’s equation, field equivalence theorems; applications to problems involving transmission scattering and diffraction of electromagnetic waves.
Prerequisites: ECEN 322; ECEN 351 or equivalent.

Course Objectives

Upon the completion of the course, the students should be familiar with the Maxwell’s equations and boundary conditions, transmission line theory, plane wave reflection and refraction phenomena, scattering of waves, waveguides, cavities, and antennas, assuming sinusoidal-steady state conditions.

Instructor Information

Name: Prof. K. A. Michalski, Department of Electrical and Computer Engineering
Telephone number: 845-5203
Email address: kmichalski@ece.tamu.edu
Office hours: TR 9:45-11:00am (or by appointment)
Office location: WEB 205H

Textbook and Resource Material

R. F. Harrington, Time-Harmonic Electromagnetic Fields, McGraw-Hill, 1961. Lecture notes and supplemental material will be made available on the course website
http://elearning.tamu.edu/

Course Policies

1. Lecture attendance is essential to complete the course successfully. For the university rules related to excused and unexcused absences visit http://student-rules.tamu.edu/rule07.
2. Telephones and pagers must be silenced while in the classroom. The use of personal computers and wireless devices during exams is prohibited.
3. Lecture notes are available on the course website and the students should print out the notes before
the lectures. Students should check the website daily for assignments and announcements.

4. Homework will be assigned via the course website and will be collected in class on the due day.

5. There will be two exams, scheduled for October 27 and November 24, 7:00-8:45pm, BLOC 457.

6. Make-up exams will not be given, except in verifiable cases of illness or emergency, or in cases of university-excused absences. Late homework will not be accepted.

7. Students may dispute their exam scores, but only within 3 days from receiving the graded work in question and only if indelible ink was used.

8. Academic dishonesty (such as copying solutions from other students or from unauthorized sources) is unethical, strictly prohibited, and will not be tolerated. Also visit [http://www.tamu.edu/aggiehonor](http://www.tamu.edu/aggiehonor).

**Grading Scale**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90-100</td>
</tr>
<tr>
<td>B</td>
<td>80-89</td>
</tr>
<tr>
<td>C</td>
<td>70-79</td>
</tr>
<tr>
<td>D</td>
<td>60-69</td>
</tr>
<tr>
<td>F</td>
<td>&lt;60</td>
</tr>
</tbody>
</table>

**Breakdown of the evaluation weights (%)**

- Homework - 20
- Exams – 2 x 40

**Course Topics**

<table>
<thead>
<tr>
<th>Week</th>
<th>Chapter</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>1</td>
<td>Fundamental concepts</td>
</tr>
<tr>
<td>3-4</td>
<td>2</td>
<td>Introduction to waves</td>
</tr>
<tr>
<td>5-6</td>
<td>3</td>
<td>Some theorems and concepts</td>
</tr>
<tr>
<td>7-8</td>
<td>4</td>
<td>Plane wave functions</td>
</tr>
<tr>
<td>9-10</td>
<td>5</td>
<td>Cylindrical wave functions</td>
</tr>
<tr>
<td>11-12</td>
<td>6</td>
<td>Spherical wave functions</td>
</tr>
<tr>
<td>13-14</td>
<td>7-8</td>
<td>Selected topics</td>
</tr>
</tbody>
</table>

**Americans with Disabilities Act (ADA)**

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Fall 2015  
ELEN 637 Numerical Methods in Electromagnetics

Description: Numerical methods of engineering electromagnetics, including efficient techniques for solving antenna, scattering, and microwave circuit problems;

Instructor: R.D. Nevels

Prerequisites: Electromagnetic Theory (ELEN 445 or equivalent), or consent of the instructor.

Textbook: Instructor’s notes, and reprints from current literature,  
*Computational Electrodynamics* by A. Taflove, Reference: any  
*Introduction to Matlab*

Office Hours: 3:00-5:00 PM Tuesday and Wednesday

Grading: 1 Exam 20%, Homework 80% turned in electronically.

Late Homework: Due date after class until 10 PM (-10%)
   Each additional day until 10 PM (additional - 10%)  
   Homework not accepted after two days  
   10 PM

TOPICS


2. Techniques in FORTRAN programming, 2-D and 3-D plotting with MATLAB from a FORTRAN code, and interactive text editing.

3. Series summation methods

4. Numerical evaluation of analytical expressions

5. Finite difference numerical algorithms applied to Laplace’s equation; implicit (matrix) method, explicit (iterative) method.

6. Relaxation methods: successive overrelaxation, under-relaxation

7. Error Criterion

8. FDTD Yee algorithm in one-and-two dimensions applied to electromagnetic scattering and wave guidance. Numerical wave velocities, numerical dispersion, numerical stability, and source models.

9. FDTD absorbing boundary conditions including Mur, Liao and Barringer methods for infinite regions applied to antennas.
10. Iterative methods for systems of linear algebraic equations (Conjugate Gradient (CG) method)

11. Weighted Residual Method (ERM) for operator equations, finite element method (FEM), method of moments (MoM),

12. FEM for differential equations: weak formulation, natural and essential boundary conditions, shape functions, Gauss quadrature, assembly of global matrix.

13. MoM, Galerkin method, collocation, Rayleigh-Ritz procedure: applications to integral equations time harmonic case in 2-D, singularity extraction and evaluation.

Syllabus – ECEN640/440 Thin Film Science and Technology

Instructor: Dr. Haiyan Wang
Contact information: RM 723 Brown Building
Phone: 979-845-5082
Email: wangh@ece.tamu.edu; hwang00@tamu.edu

Class information:
Tuesday and Thursday 2:20-3:35PM
Classroom: 113 HRBB

Lab Sessions
Tuesday 3:45-4:45PM (We will assign students into 5 9-person teams (G1-5) for lab sessions. Each team will have 2 lab sessions in total).

Office hour: Every Thursday 1:30-2:10pm additional office hours can be requested by appointment through email.

Course topics:
This graduate/undergraduate stacked course focuses on thin film science and technology widely applicable in electronic and semiconductor industry. Topics include, but are not limited to, crystal structures and defects in thin films, the basic nucleation and growth mechanisms of thin films (growth models, lattice matching epitaxy and domain matching epitaxy), thin film processing techniques (CVD, MOCVD, MBE, PLD, Laser-MBE etc.), thin film growth instrumentation aspect (energy source, chamber configurations, vacuum systems and growth controllers), and several advanced topics related to defect and dislocation control during the growth of thin films for electrical and optical devices. The following table provides a tentative guideline for course subjects.

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Topic</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Overview of thin film technology</td>
<td>9/1</td>
</tr>
</tbody>
</table>
| 2        | Crystal structures of thin films  
Defects in thin films (vacancies and interstitials, dislocations, grain boundaries etc.)  
Nanocrystalline, polycrystalline and epitaxial thin films | 9/3, 9/8  
9/10, 9/15(lab G1-1), |
<p>| 3        | Vacuum science and technology | 9/17  |</p>
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Diffusion, Surface energy, Thin film nucleation and growth models (2D, 3D, and 2D-3D combination)</td>
<td>9/22 (lab G2-1), 9/24 Quiz 1, 9/29 (lab G3-1)</td>
</tr>
<tr>
<td>5</td>
<td>Epitaxy</td>
<td>10/1, (no class on 10/6 due to meeting. Lab session 4-1), 10/13, 10/15 (lab G5-1)</td>
</tr>
<tr>
<td></td>
<td>Homoepitaxy and heteroepitaxy;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lattice matching epitaxy and domain matching epitaxy;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Superlattice structures and quantum wells</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Midterm exam</td>
<td>10/8</td>
</tr>
<tr>
<td>6</td>
<td>Vacuum science and technology (recapture some of the findings during lab sessions) and thin film characterization</td>
<td>10/20 (lab G1-2),</td>
</tr>
<tr>
<td>7</td>
<td>Thin film growth techniques (Physical Vapor Deposition-Sputtering, MBE, Laser MBE, PLD and E-beam evaporation)</td>
<td>10/22, 10/27 (lab G2-2), 10/29</td>
</tr>
<tr>
<td>8</td>
<td>Thin film growth techniques (Chemical Vapor Deposition-CVD, PECVD, MOCVD)</td>
<td>11/3 (lab G3-2), 11/5, 11/10 (lab G4-2)</td>
</tr>
<tr>
<td>9</td>
<td>Other deposition techniques: Solution based deposition techniques-Sol-Gel, PAD, LPE</td>
<td>11/12</td>
</tr>
<tr>
<td>10</td>
<td>Term paper presentation</td>
<td>11/17 (lab G5-2), 11/19, 11/24</td>
</tr>
<tr>
<td>11</td>
<td>Special topics in thin films for electrical and optoelectronics devices (solar cells and LED devices) and other applications.</td>
<td>12/1, 12/3 (half),</td>
</tr>
<tr>
<td>12</td>
<td>Special topics in thin films for fuel cells, high temperature superconductors and others.</td>
<td>12/3 (half)</td>
</tr>
<tr>
<td>13</td>
<td>Last day review and questions and answers</td>
<td>12/8 (planned)</td>
</tr>
<tr>
<td></td>
<td>Final exam</td>
<td>12/16 (1-3PM)</td>
</tr>
</tbody>
</table>
Course text books
I will use multiple books as references for this course. A partial list of references is listed below. Handouts and journal papers will also be distributed to serve as course references.


Grading Policy
Midterm exam (20%) Homework
(not graded) In- class quizzes
(20%)
Lab Report (10%)
Term paper (20%)
Final exam (30%)

Absences
I handle absences as required by the student rules.

Supplemental Reading Materials
1. For students who have very limited materials science background, I recommend the following textbook as a starting point: Materials Science and Engineering: An Introduction 6th Edition. William D. Callister, Jr. 2003, John Wiley & Sons, Inc.
6. Handouts and reference distributed during class.

2. REFERENCES:

3. COURSE CONTENT:
   Transmission Lines and Microstrip
   Lines Two-Port Networks
   Matching Networks, and Signal Flow Transistors and FET’s
   Low Noise Amplifiers Power Amplifiers
   Transistor Oscillators
   PN-junctions
   Varactor Diodes
   IMPATT and Gunn Oscillators and Amplifiers
   Mixer Diodes and Circuits
   PIN Devices
   Switches and Phase Shifters
4. GRADING SYSTEM:
The grade will be determined on the following basis:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Exam</td>
<td>35%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>45%</td>
</tr>
<tr>
<td>Homework</td>
<td>20%</td>
</tr>
</tbody>
</table>

Your final letter grade will be assigned according to the following scale:

- A  90-100
- B  80-89
- C  70-79
- D  60-69
- F  0-59

5. OFFICE HOURS AND LOCATION:
- Located at Room 205C, WEB.
- Office Hours: Tuesday and Thursday 1:00 – 2:15PM.
- You can see me at any other time by making appointments.
- Telephone No. 845-5285, Email: chang@ece.tamu.edu.
Syllabus ELEN 642
Digital Image Processing

Instructor: Jim Ji, WREC 309G; (979) 458-1468 (office), E- mail: jimji@tamu.edu Website: http://bi.tamu.edu;

Office Hours: 10-12 AM on Wednesday, WEB 309E, or by appointment.

Prerequisite: ELEN 444, or permission of the instructor.

Lectures: Tuesday and Thursday, 12: 45 pm - 02: 00 pm ; SCTS 216.

URL: http://ecampus.tamu.edu.

Textbook:

References:
Oppenheim and Schafer, Discrete-Time Signal Processing, Prentice-Hall, 1989

Journals:
IEEE Transactions on Image Processing
IEEE Transactions on Medical Imaging
(Many more on http://bi.tamu.edu/links-journalsliteratures.htm)

Grading:
The final grade will be determined from the
weightings Exams = 50%
HWs = 10%
Projects = 40%

Guaranteed: 90-100 A, 80-89 B, 70-79 C, 60-69 D, Below 60 F.
Homework and Projects:
The hw and projects will be assigned approximately every other Tuesday, which will typically be
due in two weeks. The lowest hw score will be dropped. Late HW and project will be panelized by 33%
per day, and by 100% once the solutions are posted. You will have an opportunity to work on a final
project on digital image processing and present the class in the end of the class.

Test:
There will be two midterm exams. It will be closed book but you are allowed to bring a two-
sided 8.5 by 11-inch handwritenote.

Topics:
• Review of elementary digital signal processing concepts
• Two-dimensional (2D) signals, 2D sampling, and 2D transforms
• Human visual perception
• Image formation:
  a. Photography
  b. Tomographic imaging
  c. Microscopes (optical; co-focal; SEM; TEM)
  d. Remote sensing/SAR
  e. Compressive sensing
• Image rendering/display
  a. Printing
  b. Electronic display
• Image enhancement and restoration
  a. Processing in spatial domain
     • Histogram equalization
     • Filtering
     • Denoising with non-LSI filters (median filter, anisotropic filter)
  b. Processing in transformed domain
     • Frequency-domain filtering
     • Wavelet denoising
• Morphological image processing
• Geometric transformation (ImageWarping/Morphing)
• Genomic image processing (guest lectures if possible)
• Image and video coding/compression
• Image watermarking
• Image analysis and recognition
  a. Image segmentation and clustering
  b. Image registration
  c. Quantitative analysis
• Review and project presentation

**Classroom Behavior:** Please be courtesy to your classmates and instructor. Setting your cell phone and beeper to mute mode is required in class.

**Students Needing Support Services:**
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Cain Hall, Rm. B118, or call 845-1637.

"An Aggie does not lie, cheat, or steal or tolerate those who do."
EE 643 – POWER SYSTEM RELIABILITY
2014 Fall, 3:55 – 5:10 PM, T&TH, Thom 107A
Instructor: Chanan Singh
Office 301
WERC
Office Hours: 1:00 – 3:00 PM, T&TH

Syllabus:

1. Introduction to quantitative reliability analysis
2. Probability theory and stochastic processes
3. Frequency balance approach for reliability analysis
4. Methods of quantitative reliability analysis
5. Introduction to power system reliability
6. Generation system reliability – single node analysis
7. Multi-area power system reliability – multi node analysis
8. Composite power system (generation and transmission) reliability evaluation – expanded multi node analysis
9. Impact of integrating renewable energy sources on the grid reliability
10. Reliability of Energy Cyber-Physical Systems

Grading:
Homework 15 %
Project 35 %
Mini tests 10 %
Mid term exam 20%
Final exam 20%

References:
1. Course Notes by C. Singh
4. Selected Papers
Course title and number  ECEN 644
Term         Spring 2016
Meeting times and location TR 12:45 -2:00 PM, EABA 108

Course Description and Prerequisites
This is a graduate-level DSP course that is designed to provide students with a broad perspective on
the DSP field. It builds upon the undergraduate-level DSP course ECEN 444 and cover advanced
topics such as filter design, multirate digital signal processing, linear prediction and optimum linear
filters, adaptive filtering, and power spectrum estimation.

Prerequisites: ELEN 444 and ELEN 646, or permission of the Coordinator.

Learning Outcomes or Course Objectives
After taking this graduate-level course in digital signal processing, students should understand most
concepts in digital signal processing and be ready to take on more advanced topics such as
multidimensional DSP, image and video processing, pattern recognition, and data compression.

Name             Zixiang Xiong
Telephone number  979-862-8683
Instructor Information
Email address uzx@ece.tamu.edu
Office hours       TR 4:30pm-5:30pm
Office location    WEC 334H

Textbook and/or Resource Material

References
Grading:

- Two midterm exams: 20% each
- Final exam: 40%

Course Policies:
1. Homework Submission: Homework solutions should be submitted before the class on the due date.
2. Late homework policy: On time (100%), same day (90%), next day (80%), 2 days (70%), 3 days (50%), 4 days or later (0%)
3. Collaboration: You are encouraged to discuss the assigned problems with your classmates. But you are not allowed to talk about the final solutions. Every student has to prepare his/her solution independently. Preparing the final solution: Please write your solution in a clear, readable, and concise form. Every answer should be fully justified.

Late work policy
Late work will be accepted only when a student provides documentation of a university excused absence. In such cases, the student will have the opportunity to make up any quiz, exam or other graded activities. See http://student-rules.tamu.edu/rule07

Course Topics, Calendar of Activities, Major Assignment Dates

Weekly class plan:
Week 1: Review of elementary DSP techniques (Chapters 1-5, 7 and 9 in textbook, chapters 1-9 in reference 1, and class notes)
Weeks 2-3: Algorithms for DFT: Winograd's DFT algorithm (Chapter 6 in textbook and chapter 2 in reference 2)
Week 4-5: Filter design: Least square method (Chapter 8 in textbook)
Week 6-8: Multirate digital signal processing (Chapter 10 in textbook and class notes)
Weeks 9-11: Linear prediction and optimum linear filters (Chapter 11 in textbook) Week 12: Adaptive filtering (Chapter 6 in reference 2)
Weeks 13-14: Power spectrum estimation (Chapter 12 in textbook)

Other Pertinent Course Information

Classroom Behavior: Please be courteous to your fellow classmates and the instructor. Please turn off your cell phones or set them to silent mode in the classroom.

Americans with Disabilities Act (ADA)
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for
reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu

**Academic Integrity**

*For additional information please visit: http://aggiehonor.tamu.edu*

“An Aggie does not lie, cheat, or steal, or tolerate those who do.”
Course title and number: ECEN 647 Information Theory
Term: Spring 2016
Meeting and location: Tuesday and Thursday 08:00am – 09:15am
Civil Engineering Building (CE) 136

Course Description and Prerequisites

This course covers fundamentals of information theory, with applications drawn from data compression and communication over noisy channels.

Course Objectives

The goal of this course is to develop the abilities of students:

- To understand the basic language and tools of information theory;
- To apply the basic tools of information theory to solve various communication engineering problems.

Instructor Information

- Instructor: Prof. Tie Liu
- Email: tieliu@tamu.edu
- Office hours: By appointment via email
- Office location: 301FA Wisenbaker Engineering Building (WEB)

Textbook and/or Resource Material

The following textbooks are required:


Grading Policies
The requirements include biweekly problem sets (20%), a midterm exam (40%), and a final exam (40%). The final exam may be replaced by a mini research project agreed upon by student and instructor.

Course Topics, Calendar of Activities, Major Assignment Dates

Course topics:

- Information measures and inequalities
- Variable-length data compression
ECEN 649 Pattern Recognition – Spring 2016
Class Meetings: MWF 9:10AM–10:00AM
Room: THOM 107A
Credits: 3

Course Objective: This course aims to introduce the basic elements of Statistical Pattern Recognition, focusing on critical mathematical and statistical aspects underlying pattern recognition methods. After a brief review of probability theory, we will cover fundamental concepts of classification, such as Bayesian classification and classification consistency, followed by a study of several families of classification rules, error estimation, dimensionality reduction, and model selection, including an introduction to Vapnik-Chervonenkis theory. Performance will be assessed by means of one midterm exam and one final exam, computer assignments, and problem set assignments.

Instructor: Ulisses M. Braga-Neto
Room: Web 236B
E-mail: ulisses@ece.tamu.edu
Office Hours: Piazza or by appointment

Grader: Mr. Emre Arslan
E-mail: earslan@tamu.edu

Primary Texts:

Supplementary Reading:


Course Topics:

1. Introduction to Pattern Recognition

2. Review of Probability (Appendix A of BND)
   - Sample Space, Events, Definition of Probability
   - Borel-Cantelli Lemmas
   - Conditional Probability, Independence
   - Random Variables
   - Expectation, Variance, Correlation
   - Joint distributions
   - Conditional Expectation and Prediction
   - Multivariate Gaussian distribution
   - Random sequences and convergence
   - Laws of large numbers, Central Limit Theorem

3. Fundamental Concepts in Classification
   - Bayes Decision Theory (DHS 2.1–2.4, 2.7; DGL 2.1–2.4)
   - Multivariate Gaussian Case (DHS 2.5–2.6)
   - Alternate Distance Measures (DGL 3.1, 3.3–3.5, 3.7–3.8; DHS 2.8.1–2.8.2)
   - Classification Consistency (DGL 2.5, 6.1–6.2)

4. Classification Rules
   - Parametric Discriminant Analysis (DHS 3.8.2; DGL 4.3, 16.0, 16.2; class notes)
   - Histogram Rule (DGL 6.3, 6.4)
   - Nearest-Neighbor Rules (DGL 5.1–5.2, 5.4, 5.7–5.8; DHS 4.4–4.5)
   - Kernel-Based Methods (DGL 10.0–10.1, 10.3; DHS 4.1–4.3)
   - Perceptrons (DHS 5.1–5.2, 5.4–5.7)
   - Support-Vector Machines (DHS 5.11; Webb 4.2.5, 5.4.0–5.4.2)
   - Neural Networks (DHS 6.1–6.3; DGL 30.1–30.2, 30.4 (Thm 30.7), 30.5; Webb 6.2.1–6.2.4)
   - Decision Trees (DHS 8.1–8.3; DGL 20.0–20.1, 20.9, 20.11)
   - Discrete Classification (DGL 27.0–27.1; class notes)
5. Error Estimation (Chapter 2 of BND; DGL 8.1–8.3, 8.5, 23.0–23.2, 24.0, 24.2–24.5)

6. Dimensionality Reduction (DGL 32.1, 32.4; Webb 9.1–9.3.2, 9.4.0, 9.4.2)
7. Model Selection and Vapnik-Chervonenkis Theory (Appendix B of BND; DGL 8.4, 12.1, 12.4–12.6, 13.1–13.3, 14.3–14.4, 18.1, 30.4; DHS 6.3.3, 9.6.2, 9.6.8; Webb 11.1.1–11.1.2)

Grading:

- Problem Sets: 4 assignments, ~1 every 3 weeks. Homework will not be graded in all detail; in fact it will be discussed in class. But if you turn in at least 50% of the assignment, you will get credit. (15%)

- Computer Projects: 4 assignments, ~1 every 3 weeks (25%)
- Midterm: March 7 (during class, 1-hour exam, 30%)
- Final: April 29 (during class, 1-hour exam, 30%)

You are allowed to use the class notes and the references listed on this syllabus in the solution of the assignments, but no other external sources. One A4 sheet of paper with formulas (front and back) is allowed for the Midterm exam, whereas 2 sheets are allowed for the Final exam.

Americans with Disabilities Act (ADA) Policy Statement:

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Aggie Code of Honor:

"An Aggie does not lie, cheat, or steal, or tolerate those who do."

For detailed information on Texas A&M academic integrity policies, please visit http://www.tamu.edu/aggiehonor/know.html
ECEN 651 Microprogrammed Control of Digital Systems  
Fall 2015

Instructor:  Dr. M. Lu

Office:  332E WERC

E-mail:  mlu@ece.tamu.edu

Office Hours:  M 4:20 - 5:00pm  
F 10:40-11:20am

Credit: 4 hours

Prerequisite:  ECEN350 and 449

Text:  Computer Architecture – A Quantitative Approach  
Fifth edition,  *J. L. Hennessy and D. A. Patterson*

Grading:  
<table>
<thead>
<tr>
<th></th>
<th>Homework</th>
<th>Lab</th>
<th>Midterm</th>
<th>Final</th>
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Syllabus:  
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<thead>
<tr>
<th>Week</th>
<th>Notes</th>
<th>Appd.</th>
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<tbody>
<tr>
<td>1</td>
<td>Ch1</td>
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<tr>
<td>2</td>
<td>Ch1 / Notes</td>
<td>Appd. A</td>
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<tr>
<td>3</td>
<td>Notes</td>
<td>Appd. B / Ch 2</td>
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<tr>
<td>4</td>
<td>Notes / Appd. A</td>
<td>Appd. C</td>
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<td>5</td>
<td>Ch 2</td>
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<td>6</td>
<td>Appd. C</td>
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</table>

Design Fundamentals  
Instruction Set  
Pipelining
| Week 8 | Appd. C   | "   " |
| Week 9 | Review/Midterm | "   " |
| Week 10 | Ch 3 | Instr.-level Parallelism |
| Week 11 | Appd. J | Computer Arithmetic |
| Week 12 | Appd. J | "   " |
| Week 13 | Ch 4 | Data-level Parallelism |
| Week 14 | Final | "   " |
ECEN 653
Computer Arithmetic Unit Design
Spring 2016

Instructor: Dr. M. Lu
Office: 322E WERC
Phone: 845-3749
E-mail: mlu@ece.tamu.edu
Office Hours: T 11:00-12:00
Credit: 3 hours
Prerequisite: ECEN 651 or approval of
instructor Text:

ARITHMETIC AND LOGIC IN COMPUTER SYSTEMS
Mi Lu
John Willey & Sons, Inc

Course Syllabus:

Week 1. Computer Number Systems
(Ch. 1) Week 2. Addition and subtraction
(Ch. 2) Week 3. High-speed Adders (Ch. 3)
Week 4. Multioperand Adders (Ch. 3)
Week 5. Sequential Multiplication (Ch. 4)
Week 6. Review, Exam 1
Week 7. Recoding Technique (Ch. 4)
Week 8. Array Multipliers
(Ch. 5) Week 9. Spring Break
Week 10. Array Multipliers (Ch. 5)
Week 11. Standard Division, Restoring
(Ch. 6)
(Ch. 6) Week 13. Array Dividers (Ch. 7)
Week 14. Review, Exam 2
Week 15. Floating Point Arithmetic
(Ch. 8) Week 16. Residue Number
Operations (Ch. 9)
Grading Policy: Homework  30%

<table>
<thead>
<tr>
<th>Exam</th>
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<tr>
<td>Exam 1</td>
<td>35%</td>
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<td>Exam 2</td>
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</table>
Objective: This course introduces theories and approaches for synthesizing very large scale integration (VLSI) circuits and carries an ASIC development/design laboratory that emphasizes low-power high-performance and reliability issues using an application from an emerging technology area.

The key components of this course are:

I. Advance VLSI concepts: Floor planning, placement, routing, performance tuning, compaction, low-power design, verification, reliability design, diagnostics, ASIC CAD, application-specific design issues and advanced design issues.

II. CAD algorithm: Writing placement and routing algorithms and using them on small examples

III. Project Laboratory: Design and synthesis of an ASIC processor for either a wireless communication system or bio-informatics. The lab involves mixed-mode (behavioral and structural) synthesis, use of CAD tools, and verification.

Class Schedule: MWF 9.10am – 10am @1034 ETB

Instructor: Gwan S. Choi Office: 333G WERC Hours: MWF 12 – 1pm or TThWeekend by apt on email email: gchoi@ece.tamu.edu Phone: 979)845 7486 Fax: 979)845 2360
Notes ‘n More: http://ece.tamu.edu/~gchoi/hi654.htm

“VLSI Physical Design Automation*” by Sait and Youssef

*On line manual of Verilog at /baby/cadence@ee.tamu.edu Grading Policy:
Design Project 28% *will be announced*
Project Programming Assignment 1 8% Placement
Programming Assignment 2 8%
Routing Programming Assignment 2 8%
The other one Pop Quizzes & Participation
18% Exam #1 28%
Total 100%
Letter grades will be based on final curve or 90/80/70-ABCcutoff
ELEN654 Course Outline (Tentative and does not include project discussions) Lecture0 CMOS VLSI circuits
Lecture1 Graph Theory and CAD issues Lecture2 Algorithms I Lecture3 Algorithms II Lecture4 CAD approaches

Policies: You are encouraged to share ideas, and discuss issues in the assignments. These discussions should concern principles, not results or implementations for the assignments. Penalty is given for missed or late projects, assignments or exams. No make-up exam will be administered unless due to extraordinary circumstances.
Cheating: You may share or co-develop ideas. But no copying programs, designs or write-ups.
ECEN 665: Integrated CMOS RF Circuits and Systems

- **Fall 2015**: M/W 4:20 – 5:35 p.m., ETB 1003

- **Instructor**: Kamran Entesari  
  **Office Hours**: M/W 2:00 pm-3:00 pm  
  **Office Location**: WERC 315-C  
  **Phone**: (979) 845 – 9586  
  **E-mail**: kentesar@ece.tamu.edu  
  **Web page**: http://www.ece.tamu.edu/~kentesar

- **Prerequisite**: ECEN 474 (Needs to be taken at least simultaneously), Graduate standing, Approval of the instructor


- **Description**: The purpose of this course is to understand, analyze and design of RF integrated systems and circuits. Special attention for a top-down design approach will be given. In particular the analysis and design of key building blocks are presented. Discussion of modern applications of RFICs will be provided. It is advisable that you are familiar with CADENCE, Simulink, RF-Spectre and other communication system simulators.

- **Learning Outcomes**: This is a graduate level course on the principles and applications of RF integrated circuits for wireless transceivers. The principles of operation, modeling, design and fabrication of the most common RF CMOS integrated circuits will be discussed.

- **Grading Policy**:  
<table>
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<tr>
<th>Component</th>
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<tr>
<td>Laboratory</td>
<td>25%</td>
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<tr>
<td>Two Exams</td>
<td>35%</td>
</tr>
<tr>
<td>Final Project</td>
<td>25%</td>
</tr>
<tr>
<td>Homework</td>
<td>15%</td>
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</table>

- **Topics to be covered**:  
  1. Basic concepts in RF design  
  2. Wireless standards and transceiver architectures  
  3. Passive devices on silicon  
  4. Low-noise amplifiers  
  5. Mixers  
  6. Voltage-controlled oscillators  
  8. Phase Noise

- **Americans with Disabilities Act (ADA) Policy Statement**:  
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comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Room 126 of the Koldus Building or call 845-1637.
Title: Power System Stability (Focus: Power System Monitoring and Control Issues, Nonlinear Stability, Stability Region, Its Application to power systems)

Required Prerequisite Knowledge: Basic Power Knowledge, some mathematical maturity, computer programming would help. 615 a must.


Office Hours: M 1:30-2:30. Feel free to come in at any time to discuss course related issues.

Objectives:
Learn techniques to analyze and design dynamic nonlinear systems for power system stability monitoring and control by attending classes, reading course materials, solving some bonus problems and presenting the obtained knowledge through a report and classroom discussions. A comprehensive examination, homework and project report (plus bonuses) determine your grade. Extra bonus points will be rewarded for participation in class room discussions and solving bonus problems. Good presentations and discussions will be rewarded for extra credits.

Knowledge Sources:
1. Dynamics and Control of Large Electric Power Systems, Marija Iliæ and John Zaborszky.
2. H. Khalil, Nonlinear Systems, Third Ed., Prentice Hall, 2002. (Chapters 1-6, but will omit some sections and add other material as needed) {Or similar material can be found in Vidyasagar, Nonlinear System Analysis}
5. Papers and books from different sources.
6. Class Notes
Schedules
1. Introduction and review: Power system monitoring and control issues. Quick review on basics. Steady State stability, small signal stability, large system stability.
Discussion focus #1: How technology and policy impact on power systems (analysis, operations
and controls). How basics are used to resolve power system issues. Reliability? Security?

stability?

2. Power system stability from system viewpoints: Nonlinearity and high dimensions.
Discussion focus #2: How NONLINEAR Systems differ from LINEAR Systems (Description of
systems, analytical methods, design methods, etc.)?
Homework: Power Related Examples to illustrate the key differences between linear and
nonlinear systems.

3. Dynamic System Simulation: Brute force modeling and simulation
Discussion focus #3: Can we simulate everything by computers? Numerical stability vs physical
computer intelligence is involved?

4. Phase portrait analysis and its application to power system stability analysis using small
system examples. (Nonlinear system stability)
Discussion focus #4: Equilibrium points, stability regions, small disturbance stability, large
disturbance stability, power system dynamic stability, transient stability, stability monitoring. Bonus:
examples to demonstrate power system steady state stability, transient stability, dynamic stability,
voltage stability issues.

5. Extending to large power systems: Lyapunov Stability and General Stability Issues
Source from Khalil: 3.1.-3.5, 4.1-4.2, Some of Chapter 6.
Discussion focus #5: Stability concept. Why stability is an important issue in engineering and power
system in particular? What is stability boundary and how to demonstrate it graphically? How matlab
helps demonstrate?
Bonus: Examples to demonstrate the key Issues of large power system stability.

Discussion focus #6: How to find the new equilibrium point after a disturbance? (Computational
and physical issues.)
Bonus: Examples to demonstrate stabilizing control issues.

The purpose of the study project is to develop the graduate students’ ability on paper searching,
technical investigation, and creativity by summarizing and reporting on the obtained knowledge of a
topic that is an interest to the student and which is also related to the course. In addition, enhance the
writing, presentation and discussion skills in English.

GRADING POLICY: Grade will be computed based on study project report 40%, Homework 10%
and comprehensive examination (50%) (extra bonuses from bonus problems + bonus presentations
and discussions.)
• Fixed-length data compression
• Zero-error communication
• Coding for discrete memoryless channels
• Feedback capacity and source-channel separation theorem
• Coding for discrete memoryless continuous-valued channels

Exam dates:
• Midterm exam: Thursday March 3
• Final exam: Friday May 6

Americans with Disabilities Act (ADA)

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Academic Integrity

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For additional information please visit: http://aggiehonor.tamu.edu/
The course covers the basic unit process operations for the fabrication of silicon bipolar and MOS microelectronic devices and integrated circuits; emphasis is on the theory and practice of oxidation, diffusion, ion implantation, photolithography, metallization, plasma processing and epitaxy; yield and reliability considerations, simulation, and characterization of semiconductor devices. The emphasis is directed towards an understanding of the fundamental unit operations of silicon wafer fabrication and the impact these processes have on the electrical properties of the resulting devices. The basic process operations are used in the laboratory. Simple devices are built and characterized. Prerequisites: ECEN 325, 370.


