EXECUTIVE SUMMARY

of the

A SELF STUDY REPORT

School of Science and Technology
Sonoma State University

November 6, 2009
Executive Summary of the Self-Study Report

I. Program Introduction and History

- The MS-CES Program was launched in Fall 2001 as a self-support program through School of Extended Education with the following revenue sources: tuition ($500/unit), income from endowment funds, donations in cash and kind from the industries and businesses, grants from private and public agencies.
- An Industry Advisory Board (IAB) provides the Program inputs on new scientific and technological trends, educational needs of the industry, facilitates internship opportunities for students and various other types of collaboration with the industries.
- The Program supports SST without any charge back whenever needed and possible. The BSES program was launched on the strength of the MSCES Program’s resources, the MS-CES laboratories and facilities are being used by many other programs and the program has provided substantial professional development funds to SST in the past.

II. Curriculum

- An interdisciplinary curriculum, it consists of the following five parts: 9 units of core, 12 units of track core, 3 to 6 units of electives, culminating experience and an internship requirement. The internship requirement is an informal non-credit requirement. The program meets the needs of the industries, particularly of the industries in the North Bay region. While the program is equivalent to any other master’s degree in engineering, to our knowledge there is no similar program at any other institution.
- To accommodate the changing industry needs, the curriculum is being revised to include some professional components and formalize internship requirement. The revised program will meet the ‘Professional Science Masters (PSM)’ program requirements that will give the program much publicity and qualify it for special NSF funding.
- The ‘Professional Science Masters (PSM)’ programs are being aggressively supported and pursued by the CSU System

III. Faculty

- The Program supports only one full-time position: Director of the Program. While the MSCES Faculty is the faculty of the Department of Engineering Science, several faculty members from the departments of Computer Science, Physics and Astronomy and Mathematics and about 12 adjunct faculty from the North Bay Region industries participate in the program. All regular and adjunct faculty are highly qualified and dedicated to making MSCES an excellent program.
- The Program reimburses Campus for the MSCES workload carried by the ES and other SST faculty.

IV. Students

- The Program admits students from engineering, scientific as well as non-scientific disciplines.
- Of the MSCES student population, 60% are professional, 20% are international students and 20% are from Sonoma County area with degrees in non-engineering disciplines.
- The graduation time varies from 2 to 4 years depending upon students’ load.
- Employment rate for the MSCES graduates is nearly 100%.
- Students would like to have more courses offered, more flexibility in curriculum and separate degrees in EE and CS.
- Enrollment has declined significantly due to industry downturn but is still in demand by the area industries. Recently, there are signs of increasing enrollment. The addition of Bioengineering Program, in-process curriculum revision (to qualify as PSM programs), and, International collaborations being explored are likely to have significant impact on enrollment.
- Lack of financial assistance for graduate students is a significant shortcoming of the Program.
- Assessment of learning outcomes has been unsatisfactory. This has been because of the high turnover of the ES faculty during the last 3 years, lukewarm interest and responses from the students as well as their employers, lack of expertise in this area and other higher priority activities.

V. Facilities and Institutional Support

- The Program has eight laboratories with about $3 million worth equipment. However, a significant fraction of the equipment has become outdated and needs to be refreshed to continue to provide high-quality education. Being a self-support program, it enjoys no institutional support but often supports the institution itself.

External Review, Faculty Response and Action Plan

External Reviewer: Dr. Ram Nunna, Associate Dean and Professor (EE), CSU, Fresno, CA

a. Faculty

Findings and recommendations:
• Faculty needs to be actively involved in the program and their Professional development needs should be addressed.
• Have a faculty retreat to address various faculty responsibilities and how to share them.

Response:
• The new faculty has already begun taking a keen interest in the program activities.

Action Plan:
• A faculty retreat will be planned before the end of the current academic year to develop a strategy for a successful operation of the programs, sharing of the responsibilities professional development of the new faculty.

b. Curriculum

Findings and recommendations:
• The two existing tracks may not be sustainable due to low enrollment and adding a new track may be stretching too thin although it has potential to increase enrollment.
• Assessment of learning outcomes and program effectiveness needs to be addressed.
• Revise core curriculum with the addition of bioengineering track, add a business related course and formalize the internship requirement to make the program more effective as well as attractive.

Response:
• The two existing tracks are necessary to meet the needs of the hightech industries in the North Bay Region whose support was instrumental in starting the Program. Further, the current resources are sufficient to sustain the Program and the trend appears to be increasing enrollment.
• The addition of Bioengineering track will mean three additional courses per year to be offered. This need can be easily met by the current regular and adjunct faculty using the additional tuition revenue generated.
• We agree that there has been lack of an effective assessment strategy because manpower shortage as well as lack of expertise in this area.

Action Plan:
• The faculty is already preparing a proposal to revise the curriculum accordingly to be effective in Fall ’10.
• The Program will address assessment issues and design and implement an effective protocol for this purpose within the next two years.
• The above revision will allow the three tracks to be recognized as PSM Programs and give them significant publicity and make them eligible for special NSF funding. A proposal is being submitted to obtain this funding.

c. Laboratory

Findings and recommendations:
• The laboratory infrastructure has become old and needs to be refreshed.
• Computer in the labs need to be replaced immediately.

Response:
• These issues have been recognized and discussed several times with Dean Rahimi over the last two years. Dean Rahimi promised to do his best to address these needs. Recently, he provided funds to replace 50 of the about 120 old computer in our laboratories.

Action Plan:
• We will continue to bring this up with Dean Rahimi and also try to get support from the Industries to make equipment and computer refresh possible.

d. Students and Enrollment

Findings:
• Students want more course choices and separate degrees of Electrical engineering and Computer Science as opposed to Computer and Engineering Science.
• In the absence of financial support, it will be difficult to attract good graduate students, particularly