ELEN 472 Laboratory Manual

Instructors: Prof. H.R. Harris
724 Brown Eng
Bldg / ZEC 208J
979-845-4217
rusty.harris@tamu.edu

Office Hours: MW 1:30 PM
– 2:30 PM
Other times by appointment

Grading: Lab 25%
3 Exams 45% NO FINAL
Simulation Assignments 10%
In-class quizzes 10%
Reports / Presentations 10% 100%

Quiz Policy:
All quizzes will be based on suggested homework assignments. Homework is a set of suggested
problems from text, internet research and investigation, reading assignments and miscellaneous material concurrent with classtopics.

Goals:
ECEN 688 will provide an overall view of the unit processes used in silicon micro-electronic device fabrication and exposure to the techniques, systems, and procedures used in the manufacturing operations. The lectures provide the basic fundamentals; the text provides amplification, direction for further exploration, and problems to apply the knowledge gained from lecture and text; and the laboratory provides “hands-on” experience and application of the principles learned. The knowledge acquired in this course will allow the student to understand the processes and process tools used in a state-of-the-art wafer fab.

Safety:
Safety in the lab is the highest priority. Safety training and protocol will consist of two parts:

1. Complete the Online training
   a. Go to https://ehsd.tamu.edu/Pages/EngSafetyTraining.aspx and click on "Training."
      i. The student version of the website is in a state of flux. You will be updated
      ii. Your statement, under the Aggie Honor Code, that you have thoroughly studied and completed the course materials and that you pledge to apply this knowledge to reduce risk for themselves and others.

   You will (eventually) receive a training certificate as a PDF format document. You must bring this certificate with you on the first day of lab.

2. You must complete the Lab Safety Agreement on the Howdy portal.
3. You will need to review class-specific safety section in the lab manual, pages 5-9. The student safety agreement is posted on the Howdy portal and must be completed prior to the first scheduled lab activity.

Academic Integrity:
“Texas A&M University encourages Academic Integrity and strictly enforces policies against any form of scholastic dishonesty. Please review the Student Rules at http://student-rules.tamu.edu for more information regarding these policies.” …Student Conflict Resolution Services

TOPICS

Students are expected to read the material assigned each week before class.
<table>
<thead>
<tr>
<th>Week</th>
<th>Chapter</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Preface, 1, &amp; 2</td>
<td>Overview, Introduction, Substrates (Wafers)</td>
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<tr>
<td>2</td>
<td>4</td>
<td>Oxidation</td>
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<td>3</td>
<td>7, 11.1</td>
<td>Lithography / Chemical Etching</td>
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<td>5</td>
<td>5,6</td>
<td>Ion Implantation/Rapid Thermal Processing</td>
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<td><strong>TEST I</strong></td>
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<tr>
<td>6</td>
<td>10</td>
<td>Plasmas and Vacuum Science</td>
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<tr>
<td>7</td>
<td>10, 11</td>
<td>Plasmas and Vacuum Science / Plasma Etching</td>
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<tr>
<td>8</td>
<td>12</td>
<td>Physical Vapor Deposition</td>
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<td>9</td>
<td>13</td>
<td>Chemical Vapor Deposition</td>
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<td>10</td>
<td>15</td>
<td>Contacts and Metallization</td>
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<td>16</td>
<td>CMOS Process Integration</td>
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<td>12</td>
<td>13</td>
<td>Non-CMOS Technologies</td>
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<tr>
<td></td>
<td>-</td>
<td>Electrical Characterization of CMOS</td>
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<tr>
<td>14</td>
<td>-</td>
<td>Advanced Topics</td>
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Introduction to Hardware Design Verification
CSCE, EECN 489/689
Fall 2015

Course Logistics

1. Time and Place: TR 8:00am – 9:15am Room: HRBB-113
2. Course Page (eCampus): HERE
3. Course Discussion Forum (Piazza): HERE
4. Instructor: Aakash Tyagi, HRBB-515A, 979-845-5480
5. Office Hours: By Appointment (email to tyagi@tamu.edu)

Prerequisites

- CSCE 312 or 350 or equivalent course in Computer Architecture
- Familiarity with C/C++/Verilog/VHDL programming

Description

The objective of this course is to provide you with an overall breadth understanding of the landscape of Hardware Design Verification. Verification asks the critical question: Are we designing the right product. This course will place early emphasis on the criticality of Verification in Integrated Circuit Hardware Design via Case Studies and Best Known Industry Practices. Special emphasis will be placed on Logic Functional Verification.

Key takeaways for students are as follows:
- Appreciation for Verification and Validation in Product Development
- Design Specification
- Design Functional

Verification Textbooks


Additional Reference Book: Hardware Design Verification: Simulation and Formal Method-
Based Approaches, William K. Lam, Prentice Hall, 2005

In addition, we will refer to published papers in areas of verification and validation. **Grading Policies (Subject to Change)**

Grading broken down in 50-50 proportions between project and exams as follows for a total of 100 points.

- **Project:** 50 points
- **Exams:** 2 (1 midterm, 1 final): 50 points (25 points each)

Grade scale is as follows: 90-100=A, 80-89=B, 70-79=C, 60-69=D, Below 60 = F

Late-Submission Policy: Unless stated otherwise, lateness is penalized as a simple linear function of minutes late (%Penalty = m/57.6, where m is # of mts late). This is a % of the score.

**Course Topics (Subject to Change)**

1. **Introduction to Design Verification**
   - **Verification in the Chip Design Process - Product life cycle, Case Studies of Major Verification and Validation Escapes**
   - **Verification Flow**
   - **Fundamentals of Simulation Based Functional Verification**
   - **Fundamentals of Formal Verification**
   - **The Verification Plan**

2. **Simulation Based Verification**
   - **HDL’s and Simulation Engines**
   - **Verification Environments**
   - **Strategies for Simulation-Based Stimulus Generation**
   - **Strategies for Results Checking in Simulation-Based Verification**
   - **Re-Use Strategies and System Simulation**

3. **Comprehensive Verification**
   - **Pervasive Functional Verification**
   - **Completing the Verification Cycle**

4. **Case Studies inspired by Industry Examples**

**Academic Integrity Statement and Policy**

"An Aggie does not lie, cheat or steal, or tolerate those who do." For additional information, please visit: http://aggiehonor.tamu.edu.

**Americans with Disabilities Act (ADA) Policy Statement**

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Special Topics in Data Acquisition &
Embedded Systems

Number: ECEN 489/689
Term: Fall 2015
Lecture: MW 3:00 pm – 3:50 pm
Laboratory: F 2:00 pm – 5:00 pm
Prerequisites: Junior or Senior Classification
Instructors: Dr. Jean-Francois Chamberland
             Dr. Gregory Huff
             chmbrln@tamu.edu  ghuff@tamu.edu
             Phone: 979-845-6204  Phone: 979-862-4161
Department: Electrical & Computer
Office Hours: F 2:00 pm – 5:00 pm
Location: EIC

Course Description: The goal of this multidisciplinary project-based laboratory course is to provide instruction on data acquisition, system-level integration and design through a range of hands-on activities that complement the traditional classroom experience. This includes circuit prototyping, PCB fabrication, microcontrollers and C++ programming, networking, and data visualization. The main focus is on modular application development, algorithms, information management, control and actuation. In addition, emphasis is put on team work, presentation skills, time management, creativity and innovation.

Additional Material (ECEN 689): Students enrolled in the graduate section of the course will apply statistical inference techniques, vector space methods, optimization and/or linear control within the context of each project. They will have to demonstrate proficiency in these areas through challenges aimed at graduate students, the creation of additional tutorials, and select project components focused on information processing, control and optimization.

Learning Outcomes:

1. Enhance engineering education by facilitating learning through engineering projects.
2. Review the basics of circuit building, programming concepts, computer-aided design tools, the fundamentals of microcontrollers.
3. Foster leadership and team work, with division of labor, complementary tasks, discussion and integration.
4. Develop the ability to bridge theoretical concepts and practical tasks.
5. Master elements of experiential learning such as abstract conceptualization, active experimentation, concrete experience, reflective observation.

6. Improve transferable engineering skills and the ability to integrate different concepts.

7. Develop confidence and leadership.

8. Promote creativity and critical thinking.

9. Refine presentation skills and the ability to conduct and manage projects.

Assignment: Tasks, assignments, challenges, and tutorials should be anticipated by participants. Students are encouraged to work in groups for many assignments, but required to complete certain tasks independently. Coded solutions must be submitted as CMake projects or Arduino sketches using git and GitHub, a distributed revision control and source code management system.

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Recommended Texts: There exist many books that offer an excellent treatment of the technologies surveyed in this course. Several such books are available at the library.

*++ Primer, 5th edition*  
Stanley B. Lippman, Josée Lajoie, Barbara E. Moo
Grade Policies: The major grade components for *Data Acquisition & Embedded Systems* and their respective weights are listed below. Assignment and test grades will only be discussed after class or during office hours. We reserve the right to ask students to present their concerns or arguments in writing. Failure to meet a deadline may result in a grade of zero for the corresponding work.

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<td>10 %</td>
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<td>Assignments &amp; Challenges</td>
<td>10 %</td>
</tr>
<tr>
<td>Tasks, Quizzes, Presentations, &amp; Media</td>
<td>20 %</td>
</tr>
<tr>
<td>Projects</td>
<td>50 %</td>
</tr>
</tbody>
</table>

The grading rule for ECEN 689 features the same percentages, but the requirements and grading schemes within components differ to accommodate additional work. If your overall grade falls within one of the prescribed ranges, then you are guaranteed to receive at least the letter grade indicated.

**Grading Scale**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90 – 100 %</td>
</tr>
<tr>
<td>B</td>
<td>80 – 89 %</td>
</tr>
<tr>
<td>C</td>
<td>70 – 79 %</td>
</tr>
<tr>
<td>D</td>
<td>60 – 69 %</td>
</tr>
<tr>
<td>F</td>
<td>0 – 59 %</td>
</tr>
</tbody>
</table>

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Course title and number: ECEN689 Special Topics in Data Science for Communications
Networking Term: Fall 2015
Meeting times and location: MW 03:00pm-04:15pm, HELD 111

Instructor Information
Name: Dr. Nicholas
Duffield Telephone number: 845-7328
Email address: duffieldng@tamu.ed
Office hours: MW 11:00am-12:00pm
Office location: WEB 332D

Course Description and Prerequisites
This course will study statistical and algorithmic methods for acquiring and analysing massive, complex, and incomplete datasets, with application to measurement and analysis of operational data in ISP communication networks, routers and protocols. Topics include network measurement, sampling, sketching, network probing, network tomography and graph sampling.

Prerequisite: graduate standing; approval of instructor. Students should have working knowledge of the basics of probability and statistics, and of computer networking.

Learning Outcomes
Acquiring knowledge of statistical and algorithmic methods in data science and their application in network measurement and analysis. Understanding the design issues and trade-offs between statistical, computation and implementation goals. The course will prepare students to conduct their own research in this area.

Grading Policies
Homework: 50%
Project: 15%
Student Presentation: 15%
Final Exam: 20%

Grading Scale: 90-100 A, 80-89 B, 70-79 C, 60-69 D, below 60 F.

Discussion of homework assignments is encouraged, but homework must be executed independently and copying is not allowed. Assignments must be typeset and handed in on time to receive full credit. No late homework and project proposals will be accepted unless an official document (e.g., doctor’s note) justifies the absence.

**Textbook and/or Resource Material**

Background references

- Peterson & Davie: Computer Networks (5th Edition)

Detailed references: selections from

- Kolaczyk: Statistical Analysis of Network Data: Methods and Models

Background review articles and tutorials

- Cormode & Duffield: Sampling for Big Data

Research literature references: will be communicated in class notes
## Course Topics

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Topic</th>
<th>References &amp; Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>Introduction; Passive Traffic Measurement in ISPs</td>
<td>Peterson Ch. 3,5 and Research Literature</td>
</tr>
<tr>
<td></td>
<td>Sampling in Traffic Measurement; Reservoir Sampling; Weighted Sampling</td>
<td></td>
</tr>
<tr>
<td>4-6</td>
<td>Order Sampling. Database Applications. Stateful stream sampling. Counting Samples. Sample and Hold. Performance trade-offs.</td>
<td>Ullman Ch. 4, and Research Literature</td>
</tr>
<tr>
<td>7-9</td>
<td>Sketching. Bloom Filters. Count-Min Sketch. Eliaialet, Martin Sketch. Cuckoo hashing and filtering</td>
<td>Research Literature</td>
</tr>
<tr>
<td>10-11</td>
<td>Network Tomography</td>
<td>Kolaczyk, Ch. 7, 9</td>
</tr>
<tr>
<td>12</td>
<td>Student Presentations</td>
<td></td>
</tr>
<tr>
<td>13-14</td>
<td>Graph Sampling and Estimation</td>
<td>Kolaczyk, Ch. 4</td>
</tr>
</tbody>
</table>

Additional references to the technical literature will be provided in class.

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"An Aggie does not lie, cheat, or steal, or tolerate those who do."
Course title and number: ECEN 689: Distributed Systems and Cloud
Computing Term (e.g., Fall 200X): Fall 2015
Meeting times and location: MR 8AM – 9:15AM, C E 137

Course Description and Prerequisites
This course introduces fundamental concepts of distributed systems, with a focus on the emerging application of cloud computing. Students will learn to design, analyze, and optimize distributed systems. Topics include, but are not limited to, MapReduce, synchronization, peer-to-peer systems, election, distributed agreement, replication, job assignment, etc.

Prerequisites: None

Learning Outcomes
At the end of the course, students will understand the design of modern distributed systems. They will be able to build various distributed systems from scratch. They will also be able to analyze and implement new modules in current architectures of distributed systems.

Instructor Information
Name: I-Hong Hou
Telephone number: (979)862-1092
Email address: ihou@tamu.edu
Office hours: MW 3PM - 4PM
Office location: 334C WEB
Textbook and/or Resource Material


Grading Policies

Homework: 30%
Midterm Exam (Nov. 5): 25%
Class Presentation: 25%
Final Paper: 15%
Class Participation: 5%

Grading scale:
A 90–100%
B 80–89.99%
C 70–79.99%
D 60–69.99%
F 0–59.99%

Attendance and Make-up Policies

Attendance and make-up policies will follow the general student rule of the university:
http://studentrules.tamu.edu/rule07.

Course Topics, Calendar of Activities, Major Assignment Dates

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Required Reading</th>
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<tbody>
<tr>
<td>1-2</td>
<td>Introduction, system models, and some backgrounds</td>
<td></td>
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<tr>
<td>3-5</td>
<td>Synchronization, global state, consensus, and concurrency control</td>
<td></td>
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<tr>
<td>6-9</td>
<td>Distributed file storage, P2P systems, replica</td>
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<tr>
<td>10</td>
<td>Review and Midterm</td>
<td></td>
</tr>
<tr>
<td>11-14</td>
<td>Emerging challenges. Read and discuss 14 papers on 7 emerging topics</td>
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Special Topics in Data Acquisition & Embedded Systems

Number: ECEN 489/689
Term: Fall 2015
Lecture: MW 3:00 pm – 3:50 pm
Laboratory: F 2:00 pm – 5:00 pm
Location: EIC

Prerequisites: Junior or Senior Classification
Instructors:
Dr. Jean-François Chamberland chmbrlnd@tamu.edu Phone: 979-845-6204
Dr. Gregory Huff ghuff@tamu.edu Phone: 979-862-4161

Department: Electrical & Computer Engineering
Office Hours: F 2:00 pm – 5:00 pm
Location: EIC

Course Description: The goal of this multidisciplinary project-based laboratory course is to provide instruction on data acquisition, system-level integration and design through a range of hands-on activities that complement the traditional classroom experience. This includes circuit prototyping, PCB fabrication, microcontrollers and C++ programming, networking, and data visualization. The main focus is on modular application development, algorithms, information management, control and actuation. In addition, emphasis is put on team work, presentation skills, time management, creativity and innovation.

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<td>C++ Classes</td>
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<td>Tasks, Quizzes, Presentations, &amp; Media</td>
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</tr>
<tr>
<td>Projects</td>
<td>50 %</td>
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- **C** 70 – 79 %
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Miscellaneous: Student dress, behavior, and speech are expected to be courteous and professional. Any deviation from this deemed inappropriate by the professor or any disruptive behavior will result in immediate ejection from the class period with swift and appropriate disciplinary measures.
Course title and number  ECEN489/689 Special Topics in Algorithms in Structural Bioinformatics
Term  Fall 2015
Meeting times & location  MWF 3:00pm-3:50pm PETR 104

Course Description and Prerequisites

This course introduces fundamental concepts, modeling techniques, and computational algorithms in structural bioinformatics especially for students interested in algorithmic development and application for computational challenges arising from the field. With a focus on algorithms involving molecular modeling, systems simulation, optimization, and learning, the course provides essential knowledge for students without prior background in the application domain and addresses learning barriers for them to make unique contributions to the field.

Applications of these algorithms are centered on how to analyze, predict, and engineer biomolecules and biomolecular systems: protein structure and function prediction, molecular dynamics simulation, protein docking, computer-aided drug design, and biomolecular systems engineering. Algorithmic solutions to these applications can provide case studies for algorithmic thinking and innovation. Students interested in practical problem-solving skills for specific applications are also welcome.

The course will involve literature-based presentation, case studies, short projects in homework, and a main final project, in addition to regular lectures.

Prerequisites: Basic knowledge in algorithms and programming. No prior knowledge in biomolecules or biomolecular systems is required.

Learning Outcomes

By taking the course, students are expected
1. to gain knowledge about fundamental concepts, pressing challenges, and rich opportunities in developing and applying algorithms for structural bioinformatics and healthcare;
2. to apply and to strengthen engineering principles and algorithmic thinking to the emerging applications of structural bioinformatics and other fields; and
3. to develop practical skills in computational approaches to analyze, predict, and engineer biomolecules and biomolecular systems.

Name  Yang Shen  Telephone number  979-862-1694  Email address  yshen@tamu.edu

Instructor Information

Office hours  TBA or by appointment
Office location  Wisenbaker Engineering Building 223A

Textbook and Resource Material

Recommended Textbooks:

Grading Policies

Weights towards final grades for undergraduate students

- 30% Homework
- 30% Midterm exam
- 40% Final Project and Presentation

Weights towards final grades for graduate students

- 20% Homework
- 25% Midterm exam
- 15% Mini Project
- 40% Final Project and Presentation

Tentative Grading Scale:
A  [90%, 100%]
B  [80%, 90%]
C  [70%, 80%]
D  [60%, 70%]
Final grades will be determined numerically based solely on individual standing to reflect how well students do in quizzes and exams. This approach is adopted to ensure at least a fair mechanism to assess how well students learn course materials and accomplish course goals. Meanwhile, diversity in student background (engineering or science) and academic standing (undergraduate or graduate) will be respected and reflected in final project topics.

**Course Topics**

Here is the tentative course outline with approximately assigned lecture time:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Related</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Background on biomolecules and structural bioinformatics</td>
<td>GB1-3, S3</td>
</tr>
<tr>
<td>2</td>
<td>Molecular visualization</td>
<td>GB9</td>
</tr>
<tr>
<td>2-3</td>
<td>Protein structure prediction: ab initio methods incl. search methods for optimization</td>
<td>GB32, S12&amp;13</td>
</tr>
<tr>
<td>3-4</td>
<td>Protein structure prediction: template-based homology modeling, threading &amp; learning</td>
<td>GB3</td>
</tr>
<tr>
<td>5</td>
<td>Molecular dynamics simulation</td>
<td>S13</td>
</tr>
<tr>
<td>6-7</td>
<td>Protein flexibility and protein docking: dimensionality reduction and optimization revisited</td>
<td>D20-23, GB24-27</td>
</tr>
<tr>
<td>7-8</td>
<td>Computer-aided protein and drug design: combinatorial optimization</td>
<td>GB39, D11</td>
</tr>
<tr>
<td>9</td>
<td>Protein function prediction from sequence, structure, and big data: learning</td>
<td>GB21 &amp; GB22</td>
</tr>
<tr>
<td>10-12</td>
<td>Biomolecular system modeling: steady states and dynamics</td>
<td></td>
</tr>
<tr>
<td>13-14</td>
<td>Final project presentation</td>
<td></td>
</tr>
</tbody>
</table>

Contents may subject to adjustment. Additional research literature will be provided in lectures.

**Attendance and Make-up Policies**

Regular and punctual attendance to the lectures and recitations facilitates the effective implementation of a systematic study plan. Please consult student rule 7 for additional information: [http://student-rules.tamu.edu/rule07](http://student-rules.tamu.edu/rule07).
Americans with Disabilities Act (ADA)

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu

Academic Integrity

*For additional information please visit:*

http://aggiehonor.tamu.edu

“An Aggie does not lie, cheat, or steal, or tolerate those who do.”
Course title and number  R and Its Applications to Genomic Systems Engineering (ECEN 489/689)  
Term  Fall 2015  
Meeting times and location  MW 10:20 am-11:35 am, TBA

Course Description and Prerequisites
Intended for students to learn R and solve problems in genomic systems engineering. In this course, we will discuss basics of R and a number of packages relevant to biology data analysis. Prerequisite: for all students knowing at least one programing language; for undergraduate students, senior classification; Mac or Linux laptop for in-class use.

Learning Outcomes
The objective of this course is to introduce students to R, a commonly used programming language for big data analysis. Students will apply the programming skills learned in the lectures to develop/improve R packages useful for biology data analysis (students will need to understand the problems that the package solves and the methods employed in the package).

Upon the completion of this course, the student will be able to write R program, to use existing packages to perform data tasks in biology, and to make new R packages.

Instructor Information
Name  Peng Yu  
Telephone number  (979) 320-9822

Email address  pengyu.bio@gmail.com  
Office hours  1 hour after each lecture (or by appointment)  
Office location  215F WEB  
Course website  https://sites.google.com/a/tamu.edu/ragse-fall2015  
Course mailing list

Textbook and/or Resource Material

Undergraduate students:
- Homework: 25
- Midterm exam: 25
Grading Policies

Graduate students:
- Homework: 20
- Midterm exam: 20
- Mini project: 10
- Project: 50
Students may discuss homework with each other. But homework solutions must be the students’ own work, not copied. Similar homework submissions will be reported.

10 points are for class participation. Students missing more than 4 lectures without excuses permitted by university rules (http://student-rules.tamu.edu/rule07) will receive F.

Late homework will not receive grade. All homework must be finished and turned in (even after due date). Otherwise, the students will receive I.

The instructor will provide a project topic. Students will be assigned into groups, and each group will work on a project. Each group is required to submit a brief report every week to ensure timely progress once the project is started (10% of the project grade). To ensure the success completion of the project, there will be weekly assignments related the project (70% of the project grade).

Numeric Grade to Letter Grade*

- $\geq 90 = A$
- $\geq 80$ and $< 90 = B$
- $\geq 70$ and $< 80 = C$
- $\geq 60$ and $< 70 = D$
- $< 60 = F$

*This is the lowest grade that you are guaranteed. Depending on the relative performance of students with similar background and undergraduate/graduate classification, your grade MAY be adjusted higher.

Each graduate student is required to do a miniproject --- scribing some lectures (typically one or two lectures per student). The notes will have to be scribed in pandoc (http://pandoc.org). The initial due dates for the notes of Monday lectures are Wednesdays, and the initial due dates for Wednesdays are due on Fridays. Students will need to respond to feedback to improve the notes (due one week and two weeks after the initial due dates). The scribed notes will be graded on the timeliness of completion as well as the responsiveness to feedback and the quality of the writeup.

*Rules for makeup exams and assignments can be found at http://student-rules.tamu.edu.

Course Topics, Calendar of Activities, Major Assignment

Dates* Week1 Getting started
- Install R
- Get familiar with the R session
- Rstudio
- Install R packages
- Get help
- History of R
Week 2-4 R data structures and related basic R functions
- Vector
- Matrix
- List
- Dataframe
- Factor
- Table

Week 5-8 R programming structures
- Loop
- If-else
- Operators
- Functions
- Environment
- Recursion

Week 9 Math functions

Week 10 Object oriented programming
- S3
- S4

Week 11 Input & output, debugging Week 12 Midterm exam

Week 13 Graphics
- ggplot2

Week 14 Project presentation
*Topics are tentative and are subject to change.
*In some lectures, project related topics will be discussed.
*Homework assignments and due dates will be announced in the class.

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Academic Integrity
For additional information please visit: http://aggiehonor.tamu.edu

“An Aggie does not lie, cheat, or steal, or tolerate those who do.”
Course title and number: ECEN 689: Data Sciences and Applications for Modern Power Systems
Term: Fall 2015
Meeting times and location: T/Th 9:35-10:50am GLAS 008

Course Description and Prerequisites

The electric power grid is transforming itself from a hierarchical, passive, and sparsely-sensed engineering system into a flat, active, and ubiquitously-sensed cyber-physical system. The emerging multi-scale data from synchrophasors, smart meters, weather, and electricity markets offers tremendous opportunities as well as scientific challenges to dynamically learn and adaptively control a smart grid. This course introduces the foundation of high dimensional spaces and data analytical tools necessary to model and operate a modern power system. Course projects will offer realistic data sets to allow students to construct tools and models for smart grid operations.

Prerequisites: ECEN 420 and 460, or equivalent.

Learning Outcomes

We will introduce basics of high dimensional space. We will introduce a suite of tools for statistical time series analysis and dimensionality reduction. We will discuss the differences between first principle models and data-driven models in real-time operations. Classroom discussion and computer-based simulation projects will prepare the students to understand better how to integrate data-driven and physics-based reasoning in modern power systems.

Instructor Information

Name: Le Xie
Telephone number: 9798457563
Email address: Le.xie@tamu.e
Office hours: Tuesdays 11-noon
Office location: WEB 301H

Textbook and/or Resource Material
There is no official textbook in this course. The instructor will post reading materials as the course progresses.

Grading Policies
Homework Assignments (20%) + Mid-term Exam (30%) + Final Project (40%) + In-class Quiz (10%) Grading Scale: 90-100 A; 80-89 B; 70-79 C; 60-69 D; below 60 F

Attendance and Make-up Policies
Attendance is required in this course in accordance of student rule 7, http://student-rules.tamu.edu/rule07. Any sick or excused absence will require students’ written note to the instructor at least 8 hours in advance.

Course Topics, Calendar of Activities, Major Assignment Dates (Subject to Change)

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Required Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Intro to Data Availability in Power Systems</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Statistics Basics</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>High Dimensional Space</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Singular Value Decomposition</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Application of SVD in Power System Anomaly Detection</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Application of SVD in Bad Data Processing for State Estimation</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Recap &amp; Mid-term Exam</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Statistical Time Series Analysis</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Systems Identification Basics</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Application of Time Series Analysis in Demand Response</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Application of Time Series Analysis in Renewable Forecasting</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Application of Time Series Analysis in Electricity Price Forecast</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Application in Power System Model Validation</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Final Project Presentation, Report Due</td>
<td></td>
</tr>
</tbody>
</table>
Other Pertinent Course Information

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Academic Integrity
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http://aggiehonor.tamu.edu

“An Aggie does not lie, cheat, or steal, or tolerate those who do.”
ECEN 474/704: (Analog) VLSI Circuit Design

Spring 2016
MW 9:10-10:25, ARCC 111 (Lecture)
http://www.ece.tamu.edu/~spalermo/ecen474.html

Instructor: Sam Palermo
Office: 315-E
WERC Office Hours:
MW 1:00-2:30 Phone:
4114
458-4114
E-mail: spalermo@ece.tamu.edu

Prerequisite: ECEN 326


References:
3. Technical Papers

Class Notes: Posted on the web and will hand out hard copies in class

Objectives: At the end of this course, students be able to
1. To discuss basic transistor models and layout techniques for design and characterization of analog integrated circuits.
2. To study the most important building blocks in CMOS technologies and understand their advantages and limitations.
3. To design basic analog IC circuits considering practical parameters.
4. To use the IC design tools, especially Cadence, Spectre, Spice, and Matlab.
5. We expect to design and fabricate some projects at the end of the semester.

Grading:
• Exams 60%
  - Three Midterm Exams (20% each)
  - Closed book
  - One double sided 8.5x11 note sheet allowed
  - No make-up exams except for university excused absences
  - No Final Exam

• Homework 10%
  - You are encouraged to work together with your colleagues on the homework.
    However, each student must turn in an independent write-up.
  - No late homework will be graded
  - 704 students may have additional problems in the homework assignments

• Laboratory 20%

• Final Project 10%
  - Report and PowerPoint presentation required

Grading Policy*:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>x = Your Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>x ≥ 90.00</td>
</tr>
<tr>
<td>B</td>
<td>89.99 ≥ x ≥ 80.00</td>
</tr>
<tr>
<td>C</td>
<td>79.99 ≥ x ≥ 70.00</td>
</tr>
<tr>
<td>D</td>
<td>69.99 ≥ x ≥ 60.00</td>
</tr>
<tr>
<td>F</td>
<td>59.99 ≥ x</td>
</tr>
</tbody>
</table>

*This is the lowest grade that you are guaranteed for your raw average, x. Depending on the relative performance of the class, your grade MAY be adjusted higher. Undergraduate and graduate students’ performance will be judged independently.

Preliminary Schedule*

<table>
<thead>
<tr>
<th>Topic</th>
<th>Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Introduction and MOS models</td>
<td>Week 1-4</td>
</tr>
<tr>
<td>II. CMOS Technologies and Layouts</td>
<td></td>
</tr>
<tr>
<td>Review Session</td>
<td>Feb. 22</td>
</tr>
<tr>
<td>1st Exam</td>
<td>Feb. 24</td>
</tr>
<tr>
<td>III. Current Mirrors and Differential Pairs</td>
<td>Week 5-9</td>
</tr>
<tr>
<td>IV. Voltage References and Differential Pairs</td>
<td></td>
</tr>
<tr>
<td>V. OTA Design (Part 1)</td>
<td>Mar. 28</td>
</tr>
<tr>
<td>Review Session</td>
<td>Mar. 30</td>
</tr>
<tr>
<td>2nd Exam</td>
<td>Mar. 30</td>
</tr>
<tr>
<td>VI. OTA Design (Part 2)</td>
<td></td>
</tr>
<tr>
<td>VII. Miller OpAmp Design</td>
<td>Week 10-14</td>
</tr>
<tr>
<td>VIII. Advanced Topics</td>
<td></td>
</tr>
<tr>
<td>Review Session</td>
<td>Apr. 25</td>
</tr>
<tr>
<td>3rd Exam</td>
<td>Apr. 27</td>
</tr>
<tr>
<td>Project Report Due</td>
<td>May 3</td>
</tr>
<tr>
<td>Project Presentation</td>
<td>May 6 (8:00AM-10:00AM)</td>
</tr>
</tbody>
</table>

*Exam dates are approximate and subject to change with reasonable notice.
Laboratory safety guidelines will be distributed at the beginning of the semester, they are to be reviewed, filled out, and turned back to the department.

**Americans with Disabilities Act (ADA) Policy Statement:**
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**An Aggie does not lie, cheat, or steal or tolerate those who do.**
Course title and number: ECEN 741 ELECTRONIC MOTOR DRIVES
Term: Spring 2016
Meeting times and location: TBD

Course Description and Prerequisites

Application of semiconductor switching power converters to adjustable speed DC and AC motor drives; steady state theory and analysis of electric motion control in industrial, robotic and traction systems; laboratory experiments in power electronic motor drives and their control. Prerequisite: Junior or senior classification in electrical engineering.

Learning Outcomes or Course Objectives

Upon completion of the course, students will be able to:

- Understand fundamentals of electric DC and AC motors.
- Understand basic power electronics for electric motor drives.
- Specify and design basic building blocks of electronic controls of electric motor drives.
- Understand applications and mechanical loads of electric motor drives.
- Understand the technical benefits of modern electric motor drives for energy conservation and efficiency.

Name: Mark Ehsani Telephone number: (979) 845-7582

Instructor Information

Email address: ehsani@ece.tamu.edu Office hours: TBD
Office location: WEB 205-N

Textbook and/or Resource Material

Grading Policies

Quiz #1: 20%
Quiz #2: 20%
Lab: 20%
Homework: 10%
Graduate Design Project: 25%
Class Participation: 5%

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

Lab reports are due one week after the completion of a lab.

For information on university excused absences visit http://student-rules.tamu.edu/rule07.

Course Topics, Calendar of Activities, Major Assignment Dates

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to electric drives</td>
</tr>
<tr>
<td>2</td>
<td>Mechanical principles of electric drives</td>
</tr>
<tr>
<td>3</td>
<td>Magnetic principles of electrical machines</td>
</tr>
<tr>
<td>4</td>
<td>DC motor drives</td>
</tr>
<tr>
<td>5</td>
<td>Power electronic converters for DC drives</td>
</tr>
<tr>
<td>6</td>
<td>Speed control of DC motors</td>
</tr>
<tr>
<td></td>
<td>Quiz #1</td>
</tr>
<tr>
<td>7</td>
<td>BLDC motor drives</td>
</tr>
<tr>
<td>8</td>
<td>Conceptual development of induction motors</td>
</tr>
<tr>
<td>9</td>
<td>Construction of induction motors</td>
</tr>
<tr>
<td>10</td>
<td>Torque production in induction motors</td>
</tr>
<tr>
<td>11</td>
<td>Induction motor equivalent circuit</td>
</tr>
<tr>
<td>12</td>
<td>Power electronic converters for AC drives</td>
</tr>
<tr>
<td>13</td>
<td>Speed control of induction motors</td>
</tr>
<tr>
<td></td>
<td>Quiz #2</td>
</tr>
<tr>
<td>14</td>
<td>Design considerations for electric motor drives</td>
</tr>
</tbody>
</table>

Design Project

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requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

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http://aggiehonor.tamu.edu
Advanced Computational Methods for Integrated System Design

Instructor  
Prof. Peng Li  
Department of Electrical and Computer Engineering 334J WERC  
Phone: 845-1612  
Email: pli@tamu.edu

Lectures  
11:10am – 12:25pm TR ETB 1003

Office Hours  
10:00am – 11:00am TR

Class Website  
http://dropzone.tamu.edu/~pli/751Spring16/

Course Description

Advanced computational techniques are essential enablers for analysis and design of complex integrated circuits and systems. These methods form the backbone of modern design automation technologies that support the development of integrated circuits with growing complexity. With a focus on VLSI computer-aided design, this course is designed to look at a range of circuit design problems from a computational standpoint of view. In particular, a number of VLSI CAD topics including circuit simulation, numerical methods, interconnect analysis and modeling, model order reduction of linear systems, and design and analysis of large IC power delivery networks. In addition to fundamental application-specific algorithm design, parallel computing will be leveraged for addressing computational challenges. Large-scale computational brain modeling and brain-inspired neuromorphic circuits will be introduced. Interactions between computational algorithm development and circuit/system design will also encouraged in the lectures and class projects.

Prerequisites

ECEN454/474 or equivalents, knowledge of basic circuit theory, circuit design and engineering mathematics, and proficiency in C/C++/MATLAB programming.

Course Objectives

The students will develop in-depth understanding on a number of computational algorithms and techniques for VLSI CAD and related emerging applications. Furthermore, they will be exposed to parallel programming and algorithm design. The students are expected to gain appropriate algorithmic backgrounds and hands-on experiences for realizing computationally efficient algorithms and tools for integrated circuits/systems design.

Topics (tentative)

1. Introduction
2. Basic circuit analysis
3. Introduction to fundamental numerical methods
4. Device modeling in circuit analysis
5. Transistor-level circuit simulation
6. Modern parallel computing systems
7. Introduction to parallel programming and parallel CAD algorithms
8. Model order reduction of linear systems
9. IC Interconnect modeling and analysis
10. Design and analysis of large IC power delivery networks
11. Introduction to large-scale computational brain modeling and neuromorphic circuits

References

[1] Research papers from various journals and conference proceedings and othersources.


[8] Online MPI tutorial from Lawrence Livermore Labs: http://www.llnl.gov/computing/tutorials/mpi

Grading (credits are given based on individual independent work except for the final class project)

Assignments: 35% Midterm: 30% (in class)
Final class project (two-person team project): 35%

Late assignment submission: late submissions would receive no credit unless stated otherwise in the assignment handout.

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building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

**Academic Integrity**

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Course Title: ECEN755 Stochastic Systems Term:
Spring 2016

Course Description
This course studies stochastic systems. It deals with various models of stochastic systems and their analysis. It studies topics such as performance evaluation, estimation, control, scheduling, identification and adaptation. It has applications in several fields such as computer systems, communication networks, control, manufacturing systems, economics, and industrial engineering.

Prerequisites
A course in probability and stochastic processes at the graduate level.

Learning Outcomes or Course Objectives
This course studies the analysis and design of dynamical systems which exhibit random behavior. It studies several models and methodologies for designing such systems. It provides a foundation for further research into systems in computer engineering, communications systems, communication networks, sensor networks and control.

Instructor Information
Name: P.R. Kumar
Telephone number: 979-862-3376 Email address: prk@tamu.edu Office Location: 331E WERC

Grading
Homeworks 50%, Projects 50%

Grading scale will be adjusted according to student performance/distribution.

Course Schedule

1. Stochastic Models
   a. Markov chains
   b. Classification and class properties
   c. Equilibrium distribution
   d. Stability
e. Queueing networks

2. Dynamic Programming
   a. Shortest path problem
   b. The dynamic programming recursion
   c. Principle of optimality
   d. Controlled Markov chains
   e. Finite horizon Cost Criterion
   f. Discounted and Average Cost criteria
   g. Value iteration, policy iteration and linear programming

3. Partially observed systems
   a. State estimation
   b. Unnormalized distribution
   c. Information state
   d. Dynamic programming for partially observed systems
   e. Bandit problems

4. Linear Quadratic Gaussian Systems
   a. State estimation
   b. Kalman filter
   c. Linear Gaussian optimization
   d. The separation of estimation and control
   e. LQG systems
   f. Certainty equivalence

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**Academic Integrity**
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Upon accepting admission to Texas A&M University, a student immediately assumes a commitment
to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System. Aggie Honor Code and Honor Council Rules and Procedures are available at http://www.tamu.edu/aggiehonor
Course title and number  ECEN 763
Stacked with ECEN 463, Cross-listed with BMEN 427/627

Term  Fall 2015

Lecture:
MW 10:20-11:10am, 203 CE-TTI Tower Bldg.

Prerequisites

Magnetic Resonance Engineering: Design, construction and application of instrumentation for MR imaging; fundamentals of the architecture of an MR spectrometer and the gradient subsystem used for image localization; emphasis on the radiofrequency sensors and systems used for signal generation and reception.

Course Prerequisites: Physics 208, and ECEN 314 or BMEN 322 or equivalent; junior or senior status or approval of instructor

Learning Outcome: After completing the course each student will be able to design and assemble a low-frequency MR spectrometer and determine the appropriate operating parameters to obtain a specified imaging resolution and signal-to-noise ratio.

Instructor Information

Steve Wright 310D Wisenbaker Engineering Building smwright@tamu.edu, 845-9413 (office)
Office hours: M, W 11:30 to 12:30 or by appointment

Textbook and/or Resource Material

Class Notes. PowerPoint lectures and lab manual will be distributed by e-mail.

Supplementary Material:

Late Work and Grading Policies

Prelabs: submit written prelab beginning of class Monday. Late prelabs will not be accepted.
Labs: submit written lab report to TAs mailbox by 5 pm Friday. Late labs will be accepted if submitted electronically directly to the TA and copied to instructors, on the due date with a 10% penalty, and with an additional 25% per day penalty up to the 3rd class period following the lab period.
Lab Notebook: Each lab will be documented by each student in a lab notebook to be submitted periodically
as part of the lab grade. The lab notebook must be signed by the TA each week.

Excused Absences: Refer to http://student-rules.tamu.edu/rule07 for all policies regarding excused absences. Please note: “The student is responsible for providing satisfactory evidence to the instructor to substantiate the reason for absence.” In the case of injury or illness of 3 or more days, “The medical confirmation note must contain the date and time of the illness and medical professional’s confirmation of needed absence.” Also, in case of injury or illness of less than 3 days, it is the policy of this class that the student likewise provide a medical confirmation note containing the date and time of the illness and medical professional’s confirmation of needed absence. The Texas A&M University Explanatory Statement for Absence from class form (http://attendance.tamu.edu.) will not be accepted as evidence of an excused absence for this course.

Grading scale: 90-100 A, 80-89 B, 70-79 C, 60-69 D, below 60 F.

Grading Policy: Midterm Exam and Final Exam 35 % Labs & Prelabs 65 %

Final Exam and midterm date: Midterm will be sometime after the 5th Lab and Lecture (The Basic MR Experiment). Final exam according to University scheduling.

The undergraduate section differs from the graduate section in the following ways:
1. The exams for the graduate section will have additional questions based on supplementary material and laboratory steps provided for the graduate students.
2. The labs on RF coils, projection reconstruction, RF front ends and improving your MR Image will have additional exercises required only of those students in the graduate section. These labs will have more points possible, but both will be scaled to 100% after grading and the same overall grading scale used.

Course Topics, Calendar of Activities, Major Assignment Dates

**Lab:** One 3 hour lab per week. Labs will be in 321 CVLB other than first week (127D USB, directions will be provided)

3 hours (2 hour lecture, 1 hour lab (3 hours contact/wk))

<table>
<thead>
<tr>
<th>Week</th>
<th>Lab Exercise (M,T)</th>
<th>Lecture (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MRI Lab Tour, Demo, Safety Test</td>
<td>M: MRI Block Diagram. Safety W: Intro to MRI</td>
</tr>
<tr>
<td>2</td>
<td>Lab 1. Introduction to an MRI Scanner RF Coils</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Lab 2. Construction and Testing of RF Coils for MRI Intro to LabView</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Lab 3. Introduction to Pulse Sequence Programming and LabVIEW RF Front Ends</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Lab 4. RF Front Ends The Basic MRI Experiment</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Lab 5. The Basic MR Experiment Lab Discussion W: Exam Review</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Open lab- Make up/ review. M: Exam</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Lab 6. MRI GUI and Gradient Control Theory of Gradient Design Gradient Interface</td>
<td></td>
</tr>
</tbody>
</table>
Lab 7. Gradient Control Construction and Mapping   Testing the MRI Interface
Lab 8. Testing your MRI GUI   Projection Reconstruction Imaging
Lab 9. Projection Imaging I   PR exercise
Lab 9b. Projection Imaging II   Introduction to MRI Receivers
Lab 10. Receiver Possibilities   Improving MR Image
Lab 11. Improving your MR Image   Advanced imaging – phase encoding
Totals 42 Lab Contact h

Americans with Disabilities Act (ADA)
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu

Academic
Integrity
For additional information please visit:
http://www.tamu.edu/aggiehonor “An Aggie does not lie, cheat, or steal, or tolerate those who do.”
Appendix D – Faculty Biographies

Texas A&M University

Department of Electrical and Computer Engineering

Faculty Biographies

Spring 2016
Robert S. Balog, Ph.D., P.E.
Associate Professor (with tenure), Department of Electrical & Computer Engineering, Texas A&M University

A) Professional Preparation

<table>
<thead>
<tr>
<th>Institution</th>
<th>Major/Area</th>
<th>Degree</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rutgers University</td>
<td>Electrical Engineering</td>
<td>B.S.</td>
<td>1996</td>
</tr>
<tr>
<td>University of Illinois at Urbana-Champaign</td>
<td>Electrical Engineering</td>
<td>M.S.</td>
<td>2002</td>
</tr>
<tr>
<td>University of Illinois at Urbana-Champaign</td>
<td>Electrical Engineering</td>
<td>Ph.D.</td>
<td>2006</td>
</tr>
</tbody>
</table>

B) Appointments

2015-Present  Associate Professor, Dept. of Electrical & Computer Eng., Texas A&M University
July 2012      TUBITAK visiting scientist, Middle East Technical University, Ankara, Turkey
2009–2015     Assistant Professor, Dept. of Electrical & Computer Eng., Texas A&M University
2006–2009     Senior Engineer, SolarBridge Tech (formerly SmartSpark Energy Systems), Austin, TX
2005–2006     Research Consultant, US Army Engineer Research and Development Center – Construction Engineering Research Laboratory (ERDC-CERL), Champaign, IL
1999–2006     Graduate Research Assistant, University of Illinois at Urbana-Champaign
               Thesis Advisor: Philip T. Krein
1996–1999     Engineer, Lutron Electronics, Coopersburg, PA

C) Products Most Closely Related to This Project


Additional Significant Products

D) Synergistic Activities


- **Student Mentorship**: Mentored student team which took 1st place in Power Across Texas “solar primer” competition, students received $9,000 scholarship from NRG Energy (http://energy.ece.tamu.edu/solarprimer/). Faculty mentor and co-PI, NSF Research Experiences for Undergraduates: Smart Energy and Smart Systems – Powering the SmartGrid Sensor System (http://www.ece.tamu.edu/~reu/), Engineering Projects in Community Service, student team mentor (Fall 2010, Spring 2011) (http://solarags.tamu.edu)

- **Standards Development**: Standards Technical Panel (STP) voting member: UL 1741 - Inverters, Converters, and Controllers for Independent Power Systems, UL 1699B - Photovoltaic (PV) DC Arc-Fault Circuit-Interrupters; Participant: IEEE 1547 - Distributed Resources with Electric Power Systems

- **Professional Organization Membership, Leadership, and Recognition**: IEEE Senior Member; IEEE Power Electronics Society Graduates of the Last Decade (GOLD) Committee Chair, Membership co-chair, Member-at-Large, ADCOM; Nominated, Richard M. Bass 2009 Outstanding Young Power Electronics Engineer; Technical Program Chair 2016 IEEE Energy Conversion Congress and Exposition.

- **Integration, Transfer, or Creation of Knowledge**: Holds 17 issued and pending US patents in power electronics; multiple international patents; authored encyclopedia chapter on batteries, charging, and battery management (Springer); **Technology transfer** – Senior Engineer and principle technologist of start-up company SolarBridge Technologies - Led team of 10 engineers performing R&D on an advanced technology photovoltaic module-integrated inverter (ACPV) using custom-modified semiconductor switch devices; DoE / Texas State Energy Conservation Office grant – 30kW PV demonstration on TAMU campus. Research, teaching, and community outreach project to investigate integrating PV generation into a campus electrical network and capability for future “smart campus energy systems”; developed new course TAMU ECEN 689: Power Electronics for Renewable Energy Systems; improved sophomore first-principles class TAMU ECEN 214: Electrical Circuit Theory with expanded Solar PV laboratory activities.

E) Collaborators & Other Affiliations

Collaborators and Co-Editors: H. Abu-Rub, S. Ahmed, O. Ellabban, S. Bayhan, Y. Liu (TAMUQ); P.L. Chapman (SolarBridge); T. Esram (Pacific Northwest National Lab); L. Kish, P. Enjeti, B. Ge (TAMU); B. Fahimi (U. Texas Dallas); M. Kezunovic (TAMU); J.W. Kimball (Missouri University of S&T); P.T. Krein (UIUC); B. T. Kuhn (SolarBridge); A. Kwasinski (U. Texas); W.W. Weaver (Michigan Tech U.)

**Graduate Advisor**: Philip T. Krein, University of Illinois at Urbana-Champaign

**Thesis Advisees**: D. Balakrishnan (female, MS 2010); S. Castillo (female – US Citizen, MS 2011); A. Karavadi (female, MS 2011); M. Kedia (MS 2013); B. Tian (MS 2014); H. Zhu (female, MS 2016); L. Alpuerto (MS 2016); S. McConnell (MS 2016); M. Mirjafari (PhD 2013); S. Harb (PhD 2014); Z. Wang (PhD 2016), H. Zhang (PhD 2016); M. Shadmand (MS 2012, PhD 2015), X. Lie (PhD 2017), M. Metry (PhD 2018), M. Mosa (PhD 2017), Shunlong Xiao (PhD 2018).

**TOTAL PhD**: 9 **TOTAL MS**: 9
MIROSLAV M. BEGOVIC
Carolyn S. & Tommie E. Lohman ’59 Professor and Head, Dept. of ECE, Texas A&M University, and Director, Division of Electrical and Computer Engineering, Texas A&M Engineering Experiment Station, President, IEEE Power and Energy Society, E-mail: begovic@ece.tamu.edu

PROFESSIONAL PREPARATION
Belgrade University, Belgrade, YU ECE B.S.E.E., 1980
Belgrade University, Belgrade, YU ECE M.S.E.E., 1985
Virginia Tech University, Blacksburg, VA ECE Ph.D.E.E., 1989

APPOINTMENTS
2015 – present Carolyn S. & Tommie E. Lohman ’59 Professor and Head, Dept. of ECE, Texas A&M University, and Director, Division of Electrical and Computer Engineering, Texas A&M Engineering Experiment Station
1989 - 2014 Assistant, Associate Professor and Professor, School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta GA
1985 - 1989 Graduate Research Assistant, Dept. of Electrical Engineering, Virginia Polytechnic Institute, Blacksburg VA
1981 - 1985 Lecturer and Graduate Instructor, Dept. of Electrical Engineering, Belgrade University, Belgrade YU
1989 – present Consultant to utilities and companies on photovoltaic systems technologies and wide area smart grid solutions.

RELATED PUBLICATIONS

OTHER SIGNIFICANT PUBLICATIONS


**SYNERGISTIC ACTIVITIES**

1. **Research Experience:** Dr. Begovic’s primary research is based on application of wide area disturbance analysis and control in power systems, especially voltage stability monitoring and control in large power systems, volt/var control of transmission networks, sustainable energy systems, especially photovoltaic systems, their integration into smart grid, and measurement systems for power engineering applications and asset management techniques.

2. **Environmental Impact Assessment:** Dr. Begovic was a co-designer of the 340 kW roof-mounted photovoltaic system on the Georgia tech Aquatic Center, which was built for the Centennial (1996) Olympic Games in Atlanta and was the largest roof-mounted photovoltaic system at the time of its construction. Currently serving as Section Editor for “Transmission Systems and Smart Grids,” Springer-Verlag *Encyclopedia of Sustainability Science and Technology*, to be published in 2011.

3. **Research Projects:** Miroslav Begovic has been the Project Director, or Principal Investigator, in 36 projects, with a total funding of over $12 million. (This does include the design and construction of the PV system at Georgia Tech Aquatic Center, the largest roof-mounted PV system in the world at the time of commissioning, which had a budget of another $5 million and the project on the cable diagnostics, co-funded by the US Department of Energy (DOE) and NEETRAC with a budget of $3 million.)


**COLLABORATORS AND OTHER AFFILIATIONS**

S. P. Bhattacharyya

Professor of Electrical Engineering
Dept. of Electrical Engineering, Texas A&M University, 3128 TAMU
College Station, TX 77843-3128, U.S.A
Tel: (979)-845-7484
email: bhatt@ece.tamu.edu
Citizenship: U.S.A.

Education
• B.Tech (Hons.) in Electrical Engineering, Indian Institute of Technology, Bombay, 1967.
• M.S. in Electrical Engineering, Rice University Houston, 1969.
• Ph.D. in Electrical Engineering, Rice University, Houston, 1971.

Appointments:
• Professor, Department of Electrical Engineering, Texas A&M University, College Station, September 1984-present.
• Associate Professor, Department of Electrical Engineering, Texas A&M University, College Station, September 1980-August 1984.
• Head, Department of Electrical Engineering, COPPE, Federal University, Rio de Janeiro, Brazil, 1978-1980.
• Professor, Department, Department of Electrical Engineering, COPPE, Federal University, Rio de Janeiro, Brazil, 1976-1980.
• Associate Professor, Department of Electrical Engineering, COPPE, Federal University, Rio de Janeiro, Brazil, 1972-1976.
• Assistant Professor, Department of Systems Engineering, COPPE, Federal University, Rio de Janeiro, Brazil, 1971-1972.

Recent Grants

List of publications: (8 books and over 350 Journal and Conference Papers)

Recent Publications

Additional Publications

Synergistic Activities
- Senior Fulbright Lecturer, 1989.
- Boeing-Welliver Faculty Fellow, Boeing Corporation, Seattle, 1998.
- IFAC Fellow, 2011.
- Foreign Member, Academia Brasileira de Ciencias 2012.
- Foreign Member, National Academy of Engineering, Brazil, 2015
- Study Abroad Brazil Engineering Faculty, since 2005-Present
- College of Engineering Teaching Award, 2016.

Graduate Students Supervised:

PhD Advisor: (Late) Prof. J. B. Pearson, Rice University
Biographical Sketch
Ulisses Braga-Neto

Professional Preparation

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<th>Undergraduate Institution</th>
<th>Major</th>
<th>Degree &amp; Year</th>
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<tr>
<td>Federal University of Pernambuco, Brazil</td>
<td>Electrical Engineering</td>
<td>B.S., 1992</td>
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<table>
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<tr>
<th>Graduate Institutions</th>
<th>Major</th>
<th>Degree &amp; Year</th>
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<tr>
<td>State University of Campinas, Brazil</td>
<td>Electrical Engineering</td>
<td>M.S., 1994</td>
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<tr>
<td>The Johns Hopkins University, Baltimore, MD</td>
<td>Electrical &amp; Computer Eng.</td>
<td>M.S.E., 1998</td>
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<tr>
<td>The Johns Hopkins University, Baltimore, MD</td>
<td>Mathematical Sciences</td>
<td>M.S.E., 1998</td>
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<tr>
<td>The Johns Hopkins University, Baltimore, MD</td>
<td>Electrical &amp; Computer Eng.</td>
<td>Ph.D., 2002</td>
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<th>Postdoctoral Institution</th>
<th>Area</th>
<th>Years</th>
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<tr>
<td>UT MD Anderson Cancer Center, Houston, TX</td>
<td>Genomic Signal Processing</td>
<td>2002-2004</td>
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</table>

Appointments

<table>
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<tr>
<th>Years</th>
<th>Rank</th>
<th>Institution</th>
</tr>
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<tr>
<td>2013-present</td>
<td>Associate Professor</td>
<td>Dept. ECE, Texas A&amp;M University, College Station, TX</td>
</tr>
<tr>
<td>2007-2013</td>
<td>Assistant Professor</td>
<td>Dept. ECE, Texas A&amp;M University, College Station, TX</td>
</tr>
<tr>
<td>2007-2013</td>
<td>Assistant Professor</td>
<td>Dept. ECE, Texas A&amp;M University, College Station, TX</td>
</tr>
<tr>
<td>2004-2006</td>
<td>Assistant Researcher</td>
<td>Fundação Oswaldo Cruz (FIOCRUZ), Recife, Brazil</td>
</tr>
<tr>
<td>2002-2004</td>
<td>Post-Doctoral Fellow</td>
<td>Sect. Clinical Cancer Genetics, UT MDACC, Houston, TX</td>
</tr>
<tr>
<td>2001-2002</td>
<td>Research Associate</td>
<td>Dept. ECE, The Johns Hopkins University, Baltimore, MD</td>
</tr>
<tr>
<td>1998-2001</td>
<td>Research Assistant</td>
<td>Dept. ECE, The Johns Hopkins University, Baltimore, MD</td>
</tr>
</tbody>
</table>

Five publications most closely related to the proposed project


Five other significant publications related to the proposed project


**Synergistic Activities**

1. President of the MidSouth Computational Biology and Bioinformatics Society, 2010-2011 term.

2. Led Study Abroad Program on three consecutive Summers with a total of more than 60 undergraduate engineering students to Brazil, 2013–2015.


4. Organization of Conferences: General Chair: MCBIOS’2011, College Station, TX; Student Award Co-Chair: IEEE GENSIPS2013, Houston, TX; Program Committee Member: GENSIPS2012, Washington, DC; Publications Chair: GENSIPS’2009, Minneapolis, MN; Publicity Chair: GENSIPS’2008, Phoenix, AZ; Program Committee Co-Chair: ISMM’2007.


**Collaborators and Other Affiliations**

1. Senior Collaborators: A. Datta, Texas A&M University, I. Ivanov, Texas A&M University, M. Dickman, AgriLife Research; C. Johnson, AgriLife Research; M. Bittner, Translational Genomics; M.J. Cunningham, Nanomics Biosciences; E. Dougherty, Texas A&M University; J. Hua, Translational Genomics; E.T.A. Marques, Jr., The Johns Hopkins Medical School; C. Sima, Translational Genomics; Z. Xiong, Texas A&M University.

2. Graduate Advisors: John Goutsias, Johns Hopkins University (Ph.D); Roberto Lotufo, Universidade Estadual de Campinas, Brazil (M.Sc.).

3. Post-Doctoral Sponsors: Edward Dougherty, Texas A&M University; Louise Strong, University of Texas MD Anderson Cancer Center.
KAREN L. BUTLER-PURRY, Ph.D., P.E.

Professional Preparation
Southern University, Baton Rouge  Electrical Engineering  BS, 1985
University of Texas at Austin  Electrical Engineering  MS, 1987
Howard University, Washington, DC  Electrical Engineering  PhD, 1994

Appointments
Texas A&M University
4/2011-present  Associate Provost for Graduate and Professional Studies
9/2005-present Professor, Department of Electrical and Computer Engineering
7/2010-4/2011  Associate Vice-President for Graduate Studies (position changed titles)
1/2008-7/2010 Associate Dept. Head, Department of Electrical and Computer Engineering
2001-2005  Associate Professor, Department of Electrical Engineering
2001-2004  Assistant Dean for Graduate Programs, College of Engineering
2002-2004  Program Head, Interdisciplinary Engineering Program; Program Head, Doctor of Engineering Program, College of Engineering
1995-2001  Assistant Professor, Department of Electrical Engineering
1994-1995  Visiting Assistant Professor, Department of Electrical Engineering
1988-1989  Technical Staff, Hughes Aircraft Co. - Radar Systems Group, Los Angeles, CA,

Products
(*-- denotes graduate student authors)
Synergistic Activities

- Broadening Participation of Underrepresented Minorities in STEM -- Serves as Project Director and Co-PI since June 2006 for National Science Foundation Texas A&M University System Louis Stokes Alliance for Minority Participation (TAMUS LSAMP) Projects (an Alliance of TAMU, PVAMU, TAMU-CC to increase number of URM STEM graduates).
- 2005 AAAS Mentor Award recipient. Citation -- “For efforts to mentor students from underrepresented groups and for leadership in promoting PhD careers for them in electrical engineering and computer sciences”
- Undergraduate Student Research and Mentoring – Has supervised over 65 undergraduate students (33% female, 70% minority) performing undergrad research in my lab, either as a part of a College of Eng. Summer Undergrad Res. Program, Dept of Electrical Eng. Res. Scholarship Program, NSF REU supplements, NSF REU site award, or funded research projects. Directed the TAMU College of Eng. Undergraduate Summer Research Program from 2001-2004. Currently serves as PI and Project Director of a NSF REU Site on “Smart Energy and Smart Systems: Enabling the Future through Electrical and Computer Engineering” which has been funded since 2003.
- Graduate Student Development and Mentoring- From 2003-2006 - served as an Associate Coordinator for the TX NSF LS-AMP Bridge to Doctorate Fellows Program (12 eng. and 8 science and agriculture and life sciences minority PhD students); developed a Graduate Fellows seminar series focused on PhD professional dev. with Sloan Minority PhD Scholars, GAANN fellows, and Bridge to Doctorate fellows. From October 2003-2007, served as the Coordinator of the TAMU Engr. Sloan Minority Ph.D. Scholars Program funded by the Sloan Foundation, and 2007-2009 served as the ECE Department Coordinator; and provided PhD professional development activities and mentoring for the PhD scholars.

Collaborators & Other Affiliations

(i) Collaborators and Co-Editors: Venkat Ajjarapu (Iowa State U.); Karen Miu (Drexel U.); Dagmar Niebur (Drexel U.); Chika Nwankpa (Drexel U.); Noel Schulz (Kansas State U.); Aleksandar Stankovic (Tufts U.); Felecia Nave (Prairie View A&M U.); Judy Kelley (West Texas A&M); Pam Obiomon (Prairie View A&M U.).
(ii) Graduate and Postdoctoral Advisors
Dr. James Momoh, Ph.D. -- Advisor; Professor of ECE, Howard University
(iii) Thesis Advisor and Postgraduate-Scholar Sponsor
17 PhD and 27 ME/MS students advised & sponsored and 4 postdoctoral scholars sponsored.
Graduated: Jun Li (PhD), Mir Mousavi (PhD) -- ABB Research Center and Xianyong Feng (PhD) – ABB Research Center, Fabian Uriarte (PhD)-Post Doctoral Researcher at University of Texas at Austin, Hector Leon (ME), Hamed Funmilaya (MS)-CenterPoint Energy, Tushar Amba (MS)-Bechtel, Ayo Akinnikawe (MS), Hariraran Subramanian (M.E.), Chu Zhengguo (MS), Apoorv Bansal (ME), Laurence Thomas (MS), Gayatri Damle (ME), Fred Ituzaro (MS), Richard Douglin (MS), Ebony Mayhorn (PhD), Milad Falahi (PhD), Salman Mashayekh, (PhD)
Current Grad. Students: PhD-- Hung-Ming Chou, Bo Chen, Ogbannaya Bassey
Pierce E. Cantrell  
Associate Professor, Electrical and Computer Engineering  
Texas A&M University  
p-cantrell@tamu.edu

Professional Preparation

Georgia Institute of Technology, Electrical Engineering, B.E.E. (with honor) 1970  
Georgia Institute of Technology, Electrical Engineering, M.S.E.E. 1971  
Georgia Institute of Technology, Electrical Engineering, Ph.D. 1981

Experience

Vice President and Associate Provost for Information Technology, Texas A&M University, March 2006–June 2014  
Associate Provost for Information Technology, Texas A&M University, March 1999–February 2006  
Interim Associate Provost for Information Technology, Texas A&M University, April 1998–February 1999  
Associate Professor, Electrical and Computer Engineering, Texas A&M University, September 1988–Present  
Assistant Professor, Electrical and Computer Engineering, Texas A&M University, January 1982–August 1988  

Related Publications

Other Significant Publications


Synergistic Activities


NSF Foundation Coalition (1993-1997), Responsible for computer and classroom technology and member of the campus management team.

Collaborators

Dr. Mladen Kezunovic. Professor ECE, Texas A&M University
Dr. Walt Magnusseen, Director of Telecommunications, Texas A&M University
Dr. Rod Zent, Exec. Director Educational Broadcast Services, Texas A&M University

Advisor and Advisees

Advisor: Dr. Jay H. Schlag, Professor Emeritus, Department of Electrical and Computer Engineering, Georgia Institute of Technology

Jean-Francois Chamberland

Department of Electrical and Computer Engineering  
Texas A&M University  
College Station, TX 77843-3128

Office: (979) 845-6204  
Fax: (979) 862-4630  
chmbrlnhd@tamu.edu

Professional Preparation

McGill University  
Electrical Engineering  
B.Eng. 1998

Cornell University  
Electrical Engineering  
M.S. 2000

University of Illinois at Urbana-Champaign  
Electrical Engineering  
Ph.D. 2004

Appointments

Associate Professor, Electrical & Computer Eng., Texas A&M University, 2010-present.
Assistant Professor, Electrical & Computer Eng., Texas A&M University, 2004-2010.
Teaching Assistant, School of Electrical and Computer Eng., Cornell University, 1999-2000.
Research Assistant, School of Electrical and Computer Eng., Cornell University, 1998-1999.

Publications

Publications most closely related to the proposed project


Other significant publications


**Synergistic Activities**


- **Frontiers of Engineering Education Symposium,** National Academy of Engineering, 2012. This symposium brings together some of the nation’s most engaged and innovative engineering educators in order to recognize, reward, and promote effective, substantive, and inspirational engineering education through a sustained dialogue within the emerging generation of innovative faculty.

- **EduDocs.** This initiative focuses on content creation. A central goal of the project is to explore ways to support the distributed authorship of educational documents, thereby promoting collaboration among experts and minimizing duplicated efforts across course sections and universities.

**Collaborators & Other Affiliations**

**Collaborators:**

**Graduate Advisors:**
V. V. Veeravalli – The University of Illinois at Urbana-Champaign.

**Graduate Students Supervised:**
Dr. Kai Chang received the B.S.E.E. degree from the National Taiwan University, Taipei, Taiwan, the M.S. degree from the State University of New York at Stony Brook, and Ph.D. degree from the University of Michigan, Ann Arbor, in 1970, 1972, and 1976, respectively.

From 1976 to 1978, he was employed by Shared Applications, Inc., Ann Arbor, where he worked in computer simulation of microwave circuits and microwave tubes. From 1978 to 1981, he worked for the Electron Dynamics Division, Hughes Aircraft Company, Torrance, CA, where he was involved in the research and development of millimeter-wave solid-state devices and circuits, power combiners, oscillators and transmitters. From 1981 to 1985, he worked for the TRW Electronics and Defense, Redondo Beach, CA, as a Section Head, developing state-of-the-art millimeter-wave integrated circuits and subsystems including mixers, VCOs, transmitters, amplifiers, modulators, upconverters, switches, multipliers, receivers, and transceivers. He joined the Electrical Engineering Department of Texas A&M University in August 1985 as an Associate Professor and was promoted to a Professor in 1988. From 1990 to 2006, he was appointed Raytheon E-Systems Endowed Professor of Electrical Engineering. Currently, he is the holder of the Texas Instruments Endowed Chair.


Dr. Chang is a Fellow of IEEE. He has served as the technical committee members and session chairs for IEEE MTTS, APS, and many international conferences. He was the Vice General Chair for the 2002 IEEE International Symposium on Antennas and Propagation. He received the Special Achievement Award from TRW in 1984, the Halliburton Professor Award in 1988, the Distinguished Teaching Award in 1989, the Distinguished Research Award in 1992, and the TEES Fellow Award in 1996 from the Texas A&M University. He was selected to receive the 2007 Distinguished Educator Award of the IEEE Microwave Theory and Techniques Society.
Biographical Sketch

Name: Gwan Seong Choi

(a) Professional Preparation

B.S. (89’), M.S. (90’), and Ph.D. (94’) Electrical & Computer Engineering, University of Illinois

(b) Appointments

Associate Professor, Dept. of Electrical Engineering, Texas A & M University, 8/2000 – present
Co-Founder and VP of Engineering, TexasLDPC Inc. 07/2014-8/2015
Visiting Professor, EECS Dept., Univ. of California, Berkeley, 8/2000-5/2001
Assistant Professor, Dept. of Electrical Engineering, Texas A & M University, 8/94 - 8/2000
Research Assistant, Coordinated Science Laboratory, Univ. of Illinois, Urbana, IL, 8/88 - 8/94
Member of Technical Staff, Tandem Computers Inc., Austin, TX, 4/90 -9/90
Visiting Scientist, NASA Langley Research Center, VA, 10/89 –2/90

(c) Products. A list of:

A. Products most closely related to proposal project


B. Other significant products

2. U.S. Patent number: 8418023    Issued: April 9, 2013, An LDPC decoder includes a control unit that controls decoder processing, the control unit causing the decoder to process the blocks of a low density parity check (“LDPC”) matrix out of order.
3. U.S. Patent number: 8555140    Issued: October 8, 2013, A layered decoder of the LDPC matrix out of order and/or perform partial state processing on out of order blocks of the LDPC matrix and/or generate R messages out of order.

(e) Collaborators & Other Affiliations

A. Collaborators and Co-Editors
Peter S. Choi, Sandia National Laboratory
Ravi K. Iyer, University of Illinois
Peng Li, Texas A&M University
Krishna Narayanan, Texas A&M University
Yoonseok Yang, Intel

B. Graduate Advisors and Postdoctoral Sponsors
Ravi K. Iyer, University of Illinois (for B.S., M.S., and Ph.D.)

C. Thesis Advisor
Masters in Science
4. Rajeshwary Tayade, “Simulation Acceleration Technique for Forward-Error-Correction Analysis,” Ph.D. program at University of Texas at Austin, 2004
8. Reeshav Kumar, "Intra-Flit Skew Reduction for Asynchronous Bypass Channel in NoCs," Broadcom, 2011

Current MS Student:

Doctors of Philosophy
2. Eric Daniel, "TMR For Off-The-Shelf Unix Systems," Intel, 1999

Current Ph.D. Students:
Biographical Sketch: Shuguang (Robert) Cui

Professional Preparation
Beijing University of Posts and Telecom., P. R. China, Radio Engineering B.E., 1997
McMaster University, Canada, Electrical and Computer Engineering M.E., 2000
Stanford University, USA, Electrical Engineering Ph.D, 2005

Appointments
Texas A&M University, ECE Dept., Professor 09/15-present
Texas A&M University, ECE Dept., Associate Professor 09/11-08/15
Texas A&M University, ECE Dept., Assistant Professor 06/07-08/11
University of Arizona, ECE Dept., Assistant Professor 08/05- 05/07
Stanford University, EE Dept., Research Assistant 09/01-06/05
National Semiconductor Co., Summer Intern 06/03-09/03
Hewlett Packard Co., Technical Staff 10/97-08/98

Publications

(i) Five publications most related to the proposal:

(ii) Five other significant papers:

**Synergistic Activities**

1. **General Chair:** IEEE GlobalSIP 2018.
2. **Technical Program Committee (TPC) Chair:** IEEE Communication Theory Workshop 2007; ICC’08 CT Symposium; GLOBECOM’10 CT Symposium; IEEE SmartGridComm’12 Cyber Security and Privacy Symposium; IEEE ICC’13; IEEE WCNC’17.
3. **TPC Member:** IEEE GLOBECOM’06; ACM IWMC’06; IEEE WoWMoM’06; ACM IWMC’08; IEEE RWS’07; IEEE ICC’07; IEEE GLOBECOM’07; IEEE VTC’07F; IEEE ICCCN’07; IEEE ICC’08; IEEE GLOBECOM’08; CROWNCOM’08; IEEE CHINACOM’08; IEEE CIP’08; IEEE ICC’09; IEEE CHINACOM’09; CROWN- COM’09; IEEE ICASSP’09; IEEE GLOBECOM’09; IEEE SPAWC’09; SpaSWiN’09; MobiCom CoRoNet’09; IEEE DySPAN’10; IEEE ICASSP’10; IEEE INFOCOM’10; IEEE SPAWC’10; IEEE GLOBECOM’10; IEEE ICC’11, DySpan’11, IEEE GLOBE- COM’11, IEEE ICASSP’11, IEEE SPAWC’11, IEEE INFOCOM’11, IEEE ICC’12, IEEE ICASSP’12, IEEE SPAWC’12, IEEE SmardGridCom’12, IEEE INFOCOM’12, IEEE GLOBECOM’12, IEEE ICC’13, IEEE ICASSP’13, IEEE SPAWC’13, IEEE DC OSS’13, ACM SAC’13, IEEE INFOCOM’13, IEEE ICASSP14, IEEE SPAWC14, IEEE GLOBECOM’14, IEEE INFOCOM14, IEEE ICASSP15, IEEE INFOCOM’15.
5. **Others:** Elected to IEEE Fellow in 2013; Elected to Thomas Reuters Highly Cited Researchers List in 2014; Supervision of one Latin-American Ph.D students, three female Ph.D students, and one female Postdoc.

**Collaborators & Other Affiliations**

**(i) Collaborators and Co-Editors (42 in total):** Alfred Heros (UMich), Ali Sayed (UCLA), Ali Tajer (Wayne State), Andrew Eckford (York Univ.), Anthony So (Chinese U. of Hong Kong), Arumugan Nallanathan (Kings College, London), Changchuan Yin (Beijing Univ. of Posts and Telecom.), Cheng-Xiang Wang (Heriot-Watt Univ.), Chun-Hong Liu (National Chiao Tung Univ.), Costas Georgiades (TAMU), Dan Wang (City Univ. of HK), H. Vincent Poor (Princeton University), Hongjian Sun (Durham Univ.), Huiyan Sang (TAMU), I-Hong Hou (TAMU), Jie Li (Univ. of Tsukuba), John Thompson (Univ. of Edinburgh), Jose Moura (CMU), Jose Silva-Martinez (TAMU), Junhong Cui (U. of Connecticut), Junshang Zhang (ASU), Kamran Entesari (TAMU), Ken Ma (Chinese U. of Hong Kong), Latif Ladid (Cisco), Lifeng Lai (WPI), Liuqing Yang (CSU), Marwan Krunz (U. of Arizona), Mehdi Bennis (Univ. of Oulu), PR Kumar (TAMU), Qian Zhang (Hong Kong U. of Science and Technology), Robert Calderbank (Duke), Rui Zhang (National University of Singapore), Sebastian Hayos (TAMU), Shengli Zhou (U. of Connecticut), Taekyoung Kwon (Soul National Univ.), Tao Shu (Oakland Univ.), Tao Jiang (Huazhong Univ. of ST), Tie Liu (TAMU), Tomo Taniguchi (Fijitu), Vincent Wong (UBC), Yang Zhou (Huazhong Univ. of ST), Ying-Chang Liang (AStar), Zhi Ding (UC, Davis), Zhi Quan (Apple), Zhu Han (U. of Houston).

**(ii) Graduate Advisors (2 in total):** Ph.D-Andrea J. Goldsmith (Stanford University); ME-Zhi-Quan Luo (University of Minnesota)

**(iii) Thesis and Postdoc Advisor (21 in total): students** Long Gao (Hitachi Lab), Armin Banaei (TiDAL Systems Inc.), Qing Zhou (Qualcomm Inc.), Ahsan Aziz (National Instrument), Lili Zhang (Qualcomm Inc.), Chuan Huang (University of Electronic Science and Technology of China), Meng Zeng (Marvell), Fan Wang (Qualcomm Inc.), Mohammad Siam (Al-Isla University), Qiong Wu (Google), Jianwei Zhou (Sprint), Jiaming Qiu (Univ. of Maryland), Tarun Agarwal (Amazon), Peili Cai (Qualcomm Inc.), Charalambos Charalambous (Photos Photiades Group), Peng Wu (Texas Instruments); **postdocs** Beiyou Rong (Marvell), Jinhua Jiang (Google), Soummya Kar (CMU), Ali Eslami (Wichita State), Li Xu (TAMU).
P. I. Aniruddha Datta

Mailing Address:
Dept. of Electrical & Computer Engineering, Texas A & M University, 3128 TAMU
College Station, TX 77843-3128, U.S.A.
Tel:(979)-845-5917, Fax:(979)-845-6259, email: datta@ece.tamu.edu

Professional Preparation:
M.S.E.E. in Electrical Engineering, Southern Illinois University, Carbondale, August 1987.
M.S. in Applied Mathematics, University of Southern California, Los Angeles, May 1991.
Ph.D. in Electrical Engineering, University of Southern California, Los Angeles, August 1991.

Bioinformatics Trainee, National Cancer Institute Training Grant, Texas A & M University,
College Station, July 2001-June 2003.

Appointments:
Professor, Department of Electrical and Computer Engineering, TAMU, September 2002-present.
Director, Center for Bioinformatics and Genomic Systems Engineering, Texas A & M University,
College Station, July 2014-present; Associate Director, February 2014-July 2014.
Adjunct Professor, Department of Epidemiology and Biostatistics, University of Texas at San
Antonio Health Sciences Campus, July 2007-August 2013.
Associate Professor, Department of Electrical Engineering, TAMU, September 1997-August 2002.
Assistant Professor, Department of Electrical Engineering, TAMU, August 1991-August 1997.

List of publications:
Publications Closely Related to the Proposed Project

1. P. Venkatasubramani and A. Datta, “Modeling and Inference of the MAP Kinase Cascade in
Plant-Pathogen Interaction,” Proceedings of the 17th Yale Workshop on Adaptive and Learning
Systems, 17-21, Yale University, New Haven, CT, June 24-26, 2015.
2. P. Venkatasubramani, K. R. Narayanan and A. Datta, “A Bayesian Network Based Approach
to Selection of Intervention Points in the MAPK Plant Defense Response Pathway,” submitted to
IEEE/ACM Transactions on Computational Biology and Bioinformatics.
Between Genes Responsive to Ionizing Radiation in the NCI 60 ACDS,” Bioinformatics, Vol.
21, No. 8, 1542-1549, 2005.

Five Other Significant Publications

2. O. Arshad, P. Venkatasubramani, A. Datta and J. Venkatraj, “Using Boolean Logic Modeling
of Gene Regulatory Networks to Exploit the Links between Cancer and Metabolism for
Therapeutic Purposes,” IEEE Journal of Biomedical and Health Informatics, Vol. 20, No. 1,
works with a Prescribed Attractor Structure,” Bioinformatics, Vol. 21, No. 21, 4021-4025,
2005.

Synergistic Activities (Last 8 Years):


Collaborators & Other Affiliations

Collaborators:

Graduate Advisors:
P. A. Ioannou, University of Southern California; W. A. Harris, University of Southern California (currently deceased); and F. Pourboghrat, Southern Illinois University, Carbondale.

Postdoctoral Mentors:
R. Carroll, E. Dougherty, J. Lupton, R. Chapkin and N. Turner, all with Texas A & M University.

Graduate Students Supervised:
Biographical Sketch – Edward Dougherty

Department of Electrical and Computer Engineering
Texas A&M University
3128 TAMU
College Station, TX 77843-3128
Phone: 979-862-8896; Fax: 979-845-6259
e-mail: e-dougherty@tamu.edu

Professional Preparation

1974 Ph.D. (Mathematics) Rutgers University, New Brunswick, NJ
1986 M.S. (Computer Science), Stevens Institute of Technology, Hoboken, NJ
1969 M.S. (Mathematics) Fairleigh Dickinson University, Teaneck, NJ
1967 B.S. (Mathematics) Fairleigh Dickinson University, Teaneck, NJ

Appointments

2013-present, Distinguished Professor, Dept. Electrical and Computer Engineering, Texas A&M Univ.
2014-present, Scientific Director, Center for Bioinformatics and Genomic Systems Engineering, Texas A&M Univ.
2007-present, Robert M. Kennedy ’26 Chair (Texas A&M University), 2007.
1996-present, Professor, Dept. Electrical and Computer Engineering, Texas A&M Univ.
2005-2013, Director, Division of Computational Biology, Translational Genomics Research Institute
2009-2010, Adjunct Professor, Dept. Bioinformatics and Computational Biology, M.D. Anderson Cancer Center, Univ. Texas
2001-2009, Adjunct Professor, Dept. Pathology, M.D. Anderson Cancer Center, Univ. Texas
2007-2008, Interim Director, Computational Biology and Bioinformatics Program, Greehey Children’s Cancer Research Institute, Univ. Texas Health Science Center at San Antonio
1996-1998, Director of Imaging, Center for Applied Technology, Texas A&M Univ.
1992-1996, Professor, Center for Imaging Science, RIT
1988-1992, Associate Professor, Center for Imaging Science, RIT
1986-1988, Adjunct Professor, Department of Comp. Sci. & Electrical Engineering, Stevens Institute of Technology
1972-1980, Instructor/Assistant Professor, Dept. Mathematics, Fairleigh Dickinson Univ.


Some recent papers:


**Synergistic Activities**

1. Served as co-director of the Computational Biology Division of the Translational Genomics Research Institute.
2. Served as interim director and initiated the bioinformatics program at the Greehey Children’s Cancer Research Institute, University Texas Health Science Center at San Antonio.
3. Served as first director of the Center for Bioinformatics and Genomic Systems Engineering at Texas A&M Univ.
4. Served under an IPA as consultant to the Scientific Director of the National Human Genome Research Institute.
5. Assisted in the formation of the Genomics Core of the Department of Pathology at the M. D. Anderson Cancer Center.

**Students**

Total Post-docs Advised: 17
Total Graduate Students Advised: 31.
Nicholas G. Duffield

Contact:
Texas A&M University
Electrical & Computer Engineering
College Station, TX 77843-3259, USA
Email: duffieldng@tamu.edu
Office: +1 (979) 845-7328
Web: http://nickduffield.net/work

Professional Preparation:
1982  BA Natural Sciences (Physics and Theoretical Physics), *University of Cambridge, UK*
1983  MMath, Applied Mathematics, *University of Cambridge, UK*
1987  PhD, Mathematical Physics, *University of London, UK*

Appointments:
2014-present  *Texas A&M University, Electrical & Computer Engineering*, Professor
2013-2014  *Rutgers University / DIMACS*, Research Professor
1995-2013  *AT&T Labs—Research*
  Distinguished Member of Technical Staff, 2003-2013
  Lead Member of Technical Staff, 1998-2003
  Principal Member of Technical Staff, 1997-1998
  Senior Member of Technical Staff, 1995-1997
1991-1995  *Dublin City University, School of Mathematical Sciences*
  Assistant Lecturer, 1993-1995
  Research Fellow, 1991-1993
1989-1991  *Dublin Institute for Advanced Studies, School of Theoretical Physics*, Research Scholar
1988-1989  *University of Heidelberg, Dept. of Applied Math*, Royal Society Exchange Fellow
1986-1988  *University College Dublin, Dept. of Mathematical Physics*, Research Assistant

Other Current Affiliations and Positions:
2015 to present: Director, Texas A&M Engineering Big Data Initiative
2015 to present: Professor by Courtesy, Texas A&M Department of Computer. Sci. & Eng.
2015 to present: Associate Member, Oxford-Man Institute of Quantitative Finance
2015-2017: Member of Board of Directors, ACM Sigmetrics
2014 to present: Chief Editor for Big Data, Frontiers in ICT
2014 to present: Editor-at-Large, IEEE/ACM Transactions on Networking
1995 to present: Research Associate Dublin Institute for Advanced Studies

Honors and Achievements:
2005 IEEE Fellow
2007 AT&T Fellow
2012 & 2013 ACM SIGMETRICS Test of Time Award
Publications: 151 referred publications; 47 US Patents; 4 RFC Internet Standards;
Citations: 12,253 in Google Scholar, with H-Index 56
Research Interests:
Network and Big Data Science, including (i) data streaming algorithms; (ii) network measurement including Software Defined Networking and network security and resilience; (iii) Big data applications in transportation and engineering

Five Leading Publications:

Recent Synergistic Activities:
4. *Organization*: Director, Texas A&M Engineering Big Data Initiative; Senior Personnel on South NSF Regional Big Data Innovation Hub
5. *Educational*: Developed and delivered undergraduate and graduate courses in Data Science and Applications at Texas A&M University, 2014—2015

Current Teaching:
ECEN 689: Data Science for Communications Networks, Fall 2014, 2015
ECEN 489/689: Data Mining and Analysis

Current Research Funding:
Biographical Sketch

Mehrdad (Mark) Ehsani
Professor of Electrical Engineering
ECE Dept., Texas A&M Univ., College Station, Texas 77843
979-845-7582
ehsani@ece.tamu.edu

A. PROFESSIONAL PREPARATION

<table>
<thead>
<tr>
<th>College/University</th>
<th>Major</th>
<th>Degree &amp; Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>The University of Texas at Austin</td>
<td>Elect. Engr.</td>
<td>BS, 1973</td>
</tr>
<tr>
<td>The University of Texas at Austin</td>
<td>Elect. Engr.</td>
<td>MS, 1974</td>
</tr>
</tbody>
</table>

B. ACADEMIC/PROFESSIONAL APPOINTMENTS

Robert M. Kennedy Professor of Electrical Engineering
Halliburton Professor in the College of Engineering
Dresser Industries Professor in the College of Engineering
Ruth & William Neely/ Dow Chemical Faculty Fellow of the College of Engineering, for “contributions to the Engineering Program at Texas A&M, including classroom instruction, scholarly activities, and professional service”
BP Amoco Faculty Award for Teaching Excellence in the College of Engineering
Professor of Electrical Engineering, 1992
Associate Professor of Electrical Engineering, 1987
Assistant Professor of Electrical Engineering, 1981

C. SAMPLE PUBLICATIONS


Other Significant Publications


D. SYNERGISTIC ACTIVITIES
Director of Advanced Vehicle Systems Research Program, College of Engineering, Texas A&M University, 1992-present


Invited Short Course at Tel Aviv University on “Hybrid Electric Vehicles,” Tel Aviv, Israel, May 23-25, 2000.

Winner of 2001 Avant Garde Award from IEEE Vehicular Technology Conference for “Contributions to the Theory and Design of Hybrid Electric Vehicles.”

SAMPLE COLLABORATORS AND OTHER AFFILIATIONS
Collaborators Over The Last 48 Months:
Director: I/UCRC (phase I): Collaborative Research: National Science Foundation: Electric Vehicle Technology Development, EV-TEC

E. HONORS AND AWARDS (Over 150 international honors and awards, including)

1. Life Fellow, Institute of Electrical and Electronics Engineers, IEEE; Society of Automotive Eng., SAE
2. Distinguished Speaker, IEEE Industrial Electronics, Power Engineering, Ind. App. Societies
3. Honorary Professor of Electrical Engineering, The University of Hong Kong
4. IEEE Undergraduate Teaching Award, 2003
8. Member of Advisory Board of Automotive X Prize Foundation, Inc.

Manufacturing Relevant Activities
1. Research Engineer, Fusion Research Center, Austin, Texas, 1974-1977
3. Consultant to over 65 U.S. and International Companies and Government Agencies
a. Professional Preparation:

Texas A&M University  Electrical Engineering   B.S., 1969
Texas A&M University  Electrical Engineering   M.S., 1970
Columbia University   Electrical Engineering   M.Phil., 1975
Columbia University   Electrical Engineering   Ph.D., 1975

b. Appointments:

Professor, Electrical Engineering, Texas A&M University, 1988-Present
Associate Professor, Electrical Engineering, Texas A&M University, 1979-1987
Visiting Scientist, Naval Research Laboratory, 1983-1985 (on leave from Texas A&M University)
Visiting Summer Faculty, Sandia National Laboratory, Summers of 1979 and 1980
Assistant Professor, Electrical Engineering, 1975-1979
USAF-ASEE Summer Research Fellow, Wright Patterson AFB, Summer 1977.

c. Publications:

(i) Recent


(ii) Selected Others


d. Synergetic Activities:

Prof. Eknoyan has authored more than 93 journal articles and conference presentations. Since joining the Texas A&M faculty, he has served as Chairman of the Graduate Advisory Committee for 43 students, and as a member of the Graduate Advisory Committee for more than 120 students.

He has served as an Associate Editor for the Institute of Electrical and Electronics Engineers (IEEE) - Transactions on Components and Packaging Technology (CPT). He was a member of the Research and Development Committee of the IEEE-United States Activities Board (USAB). He served as a member of the IEEE-Solid State Circuit Council. He was a member of the organizing committee for the IEEE/Electronic Components Conference (ECC) and served as a Co-Chair and Chair of the Semiconductor Devices and Processing session for the IEEE/ECC.

e. Collaborators & Other Affiliations

(i) Collaborators during Past 48 Months


(ii) Graduate and Postdoctoral Advisors

E.S. Yang served as graduate advisor for O. Eknoyan at Columbia University. O. Eknoyan did not conduct supervised postdoctoral research at a university.

(iii) Thesis Advisor and Postgraduate-Scholar Sponsor during Past 5 Years

a. Professional Preparation:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Major</th>
<th>Degree &amp; year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osmania University, India</td>
<td>Electrical Engineering</td>
<td>B.S., 1980</td>
</tr>
<tr>
<td>Indian Institute of Technology, Kanpur, India</td>
<td>Electrical Engineering with Power Electronics &amp; Control emphasis</td>
<td>M.Tech., 1982</td>
</tr>
<tr>
<td>Concordia University, Canada</td>
<td>Power Electronic Converters &amp; Electric Machines</td>
<td>Ph.D., 1988</td>
</tr>
</tbody>
</table>

b. Appointments:

9/15 to Present:  Associate Dean of Academic Affairs (Undergraduate & Graduate Programs)
5/13 to 8/15:  Associate Dean for Undergraduate Programs
9/98 to 11/04:  Professor of Electrical Engineering at Texas A&M University.
9/94 to 8/98:  Tenured, Associate Professor of Electrical Engineering at Texas A&M University.
6/88 to 8/94:  Assistant Professor of Electrical Engineering at Texas A&M University.
1984-1988:  Graduate Research Assistant, Concordia University, Montreal, Canada

c1. Five Relevant Publications:

c2. Five Additional Relevant Publications:
10. Massoud, A; Ahmed, S; N. Denniston; Enjeti, P; Multiple module high gain high voltage dc-dc transformers for offshore wind energy systems" IEEE Transactions on Industrial Electronics, Volume 58, No. 5, May 2010 , Page(s): 1877-1886
d. Synergistic Activities:
Power Electronics, Renewable Energy Systems & Utility Interface:
My research focus is on advancing power electronic converters for utility interface of solar-pv/wind/fuel-cell/battery-energy storage power systems, switching power supply designs and solutions to complex power management issues; exploring alternative designs for achieving high density, high temperature power conversion systems with wide band-gap semiconductor devices.

1. Two industry grade power factor correction schemes for single phase and three phase diode rectifier type utility interface have been developed at TAMU as a result of my research. This technology is listed in US Patent: 5,903,066

2. High Frequency PWM Controlled Motor Drives: While high frequency PWM control represents the most advanced ac motor drive concept, when inappropriately applied the high dv/dt (5kV/μs to 11kV/μs) generates several side effects such as insulation failure of windings and bearing currents. My research has contributed to better understanding of this phenomenon and has resulted in new filtering concepts. A US Patent: 6,122,184 has been issued.

3. Power Quality Issues and Active Power Filters: the focus of my research is to develop innovative active harmonic filtering methods. An active filter to cancel neutral current harmonics in three phase four wire electric distribution systems infested with nonlinear loads has been developed (US patent 5,568,371) and licensed.

4. High power density power electronic converters with medium frequency transformer isolation: Many high power converters, such as adjustable speed AC drive (ASD) systems, employ a line frequency transformer isolation followed by a ‘multi-pulse’ rectifier system (12-pulse, 18-pulse, etc.) for better input current quality. Two simplified strategies that can significantly improve power density of high power converters, including ASDs and high current rectifier systems used in fast ev-charging stations have been proposed. The resulting systems have been shown to exhibit drastic reduction in size/weight and improved performance.

Selected Honors:
- Inaugural recipient of the R. David Middlebrook Technical Achievement Award from the IEEE Power Electronics Society, Aug 2012
- Inaugural Holder of the Texas Instruments Professorship in Engineering, Nov 2004
- University level distinguished achievement award: in recognition and appreciation of ability, personality and methods which have resulted in distinguished achievements in teaching, Presented by The Association of Former Students of Texas A&M University, May 2004.
- Recipient of the select title “Class of 2001 Texas A&M University Faculty Fellow” Award for demonstrated achievement of excellence in research, scholarship and leadership in the field.
- Elected to Fellow Grade of the IEEE, January 2000
- Received seven prize paper awards for the best research papers published in IEEE Industry Application Society; Four US patents awarded and have licensed two of them to the industry so far.

e. Collaborators & Other Affiliations:
(i) Collaborators:
Dr. Shehab Ahmed, Texas A&M University at Qatar & Dr. Ahmed Massoud, Qatar University
Dr. Robert Balog, Dr. Toliyat, Dr. Jo Howze of Texas A&M University
Dr. A. von Jouanne, Oregon State University, OR
Dr. Ira. J. Pitel, Magna Power Electronics, Boonton, NJ

(ii) Graduate Advisors:
Dr. J. F. Lindsay, Professor (Retired) & Dr. P.D. Ziogas, Professor (Deceased)
Department of Electrical Engineering & Department of Electrical Engineering
Concordia University, Montreal, Canada Concordia University, Montreal, Canada

(iii) Thesis Advisor and Postgraduate-Scholar Sponsor: Ph.D. Thesis supervised (28 total): Annette von Jouanne (Prof Oregon State); Maja Harfman Todorovic (Technical leader GE R&D); L. Palma (Professor Univ of Concepcion, Chile); H. Cha (Prof Chungnam Univ, Korea); S. Kim (Scientist, Google); J. Hahn (Sr. Engr, Apple)
Costas N. Georghiades

A. Professional Preparation
- D.Sc., Electrical Engineering, Washington University, St. Louis, 1985
- M.Sc., Electrical Engineering, Washington University, 1983
- B.E., Electrical Engineering (with distinction), American University of Beirut, 1980.

B. Appointments
- 2014-present: Associate Agency Director, Texas A&M Engineering Experiment Station
- 2012-present: Associate Dean for Research, College of Engineering, Texas A&M University
- 2005-2012: Department Head, Electrical & Computer Engineering, Texas A&M
- 2002-present: Delbert A. Whitaker Endowed Chair Professor, Texas A&M University
- 1997-2005: Group Leader, Telecommunications and Signal Processing Group
- 1997-2005: Director, Wireless Communications Laboratory (WCL)
- 1995-present: Professor, Electrical Engineering Dept., Texas A&M University
- 1991-1995: Associate Professor, Electrical Engineering Dept., Texas A&M University

C. Ten Recent Publications (total: 83 journal, 150 conference publications)
D. Synergistic Activities

Honors and Awards

- IEEE Communication Theory Technical Committee (CTTC) Service Award, 2012; “For sustained contributions as editor, conference program chair, and CTTC chair."
- E.D. Brockett Professor, 2002-2003
- Clear Lake Council of Technical Societies Educator of the Year Award, 2000
- Fellow of the IEEE, 1998 (For contributions to the theory of optimum receiver design)
- Halliburton Professor, Texas A&M University, 1995

Main Professional Activities

- Member, IEEE Wireless Communications Letters Steering Committee, 2012-2016
- Chair, IEEE Wireless Communications Letters Steering Committee, 2012-2014
- Member, IEEE Communication Society Awards Committee, 2012-2014
- Member, IEEE Richard W. Hamming Medal Committee, 2011-2014
- General Co-Chair, 2010 International Symposium on Information Theory
- Editor-in-Chief, IEEE Communication Letters, 2005-2008
- Chair, IEEE Communications Society Communications/Signal Processing Cluster, 2006-7
- Chair, IEEE Communication Theory Technical Committee (CTTC), 2005-2007
- Guest Editor, EURASIP Journal on Wireless Communications and Networking,
- Chair, SPIE Conference on Noise in Communications, Austin, Texas 2005
- Technical Program Chair, 2005 IEEE Communication Theory Workshop
- Co-Chair, IEEE Information Theory Workshop, San Antonio, Texas, October 2004
- Chair, IEEE Information Theory Society Fellows Committee, 2003-2006
- Member, IEEE Communications Society Awards Committee, 2001-2004
- Technical Program Chair, IEEE Vehicular Technology Conference, Houston, May 1999
- Associate Editor, IEEE Transactions on Information Theory, 1994-1997
- Guest Editor, IEEE Journal on Selected Areas in Communications (J-SAC), 1995
- Editor, IEEE Transactions on Communications, 1987-1995

E. Collaborators

Advisor: Donald L. Snyder, Washington University in Saint Louis, MO.

Research Collaborators
Shuguang Cui, Darren B.H Kline, M.Z. Shakir, Khalid Qaraqe, Tie Liu, H. Celebi, Alex Sprintson, Vladimir Stankovic, Krishna Narayanan, Z. Cai, Mi Lu, Zixiang Xiong, Xiaodong Wang, E. Kurtas, Garng Huang, A. Robert Calderbank, Marc Moeneclaey, Donald L. Snyder, Charalambos Charalambous, Erdal Panayirci,

PhD Students Advised (Total: 26 Ph.D., 37 MS, 17 ME)
Salim El Rouayheb, Illinois Institute of Technology; Nariman Rahimian; Armin Banaei; Ahsan Ul Aziz, National Instruments; Mustafa El Halabi, American University of Science and Technology, Lebanon; Sung Sik Nam, Hanyang University, Korea; Qiang Li, Intel; Angelos Liveris; Panayiotis Papadimitriou, Nokia; Yongzhe Xie; Murat Uysal, Ozyegin University, Turkey; Jing Li, Lehigh University; Predrag Spasojevic, Rutgers University; K.C. Chan; U. Das Gupta, Texas Instruments; Qinghua Li, Intel; Sangho Choe, The Catholic University of Korea; Yingxue Li, Interdigital; Thomas Cassaro, APL; Jong-Hyune Kim, Samsung; E. Soljanin, Rutgers University; N. Kong; S. Patarasen, Thailand Military Academy; W.S. Yuan, AMCC; Ram Velidi; Jae Choong Han; Jong-Hyune Kim.
Professional Preparation
The University of Florida, EE, B.S. 1994
The University of Florida, ECE, M.S. 1997
The University of Texas at Austin, ECE, Ph.D. 2008

Appointments
Texas A&M University, Associate Professor, 2015 - present
Texas A&M University, Assistant Professor, 2009 - 2015
The University of Texas at Austin, Research Assistant, 2003 - 2008
Intel Corp., Design Engineer, 1997 - 2003

Publications

Other Significant:

Synergistic Activities
- Received Texas A&M System Teaching Excellence Award, Top 5%, for ECEN 676, Spring 2010.

Collaborators
Recent Collaborators: G. Choi (TAMU), B. Grot (U Edinburgh), J. Hu (TAMU), D. Jimenez (TAMU), N. Reddy (TAMU), V. Soteriou (CUT), A. Sprintson (TAMU)
Graduate Advisors: S.W. Keckler (UT/Nvidia), D. Burger (MSR)
Graduate Students (MS): Prabal Sharma, Guangning Chen, Anusha Shankar, Reena Panda, Mukund Ramakrishna, Vinayak Pai, Tushar N. K. Jain, Swapnil Lotlikar, Tarun Soni, Subodh Prabhu
Arum Han

a. Professional Preparation:
- Seoul National University, Electrical Engineering, B.S., 1997
- University of Cincinnati, Electrical Engineering, M.S., 2000
- Georgia Institute of Technology, Electrical Engineering, Ph.D., 2005

b. Appointments
- 2011 – present: Associate Professor, Dept. Biomedical Engineering, Texas A&M University
- 2011 - present: Associate Professor, Dept. Electrical and Computer Eng., Texas A&M University
- 2011 - present: Graduate Faculty, Texas A&M Institute for Neuroscience
- 2009: Visiting Professor, Institute of Industrial Science (IIS), University of Tokyo
- 2006 - 2011: Assistant Professor, Dept. Biomedical Engineering, Texas A&M University
- 2005 - 2011: Assistant Professor, Dept. Electrical and Computer Eng., Texas A&M University

c. Publications (selected from 80 peer-reviewed publications):

(i) Most Closely Related:

(ii) Other Significant Publications:

d. Synergistic Activities
1. Course Development: Developed a graduate level course, ECEN 660: BioMEMS and Lab-on-a-Chip, in the Dept. of Electrical and Computer Engineering at Texas A&M University in 2005.
2. Course Development: Developed an undergraduate level laboratory course, ECEN 414 Biosensors Lab, in the Dept. Electrical and Computer Engineering at Texas A&M University in Spring of 2008.
3. Service for Scientific Journals: Editorial Board Member for PLoS ONE; Reviewer for 30 journals
5. Service on Conferences: Promotion Committee of The 16th International Conference on Miniaturized Systems for Chemistry and Life Sciences (μTAS); General Co-Chair of The 3rd Circuits and Systems for Medical and Environmental Applications (CASME 2012) (2012, Merida, Mexico); Technical Program Committee (TPC) of the 16th International Conference on Solid-State Sensors, Actuators, and Microsystems (Transducers) (2011, Beijing, China)

e. Collaborators & Other Affiliations
(i) Collaborators (past 48 months, 43 total)

Chen, G, Emory University  Jayaraman, A, TAMU  Righetti, R, TAMU
Cheng, X, TAMU  Jo, YK, TAMU  Sadr, R, TAMU - Qatar
Cho, Y, Seoul Nat. Uni. Tech. Kim, B, University of Tokyo Safe, S, TAMU
de Figueiredo, P, TAMU Kim, J, TAMU  Samocha, T, TAMU – Corpus Christi
Devarehne, T, TAMU Kim, YJ, TAMU  Sanchez-Sinencio, E, TAMU
Dickman, M, TAMU Ko, G, TAMU  Shim, WB, TAMU
Dougherty, E, TAMU Koito, H, TAMU  Shin, DM, Emory University
Ferrari, M, Methodist Hospital Li, J, TAMU  Sills, D, Cornell University
Research Institute Li, L, TAMU  Son, DH, TAMU
Ficht, T, TAMU Longsine-Parker, W, TAMU  Stern, D, Boyce Thompson Inst. Plant Research
Gross, D, TAMU  Ma, B, Rice University  Suh, J, Rice University
Grunlan, M, TAMU Maitland, K, TAMU  Tester, J, Cornell University
Hahn, M, TAMU McDougall, M, TAMU  Wright, SM, TAMU
Hou, H, Penn State Moriss, J, City Col. of NY  Yoon, BJ, TAMU
Ong, K, TAMU

(ii) Graduate and Postdoctoral Advisors (2 total)
A. Bruno Frazier, Electrical Engineering, Georgia Institute of Technology (Ph.D. advisor)
Chong H. Ahn, Electrical Engineering, University of Cincinnati (M.S. advisor)

(iii) Thesis Advisor and Postgraduate-Scholar Sponsor


Undergraduate Students: 43 total (names not listed here)
CV – Philip Hemmer – May 2015

Professor, Department of Electrical & Computer Engineering,
Texas A&M University, 3128 TAMU, College Station, TX 77845, Tel: 979-845-8932, Fax: 979-845-6259, email: prhemmer@ece.tamu.edu

Technical Areas of Expertise:

Education:

Work history:

Awards:
Fellow of the Optical Society of America, 2012; TEES Fellow 2007 & 2010; Ruth and William Neely ’52 Dow Chemical Fellowship, 2003; Air Force Research Laboratory Chief Scientist’s Award, 1993; AFOSR Star Team Award (3 times), 1990, 1992, 1994; National Science Foundation Fellowship, 1976; Summa Cum Laude University of Dayton, 1976

Brief Statement of Work History:
I have primarily concentrated on adapting the latest concepts in the forefront of optics to solving difficult problems of commercial and military importance. Past and current work includes:
1) Quantum optical memories using silicon-vacancy (SiV) centers in diamond.
2) Room temperature detection of a single rare-earth ion using up-conversion.
3) Sub-wavelength imaging of single electrons spins in nitrogen-vacancy (NV) diamond,
4) Room temperature single shot readout of nuclear spin in NV diamond,
5) Photon-spin entanglement in NV diamond,
6) Ultra-sensitive room temperature solid state magnetometers with NV diamond,
7) Ultrasound optical tomography with persistent spectral hole burning materials and slow light
8) Optically excited spins in room temperature NV diamond for quantum processor nodes,
9) Plasmon nano-optics for few molecule chemical sensors and quantum information,
10) Demonstration of slow and stopped light in solids,
11) Room-temperature slow and fast light in solid-state for optical buffers and delay lines,
12) Low-threshold nonlinear optics for optical processing and turbulence aberration correction,
13) Materials and techniques for high-temperature spectral holeburning memories,
14) Polymer-based holographic optical memory materials for automatic target recognition,
15) Uses of smart-pixel devices for optoelectronic image processing and aberration correction,
16) Investigation of laser cooled and trapped atoms,
17) Development of more compact atomic clocks using optical Raman excitation.

Representative Publications:
1. Rogers, Lachlan J.; Jahnke, Kay D.; Metsch, Mathias H.; Sipahigil, A; Binder, JM; Teraji, T; Sumiya, H; Isoya, J; Lukin, MD; Hemmer, P; Jelezko, F, All-Optical Initialization, Readout, and Coherent Preparation of Single Silicon-Vacancy Spins in Diamond, PHYSICAL REVIEW LETTERS 113, 263602 Published: DEC 22 2014.
3. “The universal scaling laws that determine the achievable resolution in different schemes for super-resolution imaging,” Hemmer, Philip R.; Zapata, Todd; JOURNAL OF OPTICS 14 (8), 083002 (AUG 2012)
Biographical Sketch

I-Hong Hou  
Assistant Professor  
334C WEB., 3128 TAMU, College Station, TX, 77843-3128  
(979)862-1092  
ihou@tamu.edu

A. PROFESSIONAL PREPARATION

<table>
<thead>
<tr>
<th>College/University</th>
<th>Major</th>
<th>Degree &amp; Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Taiwan University</td>
<td>Electrical Engineering</td>
<td>B.S., 2004</td>
</tr>
<tr>
<td>Univ. of Illinois, Urbana-Champaign</td>
<td>Computer Science</td>
<td>MS, 2008</td>
</tr>
<tr>
<td>Univ. of Illinois, Urbana-Champaign</td>
<td>Computer Science</td>
<td>PhD, 2011</td>
</tr>
</tbody>
</table>

B. ACADEMIC/PROFESSIONAL APPOINTMENTS

2012 -   Assistant Professor, Dept. of ECE, Texas A&M University  
2011 – 2012 Assistant Research Engineer, Dept. of ECE, Texas A&M University

C. PRODUCTS

Products Most Closely Related to Proposal


Other Significant Products


D. SYNERGISTIC ACTIVITIES
1. Symposium Chair, IEEE/CIC International Conference on Communications in China (ICCC), 2013
2. Workshop Co-Chair, ACM MobiHoc 2014
3. Chair, Workshop on Indoor and Outdoor Small Cells, 2014
5. Primary Advisor, Taiwanese Student Association, 2014–present

Ph. D. Thesis advisor
P.R. Kumar, Department of ECE, Texas A&M University

COLLABORATORS AND OTHER AFFILIATIONS
Collaborators and Co Editors (11):
Chung Shue Chen, (Alcatel-Lucent Bell Labs); Shuguang Cui, (Texas A&M University); Afef Feki, (Alcatel-Lucent); Liang Ge, (Texas A&M University); Piyush Gupta, (Bell Labs, Alcatel-Lucent); P.R. Kumar, (Texas A&M University); Alex Sprintson, (Texas A&M University); Rath Vannithamby, (Intel); Lei Ying, (Arizona State University); Simon Yao, (Texas A&M University); Jing Zhu, (Intel)

Thesis Advisor (2)
Abhishek Jain, (Apple); Yao Liu, (Intel)

Postgraduate-Scholar Sponsor (0)
Sebastian Hoyos

Email: hoyos@tamu.edu; http://www.ee.tamu.edu/~hoyos/

Professional Preparation

Pontificia Universidad Javeriana, Electronics, Bachelor in Electronic Engineering - 2000
University of Delaware, Signal Processing Applications, Master in Electrical Engineering - 2002
University of Delaware, Signal Processing Applications, Ph.D. in Electrical Engineering - 2004

Appointments

Fall 2012 – Present  Associate Professor, Texas A&M University, Department of Electrical and Computer Engineering, College Station, TX
Fall 2006 – Summer 2012  Assistant Professor, Texas A&M University, Department of Electrical and Computer Engineering, College Station, TX
October 2004 – August 2006  Postdoctoral Researcher, Berkeley Wireless Research Center, Dept. of EECS, University of California at Berkeley, CA
Spring 2004  Instructor, Department of Electrical and Computer Engineering, University of Delaware, Newark, DE
2000-2004  Researcher, Department of Electrical and Computer Engineering, University of Delaware, Newark, DE
1998-2000  Instructor, Pontificia Universidad Javeriana, Bogota, Colombia

Products

(i) Related to Proposed Project:


(ii) Other Significant Products:

Synergistic Activities

Recent National and International Presentations:


New Course Development: Advanced Mixed-Signal Interfaces: This course introduces emerging and state of art mixed-signal techniques for the design of narrowband, wideband and ultra-wideband transmitters and receivers. The course teaches how the emerging services are demanding highly flexible, programmable and scalable architectures to be able to cope with a large number of applications including several communications standards. Additionally, the course addresses some of the topologies proposed to realize concepts like Software-Defined-Radios, Cognitive-Radios, and Ultrasound Imaging Receiver and Transmitters.

Participation of underrepresented students in science: We have made some important progress toward creating incentives for underrepresented students to join our research center as graduate students. In general, the Texas A&M University has a continuing campaign to create the right venues to foster the representation of students from minority groups in both our graduate and undergraduate programs, as well as the representation of local American students in our graduate programs.

Participation in Technical Committees:
TC member of the Twentieth Symposium on Signal Processing, Images and Computer Vision (STSIVA15), Bogota, 2015
TC member of Sampling Theory and Applications 11th International Conference (SampTA15), Washington DC., 2015
Member of the Editorial Board of the Journal of Advances in Electronics, 2015-present
Member of the ECEN Undergraduate Studies Committee, ECE Department, Texas A&M University, 2014-present

Collaborators and Co-Editors(8): Dr. Brian M. Sadler (ARL), Dr. Ehsan Zhian Tabasy (Altera), Fabian Silva-Rivas (Broadcom), Prof. Jose Silva-Martinez (TAMU), Dr. Hyung-Joon Jeon (Broadcom), Keytaek Lee (Intel), Prof. Samuel Palermo (TAMU), Shan Huang (Maxim)
Graduate Advisor (MS and PhD): Prof. Gonzalo R. Arce, University of Delaware
Postdoctoral Advisor: Prof. Borivoje Nikolic, University of California at Berkeley
Postdoctoral Sponsor and Co-Author: Dr. Brian M. Sadler, Army Research Laboratory
PhD. Students Advised (3): Shiva Kiran, Amir Tofigui, Oscar Barajas
Former Students (11): Jun Zhou(Broadcom), Ehab Sobhy(Qualcomm), Ramy Saad(Qualcomm), Xi Chen(Broadcom), Zhizhuan Yu(Texas Instruments), Mario Ramirez (Intel), Srikanth Pentakota(Silicon Labs), Vikram Gigoo(Qualcomm), Hemant Raghavan(Qualcomm), Pradeep Kotte(Linear Tech.), Mandar, Kulkami(Cactus)
Jiang Hu, Ph.D.

Professional Preparation

Zhejiang University  Hangzhou, China  Optical Engineering  B.S., 1990
University of Minnesota  Duluth  Physics  M.S., 1997
University of Minnesota  Minneapolis  Electrical Engineering  Ph.D., 2001

Appointments

Professor  Dept. of ECE, Texas A&M University  2014-Present
Associate Professor  Dept. of ECE, Texas A&M University  2008-2014
Assistant Professor  Dept. of ECE, Texas A&M University  2002-2008
Advisory Engineer  IBM Microelectronics  2001-2002
Electronic Engineer  Tech Center for Aids to Navigation, Tianjin  1990-1995

Related Publications (or Products)


Other Significant Publications (or Products)


Synergistic Activities


• General Chair (2012) and Technical Program Chair (2011) for ACM International Symposium on Physical Design.

• Physical Design and Manufacturability Track Chair for ACM/IEEE Design Automation Conference 2008.

• Co-founder IEEE Texas Workshop on Integrated System Exploration 2012.

• Faculty mentor for the Undergraduate Summer Research Grant program at the Texas A&M University.

Ph.D. Thesis Advisor: Professor Sachin Sapatnekar, Dept. of ECE, University of Minnesota

Collaborators

• Paul Gratz, Dept. of ECE, Texas A&M University.
• Sunil Khatri, Dept. of ECE, Texas A&M University.
• Umit Ogras, School of Electrical, Computer and Energy Eng., Arizona State University.
• Dana Porter, Dept. of Biological and Agricultural Engineering, Texas A&M University.
• Jeyavijayan Rajendran, Dept. of EE, Univ. of Texas at Dallas.
• Edgar Sanchez-Sinencio, Dept. of ECE, Texas A&M University.
• Sachin Sapatnekar, Dept. of ECE, University of Minnesota.
• Srinivas Shakkottai, Dept. of ECE, Texas A&M University.
• Alex Sprintson, Dept. of ECE, Texas A&M University.

Graduated Ph.D. Students

C.-N. Sze (IBM Research), Di Wu (Cadence), Ganesh Venkataraman (Magma), Ke Cao (Marvell), Shiyan Hu (Michigan Tech University), Rupak Samanta (Intel), Yifang Liu (Google), Kyu-Nam Shim (Intel), Xi Chen (Qualcomm), Jae-Yeon Won (Synopsys).
Jim Ji

A. Professional Preparation
Tsinghua University, China Electronics Engineering B.S. 1993
Tsinghua University, China Electronics Engineering M.S. 1997
University of Illinois at Urbana-Champaign Electrical Engineering Ph.D. 2003

B. Appointments
2009-present Associate Professor, Electrical & Computer Engineering, Texas A&M University
2003-present Assistant Professor, Electrical & Computer Engineering, Texas A&M University
1997-2003 Research Assistant, Electrical Engineering, University of Illinois at Urbana-Champaign

C. Products
Five Products Most Relevant to the Proposed Research:

Selected Other 5 Significant Products
6. PULSAR (Parallel Imaging Utilizing Localized Surface-coil Acquisition and Reconstruction), an open source Matlab toolbox for parallel receive MRI reconstruction and performance evaluation (more than three hundred downloads up to date)
[http://bi.tamu.edu/pulsarweb/index.htm](http://bi.tamu.edu/pulsarweb/index.htm)

D. Synergistic Activities
(i) **Editorship:**
Associate Editor, IEEE Transactions on Biomedical Engineering (TBME), 2013 - present
Editorial Board, Quantitative Imaging in Medicine and Surgery, 2011-present
Editorial Board, IEEE Engineering in Medicine and Biology Int. Conference, 2014-

(ii) **Chair & co-chair:**
Program co-Chair, IEEE-EMBS International Conference (EMBC), Chicago, 2014.
EMBC Student Paper Competition Committee (2009,2011 and 2012)
Imaging Track Chair (2004, 2006) and Session chair (2003 2011)
Student Activities Chair, IEEE Symposium on Biomedical Imaging (ISBI), 2011

(iii) **Outreach:** Regular speakers/hosts for Society of Women in Engineering summer camps, Discover Electrical & Computer Engineering outreach, and for campus-visiting high school students on biomedical imaging research.

(iv) **Training:** Supervised 17 undergraduate (6 females) and 15 graduate students (4 females) for research projects at Texas A&M University. Three undergraduate students performed research in our group for their honor degrees.

(v) **Bioimaging Curriculum Development:**
ECEN 410: Introduction to Medical Imaging
ECEN 617: Advanced Signal Processing for Medical Imaging
ECEN 764: Medical Imaging

E. **Collaborators & Other Affiliations**

(i) **Collaborators and Co-Editors**
Michael Arif (Univ. of Illinois); Zheng Chang (Duke University); Christopher P. Hess (UCSF); Jingfei Ma (Univ. of Texas MD Anderson Cancer Center); Mary McDougall (Texas A&M); Jeff Tsao (Novartis Institutes for BioMedical Research); Song Wang (Univ. of South Carolina); Eric Winner (Univ. of Pittsburgh); Steve Wright (Texas A&M); Guoxi Xie (SIAT, CHINA); Yihong Yang (NIH); Xiaoping Zhang (UCSF); Xiaoping Zhu (University of Manchester UK).

(ii) **Graduate and Postdoctoral Advisors**
Thomas Huang (Univ. of Illinois); Paul C. Lauterbur; Zhi-Pei Liang (Univ. of Illinois); David C. Munson, (Univ. of Michigan); Desheng Wang (Tsinghua University, China)

(iii) **Thesis Advisor and Postgraduate-Scholar Sponsor**
Jong Bum Son (PhD 2007, now at MD Anderson); Yuttapong Jiraraksopakun (PhD 2008, King Mongkut’s University Thailand); Yinan Liu; Xiaoxi Ou (MS 2011, now at NI); Harneet Singh (MS 2010, now at AT&T); Ravindra Garach (MS 2005, now at Qualcomm); Swati Rane (MS 2005, now at Vanderbilt); Shuo Feng (now at UCLA); Joohyung Lee.
Dr. Mladen Kezunovic, P.E.
Department of Electrical and Computer Engineering,
Texas A&M University
Tel: 979-845-7509; FAX: 979-845-6259; E-mail: kezunov@ece.tamu.edu

(i) Professional Preparation
University of Sarajevo  Sarajevo, Bosnia  Electrical Engineering  Dipl. Ing., 1974
University of Kansas  Lawrence, KS  Electrical Engineering  M.S., 1977
University of Kansas  Lawrence, KS  Electrical Engineering  Ph.D., 1980

(ii) Appointments
2012-Present  Director, Smart Grid Center, Texas Engineering Experiment Station
2010-2014  Deputy Director, NSF/UCRC-EV-TEC, Texas A&M University
2000-Present  Eugene E. Webb Professor, Department of Electrical and Computer Engineering, Texas A&M University
1999-Present  Site Director, NSF I/UCRC-Power Systems Engr. Res. Center, Texas A&M University
1996-Present  Professor, Department of Electrical Engineering, Texas A&M University
1997-2006  Director, Electric Power and Power Electronics Institute, Texas A&M University
1997-2006  Coordinator, Electric Power and Power Electronics Program, Texas A&M
1992-1996  Associate Professor, Dept. of Electrical Engineering, Texas A&M University
1991  Adjunct Associate Professor, Dept. of Electrical Engineering, Texas A&M
1989-1991  Visiting Associate Scientist, Dept. of Electrical Engineering, Texas A&M
1986-1989  Visiting Associate Professor, Dept. of Electrical Engineering, Texas A&M
1986-1989  Assoc. Professor, Dept. of Electrical Engineering, University of Sarajevo
1974-1986  Assistant Professor, Dept. of Electrical Engineering, University of Sarajevo
1982-1987  Project Leader, Energoinvest
1980-1982  Systems Engineer, Energoinvest

(iii) Products
(a) Products Closely Related to the Proposal

(b) Other Significant Products


(iv) Synergistic Activities

1. As the Director of the Smart Grid Center at TAMU (2012-present), coordinates activities of over 70 professors working in smart grid-related research programs and partnering with industry members to conduct transformational research to generate new concepts, technologies and integrated systems, and train electrical engineering students. Currently leads development of Large Scale Testbed facility worth over $5 million.

2. As TAMU’s Site Director for NSF’s I/UCRC PSerc (1999-present), coordinates TAMU’s collaborative efforts with the consortium that has 38 industry and 13 university members with a total of over 100 university researchers and industry participants. He was responsible for coordination of research plans in the Electric Power Transmission and Distribution Technology area during 1999-2005.

3. As a Principal Investigator, he carried out over 100 research projects with funding exceeding $30M over the last 30 years. The funds came from very diverse sponsors: NSF, DOE, DOD, EPRI, private industry, and equipment vendors. In his research, cooperated with over 50 senior researchers; developed one patent and collaborated on creating twelve IEEE standards related to power systems operations, reviewed scientific papers for eight journals and science programs, and served as an editorial board member of a US and a European research journal.


5. As an Academic Supervisor and Educator, advised the research and course studies of 23 Ph.D. students, 21 M.Sc. students, and 8 M.E. students. Moreover, led a curriculum restructuring effort of the Electric Power and Power Electronics (EPPE) academic program at TAMU (1997-2006) securing industry donation (over $1M in cash and equipment), which resulted in developing the Power Engineering Lab and re-designing EPPE courses attracting over 250 undergraduate and 50 graduate students annually since the change. In the last 25 years, he worked together with 16 postdoctoral research associates on various research topics related to power systems.
Sunil P. Khatri, PI

Professional Preparation
IIT (Kanpur, India)  Electrical Eng.  B. Tech., 1987
UT, Austin  Electrical and Computer Eng.  M.S., 1989
UC, Berkeley  Electrical Eng and Computer Sc.  Ph.D., 1999

Appointments
9/2015 – present  Professor, Texas A&M University, College Station
9/2010 – present  Associate Professor, Texas A&M University, College Station
6/2004 – 8/2010  Assistant Professor, Texas A&M University, College Station
1/2000–5/2004  Assistant Professor, University of Colorado, Boulder

Related Publications


Synergistic Activities

• VLSI/CAD across the University: Advised 12 undergraduate students under Texas A&M University’s NSF REU program (2005-12), and recruited two women into his research group (2005); Worked as an active spokesman for VLSI research within the Electrical and Computer Engineering (ECE) department and the College of Engineering of the University of Colorado at Boulder. Highlighted VLSI design in the college-wide Engineering Day in 2000, to present VLSI as a career choice to undergraduate students; Co-organized, along with Prof. Fabio Somenzi, the Computer-Aided Design seminar in the ECE department, University of Colorado at Boulder, 2000-04; Chaired the Computer-Aided Design Preliminary Examination in the ECE department, University of Colorado at Boulder, 2003-04; Organized the Industrial Visitor Day in the ECE department, University of Colorado at Boulder, 2000; Member, Graduate Admissions Committee, Department of ECE, Texas A&M University (2005–) and University of Colorado at Boulder (2000 -2004)

• VLSI/CAD outside the University: Contributed to the release of VIS, a formal verification tool distributed by the VLSI group under the direction of Prof. Fabio Somenzi (Summer 2001 and 2002). This software is widely used in academia and industry in formally verifying digital systems; Member, Technical Program Committee, IEEE International Conference on Computer Communications and Networks (ICCCN) 2004, IEEE International Workshop on Power and Timing Modeling, Optimization and Simulation (PATMOS) 2004-2006, IEEE International Workshop on Logic Synthesis (IWLIS) 2005 2006; Session Chair, International Conference on Networking (ICON) 2003 and Design Automation Conference (DAC) 2004

• Dissemination of VLSI/CAD research: Given several invited research talks on VLSI/CAD at Samsung Microelectronics (Seoul, S. Korea), Indian Institutes of Technology (Kanpur, Bombay, Delhi and Madras), Seagull Semiconductor (Austin, TX), Hewlett-Packard Company (Fort Collins, CO), Cirrus Logic (Broomfield, CO), Cadence Design Systems (San Jose, CA), Sun Microsystems Laboratories (Menlo Park, CA) and National Semiconductor Corporation (Santa Clara, CA).


• 6 patents in the area of VLSI design and EDA. 1 invited journal paper (out of 30), 10 invited conference/journal papers (out of 149), and 3 invited workshop papers (out of 33). My H-Index is 27. “Outstanding Professor Award”, Dept of ECE, Texas A&M University (2007), and “AFS Distinguished Achievement Award in Teaching”, Texas A&M University (2009). Invited to serve as conference panelist on 5 occasions, also presented 2 conference tutorials.

Collaborators & Other Affiliations

Collaborators: PI has collaborated with: R. K. Brayton (University of California, Berkeley, CA), R. Calderbank (Princeton), E. Goldberg (Cadence Berkeley Laboratories, Berkeley, CA), W. Gosti (Cadence Design Systems, San Jose, CA), A. Kuehlmann (Cadence Berkeley Laboratories, Berkeley, CA), Sangiovanni-Vincentelli (University of California, Berkeley, CA), S. Sinha (Intel Corporation, Portland, OR).

Graduate (PhD) Advisors: R. K. Brayton and A. Sangiovanni-Vincentelli (UC Berkeley)

Thesis Advisor and Postgraduate-Scholar Sponsor: PhD advisor to 9 graduated students (N. Jayakumar, B. Lameres, C. Duan, S. Das, R. Garg, K. Gulati, K. Lin, A. Mandal, K. Bian), and 3 ongoing PhD candidates. Served as a thesis advisor to 14 graduated M.S. students and 5 B.S. Honors Thesis students, and currently advises 2 M.S. students. Served as the graduate advisor of about 35 students and the undergraduate advisor of about 120 students.
Laszlo B. Kish
Dept. of Electrical and Computer Engineering, Texas A&M University
College Station, Texas 77843-3136

Professional Preparation
M.S. (Physicist Diploma) Attila Jozsef University, Hungary, June 1980
Docent (Habilitation, Solid State Physics), Uppsala University, Sweden, March 1994.

Appointments
• Professor at the Department of Electrical and Computer Engineering, TAMU, 9/1/2006 - present
• Associate Professor/Tenure at Dept. Electrical and Computer Eng. TAMU, 9/1/2001 - 8/30/2006.
• Assistant/Associate Professor, Attila Jozsef University, Hungary, 9/1982 - 3/1997.

Products http://www.ece.tamu.edu/%7Enoise/publist.pdf
> 390 publications; including:
205 peer-reviewed journal papers;
150 conference presentations and book chapters; 66 invited or plenary talks at international conferences;
13 books/proceedings edited; 24 patents and patent disclosures.

Publications most related to the proposed project
Other significant and relevant publications


Synergistic Activities

Editorial Positions at Scientific Journals:
  • Honorary Editor, Fluctuation and Noise Letters (World Scientific), 2009 - present.
  • Sensors/Biosensors Section Editor: the journal Sensors, 2009/6 - present.

Created the following conference series and symposium series:
  • Unsolved Problems of Noise, UPoN.
  • Hot Topics in Physical Informatics (HoTPi)
    http://www.ece.tamu.edu/~noise/HotPI_2013/HoTP_2013.html
  • SPIE “Fluctuations and Noise” (FaN) Symposium.

Important research featured in the media:
  Noise-based logic (originator);
  Fluctuation-enhanced sensing (co-inventor);
  Noise/dissipation-limits of Moore's law (originator);
  Secure communication with Kirchhoff's law and Johnson noise (originator).

Graduate advisor and postdoctoral sponsor:
  4 PhD students and 1 postdoctorate during the last five years.

Collaborators and Co-Editors during the last 4 years:
  S. Bezrukov, NIH
  D. Ferry, Arizona State University
  Z. Gingl, University of Szeged, Hungary
  C.G Granqvist, Uppsala University, Sweden
  S. Khatri, Texas A&M University
  M.D. King, Texas A&M University
  Ch. Kwan, Signal Processing Inc.
  F. Peper, NICT, Japan
  G. Schmera, SPAWAR
P. R. Kumar

a. Professional Preparation
Indian Institute of Technology, Madras  Electrical Engineering (Electronics)  B. Tech., 1973
Washington University, St. Louis  Systems Science and Mathematics  M.S., 1975
Washington University, St. Louis  Systems Science and Mathematics  D.Sc., 1977

b. Appointments
University Distinguished Professor, Texas A&M University, Aug 30, 2014-present.
Professor and Holder of College of Engineering Chair in Computer Engineering, Department of
Electrical and Computer Engineering, Texas A&M University, Aug 16, 2011-present.
Courtesy Joint Appointment, Department of Industrial and Systems Engineering, Texas A&M
University, Jan 9, 2014-present.
Professor Emeritus, Department of Electrical and Computer Engineering, University of Illinois,
Urbana-Champaign, 2011-.
D. J. Gandhi Distinguished Visiting Professor, IIT Bombay, 2013-.
Visiting Professor, Robert Bosch Centre for Cyber-Physical Systems, Indian Institute of Science,
Bengaluru, India, August 2013 -15.
Honorary Professor, IIT Hyderabad, 2010-.
Guest Chair Professor and Leader of the Guest Chair Professor Group on Wireless Communication
and Networking, Tsinghua University, Beijing, China, 2009-2012.
Franklin W. Woeltge Professor, Department of Electrical and Computer Engineering, University of
Illinois, Urbana-Champaign, 2000-2011.
Department of Electrical and Computer Engineering, University of Illinois, Urbana-Champaign,
Department of Mathematics, University of Maryland Baltimore County, Associate Professor, 1982-
84; Assistant Professor 1977-1982.

c.i. Five Publications Related to the Proposed Project

5. Feng Xue and P. R. Kumar, *Scaling Laws for Ad Hoc Wireless Networks: An Information

c.ii. Five Other Significant Publications


d. Synergistic Activities

1. External Review of UC Riverside, Graduate Programs in Computer Science, 2015.
2. Advisory Board of ShanghaiTech University, School of Information Science and Technology, 2014—.
3. Panel Member of External Review Committee of IIT Hyderabad, August 11-12, 2014.
4. Advisory Council of RBCCPS, Indian Institute of Science, Bangalore, March 2014—.
9. Advancement Committee for Department of ECE, Rice University, 2013–.
10. Chair of Exec Cmtee of NSF Science & Tech Center: Center for Science of Information, 2010–.
15. Chair of Steering Committee of ACM MobiHoc, 2010–.
17. Member of the Visiting Committee, Division of Systems Engineering, Boston University, 2009–.
19. External Review Committee of Dept of EECS, University of California, Berkeley, Fall 2009.
20. Member of U.S. Army Research Office Computing and Information Sciences Division Triennial Planning Strategy Wkshp, on Wireless Communications and Networks Program, 2008
22. Scientific Advisory Board of ACCESS Linnaeus Center, KTH, Sweden.
24. External Advisory Board of ESE Department, Washington University in St. Louis, MO, 2005–.
25. Steering Committee of Information Processing in Sensory Networks (IPSN), 2003–.

e. **Total number of graduate students advised:** 33 Ph.D.s, 34 M.S.s.
**Total number of postdoctoral scholars sponsored:** 6.
Dr. Peng Li  
Professor of Electrical and Computer Engineering  
Texas A&M University

A. Professional Preparation

- Xi’an Jiaotong University, Xi’an, China, Information Engineering, B.E., 1994
- Xi’an Jiaotong University, Xi’an, China, Systems Engineering, M.E., 1997
- Carnegie Mellon University, Pittsburgh, PA, Electrical and Computer Engineering, Ph.D., 2003
- Carnegie Mellon University, Pittsburgh, PA, Electrical and Computer Engineering, Postdoctoral Fellow, 2003-2004

B. Appointments

- **Professor**, Department of Electrical and Computer Engineering  
  Texas A&M University, College Station, TX, September 2015 – Present
- **Member**, Graduate Faculty, School of Graduate Studies  
  Texas A&M Health Science Center, College Station, TX, June 2011 – present
- **Member**, Faculty of Neuroscience  
  Texas A&M University, College Station, TX, February 2011 – present
- **Associate Professor**, Department of Electrical and Computer Engineering  
  Texas A&M University, College Station, TX, September 2010 – August 2015
- **Assistant Professor**, Department of Electrical and Computer Engineering  
  Texas A&M University, College Station, TX, August 2004 – August 2010

C. Products

Supervised students and post-docs are delineated with **.

Selected Five Publications Related to This Proposal:

Selected Other Five Significant Publications:


D. Synergetic Activities

(i) **Teaching and Training:** (1) Participated in the College of Engineering E3 Teachers’ Summer Research Program. Hosted two math teachers from minority high schools in Texas. (2) Supervised two female and one African American undergraduate students. (3) Graduated 11 Ph. D. students and 18 M. S. students. Currently supervise 8 Ph. D. students and 8 M.S students.


(iii) **Industrial Engagement:** Consulted for Intel Corporation and two silicon-valley startups.

E. Collaborators and Other Affiliations

(i) **Collaborators and Co-Editors (total: 15):** Chirayu Amin (Intel), Yiran Chen (U. Pittsburgh), Yoonsuck Choe (Texas A&M), Gwan Choi (Texas A&M), G. Peter Fang (Texas Instruments), Zhuo Feng (Michigan Tech.), Garng M. Huang (Texas A&M), Tingwen Huang (Texas A&M, Qatar), Chris Myers (U. Utah), Sani Nassif (Radyalis), Edgar Sanchez-Sinencio (Texas A&M), Vivek Sarin (Texas A&M), Savithri Sundareswaran (Freescale), Bin Wu (Qualcomm), Frank Liu (IBM)

(ii) **Graduate Advisors and Postdoctoral Sponsors (total: 1):** Larry Pileggi (CMU, Ph. D. advisor & Postdoctoral Sponsor)

(iii) **Thesis Advisor and Postgraduate-Scholar Sponsor (total: 30):**

Ph. D. students (11): Wei Dong (Texas Instruments), Zhuo Feng (Michigan Tech.), Yongtae Kim (Intel), Suming Lai (Maxim), Parijat Mukherjee (Intel), Xiaoji Ye (Intel), Tong Xu (Cadence), Leyi Yin (Cirrus Logic), Guo Yu (Oracle), Zhiyu Zeng (Cadence), Yong Zhang (Cadence)

Postdoctoral scholars (1): Boyuan Yan (Cornell Medical College)

M. S. students (18): Hariraran Bhagavatheswaran (Qualcomm), Di Gao (Cadence), Ahmad Bashaireh(Texas A&M), Ruicheng Dai (Nvidia), Akshit Dayal (Texas Instruments), Yu Deng (Zipalog), David Fan (Georgia Tech), Jingzhen Hu (AMD), Srinath Narasimhan (Intel), Botang Shao (Freescale), Amandeep Singh (Cypress Semi), Nityendra Singh (Cadence), Kumaran Thulasiraman (Cisco), Mingchao Wang (Mentor Graphics), Shaoda James Yu (BioTex), Chang Zhao (Synopsys), Parijat Mukherjee (Intel), Xiaoji Ye (Intel)
POSITION
Assistant professor: Department of Electrical & Computer Engineering
Center for Remote Health Technologies and Systems
Center for Translational Environmental Health Research
Texas A&M University, College Station, TX

EDUCATION & DEGREE AWARDED
Postdoc fellow: Microphotonics center, Massachusetts Institute of Technology
PhD: Materials Science and Engineering, Northwestern University

RESEARCH INTERESTS
• Label-free biochemical sensors on-a-chip
• Body wearables and implanted devices
• Sensor networks and internet of things (IOT)
• Mid-Infrared integrated photonics
• Multiscale fabrication technologies
• Nano-biophotonics & metamaterials

AWARDS
• IEEE Nano Conference - Best Paper Finalist Award, 2014
• MIT-SUTD Postdoctoral fellowship, 2013-2015
• User Award talk for Argonne National Laboratory Annual Users Meeting (2008). Invited to speak in the same section as Nobel Prize Lecturer.

SELECTED GRANTED PROPOSALS (Participant/Key personnel/Co-writer/Spokesman)
• “Compact, highly sensitive and selective Mid-Infrared (MIR) chemical sensors,” Department of Energy (DOE)
• “Gradient Films from Shape Memory Nanofoams for Waveguide Coating,” Defense Threat Reduction Agency (DTRA)
• “Low Cost Rapid Algal Bloom Sensing Device,” Masdar Institute of Science and Technology - Masdar Institute (MMIP)

JOURNALS & PROCEEDINGS REVIEWER
• Nanoscale
• Optics Letters
• Journal of Applied Physics
• Advanced Optical Materials
• Optical Materials Express
• Journal of the Optical Society of America B
• journal of Photonics Research
• Optics Express
• IEEE Photonics Technology Letters
• Applied Optics
• Optical Materials
• MRS Meeting proceedings
• Physical Chemistry Chemical Physics
• Infrared Physics & Technology

PROPOSALS & GRANTS REVIEWER
• US Environmental Protection Agency (EPA) - Air & Climate peer review
• Argonne National Laboratory - Center for Nanoscale Materials
• Optical Society of America (OSA) - Professional Development Grants
• International Optical Engineering Society (SPIE) - International Year of Light (IYL2015) grants
LEADERSHIP
• Vice-Chairman of the IEEE Photonics Society-Boston Chapter, 2012-2014
• Technical Planning Committee of IEEE Photonics Society-Boston Chapter, 2011-2015
• Chair of SPIE Leadership Workshop & Awards subcommittee, 2008-2009

PROFESSIONAL SOCIETY MEMBERSHIPS
Materials Research Society (MRS), International Optical Engineering Society (SPIE), Optical Society of America (OSA), Institute of Electrical and Electronics Engineers- Laser & Electro-Optics Society (IEEE-LEOS), American Physical Society (APS), The American Ceramic Society (ACerS)

SELECTED JOURNAL PUBLICATIONS
Journal papers [25 peer reviewed journal papers]
5. P. T. Lin, V. Singh, J. Wang, H. Lin, J. Hu, K. Richardson, J. D. Musgraves, I. Luzinov, J. Hensley, L. C. Kimerling, A. Agarwal, “Si-CMOS Compatible Materials and Devices for Mid-IR Microphotonics,” Opt. Mater. Express 3, 1474 2013. This work was highlighted as a spotlight article by the Optical Society (OSA) journals to show its excellent scientific quality.

Selected conference papers and presentations [>60 international conference presentations]

Selected patents and inventions
Biographical Sketch of Tie Liu

(a) Professional Preparation

Tsinghua University, Beijing, China   Electrical Engineering    B.E. 1998
Tsinghua University, Beijing, China   Electrical Engineering    M.E. 2000
University of Illinois at Urbana-Champaign   Mathematics    M.S. 2004
University of Illinois at Urbana-Champaign   Electrical and Computer Engineering    Ph.D. 2006

(b) Appointments

09/2015 – Present:   Associate Professor, Center for Bioinformatics and Genomic Engineering, Texas A&M University, College Station
09/2012 – Present:   Associate Professor, Department of Electrical and Computer Engineering, Texas A&M University, College Station
08/2006 – 08/2012:   Assistant Professor, Department of Electrical and Computer Engineering, Texas A&M University, College Station
08/2001 – 07/2006:   Research Assistant, Beckman Institute and Coordinated Science Laboratory, University of Illinois at Urbana-Champaign
06/2003 – 08/2003:   Research Intern, Cryptography and Anti-Piracy Group, Microsoft Research Redmond

(c) Publications

Five publications most related to the proposed project:


Five other significant publications:


(d) Synergistic Activities

Associate Editor for Shannon Theory, IEEE Transactions on Information Theory (January 2014 – Present); General Co-Chair, 2011 IEEE North American School of Information Theory; Organized the invited session “Wireless Networks” for the 2010 IEEE Information Theory Workshop in Cairo; Hosted two high-school math teachers in the Summer 2010 TAMU/NSF Enrichment Experiences in Engineering (E3) program; Communication Theory Symposium Co-chair, 2008 IEEE Global Communications Conference

(e) Collaborators & Other Affiliations

Collaborators:

Raymond W. Yeung (CUHK), Chung Chan (CUHK), Jun Chen (McMaster), Chao Tian (UTK), Ashish Khisti (Toronto), Yingbin Liang (Syracuse), Ruoheng Liu (Qualcomm), H. Vincent Poor (Princeton), Shlomo Shamai (Technion-IIT, Israel), Costas Georgiades (TAMU), Scott L. Miller (TAMU), Shuguang Cui (TAMU), Krishna Narayanan (TAMU), Xiaoning Qian (TAMU)

Ph.D. thesis advisors:

Pierre Moulin (UIUC), Pramod Viswanath (UIUC)

Thesis advisor and postgraduate-scholar sponsor:

Easton L. Xu (TAMU), Paul McVey (TAMU), Xiaoping Sui (TAMU), Shuo Shao (TAMU), Shuo Li (TAMU), Amir Salimi (TAMU), Lakshmi Venugopal (TAMU), Mustafa El-Halabi (AUST, Lebanon), Jinjing Jiang (Marvell), Jae Won Yoo (Qualcomm), Hung D. Ly (Qualcomm), Xinyi Cai (Tektronix Communications), Neeharika Marukala (Qualcomm), Richa Dixit (Google)

[Total: 14 collaborators during the last 48 months, 2 Ph.D. thesis advisors, 13 graduate students advised, and 1 postdoctoral scholar sponsored]
MI LU
Dept. of Electrical and Computer Engineering
Texas A&M University
College Station, TX 77843

Education:
Ph.D. in Electrical and Computer Engineering, Rice University, Houston, 1987.
M.S. in Electrical and Computer Engineering, Rice University, Houston, 1984.
B.S. in Electronics, University of Shanghai for Science and Technology, 1981.

Experience:
1998- Professor, Texas A&M University.
1993-98: Associate Professor, Texas A&M University.
1987-93: Assistant Professor, Texas A&M University.

Publication:

Professional Activities:

NSF panel, review panel for the CISE Directorate of the National Science Foundation, 2014.
Associate Editor, Computer Science and Engineering, Scientific and Academic Publishing.
Associate Editor, Journal of Computing and Information.
Conference Chairman, 7th International Conference on Computer Science and Informatics, 2003.
Conference Chairman, 6th International Conference on Computer Science and Informatics, 2002.
Conference Chairman, 5th International Conference on Computer Science and Informatics, 2000.
Stream Chairman, 7th International Conference on Computing and Information, 1995.
Panelist, National Science Foundation, 1993.

Honors:

Faculty Fellow, College of Engineering, TAMU, 2002.
Senior Member, IEEE Computer Society.
Registered Professional Engineer, Texas.

Graduate advisors: B. Sinclair, Rice University
P. Varman, Rice University.

Ph.D. Students advised: (12 in total)
F. N. Sibai, Ph.D., graduated in Aug. 89.
S. Lee, Ph.D., graduated in Dec. 91.
J. S. Chiang, Ph.D., graduated in May 92.
J. Yin, Ph.D., graduated in Dec. 95.
W. Chang, Ph.D., graduated in May 96.
Y. Liao, Ph.D., graduated in Nov. 96.
H. Nagumo, Ph.D., graduated in Nov. 96.
F. Qiu, Ph.D., graduated in May, 2003.
C. He, Ph.D., graduated in Feb. 2007.
L. Zou, Ph.D., graduated in May, 2007.
Krzysztof A. Michalski

Education
PhD, Electrical Engineering, University of Kentucky, Lexington, 1981
MSc, Electrical Engineering, Wrocław Technological University, Poland, 1974

Employment
Associate Professor, Department of Electrical and Computer Engineering, Texas A&M University, 1987–
Assistant Professor, Department of Electrical Engineering, University of Mississippi, 1983–1986
Instructor, Institute of Telecommunications and Acoustics, Wrocław Technological University, 1974–1978

Visiting Appointments
Laboratoire d’Electromagnétisme at d’Acoustique, Ecole Polytechnique Fédérale de Lausanne, Switzerland, Summer 2015
Laboratoire d’Electromagnétisme at d’Acoustique, Ecole Polytechnique Fédérale de Lausanne, Switzerland, Summer 2013
Laboratoire d’Electromagnétisme at d’Acoustique, Ecole Polytechnique Fédérale de Lausanne, Switzerland, Summer 2007
Texas A&M University at Qatar, Doha, Qatar, Fall 2006 – Fall 2008
National Institute of Standards & Technology, Gaithersburg, MD, Spring and Summer 2006
Sandia National Laboratories, Albuquerque, NM, Summer 2004
Laboratoire d’Electronique, Antennes et Télécommunications, Université de Nice–Sophia Antipolis, France, Summer 1997
Departament de Teoria del Senyal i Comunicacions, Universitat Politecnica de Catalunya, Barcelona, Spain, Summer 1995
Laboratoire d’Electromagnétisme at d’Acoustique, Ecole Polytechnique Fédérale de Lausanne, Switzerland, Spring and Summer 1994
Institute für Hochfrequenztechnik, Technische Universität München, Germany, Fall 1993

Honors and Awards
IEEE Fellow, “For the development of numerical solution methods in electromagnetic scattering, antennas, and microwave circuits”, 2000
Research Fellow, Texas Engineering Experiment Station, 1991
The Oliver Lodge Premium, IEE (London), 1986
Best EMP Paper Award, Summa Foundation, 1984
IEEE Antennas and Propagation Society Sergei A. Schelkunoff Transactions Prize Paper Award, 2015

Professional Activities
Editorial Board Member, Microwave and Optical Technology Letters, 1988–
Associate Editor, IEEE Transactions on Antennas and Propagation, 1999–2004
Chair, Technical Program Committee, IEEE APS International Symposium and URSI National Radio Science Meeting, San Antonio, TX, 2002
Associate Editor, Radio Science, 1993–1996
Guest Editor, International Journal of Microwave and Millimeter-Wave Computer-Aided Engineering, April 1994
Reviewer, IEEE and other journals
Reference and Nominator, IEEE Fellows
University Service
Undergraduate Studies Committee, TAMU ECE Dept.

Current Funded Research

Recent Articles


Scott L. Miller

A. Professional Preparation

**Bachelor of Science** in Electrical Engineering, University of California, San Diego, June 1985.

**Master of Science** in Electrical Engineering (Communication Theory and Systems), University of California, San Diego, June 1986.

**Doctor of Philosophy** in Electrical Engineering (Communication Theory and Systems), University of California, San Diego, July 1988.

B. Appointments

Texas A&M University

University of California, San Diego
- Visiting Associate Professor, Dept. of Elec. And Comp. Eng., June – Aug. 1996.

University of Utah

University of Florida

C. Selected Recent Journal Publications


D. Selected Major Service Activities

- Graduate Coordination for Elec. and Comp. Eng. Dept. (TAMU), Sep 2005 - July 2012
- General Chairman for the 1998 and 2001 IEEE Communication Theory Workshop

E. Collaborators and Other Affiliations

Collaborators (last 5 years): A. Balasubramanian, A. K. Farraj, M. Jain, J. Jing, T. Liu, J. McDougall, K. A. Qaraqe, A. Sprintson, N. R. A. Tungala.

Graduate Advisor: L. B. Milstein, Univ. of Calif., San Diego.

Graduate Students Advised (past 5 years):

**MS Students:**
- Manish Jain, 2011
- Ashish Basireddy, 2012
- N. R. Anudeep Tungala, 2015
- Ahmed Redissi, 2015

**PHD Students:**
- Abdallah Farraj, 2012
- Wei-Yu Chen, 2013
- Ahmed Redissi,

Total Number of Graduate Students Advised: MS=19, PHD=14
Professional Preparation

<table>
<thead>
<tr>
<th>Institution</th>
<th>Field of Study</th>
<th>Degree</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coimbatore Institute of Technology</td>
<td>Electronics and Communications Engineering</td>
<td>B.E.</td>
<td>1992</td>
</tr>
<tr>
<td>Iowa State University, Ames</td>
<td>Electrical and Computer Engineering</td>
<td>M.S.</td>
<td>1994</td>
</tr>
<tr>
<td>Georgia Institute of Technology</td>
<td>Electrical and Computer Engineering</td>
<td>Ph.D.</td>
<td>1998</td>
</tr>
</tbody>
</table>

Appointments

- 2008 - present: Professor, Department of Electrical and Computer Engineering, Texas A&M University
- 2012 - 2014: Director of Graduate Studies, Department of Electrical and Computer Engineering, Texas A&M University
- 2004 - 2008: Associate Professor, Department of Electrical and Computer Engineering, Texas A&M University
- 1998 - 2004: Assistant Professor, Department of Electrical and Computer Engineering, Texas A&M University

Products (Publications)


Other Significant Products


Synergistic Activities

- Associate editor, IEEE Transactions on Information Theory, 2015-present
- Area editor, IEEE Transactions on Communications, 2007-2011
- Editor, IEEE Transactions on Communications, 2005-2011
- Editor, IEEE Journal of Selected Areas in Communications, Special issue on Equalization, 2008
- Technical program committee co-chair for the 2010 IEEE International Symposium on Information Theory

Recent Collaborators

- Prof. B. Aazhang, Dept. of Elect. Engineering, Rice University
- Prof. J.J. Boutros, Dept. of Elect. Engineering, Texas A&M University, Qatar
- Prof. J.-F. Chamberland, Dept. of Elect. Engineering, Texas A&M University
- Prof. T. Liu, Dept. of Elect. Engineering, Texas A&M University
- Prof. P.R. Kumar, Dept. of Elect. Engineering, Texas A&M University
- Prof. B. Nazer, Dept. of Elect. Engineering, Boston University
- Prof. H. D. Pfister, Dept. of Elect. Engineering, Duke University
- Prof. K. Ramchandran, Dept. of Elec. Engineering, Univ. of California at Berkeley
- Prof. E. Serpedin, Dept. of Elect. Engineering, Texas A&M University
- Prof. M. Smotherman, Department of Biology, Texas A&M University
- Prof. A.R. Srinivasa, Dept. of Mechanical Engineering, Texas A&M University
- Prof. X. Zhang, San Disk Corp.


Thesis Advisor to: (15) Kapil Bhattad, Qualcomm Inc., Dung Ngoc Doan, Qualcomm Inc., Vivek Gulati, Broadcom Inc., Brett Hern, Chevron Inc., Yu-Chih Huang, National Taipei University, Jing Jiang, Qualcomm Inc., Ching Fu Lan, Current employer unknown, Jing Li, Lehigh University, Nitin Nangare, Marvell Semiconductors, Phong Nguyen, Marvell Semiconductors, Janath Peiris, Broadcom Inc., Hari Sankar, Qualcomm Inc., Nihat Engin Tunali, Xilinx Inc., Makesh Wilson, Qualcomm Inc., Arvind Yedla, Samsung Research
Resume

Name: Robert D. Nevels, Professor, IEEE Life Fellow

Professional Engineer: Texas Registration No. 76695

Degrees:
  Ph.D., EE, University of Mississippi, Oxford, Mississippi, 1979
  M.S., EE, Georgia Institute of Technology, Atlanta, Georgia, 1974
  B.S., EE, University of Kentucky, Lexington, Kentucky, 1969

Academic Experience:
  1993- Professor, Texas A&M University
  1998-05  Associate Head, Electrical Engineering Department, Texas A&M University
  1978-93 Assistant and Associate Professor, Texas A&M University
  1992  Visiting Professor Physics Department, Fudan University, China
  1977-78  Acting Assistant Professor, University of Mississippi
  1974-77  Research Assistant, University of Mississippi
  1972-73  Research Engineer, Georgia Tech Research Institute

Synergistic Activities:
  Designed the first working microwave catheter for ventricular fibrillation ablation
  Solved the Coulomb gauge problem in electromagnetics – a 125 year old problem in EM
  Derived a generalized gauge that encompasses ½ the range of all possible gauges in EM
  A vector diagram for EM fields, potentials, and gauges – current work on this subject
  Designed a successful microwave system for checking quantum algorithms
  Derived the propagator solution for the electromagnetic field – a 50 year old problem in EM
  Developed several numerical methods in EM based on the Path Integral propagator – current work
  A pioneer in nano antennas including a single molecule Rahman scattering detection design.
  First to propose a solid state on chip plasma antenna – current work on this subject

Collaborators & Other Affiliations
  (a) Collaborators and Co-Editors
      Texas A&M:
          ECEN: R.Biard, K. Chang, P. Hemmer, K.A. Michalski, F. Strieter, L. Tsang, M. Dahleh
          Physics: M. Scully, S. Scully, A. Sokolov, G. R. Welch
          Math: G. Chen, S. Fulling
      University of Houston: D.R. Wilton
      University of Mississippi: C.M. Butler, A. Elsherbeni, R. Pogorzelski, L. Tsai
      St. Ambrose University: T. Yang
      University of Dundee, Scotland: P.D. Smith, B.P. Rynne
      University of Arizona: C. Balm, D. Dudley, A.Q. Howard
      Harvard University: R.W.P. King
      Kong-Ju University, Korea: I-P Hong
  (b) Graduate Advisors: Georgia Tech.: C. Ryan, University of Mississippi: C.M. Butler now at Clemson

Book Editorships, Monograph and Book Chapters:

Honors and Awards:
IEEE Antennas & Propagation Society President 2010, President-Elect 2009
Eugene E. Webb ’43 Faculty Fellow
Fellow of The Electromagnetics Academy and IEEE
Eta Kappa Nu (Electrical Engr. Honor Society)
Nine teaching awards

Selected Recent Publications:
Cam Nguyen, Ph.D.

Texas Instruments Endowed Professor
Department of Electrical and Computer Engineering, Texas A&M University, College Station, TX 77843-3128
Tel: (979) 845-7469 Fax: (979) 845-6259 E-mail: cam@ece.tamu.edu

a. Professional Preparation

California State Polytechnic University, Pomona, Electrical Engineering, B.S., 1977-1980
California State University, Northridge, Electrical Engineering, M.S., 1981-1983
University of Central Florida, Orlando, Electrical Engineering, Ph.D., 1987-1990

b. Appointments

1991-Present Texas Instruments Endowed Professor, Professor, Associate Professor, Assistant Professor, Department of Electrical and Computer Engineering, Texas A&M University, College Station, Texas
2003-2004 Program Director, RF and Wireless Technologies Program, NSF, Arlington, VA
1989-1991 Sr. Staff Engineer, TRW Inc., Redondo Beach, California.
1987-1989 Member Professional Staff, Martin Marietta Co., Orlando, Florida.
1983-1986 Member Technical Staff, TRW Inc., Redondo Beach, California.
1982-1983 Member Technical Staff, Hughes Aircraft Co., Torrance, California.

c. Publications

6 books, 3 books (Ed.), 6 book chapters, 282 papers,
179 conference presentations

Five Related Recent Publications


Five Other Recent Publications


d. Synergistic Activities

1. Established and lead a multidisciplinary research program in RF, microwave and millimeter-wave ICs and systems, ultra-wideband (UWB) components, antennas and systems, UWB wireless communications, and sensors. This activity has resulted in many novel RF, microwave and millimeter-wave integrated circuits, transmission lines, and systems – contributing to the advances of RF and microwave engineering. For example, the first millimeter-wave integrated-circuit multifunction sensor for displacement and low-velocity measurement achieving an unprecedented resolution of λ/840.

2. Established various interdisciplinary research activities in sensing between the Departments of Electrical, Petroleum, Agricultural Engineering, Geology & Geophysics, and Texas Transportation Institute of Texas A&M University.

3. Integrated research and education activities, resulting in several textbooks published, and five new undergraduate and graduate electrical engineering courses developed and taught.

4. Provided significant leadership and service to the scientific and engineering community. For example:
   - Member of editorial board and committees, and reviewers for various journals and conferences.

5. IEEE Fellow, Institute of Electrical and Electronics Engineers, for *contributions to microwave integrated circuits and systems*; 3M Faculty Fellow, Texas A&M University, TEES Fellow, Texas A&M University.

e. Collaborators & Other Affiliations

(i) Collaborators

T. Blasingame, M. Everett, T. Scullion, Texas A&M University.

(ii) Graduate Advisor

Professor C. Christodoulou (University of New Mexico)

(iii) Graduate Students Graduated over the Past 5 Years

J. Lee (PhD), Freescale Semiconductor, USA
D. Lee (PhD), RFMD, USA
C. Geha (PhD), USA
S. Lee (PhD), Samsung, S. Korea
Y. Luo (MS), Peregrine Semiconductor, USA
M. Chirala (PhD), Samsung, USA
C. Huynh (PhD), Ho Chi Minh City University of Technology, Vietnam
Samuel Palermo

Email: spalermo@tamu.edu, http://www.ece.tamu.edu/~spalermo/

Professional Degrees
Texas A&M University, College Station, TX Electrical Engineering B.S. 1997
Texas A&M University, College Station, TX Electrical Engineering M.S. 1999
Stanford University, Stanford, CA Electrical Engineering Ph.D. 2007

Appointments
2015 – Present Associate Professor, Texas A&M University, Department of Electrical and Computer Engineering, College Station, TX
2009 – 2015 Assistant Professor, Texas A&M University, Department of Electrical and Computer Engineering, College Station, TX
2006 – 2008 Senior Design Engineer, Intel Corp., Advanced Circuits and Technology Integration Group, Hillsboro, OR
2000 – 2006 Research Assistant, Stanford University, Computer Systems Laboratory, Stanford, CA
Summer 2002 Design Engineer, Texas Instruments, Inc., High-Speed Interfaces Group, Dallas, TX
1999 – 2000 Research Assistant, Texas A&M University, Analog & Mixed-Signal Design Group, College Station, TX
Summer 1997 Design Intern, Motorola, Inc., Microcontroller Design Group, Austin, TX
Spring & Fall 1996 Design & Test Co-op, Texas Instruments, Inc., ASIC Design & Test Groups, Dallas, TX
Summer 1995

Ten Significant Publications


Synergistic Activities
New Course Development: High-Speed Links Circuits and Systems: Taught once a year at the Analog and Mixed-Signal Center (AMSC) at Texas A&M University (slides and other material are available online at http://www.ece.tamu.edu/~spalermo/ecen720.html). This graduate level course focuses on high-speed serial and parallel wireline interfaces (links) circuits and systems issues. Electrical and optical channel properties and modeling, link measurements and communications techniques, and drivers, receivers, equalizers, and synchronization circuits are covered. A comprehensive final design project includes systems analysis with a statistical bit-error-rate simulator and circuit design of key link circuit blocks. State-of-the-art circuit architectures and signal processing techniques that are currently pushing performance envelopes are introduced.

Undergraduate Research Advisor: The PI has previously had two undergraduate students working in his lab that were sponsored under NSF award “CAREER: Process, Voltage, and Temperature (PVT)-Tolerant CMOS Photonic Interconnect Transceiver Architectures” (ECCS-1254830). These include Chia-an Fu, who is a female U.S. citizen, and Zunyan Yang. Advised undergraduate student, Kun Mo Kim, during Summer 2009 in the Undergraduate Summer Research Grants Program and throughout the 2009/10 academic year.

Associate Editor of IEEE Transactions on Circuits and Systems II
Member of IEEE Circuits and Systems Society Board of Governors (2011-2012)

Collaborations from the past 48 Months & Other Affiliations
Tom Baehr-Jones (Coriant), Raymond Beausoleil (HP), Patrick Chang (Or. St. Univ.), Chin-Hui Chen (HP), Kamran Entesari (TAMU), Marco Fiorentino (HP), Sebastian Hoyos (TAMU), Paul Gratz (TAMU), Michael Hochberg (Coriant), James Jaussi (Intel), David Onsongo (IBM), Robert Payne (TI), Zhen Peng (HP), Jose Silva-Martinez (TAMU), Nirmal Warke (TI)

Graduate Advisors: Mark Horowitz (Ph.D.), Jose Pineda de Gyvez (M.S.)

Students Advised (20): Shengchang Cai, Osama El-Hadidy, Shahriar Ferdous (Intel), Vivekananth Gurumoorthy (Vitesse), Hao Huang (Nvidia), Shan Huang (Maxim), Kun Mo Kim (Oracle), Keytaek Lee (Intel), Cheng Li, Yang Liu (Broadcom), Byungho Min, Arun Palaniappan (Broadcom), Ahmed Ragab (Nvidia), Ashkan Roshan Zamir, Ayman Shafik, Younghoon Song (Freescale), William Torke (National Instruments), Noah Yang, Kunzhi Yu, Ehsan Zhian-Tabasy (Altera)
Xiaoning Qian  
Department of Electrical and Computer Engineering  
Texas A&M University  
College Station, TX 77843-3128

Professional Preparation  
Shanghai Jiaotong University, Shanghai, China  
Electronic Engineering B.S.E., 1997  
Shanghai Jiaotong University, Shanghai, China  
Electronic Engineering M.S.E., 1999  
Yale University, New Haven, CT  
Electrical Engineering M.S., M.Ph., 2003  
Yale University, New Haven, CT  
Electrical Engineering Ph.D., 2005  
Yale University, New Haven, CT  
Medical Imaging Postdoc, 2005 – 2007  
Texas A&M University, College Station, TX  
Bioinformatics Postdoc, 2007 – 2009

Appointments  
Assistant Professor, Department of Electrical & Computer Engineering, Texas A&M University, College Station, TX, 2013 – present.  
Assistant Professor, Center for Bioinformatics & Genomic Systems Engineering, Texas A&M University, College Station, TX, 2013 – present.  
Courtesy Assistant Professor, Departments of Computer Science & Engineering and Pediatrics, University of South Florida, Tampa, FL, 2013 – 2015.  
Assistant Professor, Department of Computer Science & Engineering, University of South Florida, Tampa, FL, 2009 – 2013.

Publications  
Publications most closely related to the program:  

Other recent significant publications:  


**Synergistic Activities**

1. **Teaching:**
   Curriculum Development: Created new courses entitled “Computational Molecular Biology,” “Data Mining in Bioinformatics,” “Biological Network Analysis,” “Machine Learning with Networks,” and “At the Interface of Engineering and Life Sciences” that encourage interdisciplinary research.

2. **Development & Distribution of Research Tools:**
   (a) Developed HMMPQ (HMM Pathway Query), for identifying conserved pathways in biological networks using hidden Markov models (freely available at http://www.cse.usf.edu/~xqian/hmmpq/);
   (b) Visited the Lister Hill National Center at the National Library of Medicine (NLM) to install the developed shape-based medical image retrieval package (SBMIR) on the NHANES II database and give training to the staff, 2005.

3. **Service to the Scientific Community:**
   (a) Panel Reviewer: NSF Ad-hoc Reviewer (2011); NSF Review Panelist (2010,2015); Research Grants Council (RGC) of Hong Kong (2009).
   (b) Journal Editorial Board Member: Pattern Recognition Letters; PLoS ONE; Journal of Biological systems; EURASIP Journal on Bioinformatics and Systems Biology; IEEE/ACM Transactions on Computational Biology and Bioinformatics (Special Issue Guest Editor); BMC Genomics (Special Issue Guest Editor).
   (c) Conference Organizing Services: Local Arrangement Co-Chair for the ACM International Conference on Bioinformatics, Computational Biology, and Biomedicine (2012); Student Award Co-Chair for the IEEE International Workshop on Genomic Signal Processing and Statistics (2012); Publication Co-Chair for the IEEE International Workshop on Genomic Signal Processing and Statistics (2013); Program Co-Chair for the International Workshop on Computational Network Biology: Modeling, Analysis, and Control (2014-2015).

**Collaborators & Other Affiliations**

**Ph.D. Thesis Advisor:** Hemant Tagare (Yale).

**Collaborators (28):** Turab Lookman (LANL); Eric B. Haura (Moffitt Cancer Center); Ulisses Braga-Neto, Robert S. Chapkin, Timothy Devarenne, Edward R. Dougherty, Jianhua Z. Huang, Ivan Ivanov, Hisashi Koïwa, Michael V. Kolomiets, Tie Liu, Byung-Jun Yoon (Texas A&M); Michael Bittner (TGEN); Jill Norris (UC Denver); Tamer Kahveci (UFl); Ji Liu (UR); Jeffrey Krischer, Hye-Seung Lee, Jaime Sanchez, Yu Sun, Rebecca Sutphen, Vladimir N. Uversky, Kendra Vehik, Bo Zeng (USF); Mingyuan Zhou (UT Austin); Stephen Rich (UV); William Hagopian, Shuai Huang (UW).

**Postdoctoral Sponsors (4):** Hemant Tagare, Xenophon Papademetris, Albert J. Sinusas (Yale); Edward R. Dougherty (Texas A&M).

**Total Graduate Students Advised (10):** Meltem Apaydin, Siamak Zamani Dadaneh, Kai He, Meng Lu, Shaogang Ren, Chun-Chi Tsai; Yijie Wang, Hyun-Myung Woo (TAMU); Amin Ahmadi Adl, Seyed Javad Sajjadi (USF).

**Total Postdoctoral Scholars Sponsored:** 0.
A. L. Narasimha Reddy

Dept. of Electrical and Computer Engineering  Phone: (979) 845-7598
3259 TAMU, Texas A&M University  reddy@ece.tamu.edu
College Station, TX 77843-3259  http://cesg.tamu.edu/faculty/narasimha-reddy/

Professional Preparation
Indian Institute of Technology, Kharagpur, ECE, B.Tech(Hons). 1985
University of Illinois at Urbana-Champaign, ECE, M.S. 1987
University of Illinois at Urbana-Champaign, ECE, Ph.D. 1990

Appointments
Texas A&M University, J.W.Runyon Professr of ECE, 9/08-Present
University of Carlos III, Madrid, Spain, Catedra de Excelencia, 8/09 -2/10.
Texas A&M University, Professor, 9/04-9/08.
Texas A&M University, Associate Professor, 8/95-8/04.
IBM Almaden Research Center, Research Staff Member, 8/90-8/95.

Publications
- Seungwon Shin, Guofei Gu, A. L. Narasimha Reddy and Christopher Lee,

Synergistic Activities

- Society Memberships: Fellow of the IEEE Computer Society, Member of ACM SIGARCH, SIGCOMM.
- Recognition: Cited for ”One of the most influential papers at 1st ACM Conf. on Multimedia” for work on disk QOS scheduling; Distinguished Achievement Award for teaching (College Level), Texas A& M University, 2005; Outstanding Professor Awards, Dept. of ECE, TAMU, 2003-04, 1997-98; Ford Faculty Fellow, 2003, TEES Faculty Fellow, 2001, Neely Faculty Fellow, 1999, College of Engg., TAMU; Invention Achievement Plateau Award, IBM, 1995; Awarded 5 patents, IBM, 1990-1995
- Outreach: Participated in several outreach activities with freshman engineering students, high school students and undergraduate research students
PETER M. RENTZEPIS
Ph.D. University of Cambridge (UK)

Present Position:
Professor Electrical and Computer Engineering
Distinguished Professor TEES
Texas A&M University
College Station, Texas 77843

Awards - Over twenty five major awards and prizes
Honorary D. Sc. - four
Name Lectureships - over 35
Professorships - 10
Publications over 480
Patents - 89
Books - 5

Employment
Member of Technical Staff, Research Laboratories, General Electric Co., Schenectady, NY.
Member of Technical Staff, AT&T Bell Laboratories, Murray Hill, NJ 07974
Head, Physical and Inorganic Chemistry Research Department, AT&T Bell Laboratories, Murray Hill, NJ 07974 1964-1984
Presidential Chair and Professor Chemistry, Electrical Engineering and Material Sciences and Engineering University of California, Irvine, CA 92717 1974-2014
Professor, Electrical and Computer Engineering and Distinguished Professor TEES. Texas A&M University, College Station TX, 77843 2014-

Professorships (partial list)
Visiting Professor, Rockefeller University, N.Y.
Visiting Professor of Chemistry, Massachusetts Institute of Technology, Cambridge, MA
Visiting Professor of Chemistry, University of Tel-Aviv, Tel-Aviv, Israel
Adjunct Professor of Chemistry, University of Pennsylvania, Philadelphia, PA
Center for Biological Studies, State University of New York, Albany, New York
Adjunct Professor of Chemistry and Biophysics, Yale University, New Haven, CT.
Honorary Professor National Technical University of Greece.

Awards (Partial list)
The Irving Langmuir Award in Chemical Physics, Awarded by The American Physical Society
Scientist of the Year Award. Research and Development
Member of National Academy of Sciences,
The A. Cressy Morrison Award in Natural Sciences-awarded by the N.Y Academy of Sciences
ISCO Award, for Biological Sciences Research
Scientist of the year,1974
AHEPA Award-for Leadership in Science and Education
Honorary Doctor of Philosophy, Syracuse University
Honorary Doctor of Science, Denison University
The Peter Debye Award in Physical Chemistry-Awarded by The American Chemical Society.
Fellow-New York Academy of Sciences
Fellow-American Physical Society
Regent's Professor, University of California, at Los Angeles
Camille and Henry Dreyfus-Distinguished Scholar
Distinguished Alumni, SUNY
US Honorary Research Society, Sigma Xi
Honorary Doctor of Science, Carnegie-Mellon University
The H.S. Ganning Award, University of Alberta, Canada
Regent's Lecturer, University of California at Irvine
AAAS Fellow
Member, Athenian Academy, (National Academy of Greece)
Int. Quantum and Laser Society Award
Honorary Doctor of Science, National Technical University of Greece
Distinguished Faculty Research Award, University of California, Irvine
Honorary Professor, Academy of Sciences of The Peoples Republic of China
The American Chemical Society Tolman Medal

Name Lectureships (Partial list)
Robert A. Welch Foundation-Lecturer
Faculty Lecturer-Rensselaer Polytechnic Institute, Troy, New York
Alumni Scholar, Denison University
IBM Lecturer-Williams College
Distinguished Lecture Series-University of Utah
Regents Lecturer, University of California, Los Angeles
Xerox Lecturer-North Carolina State University
Frank C. Whitmore Lectures in Chemistry-Pennsylvania State University
Dreyfus Distinguished Scholar Lectures
Regent's lecturer, University of California, Irvine
The Harry S. Gannig Distinguished Lectures, University of Alberta, Canada
University of Crete, Greece, Distinguished Lecturer
York University, Canada, Distinguished Lecturer
Yale University, New Haven, CT., Distinguished Lecturer
University of Leuven, Belgium, Distinguished Lecturer

Advisory Boards,External (Partial list)
State University of New York, at Buffalo, Evaluation Panel, Physical Chemistry Division,
National Institute of Science and Technology, Bureau of Standards, Washington DC.
Evaluation Board for Center for Thermodynamics and Molecular Science
U.S.A., Foreign Applied Science Assessment, US. AmCCOM Advisory Committee
US. Army ARRACOM Executive Science Advisory Committee
Board of Army Science and Technology, International Science foundation
Raffaella Righetti  
Department of Electrical & Computer Engineering, Texas A&M University  
righetti@ece.tamu.edu

Professional Preparation.
University of Florence  Electrical Engineering  Dr. Eng. 1999
University of Houston  Electrical Engineering  M.A.Sc. 2001
University of Houston  Electrical Engineering  Ph.D., 2005

Appointments.
2014-present  Associate Professor, Texas A&M University, Electrical & Computer Engineering
2007-2014  Assistant Professor, Texas A&M University, Electrical & Computer Engineering
2005-2007  Post-Doctoral Fellow, The University of Texas Health Science Center, Dept. of Diagnostics and Interventional Imaging

Publications. (*identifies co-authors who are graduate students of the PI)
(i) Closely Related to Proposal.

(ii) Other.

Synergistic Activities.

*Editorial services:* Biomedical Microdevices, Assistant Editor (since 2010)
Journal of Medical Engineering, Editorial Board member (since 2012)
TheScientificWorldJOURNAL, Radiology, Editorial Board member (since 2011)
Ultrasonic Imaging, Editorial Board member (since 2013)
Journal of Advanced Bone Research, Editorial Board member (since 2015).

*Other:* National Institute of Health, National Science Foundation, Italian Ministry of Health, Department of Public Health and Innovation, Department of Defense, National Space Biomedical Research Institute.

- **Chair & Co-Chair.**

- **Patent** in elastography for the estimation and imaging of displacements, strains and strain ratios *in vivo* (2009)
- **Awards & Honors.** Outstanding Professor Award, Department of Electrical and Computer Engineering, Texas A&M University, received December 2011
  Featured in the British magazine “The Economist” (The Economist, Dec. 29, 2010)
- **Course and Academic Material Development.** Development of ECE TAMU Course on Ultrasound Imaging (2008-present), which averages more than 40 undergraduate students. Development of Matlab-based modules (through Mathworks support).
- **Outreach Activities.** Volunteer for a number of activities involving high school students (ECE Discovery at TAMU) and the Society of Women Engineer. Volunteer for Women in Engineering (WE) IDEAS summer camp, a 6-day residential summer camp program designed for female high school students and ENGAGE (Engineering Aggies Gaining Experience) Summer Camp, a six-day residential summer camp program designed for underrepresented students.

**Collaborators and Other Affiliations.**

(i) **Collaborators within the past 5 years:** Houston Methodist Hospital, Houston Methodist Research Institute, The University of Texas Health Science Center, RICE University, Northwestern University, Texas Medical Center. Internal collaborations with other TAMU faculty members of: Department of Electrical and Computer Engineering, Department of Biomedical Engineering, Department of Mechanical Engineering, Department of Kinesiology, College of Veterinary, TIPS.

(ii) **Graduate Advisor:**
Ph. D. students advised: Xu Yang (active), Sanjay Nair (active), Anuj Chaudhry (active), Shafeeq Shajudeen (active), Songyuon Tang (active). Biren Parmar (now at QT Ultrasound, LLC).
Ph.D. students co-advised: Chiwan Koo (ECE, TAMU), Ching-Hua Chang (ECE, TAMU), Scott Mattison (BIOMED, TAMU), Fatma Yilmaz (MATH, TAMU), Silvia Ferrati (Graduate School of Biomedical Sciences, The University of Texas), Jonathan Martinez (Graduate School of Biomedical Sciences, The University of Texas).

(iii) **Thesis Advising:**
M.S. students advised: 7 graduated, 1 active.
M.S. students co-advised: 5 graduated; 4 active.
B. Don Russell, Ph.D., P.E.
Director, Power System Automation Laboratory
Distinguished Professor, Department of Electrical and Computer Engineering

Professional Preparation
Texas A&M University Electrical Engineering B.S., 1970
Texas A&M University Electrical Engineering M.E., 1971
University of Oklahoma Electrical Engineering Ph.D., 1975

Professional Research Emphasis
The Power System Automation laboratory directed by Dr. Russell investigates and develops innovative concepts for the automation, control, and protection of electric power systems. Recent work has centered on intelligent systems for improving the reliability and control of distribution systems supporting the introduction of renewable energy sources. Work has included the development of high fidelity real-time monitoring systems for asset management, condition-based-maintenance, incipient failure detection, and real-time situational awareness for operator control to improve the quality and reliability of electric distribution service.

Appointments
2009-present: Distinguished Professor, Electrical Engineering, Texas A&M University
2008-present: Harry E. Bovay, Jr. Endowed Chair
2000-present: Regents Professor, Texas A&M University System
1988-present: Professor, Electrical Engineering, Texas A&M University
1981-present: Director, Power System Automation Laboratory
2002-2008: J. W. Runyon, Jr. Professorship I in Engineering
1996-2002: Associate Vice Chancellor for Engineering Research, Texas A&M University System
1996-2002: Deputy Director, Texas Engineering Experiment Station, Texas A&M University System
1996-2002: Associate Dean for Research, College of Engineering, Texas A&M University
1994-1996: Associate Vice Chancellor for Academic Programs, Texas A&M University System
1994-1996: Executive Associate Dean, College of Engineering
1994-1996: Assistant Agency Director, Texas Engineering Experiment Station
1986-1992: Assistant Department Head, Electrical Engineering
1979-1988: Associate Professor, Electrical Engineering, Texas A&M University
1982-1985: Associate Director, Institute for Ventures in New Technology (INVENT)
1980-1981: Director, Electric Power Institute
1976-1979: Assistant Professor, Electrical Engineering, Texas A&M University

Publications
(a) Five most related


(b) Patents

Synergistic Activities
Past Chair Section 6, Electric Power and Energy Engineering, National Academy of Engineering
Vice President USNC International Council on Large Electric Systems
Editor-in-chief emeritus, Electric Power Systems Research, a journal designed to bring the latest in power systems research to engineering researchers.
Chair, Conference for Protective Relay Engineers (annual). Provides annual venue for 275 power systems engineers to exchange knowledge and share research as well as operational experiences.
Former President, IEEE Power and Energy Society

Collaborations:
Carl Benner, P.E.; Research Associate Professor
Karthick Muthu-Manivannan; TEES Engineering Research Associate
Jeffrey Wischkaemper; TEES Engineering Research Associate II
Edgar Sánchez-Sinencio
Distinguished Professor and TI J. Kilby Chair Professor
Department of Electrical and Computer Engineering, Texas A&M University
Phone: 979-845-7498 Email: s-sanchez@tamu.edu
http: www.ece.tamu.edu/~sanchez/

a) PROFESSIONAL PREPARATION
MSEE, Stanford University, Stanford, California, USA, January 1970.
Communications and Electronics Engineer. (Professional Degree) National Polytechnic Institute of Mexico, Mexico City. October 1966

b) APPOINTMENTS
T.I./Jack Kilby Chair Professor Holder, Texas A&M University, February 2002 – present.
Chief Technical Officer and Founder, Vidatronic Inc., College Station, Oct. 2010- present.
Director of the Analog and Mixed-Signal Center, Texas A&M University, March 1999 - present.
Professor, Department of Electrical and Computer Engineering, Texas A&M University (TAMU), College Station, Texas, USA. September 1984 - present.

c) PRODUCTS
Publications related to the proposed project:

5. X. Liu and E. Sánchez-Sinencio, “A Highly Efficient Ultralow Photovoltaic Power Harvesting System with MPPT for Internet of Things Smart Nodes”, IEEE Trans. on VLSI, accepted to be published

Other publications:


d) SYNERGISTIC ACTIVITIES

**Instructors of undergraduate courses**: Op Amp Theory and Applications, Analog Active Filters; **graduate courses**: Advanced Analog Circuits, RF Circuits and Systems; Modern Active Filters


**Co-organizer of symposia**: IEEE Midwest Symposium on Circuits and Systems 2014

**Member of IEEE Technical Committees**: IEEE ISSCC Analog sub-committee member 2013-present

**Honors and Awards**

1992 IEEE Fellow Member. For contributions to Monolithic Analog Filter Design.
1993 Halliburton Professorship, College of Engineering, Texas A&M University.

November 1995. **Honoris Causa Doctorate** awarded by the National Institute for Astrophysics, Optics, and Electronics (INAOE), Mexico. The first honorary degree in Microelectronics given in Mexico.

March 25, 1996. **Texas Senate Proclamation #373** for Outstanding Accomplishments. Senator Jim Turner


May 2008 **IEEE Circuits and System Society, 2008 Technical Achievement Award.**

January 2010 **IEEE Life Fellow**

e) COLLABORATORS & OTHER AFFILIATIONS.

a. Editors and Collaborators; Michel Flynn, EIC of JSSCC
b. Graduate Advisor: Dr. Timothy N. Trick, Professor Emeritus U. Of Illinois
c. I have currently 19 Ph. D. students and 5 MSc students. I have graduated 45 Ph. D. students and 57 MSc students. The list is too long to include in this space.
Biographical Sketch of Serap A. Savari

Professional Preparation:
Massachusetts Institute of Technology, Electrical Engineering, S.B. June, 1990
Massachusetts Institute of Technology, Operations Research, S.M., September, 1991
Massachusetts Institute of Technology, Elect. Eng. and Computer Science, Ph.D., Feb., 1996

Appointments:
2008-present: Associate Professor of Electrical and Computer Engineering, Texas A&M University.
2004-2007: Associate Professor, EECS Dept., University of Michigan, Ann Arbor.
Fall 2003: Adjunct Professor, EECS Dept., University of Michigan, Ann Arbor.
1996 - 2003: Member of Technical Staff, Computing Sciences Research Center, Bell Laboratories, Lucent Technologies.

Products:

Five Other Significant Products:


3. Bell Labs representative to the DIMACS Council from 2001-2003. DIMACS is a national research center with the mission of developing and disseminating the interrelated fields of discrete mathematics and theoretical computer science.

4. Increasing the Participation of Women in Graduate School Programs and Improving the Environment for Women Students: In Summer 2011 TAMU sophomore Xiaohui Li worked together with J. Yang to begin work on an FPGA implementation of one of our layout image compression algorithms. Faculty advisor for GEECS (Girls in EECS at the University of Michigan) 2005-2007. Member of the Bell Labs Graduate Research Program for Women (GRPW) fellowship committee from 1998-2003. This objective of this program is to increase the representation of women in science and engineering. Served as the GRPW mentor for Rebecca Schuller (Alphatech) and Wei Wang (University of California, Berkeley) throughout their graduate studies. Supervised Wei Wang in a summer internship in 2000. Bell Labs coordinator in 2001 for the CRA-W/Lucent graduate student recruitment workshops designed to encourage undergraduate women to consider graduate school in computer science and engineering. Participated in three panels from 2000-2001.

5. Bringing the World of Science to High School Students: Helped determine and participated in the technical program for the 2001 Lucent Technologies Global Science Scholars summit. The program is designed to support outstanding high school and first-and second-year university students who are pursuing careers in information and communications technologies. Participated in the 2001 Bell Labs World of Science seminar series, an educational series that was designed to give high school students, their teachers, and the general public an idea of what scientists do and how research can be fun. Interviewed about the scientific and engineering impact of Claude E. Shannon for the Minnesota Public Radio station program Future Tense in March 2001.

Collaborators in the last 48 months: Narendra Chaudhary (Texas A&M Univ.), Yao Luo (Texas A&M Univ.), Roger McCay (GenISys), S. M. Hossein Tabatabaei Yazdi (UIUC) Graduate advisor: Robert G. Gallager (Massachusetts Institute of Technology) Graduate Students in Last Five Years: N. Chaudhary, Y. Luo, U. Banerjee, A. Bahadorinejad, J. Yang, S.M.S. Tabatabaei Yazdi, S.M.H. Tabatabaei Yazdi. Total Number of Graduate Students Advised=10.
Biographical Sketch:
Dr. ERCHIN SERPEDIN

Professional Preparation:
M.S. in Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA, 1992.
Ph.D. in Electrical and Computer Engineering, University of Virginia, Charlottesville, VA, 1999.

Appointments:
Professor, ECEN Dept., Texas A & M University, College Station, Sept. 2010- Present.
Associate Professor, ECEN Dept., Texas A & M University, College Station, Sept. 2005- Aug. 2010.
Assistant Professor, ECEN Dept., Texas A & M University, College Station, July 1999- Aug. 2005.
Lecturer, ECEN Dept., University of Virginia, Charlottesville, Jan. 1999-June 1999.

Publications:
Five Publications Most Closely Related to the Proposed Project:


Five Other Significant Publications:

Synergistic Activities:

- Editor-in-Chief for EURASIP Journal on Bioinformatics and Systems Biology, an online journal edited by Springer, for the interval Mar. 2014-Present, and Associate Editor for IEEE Signal Processing Magazine since June 2014 till present.


- Technical Chair for 5 major workshops/symposia (Globecom 2006, SPAWC 2012, VTC 2005, ICT 2010, Asilomar 2012) and TCP member for more than 60 conferences (Globecom, ICC, ICASSP, VTC, SPAWC, ...)


Collaborators & Other Affiliations

Collaborators and Co-Editors: Slim Alouini (KAUST), Ulisses Braga-Neto (Texas A&M University (TAMU)), Xioning Qian (TAMU), Lotfi Couchane (Cornell Medical School), Edward Dougherty (TAMU), Richard Gitlin (Univ. of South Florida), Zulfi Haneef (Baylor College of Medicine), Khalid Qaraqe (TAMU), Jan Suchodolski (TAMU), Byung-Jun Yoon (TAMU).

Graduate Advisors and Postdoctoral Sponsors: Georgios Giannakis (University of Minnesota), Petre Stoica (Uppsala University, Sweden), Edward Dougherty (Texas A&M University)

Thesis Advisor and Postgraduate-Scholar Sponsor:


Honors Student Graduation Thesis Supervision: Timothy P. Dureya


Yang Shen, Ph.D

Department of Electrical and Computer Engineering, Texas A&M University, 3128 TAMU College Station, TX 77843-3128; Tel: 979-862-1694, URL: http://ece.tamu.edu/~yshen, E-mail: yshen@tamu.edu

a. Professional Preparation:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Degree</th>
<th>Year</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Univ. of Sci. and Tech. of China, Hefei, China</td>
<td>B.E.</td>
<td>2002</td>
<td>Automatic Control</td>
</tr>
<tr>
<td>Boston University, Boston, MA</td>
<td>Ph.D.</td>
<td>2008</td>
<td>Systems Engineering</td>
</tr>
<tr>
<td>Boston University, Boston, MA</td>
<td>Postdoc</td>
<td>2007-08</td>
<td>Biomedical Engineering</td>
</tr>
<tr>
<td>Mass. Inst. of Tech., Cambridge, MA</td>
<td>Postdoc</td>
<td>2008-11</td>
<td>Biological Engineering and Computer Science</td>
</tr>
</tbody>
</table>

b. Appointments:

2015- Assistant Professor, Department of Electrical and Computer Engineering, TEES-AgriLife Center for Bioinformatics and Genomic Systems Engineering, Texas A&M University

2012-2014 Research Assistant Professor, Toyota Technological Institute at Chicago

2012- Research Affiliate, Departments of Biological Engineering and Electrical Engineering & Computer Science, Massachusetts Institute of Technology

June-July 2012 Visiting Assistant Professor, Computer Science and Artificial Intelligence Laboratory (CSAIL), Massachusetts Institute of Technology

c. Publications:

List of 5 peer reviewed publications (Out of 21 journal articles, citation > 600)


List of other significant peer reviewed publications (last 5 years):


d. Synergistic Professional Activities (last 5 years):

**Development**: Optimization, dimensionality reduction, and machine learning algorithms for protein docking, drug design, and health informatics.


**Grant Reviewer**: National Science Foundation (NSF)

**Editorial Board**: Associate Editor, EURASIP Journal on Bioinformatics and Systems Biology (2015- )

**Conference Services**: Proceedings Co-Chair, ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (2015); Proceedings Committee (PC) Member, International Conference on Intelligent Systems in Molecular Biology (ISMB) (2014–16); Co-Organizer, International Workshop on Biomedical Informatics with Optimization and Machine Learning (BOOM 2016)

**Others**: Fourth place among 29 groups for performances predicting 25 oligomeric protein structures in the 30th round of CAPRI (Critical Assessment of PRedicted Interactions) — the first joint CASP (Critical Assessment of Structure Prediction)-CAPRI experiment (2014); Fifth place among 63 teams from over 10 countries in the 5th CAPRI Evaluation (2010–12).

e. Collaborators & Other Affiliations

**Collaborators** (past 5 years)
Sarat Chandarlapaty (Memorial Sloan-Kettering Cancer Center); Chris Drake (University of California, San Francisco); Michael Evans (University of California, San Francisco); Michael Gilson (University of California, San Diego); Geoffrey Greene (University of Chicago); Tariq Rana (Sanford Burnham Medical Research Institute); Charles Sawyers (Memorial Sloan-Kettering Cancer Center); Celia Schiffer (University of Massachusetts Medical School).

**Graduate Advisors**
Dr. Ioannis Paschalidis, Dr. Sandor Vajda, and Dr. Pirooz Vakili (Boston University)

**Postdoctoral Advisor**
Dr. Bruce Tidor (Massachusetts Institute of Technology)

**Thesis Advisor and Postgraduate-Scholar Sponsor**
Graduate researchers (2 students): Mostafa Karimi (TAMU, 2015– ), Haoran Chen (TAMU, 2016– )
Postdoctoral scholar (1 scholar): Tomasz Oliwa (Toyota Technological Institute, 2013–2014)
Weiping Shi

PROFESSIONAL PREPARATION
Xi’an Jiaotong University, Xi’an, Shaanxi, China, Computer Science, B.E., 1982
Xi’an Jiaotong University, Xi’an, Shaanxi, China, Computer Science, M.E., 1984
University of Illinois at Urbana-Champaign, Urbana, IL, Computer Science, Ph.D. 1992.

APPOINTMENTS
Department of Electrical & Computer Engineering
Texas A&M University, College Station, TX, August 2000 to present
Associate Professor (2000-2005), Professor (2005-present),

Department of Computer Science
University of North Texas, Denton, TX, August 1992 to August 2000
Assistant Professor (1992-1998), Associate Professor (1998-2000)

PUBLICATIONS

Five Related Publications


Five Significant Publications


COLLABORATORS AND OTHER AFFILIATIONS

Collaborators & Other Affiliations

Chuck Alpert (Cadence), Xin Cheng (Texas A&M), Jiang Hu (Texas A&M), W. Qiu (Google), Z. Li (Cadence), V. Sarin (Texas A&M), and X. Zeng (Fudan University)

Graduate Advisors

W. Kent Fuchs (University of Illinois at Urbana-Champaign, Ph. D. advisor)

Ph.D. Thesis Advisor (total: 6)

Chi-Hui Chang (Texas Instruments), Z. Li (Cadence), Xiang Lu (Apple), Shu Yan (Motorola), Yang Yi (University of Kansas), Ying Zhou (IBM).
Alex Sprintson  
Associate Professor  
Department of Electrical and Computer Engineering  
Texas A&M University  
3128 TAMU  
College Station, TX 77843-3128  
spalex@tamu.edu  
979-858-0092 (Office)

Professional Preparation

1995  B.S.  Computer Engineering, Technion – Israel Institute of Technology, Haifa, Israel  
2000  M.S.  Electrical Engineering, Technion – Israel Institute of Technology, Haifa, Israel  
2003  Ph.D.  Electrical Engineering, Technion – Israel Institute of Technology, Haifa, Israel  
Dissertation “Scalable Methods for Provisioning and Restoration of QoS Paths and Trees” Advisor: Prof. Ariel Orda

Appointments

2011- present  Associate Professor, Dept. of ECE, Texas A&M University, College Station, TX  
2005 - 2011  Assistant Professor, Dept. of ECE, Texas A&M University, College Station, TX  
2003 - 2005  Postdoctoral research fellow, California Institute of Technology, Pasadena, CA  

Products

Five Representative Publications/Products


**Five Other Publications**


**Synergistic Activities**

*Member of the Technical Program Committee, IEEE INFOCOM 2006-2016*

*Associate Editor, IEEE Transactions on Wireless Communications, 2013 - present*

*Technical Program Committee co-Chair, International Symposium on Network Coding, 2013*

*Director, Flowgrammable, a coalition of researchers and industry engineers dedicated to improving adoption of software-defined networks and networking*

*Founding Co-director, TAMU Math Circle, Outreach activity for middle and high school students.*

*Accreditation Coordinator, Department of ECE, Texas A&M University*

**Awards**

ICNP CoolSDN workshop Best paper Award (2014), Open Networking Foundation (ONF) driver competition, runner-up (2014), NSF CAREER Award (2010)

**Collaborators:** Salim El Rouayheb (Illinois Institute of Technology), Andrew Sutton (University of Akron), Paul Gratz, Nataragan Guatam, Chanan Singh (Texas A&M University), Sid Jaggi, Mayank Bakshi (Chinese University of Hong Kong), Emina Soljanin (Bell Labs)

**Current Ph.D. students:** Jasson Casey, Muxi Yan, Swanand Kadhe
Biographical Sketch – Srinivas Shakkottai

(a) Professional preparation

Undergraduate: Bangalore University, Bangalore, India, BE in Electronics and Communication Engineering, 2001
Graduate: University of Illinois, Urbana-Champaign, IL, MS in Electrical Engineering, 2003
Graduate: University of Illinois, Urbana-Champaign, IL, PhD in Electrical Engineering, 2007
Postdoctoral: Stanford University, Stanford, CA, Management Science & Eng., 2007-2008

(b) Appointments

2014-Present: Associate Professor, Dept. of ECE, Texas A&M University, College Station, TX
2008-2014: Assistant Professor, Dept. of ECE, Texas A&M University, College Station, TX
2007-2008: Postdoctoral Scholar, Dept. of Management Science and Engineering, Stanford University, Stanford, CA.

(c) Products

(i) Products most closely related to the proposed project


(ii) Other significant products

(d) Synergistic activities

Course Development:

Instruction in Smart-phone lab:
Approx 30 students (grad/UG) including many female, Hispanic and African American, have participated in “education-through-research” at the lab co-directed by the PI.

Editorships and Journal Reviewer:
Associate Editor for IEEE Transactions on Wireless Communications 2010-2013

Technical Program Committees:

Outreach:
Instructor at “ECE Unplugged” 2009-2014, a summer camp aimed at attracting high school students to the ECE program. Included many female and minority students.

(e) Collaborators & other affiliations

Collaborators (16)
Anjan Bose, Washington State University, Pullman, WA; Kimberly Claffy, CAIDA, San Diego, CA; Amogh Dhamdhere, CAIDA, San Diego, CA; Michael Freedman, Princeton University, Princeton, NJ; Natarajan Gautam, TAMU, College Station, TX; Ramesh Johari, Stanford University, Stanford, CA; Tom Hou, Virginia Tech, Blacksburg, VA; Muriel Medard, MIT, Cambridge, MA; Asuman Ozdaglar, MIT, Cambridge, MA; Chunming Qiao, University of Buffalo, Buffalo, NY; Arun Sen, Arizona State University, Phoenix, AZ; R. Srikant, UIUC, Urbana-Champaign, IL; Alex Sprintson, TAMU, College Station, TX; Vijay Subramanian, University of Michigan, Ann-Arbor, MI; Adam Wierman, Caltech, Pasadena, CA; Lei Ying, Arizona State University, Phoenix, AZ.

Graduate Advisor and Postdoctoral Sponsor (2)
Ramesh Johari, Stanford University, Stanford, CA (postdoctoral)
R. Srikant, University of Illinois at Urbana-Champaign, Urbana-Champaign, IL (graduate)

Thesis Advisor and Postgraduate-Scholar Sponsor (8)
PostDoc (0)
PhD (3): Parimal Parag, Assistant Professor at the Indian Institute of Science, Bangalore, India; Navid Abedini, Qualcomm Corporate R&D, NJ, Vinod Ramaswamy, Postdoc at U Colorado at Boulder, Boulder, CO.
MS (5): Suman Paul, Cisco Systems, Santa Clara, CA; Dibakar Das, PhD student at Rensselaer Polytechnic Institute, Troy, NY; Meghana Amble, Cisco Systems, Santa Clara, CA; Sankaip Sah, Ericsson, Santa Clara, CA; Vinith Reddy, Microsoft, Redmond, WA.
Jose Silva-Martinez

Email: jsilva@ece.tamu.edu

Professional Preparation:
Bachelor in Electrical Engineering; Universidad Autónoma de Puebla, México, BS, 1979.
Master of Science in EE: National Institute for Astrophysics, Optics and Electronics, Mexico, MSc, 1981.
Philosophy Doctor: Katholieke Universiteit Leuven, Belgium, 1992 (Greatest distinction).

Appointments:
Texas Instruments Professor in Analog Engineering, Texas A&M University, since 2010.
Associate Department Head for Graduate Student Affairs, Department of Electrical and Computer Engineering, Texas A&M University, since January 2015.
Associate Professor, Texas A&M University, 2000-2010.
Head of the Electronics Department, National Institute for Astrophysics, Optics and Electronics (INAOE) Mexico, May 1995-December 1998.
Professor, National Institute for Astrophysics, Optics and Electronics, Mexico, January 1993- Aug 1999.

Products: 5 Related Publications (Citations according to the ISI Web of Knowledge, Thomson Reuters)


Products: Significant products: total of 110 peer review journals, 165 peer review conferences, 3 books, 12 book chapters, 1 USA patent and 4 more pending.


Recent Synergistic Activities:

Member of the committee for the selection of the 2010 IEEE Fellows, Circuits and Systems Society.

Collaborations & Other Affiliations

Josep Altet (UP Catalunya, Spain), Todd Brooks (Broadcom Corporation), James Chang (Broadcom Corporation), Michael Elsbury (Sandia National Laboratories), Randall Geiger (Iowa State University), Edgar Sanchez-Sinencio, (Texas A&M University), Martin Kinyua, (TSMC Corporation), Iuri Mehr (Broadcom Corporation), Christopher Rodenbeck (US Navy), Eric Soenen (TSMC Corporation), Stewart Taylor (Intel Corporation).

Honors

CASS Distinguished Lecturer (DLP) for the 2-year term 2013-2014 by the IEEE CAS Society.
IEEE-Fellow, 2010.
TI Professor-I in Analog Engineering, Texas A&M University.
Recipient of the Best Paper Award, European Solid-State Circuits Conference (ESSCIRC), 1990.
Co-author of the paper that received the 2003 Best Student Paper Award, IEEE RF-IC 2003.
2005 Outstanding Professor Award by the ECE Department, Texas A&M University, 2005.
Co-author of a paper received the 2011 Best Student Paper Award, IEEE MWCAS 2011.

Ph.D. Advisors (2): Willy Sansen and Michiel Steyaert, Katholieke Universiteit Leuven, Belgium.

Ph.D. Thesis advises during the last 5 years (total of 26): R. Assaad (TI), C.-Y. Lu (INTEL), M. Onabajo (Assistant Professor at Northeastern University, USA), M. Kulkarni (Broadcom), Y.C. Lo (Qualcomm), Y. Kim (Assistant Professor at Hanbat National University, South Korea), A. Larsson (Synaptics), J. Hoon (Broadcom), M. Geddada (Broadcom), C-J Park (Freescale) and advised a total of 48 MS Students.
Yang Shen, Ph.D
Department of Electrical and Computer Engineering, Texas A&M University, 3128 TAMU College Station, TX 77843-3128; Tel: 979-862-1694, http://ece.tamu.edu/~yshen, yshen@tamu.edu

a. Professional Preparation:

Univ. of Sci. and Tech. of China (China) B.E. 2002 Automatic Control
Boston University, Boston, MA Ph.D. 2008 Systems Engineering
Boston University, Boston, MA Postdoc 2007-08 Biomedical Engineering
Mass. Inst. of Tech., Cambridge, MA Postdoc 2008-11 Biological Engineering and Computer Science

b. Appointments:

2015- Assistant Professor, Department of Electrical and Computer Engineering, TEES-AgriLife Center for Bioinformatics and Genomic Systems Engineering, Texas A&M University
2012-2014 Research Assistant Professor, Toyota Technological Institute at Chicago
2012- Research Affiliate, Departments of Biological Engineering and Electrical Engineering & Computer Science, Massachusetts Institute of Technology
June-July 2012 Visiting Assistant Professor, Computer Science and Artificial Intelligence Laboratory (CSAIL), Massachusetts Institute of Technology

c. Publications:

List of 5 peer reviewed publications (Out of 20 journal articles, citation > 600)


List of other significant peer reviewed publications (last 5 years):


d. Synergistic Professional Activities (last 5 years):

Development: Optimization, dimensionality reduction, and machine learning algorithms for protein docking, drug design, and health informatics.


Grant Reviewer: National Science Foundation (NSF)

Editorial Board: Associate Editor, EURASIP Journal on Bioinformatics and Systems Biology (2015-)


Others: Fourth place among 29 groups for performances predicting 25 oligomeric protein structures in the 30th round of CAPRI (Critical Assessment of PRedicted Interactions) — the first joint CASP (Critical Assessment of Structure Prediction)-CAPRI experiment (2014); Fifth place among 63 teams from over 10 countries in the 5th CAPRI Evaluation (2010-12).

e. Collaborators & Other Affiliations

Collaborators
Chris Drake (University of California, San Francisco); Michael Evans (University of California, San Francisco); Michael Gilson (University of California, San Diego); Geoffrey Greene (University of Chicago); Tariq Rana (Sanford Burnham Medical Research Institute); Charles Sawyers (Memorial Sloan-Kettering Cancer Center); Celia Schiffer (University of Massachusetts Medical School).

Graduate Advisors
Dr. Ioannis Paschalidis, Dr. Sandor Vajda, and Dr. Pirooz Vakili (Boston University)

Postdoctoral Advisor
Dr. Bruce Tidor (Massachusetts Institute of Technology)

Thesis Advisor and Postgraduate-Scholar Sponsor
Graduate researchers (2 students): Mostafa Karimi (TAMU, 2015– ), Haoran Chen (TAMU, 2016– )
Postdoctoral scholar (1 scholar): Tomasz Oliwa (Toyota Technological Institute, 2013–2014)
Chanan Singh

Professional Preparation:

Punjab Engineering College, Chandigarh, India  
Electrical Engineering B.S. 1963
University of Saskatchewan, Canada  
Electrical Engineering M.S. 1970
University of Saskatchewan, Canada  
Electrical Engineering Ph.D. 1972

Appointments

2015- Present  Regents Professor, Irma Runyon Chair Professor
2012-2015  Interim Department Head
2005-2012  Regents Professor, Irma Runyon Chair Professor
2000-2005  Regents Professor, JW Runyon Professor and Head, ECE Department
1997-2000  Professor and Head, Electrical & Computer Engineering
1995-1996  Director, Power Systems Program at the National Science Foundation
1992-1997  Professor and Director, Electric Power Institute
1986-1992  Professor and Associate Head, Electrical Engineering, Texas A&M University
1984-1986  Professor, Electrical Engineering, Texas A&M University
1981-1984  Associate Professor, Electrical Engineering, Texas A&M University
1978-1981  Assistant Professor, Electrical Engineering, Texas A&M University
1973-1978  Senior Research Officer, Ministry of Transport. & Communications, Ontario, Canada

Publications (from 183 journal papers, 181 conference proceedings, 11 published reports, 3 authored/co-authored books, 11 contributed books)

Five Publications:

August, 2008, pp. 1336-1345

Five other Publications:


Synergistic Activities

- I have co-authored 4 books and course notes on power system reliability. I have posted my course notes on the internet and numerous people have accessed these notes and used them in their educational and research activities.
- I have served as the chair of the Reliability Risk and Probability Applications subcommittee of the IEEE Power Engineering Society. This is the subcommittee that has provided the focus for encouraging research and educational activities in the area of power system reliability.
- I served as a Program Director at NSF and put together the initiative NSF 96-103 "Innovative Power Engineering Education in a Changing Environment". I brought together the EPRI and NSF to fund this initiative, several universities were funded under this initiative and this has had a positive impact on power engineering education in USA.
- I have developed many concepts, theories and algorithms for power system reliability. Many of these have found place in textbooks on this subject and commercial software used by power utilities. The work on frequency and duration methods, non-Markovian models and interconnected power systems has had a significant effect on the later developments.
- I have lectured and consulted extensively in USA, Canada, Europe, Pacific Asia, China, India South America and South Africa to promote the ideas of power system reliability evaluation.

Collaborators and Other Affiliations

**Collaborators and Co-Editors**: Vladimiro Miranda, Armando Leite da Silva, Mladen Kezunovic, James McCalley, Hamid Falaghi, Maryam Ramezani, Seth Guikema, Alex Sprintson, Joydeep Mitra, Hyungchul Kim, Jin-O Kim, Aydogan Ozdemir, George Gross, Vijay Vittal

**Graduate and Postdoctoral Advisors**: Roy Billinton

**Recent Thesis Advisor and Postgraduate-Scholar Sponsor**: Panida Jirutitjaroen, Lingfeng Wang, Rongfu Sun, Suchimita Datta Dasgupta, Yannick Degeilh, Yan Ou, Nader Samaan, Hag-Kwen Kim, Ramya Nagarajan, Xingbin Yu, Yong Liu, Saeed Saman, Kai Jiang, Hagkwen Kim, Hangtian Lei
Chin B. Su

Professional Preparation:

Chung Yuan College, Taiwan, Physics, B.S., 1970
Tsinghua University, Taiwan, Physics, M.S., 1972
Brandeis University, Physics, Ph.D., 1978

Appointments:

September 1992- present: Professor of Electrical Engineering
September 1987 to 1992: Associate Professor of Electrical Engineering
February 1986 to August 1987: Rockwell International, Dallas, TX.
September 1978 to February 1986: GTE Laboratories, Waltham, MA.

Selected Publications:


5 Other Publications


Patents

U.S. patent, No. 4,706,253, “High speed InGaAsP lasers by gain enhancement doping”, C.B. Su, V. Lanzisera


Synergistic Activities

(i) My Nano-optics Laboratory in the electrical engineering department has extensive electrical and optical equipment for conducting research in the area of biomolecule detections using plasmon resonance technique. A home-built microscopy system can be used for STED super-resolution measurements with 100 nm resolution, with current efforts concentrated on improving the resolution to 10 nm. The system with some changes in components can also be used for performing NSOM lithography with 100 nm resolution.

(ii) The proposed research supplements the undergraduate level Electronic Material and Device course taught by the co-investigator. This course often draws interests among undergraduate students resulting in their strong participation in 491 Undergraduate Research.
Short Resume

Hamid A. Toliyat

Address:  
Dept. of Electrical & Computer Engineering  
Texas A&M University, College Station, TX 77843-3128  
Phone: (979) 862-3034, Fax: (979) 845-6259, E-mail: toliyat@ece.tamu.edu

Education:  
B.S.  Electrical Engineering, Sharif University of Technology, Tehran, Iran, 1982.  
M.S.  Electrical Engineering, West Virginia University, Morgantown, WV, 1986.  

Academic Experience:  
August 2003- Present  
Professor of Electrical & Computer Engineering, Texas A&M University, College Station, TX

August 2000- August 2003  
Associate Professor of Electrical Engineering, Texas A&M University, College Station, TX

January 1995- August 2000  
Assistant Professor of Electrical Engineering, Texas A&M University, College Station, TX.

March 1994- December 1994  
Visiting Assistant Professor, Electrical Engineering, Texas A&M University.

September 1991 - January 1994  
Assistant Professor, Electrical Engineering, Ferdowsi University-Mashhad, Mashhad, Iran.

Current Fundings:  


Honors/Awards and Synergisites Activities:  
1. IEEE Nikola Tesla Field Award, 2014
2. Fellow of IEEE
7. TEES Fellow Award, Texas Engineering Experiment Station (TEES), $5000.0 prize award, Fall 2006.
10. Outstanding Professor Award, Department of Electrical and Computer Engineering, Texas A&M University, $5000.0 prize award, Fall 2005.
13. TEES Fellow Award, Texas Engineering Experiment Station (TEES), $5000.0 prize award, Fall 2004.
15. Distinguished Achievement Award in recognition of distinguished achievements in teaching, Association of Former Students, Texas A&M University, Fall 2003, $2000 prize award.
16. E.D. Brockett Professorship Award for 2002-2003, Texas Engineering Experiment Station (TEES), $4000.0 prize award.
17. Appeared on People’s Agenda talk show of KERA 90.1 Dallas/Fort Worth/Denton on “Fuel Cell Research and other Aspects of Automotive Research,” January 7, 2003, 10:00 AM-11:00 AM.
19. Eugene E. Webb’43 Faculty Fellow Award for 2000-2001, Texas Engineering Experiment Station (TEES), $5000.0 prize award, for “Overall contribution to the Engineering Program including classroom instruction, scholarly activities and professional service”.

20. Select Young Investigator Award, Texas Engineering Experiment Station (TEES), $5000.0 stipend, 1999.

21. Schlumberger Foundation Technical Awards, $30,000.0 prize award, April 2000.

22. Space Act Award by NASA Inventions and Contributions Board, $250.0 prize award, April 1999.


**Teaching:**
I stress the use of interdisciplinary ideas in my teaching. Rather than teaching students to specialize in a narrow area, I try to provide valuable perspective on how ideas relate with concepts students have already seen in other classes. With these interdisciplinary goals in mind, I have developed and taught three new courses in the area of electromechanical motion devices. These are:
1. ECEN 611 General Theory of Electromechanical Motion Devices, 3 credits
2. ECEN 612 Computer Aided Design of Electromechanical Motion Devices, 3 credits
3. ECEN 442 DSP-Based Electromechanical Motion Devices, 3 credits

**Books:**
2. DSP-Based Electromechanical Motion Control, CRC Press, Florida, 2003, 344 pages.

**Publications:**
Author/co-author of over 430 technical papers, and three technical report in the area of electric machines, adjustable speed drives, and power systems.

**Sample Publications:**

**Patents/Disclosures (Total 16 issued and pending):**
Haiyan Wang, Ph. D.
Professor
Materials Science and Engineering
Dept. of Electrical and Computer Eng.
Texas A & M University
wangh@ece.tamu.edu; Phone: 979-845-5082
http://engineering.tamu.edu/electrical/people/hwang
http://scholar.google.com/citations?user=ddM4gqIAAAAJ
http://www.researcherid.com/rid/P-3550-2014

Professional Preparation

Appointments
2014-present Professor Texas A & M University
August 2013-August 2015 Program Director U.S. National Science Foundation
Sept. 2010-August 2014 Associate Professor Texas A & M University
Jan. 2006-Aug. 2010 Assistant Professor Texas A & M University
Jan. 06–Aug. 2013 Long Term Visiting Staff Member Los Alamos National Laboratory
Jan. 05–Dec. 05 Technical Staff Member Los Alamos National Laboratory
Jan. 03–Dec. 04 Director Funded Postdoctoral Fellow Los Alamos National Laboratory

Most Relevant Publications (total 335 journal articles with a total citation of 7500 times (H factor=42), 275 journal articles since January 2006. 170 conference presentations and proceedings, and 35 invited talks as of July 2015)
5. A. Chen, Z. Bi, Chen-Fong Tsai, J. H. Lee, Q. Su, X. Zhang, Q. X. Jia, J. L. MacManus-Driscoll and H. Wang, Tunable Low-Field Magnetoresistance in (La0.7Sr0.3MnO3)0.5:(ZnO)0.5 Self-Assembled Vertically Aligned Nanocomposite Thin Films, Advanced Functional Materials, 21, 2423, (2011).

Other Significant Publications

**Patents (8 patents in the areas of thin film growth and architectures)**

**Research Interests**

- Nanostructured nitride and oxide thin film heterostructures for microelectronics, optoelectronics, ferroelectric and ferromagnetic materials, high temperature superconductors, solid oxide fuel cells, structural applications, radiation tolerant materials, etc.
- Microstructural characterizations with TEM, high resolution TEM, STEM and XRD; *in situ* TEM tools.

**Synergistic Activities**

- **Panelist** for NSF Graduate Fellowship (2007-present), DOE Center review panels (2008-present); NSF proposal and center review panels (2007-present); **Program Director** (DMR-EPM at NSF, 2013-2015)
- **Committee Member** of ASM International (2012-present), the Electronic, Magnetic and Photonic Materials Division. (TMS 2009-2013) and Electronic Division (ACerS, Chair 2015-2016, Chair-in-elect 2014-2015). **Fellow** of ASM and ACerS; **Member** of AAAS, MRS, TMS, and APS.
- Actively involved in outreach activities including the Woman Student Mentor Program, the Woman Engineering Forum and the E3 Summer Research Program for High School Teachers at Texas A&M University, Los Alamos Summer School (at the University of New Mexico), Keynote speaker at the WSE Symposia, the Texas Junior Science and Humanities Symposium (Key note speaker, TAMU)

**Recent Collaborators**

X. Zhang, X. F. Qian, P.T. Lin, L. Shao, and T. Caign-Texas A & M University
Judith Driscoll, John Hay Durrell, Mark G. Blamire-Cambridge University
S. Foltyn, Q.X. Jia, G. Swandener; Aiping Chen -Los Alamos National Laboratory
A. Manthiram, X (Elaine) Li and A. Alu –UT Austin
Hao Yang, Suzhou University, China
R. Ramesh, UC Berkeley;
A. Mukherjee, E. Lavernia- UC Davis
A. Jacobson, Jiming Bao-Texas Center for Superconductivity, the University of Houston
Jagdish Narayan, Carl Koch – North Carolina State University

**Thesis Advisors** Ph.D. – Prof. Jagdish Narayan at North Carolina State University

**Postdoctoral Mentor** S.R. Foltyn, Los Alamos National Laboratory

**Former Graduates: 14 Ph.D.s and 4 MS graduated and currently mentoring 7 Ph.D.s and 1 MS.**

J. Yoon (Ph.D. Samsung Inc.), R.A. Araujo (Ph.D. Intel, Inc.), C.Chou (MS, TRI, Inc.), J. (Joyce) Wang (MS., Corning Cooperation), I. Kim (Ph.D. LG Inc.), Z. Bi (Ph.D. IBM), S. Cho (Ph.D. Northwestern University) T. Lynch (MS, TI), M. Myers (Ph.D. Intel), C. Tsai (Ph.D. Intel), J. Lee (Ph.D. TAMU and Samsung), A. Chen (Ph.D., TAMU and Los Alamos National Lab), Li Chen (Ph.D. Intel), Y. Zhu (Ph.D., Haldor Topsoe and now at Pacific North Western National Lab). Q. Su (Ph.D., TAMU and University of Nebraska-Lincoln), F. Khatkhatay (Ph.D., TAMU and Global Foundry); Liang Jiao (Ph.D., TAMU and Intel)
Steven M. Wright  
Professor of Electrical and Computer Engineering, Bioengineering, and Radiology  
Department of Electrical and Computer Engineering, Texas A&M University  
3128 TAMU, College Station, TX  77843-3128

(a) Professional Preparation
University of Illinois, Urbana, IL  Electrical Engineering, B.S.  1980
University of Illinois, Urbana, IL  Electrical Engineering, M.S.  1981
University of Illinois, Urbana, IL  Electrical Engineering, Ph.D.  1984

(b) Appointments
2013-present:  Associate Department Head, Dept. of Elec. and Comp. Engr., Texas A&M
2006-present:  Royce E. Wisenbaker Professor II, College of Engineering, Texas A&M Univ.
2002-present:  Professor of Electrical and Computer Engineering and Professor of Biomedical Engineering, College of Engineering, Texas A&M University, and Professor of Radiology, College of Medicine, Texas A&M University Health Science System.
6/2000-12/2000:  Visiting Scientist, Univ. of Texas MD Anderson Cancer Center, Houston, TX.
2000 - Present:  Professor of Electrical Engineering, Texas A&M University.
1988 - 1993:  Asst. Professor of Electrical Engineering, Texas A&M Univ., College Station, TX.

(c) Journal Publications,
(i) publications related to this project:

(ii) Other significant publications:
(d) Synergistic Activities


2) Development of undergraduate laboratory course in MRI at Texas A&M. In this course pairs of students use homemade desktop magnets and PC instruments to develop a working MRI system over the course of a semester.

3) Development of unique rapid imaging methods for MRI, known as Single Echo Acquisition Imaging. This has been reported in a number of publications and a reference is provided in c above.

4) Development of graduate cooperative education programs through an NSF GOALI with GE Healthcare and the University of Illinois at Chicago. http://www.ece.tamu.edu/~mrsl/nsf_goali.htm

(e) Collaborators and Other Affiliations

(i) Collaborators
Samantha By, Vanderbilt Univ. Krishna Kurpad, Biotronix, Portland OR
Ke Feng, Biotronix, Portland OR Craig Malloy, UT Southwestern
Jeff Fessler, Univeristy of Michigan Mary McDougall, Texas A&M University
Jon Fredrik-Neilsen, University of Michigan Doug Noll, University of Michigan
Arum Han, Texas A&M University Joseph Rispoli, Purdue University
Jim Ji, Texas A&M University Andrew Webb, Leyden University

(ii) Graduate and Postdoctoral Advisors
Y.T. Lo, Ph.D. Advisor, University of Illinois-Urbana, (deceased)
Paul Klock, M.S. Advisor, University of Illinois-Urbana (deceased)

(iii) Thesis Advisor and Postgraduate-Scholar Sponsor
Postdoctoral students: (5)
John Brossard, PostDoc, Texas A&M University, currently lab supervisor in my lab
Jay Porter, PostDoc, Texas A&M University (Prof. in Engineering Technology)
Emilio Esparza, PostDoc, Texas A&M University (Research Associate, MD Anderson Cancer Ctr.)
Lei Hao, PostDoc, Texas A&M University, (industry)
Mary P. McDougall, Texas A&M University (Asst. Prof. in Biomedical Engineering)

Ph.D. Students graduated (14), currently advising (5)
Roger McNichols (co-chair), (deceased), Yong Han, Dallas
Arne Reykowski, Philips Nader Famili, Ericson
Jay Porter, Texas A&M University Jim Bankson, UT MD Anderson Cancer
David Brown, Private Consulting Mary P. McDougall, Texas A&M University
Krishna Kurpad, Univ. of Wisconsin Dan Spence, GE Healthcare
Naresh Yallapragada, GE Healthcare Xiaqun Liu, Texas Instruments
Ke Feng, Biotronix. John Brossard, Texas A&M

Masters Students graduated (13), currently advising (1)
Le Xie
Associate Professor
Department of Electrical and Computer Engineering
Texas A&M University
301H Wisenbaker Engineering Building
College Station, TX 77843-3128
Le.xie@tamu.edu
979-845-7563 (Office), 979-845-6259 (Fax)

Professional Preparation

2004  B.E.  Electrical Engineering, Tsinghua University, Beijing, China
2005  S.M.  Engineering Sciences, Harvard University, Cambridge MA
2009  Ph.D. Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh PA

Appointments

Sep 2015-  Associate Professor with Tenure, Texas A&M University, College Station TX
2010-2015  Assistant Professor, Texas A&M University, College Station TX
2007  Power System Analytic Intern, Edison Mission Energy Group, Boston MA

Products

Five Closely Related Publications


Five Other Publications


Synergistic Activities


*Co-Chair*, IEEE SmartGridComm Symposium on The Whole Picture: Sense, Communicate, Compute, and Control, 2013

*Faculty Advisor*, IEEE PES/PELS/IAS Student Chapter at Texas A&M, 2010

*Founding Faculty Advisor*, Texas A&M Energy Club, 2010

*Founding Chair*, IEEE PES Subcommittee on Big Data Analytics for Grid Operations, 2014

*Session Chair*, (1) National Science Foundation I/UCRC Workshop on Transportation and Electricity Convergence, October 2010; (2) IEEE Power and Energy Society General Meeting Panel on Time-coupled Look-ahead Dispatch, July 2011; (3) IFAC World Congress Session on “The Role of MPC in Smart Grids”

*Editor*: IEEE Transactions on Smart Grid


Collaborators:

Marija Ilić, Soummya Kar (Carnegie Mellon), Prasad Enjeti, Mladen Kezunovic, Steve Puller, Yu Ding, P. R. Kumar (TAMU), Evdokia Nikolova (UT-Austin), Pravin Varaiya (UC Berkeley), H. Vincent Poor (Princeton), Chongqing Kang, Qing Xia (Tsinghua, China), P.M.S. Carvalho, L.A.F.M. Ferreira (Instituto Superior Técnico, Portugal), Lijun Qian (PVAMU), Marc Genton (KAUST)

*Current Ph.D. students*: Yang Chen (Female), Yun Zhang, Omar Urquidez (Hispanic), Marie Wu (Female), Hao Ming, Xinbo Geng, Sadegh Modarresi

*Current undergraduate students*: Benjamin Wiseman
ZIXIANG XIONG

Professor, Dept of ECE, Texas A&M University, College Station, TX 77843
Tel: (979) 862-8683, Email: zx@ece.tamu.edu, URL: http://lena.tamu.edu

Professional Preparation

B.S., Electrical Engineering, Wuhan University, P. R. China 1987
M.A., Mathematics, University of Kansas 1991
M.S., Electrical Engineering, Illinois Institute of Technology 1992
Ph.D., Electrical Engineering, University of Illinois at Urbana-Champaign 1996

Professional Experience

Texas A&M University, professor in Electrical Engineering 2007-present
Stanford University, visiting professor (during sabbatical leave) Spring 2010
Texas A&M University, associate professor in Electrical Engineering 2002-2005
Texas A&M University, assistant professor in Electrical Engineering 1999-2002
University of Hawaii, assistant professor in Electrical Engineering 1997-1999
Princeton University, visiting student/research associate 1995-1997

Publications related to the proposal


Other publications


**Synergistic activities**

- Award chair, Globecom’14, Austin, TX, 2014
- Tutorial chair, ISIT’10, Austin, TX, 2010
- Technical program co-chair, ITW’07, Lake Tahoe, CA, 2007
- Publications chair, ICASSP’07, Honolulu, HI, 2007
- Associate editor for five IEEE Transactions

**Collaborators over the past 48 months**

- Javier Garcia-Frias, University of Delaware
- Wen Gao, Peking University, China
- Anders Host-Madsen, University of Hawaii
- I-Hong Hou, TAMU
- Qing Huang, Beihang University
- Nan Jiang, Qualcomm
- P. R. Kumar, TAMU
- Xiaodong Wang, Columbia University
- Jim Xia, The Methodist Hospital Research Institute, Houston
- Chengyang Yang, Beihang University
- Yang Yang, Amazon
- Heather Yu, Huawei Technologies Co. Ltd.
- Guosen Yue, NEC Research
- Dong-Qing Zhang, Huawei Technologies Co. Ltd.
- Xiaobo Zhou, Wake Forest University
- Zhu Han, University of Houston

**PhD advisors**

Michael Orchard (now at Rice University) and Kannan Ramchandran (now at UC Berkeley)

**Thesis adviser and postdocs (Summary: Postdocs 2, PhD 13, MS 17)**

**Recent PhD graduate students and postdocs**

- V. Stankovic (University of Strathclyde, UK), S. Cheng (University of Oklahoma), M. Uppal (LUMS School of Science and Engineering, Pakistan), Y. Zhang (Microsoft), Y. Chang (Toshiba Medical Research, USA), Y. Yang (Amazon), Q. Xu (Intel), Z. Liu (Aerohive Networks), L. Zou (Intel), Y. Sun (Schlumberger), J. Hua (Texas A&M University), S. Zhao (Tongji University, China), T. Lan (-), Z. Liu (-)

**Current graduate students**

- J. Gomez, N. Jiang, Y. Liu, Y. Meng, B. Wang, Z. Xuan
Byung-Jun Yoon

Associate Professor, Department of Electrical and Computer Engineering, Texas A&M University, College Station, TX 77843-3128
Tel: 979-845-6942, Email: bijoon@ece.tamu.edu

(a) Professional Preparation

<table>
<thead>
<tr>
<th>Institution</th>
<th>Major/Area</th>
<th>Degree</th>
<th>Year(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seoul National University</td>
<td>Electrical Engineering</td>
<td>B.S.</td>
<td>1998</td>
</tr>
<tr>
<td>California Institute of Technology</td>
<td>Electrical Engineering</td>
<td>M.S.</td>
<td>2002</td>
</tr>
<tr>
<td>California Institute of Technology</td>
<td>Electrical Engineering</td>
<td>Ph.D.</td>
<td>2006</td>
</tr>
<tr>
<td>California Institute of Technology</td>
<td>Computational Biology</td>
<td>Post-Doc</td>
<td>2007</td>
</tr>
</tbody>
</table>

(b) Appointments

2014 – Present  Associate Professor, Dept. Electrical & Computer Engineering, Texas A&M University
2008 – 2014  Assistant Professor, Dept. Electrical & Computer Engineering, Texas A&M University
2006 – 2007  Post-Doc, Dept. Electrical Engineering, California Institute of Technology
2001 – 2006  Research Assistant, Dept. of Electrical Engineering, California Institute of Technology

(c) Publications

i. Publications most closely related to the proposed project:


ii. Other significant publications:


(d) Synergistic Activities


5) *Software Development & Distribution*: RESQUE (Network querying algorithm), PCSVMM (RNA structural alignment algorithm), PicXAA/PicXAA-R/PicXAA-Web (Protein/DNA/RNA multiple sequence alignment algorithms), RESQUE (network querying algorithm), SMETANA (multiple network alignment algorithm)

(e) Collaborators & Other Affiliations:

*Collaborators and Co-Editors*: Edward R. Dougherty, Texas A&M; Jun R. Huh, U. of Massachusetts; Tamer Kahveci, U. of Florida; Xiaoning Qian, Texas A&M; Won-Bo Shim, Texas A&M; Charles Woloshuk, Purdue Univ.;

*Graduate Advisors and Postdoctoral Sponsors*: P. P. Vaidyanathan, California Institute of Technology *(Total Graduate Advisors & Postdoctoral Sponsors: 1)*

*Thesis Advisor and Postgraduate-Scholar Sponsor*: Chun-Chi Chen, Texas A&M; Hyundoo Jeong, Texas A&M; Mansuck Kim, Texas A&M; Navadon Khunlertgit, Texas A&M; Amir Nikooienejad, Texas A&M; Mohammad Sahraeian, Texas A&M; Junjie Su, Texas A&M *(Total Graduate Students Advised: 7, Total Postdoctoral Scholars Sponsored: 0)*
Curriculum Vitae

EDUCATION

2004–2009  •  Ph.D. in Electrical and Computer Engineering
             The University of Texas, Austin, Texas
2002–2004  •  M.S. in Physics
             University of California, San Diego, California
1998–2002  •  B.S. in Physics
             Minor in Economics
             Peking University, Beijing, P. R. China

EXPERIENCE

01/2014–present  •  Assistant Professor, Dept. Electrical and Computer Engineering & TEES-AgriLife Center for Bioinformatics and Genomic Systems Engineering (CBGSE), Texas A & M University, College Station, TX.
07/2009–12/2013  •  Postdoctoral Associate, Dept. Molecular and Human Genetics, Baylor College of Medicine, Houston, TX.

TEACHING

Fall, 2015  •  ECEN 489/689: Special Topics: R and Its Applications to Genomic Systems Engineering
Spring, 2015  •  ECEN 489/689: Special Topics: R and Its Applications to Genomic Systems Engineering
Fall, 2014  •  ECEN 489/689: Special Topics: Large-scale biological data analysis
Spring, 2014  •  ECEN 489/689: Special Topics: Large-scale biological data analysis

LIST OF PUBLICATIONS

Journal:


LIST OF PUBLICATIONS (continued)


2012

2011

2009

2008

Conference:

2008

2007

2006

2005
LIST OF PUBLICATIONS (continued)

Patent:

HONORS
2008 • William H. Hildebrand Endowed Graduate Fellowship, the University of Texas at Austin
• BioBricks Foundation SB4.0 Travel Award, Synthetic Biology 4.0
• Inventor Recognition Award, Semiconductor Research Corporation (SRC)
• BACUS Photomask Scholarship, Society of Photographic Instrumentation Engineers (SPIE)
• 11th ACM/SIGDA Ph.D. Forum at DAC Travel Grant, Association for Computing Machinery (ACM)/ Special Interest Group on Design Automation (SIGDA)
2007 • IBM PhD Fellowship Nominee, ECE Department, the University of Texas (only two nominations from the ECE department)
2005 • DAC Young Student Support Program Award, Design Automation Conference
2000 • Brilliance Scholarship, Peking University
1999 • Gangsong Scholarship, Peking University
1998 • Freshman Scholarship, Peking University
1997 • Second Prize, Chinese Physics Olympiad (CPhO), Chinese Physical Society
• Top Prize, CPhO in Henan Province, Chinese Physical Society
1996 • First Prize, CPhO in Henan Province, Chinese Physical Society

PROFESSIONAL ACTIVITIES
• Associate Editor, BMC Bioinformatics (2016 - present)
• Editorial Board Member, EURASIP Journal on Bioinformatics and Systems Biology (2015 - present)
• Editorial Board Member, the Journal of Metabolomics and Systems Biology (JMSB) (2014 - present)
• Regional Editor, American Journal of Bioinformatics (2014 - present)

Ad hoc Review, Refereed Journals
• BMC Bioinformatics, (2014)
• Bioinformatics, (2015-present)
• Computers (ISSN 2073-431X), (2015-present)

PROFESSIONAL MEMBERSHIP
2014 - present • Member, The American Society of Human Genetics (ASHG)
• Member, International Society for Computational Biology (ISMB)
RESEARCH INTERESTS
Mobile wireless networks and communications, statistical QoS provision for delay-bounded multimedia wireless networks, 5G mobile wireless networks, cognitive radio networks, statistical communications, random signal processing, information theory, and control theory and systems.

EDUCATION
Ph.D., Electrical Engineering and Computer Science (Electrical Engineering–Systems), The University of Michigan, Ann Arbor, Michigan, U.S.A.
M.S., Electrical Engineering and Computer Science, Lehigh University, Bethlehem, PA, U.S.A.
M.S., Electrical Engineering and Computer Science, Xidian University, P. R. China
B.S., Electrical Engineering and Computer Science, Xidian University, P. R. China

PROFESSIONAL EXPERIENCES
Full Professor, Electrical and Computer Engineering, Texas A&M Univ. (2014 – Present)
Associate Professor, Electrical and Computer Engineering, Texas A&M Univ. (2008 – 2014)
Assistant Professor, Electrical and Computer Engineering, Texas A&M Univ. (2002–2008)

AWARDS AND HONORS
- IEEE Fellow for Contributions to Quality of Service (QoS) in Mobile Wireless Networks
- U.S. NSF CAREER Award received from U.S. National Science Foundation, 2004–2011
- IEEE Communications Society Distinguished Lecturer (2011—present)
- IEEE Vehicular Technology Society Distinguished Lecturer (2013—present)
- Best Paper Award in IEEE GLOBECOM 2014
- Best Paper Award in IEEE GLOBECOM 2009
- Best Paper Award in IEEE GLOBECOM 2007
- Best Paper Award in IEEE WCNC 2010
- IEEE Communications Society BEST READINGS (with top citation rate) Journal Paper
- TEES Select Young Faculty Award for Excellence in Research Performance, Texas A&M University, College Station, Texas, U.S.A., 2006

Six Most Recent Publications:
3. Xi Zhang, Wenchi Cheng, and Hailin Zhang, "Heterogeneous Statistical QoS Provisioning..."


Five Other Important and Significant Publications:


Synergistic Professional Activities

- Editor for the *IEEE Transactions on Communications*
- Editor for the *IEEE Transactions on Wireless Communications*
- Associate Editor for *IEEE Transactions on Vehicular Technology*
- Guest Editor for *IEEE Journal on Selected Areas in Communications (J-SAC)* for 2 times
- Associate Editor for the *IEEE Communication Letters*
- Lead Guest Editor for the *IEEE Communications Magazine* for 4 times
- Lead Guest Editor for the *IEEE Wireless Communications Magazine*
- Associate Editor for the *Wiley Wireless Communications and Mobile Computing Journal*
- Technical Program Chair (TPC) Area Co-Chair for the *IEEE INFOCOM 2012*
- Technical Program Chair (TPC) Chair for the *IEEE GLOBECOM 2011*
- TPC Vice-Chair for the *IEEE INFOCOM 2010*
- TPC Chair for the *IEEE INFOCOM 2009 –Mini-Conference*
- Demo Co-Chair for *IEEE INFOCOM 2008*; Travel Grant Chair for *IEEE INFOCOM 2007*
- TPC Chair for *IEEE ICC 2008 -INS Symposium*
- TPC Chair for *IEEE GLOBECOM 2008 -WCS Symposium*
- Invited Keynote/Plenary/Tutorials Talks for numerous *IEEE Flagship Conferences/Symposia*
- Member of Association for Computing Machinery (ACM) as the author who has published more than 300 technical papers in IEEE/ACM areas.
Jun Zou

A. Professional Preparation

Chongqing University (Chongqing, China)  Precision Instruments  B.S., 1994
Tsinghua University (Beijing, China)  Precision Instruments  M.S., 1997
University of Illinois (Urbana, Illinois)  Electrical Engineering  Ph.D., 2002
University of Illinois (Urbana, Illinois)  MEMS & Nanofabrication  Postdoc, 2002-2004

B. Appointments

2011 – Present  Associate Professor, Department of Electrical and Computer Engineering, Texas A&M University, College Station, TX.
2004 – 2011  Assistant Professor, Department of Electrical and Computer Engineering, Texas A&M University, College Station, TX.

C. Products

Five Products Most Related to the Proposed Research

Five Other Significant Products


D. Synergistic Activities
1. Elected to Senior Member of IEEE and SPIE.
5. NSF proposal review panelist.

E. Collaborators and Other Affiliations

Collaborators (past 4 years): 12
Profs. Cam Nguyen, Kai Chang, Edgar Sanchez-Sinencio, Donald Naugle, Hong Liang, Christine Morgan, Youjun Deng, Texas A&M University.
Prof. Lihong Wang, Washington University, St. Louis, MO.
Prof. Jinghong Chen, University of Arizona, Tucson, AZ.
Prof. Xinlin Gao, University of Texas at Dallas.
Dr. Kenneth Wang, Mayo Clinic, Rochester, MN.
Dr. Bhaskar Banerjee, University of Arizona Hospital, Tucson, AZ.

Graduate Advisor and Postdoctoral Sponsor
Prof. Chang Liu, Northwestern University (formerly with University of Illinois), Ph.D. advisor and postdoctoral sponsor.
Prof. Chad Mirkin, Northwestern University, postdoctoral sponsor

Graduate Students Advised: 17
Jung-Moo Hung (Ph.D.), Murat Yapaci (Ph. D.), Alejandro Garcia-Uribe (Ph.D.), Po-Chun Chen (Ph.D.), Cheng-Chung Chang (Ph.D.), Young Cho (Ph.D.), Chih-Hsien Huang (Ph.D.), He Hu (Ph.D.), Song Xu (Ph.D.), Cheng Fang (Ph.D.), Youwei Jiang (Ph.D.), Hyungoo Lee (Ph.D.), Carlos Sanchez (Ph.D.), Kelvin Wilkins (Ph.D.), Lamyanba Yambem (M.S.), Karthik Balareddy (M.S.), Fatih Ozkeskin (M.S.), Akhil Kumar (M.S.).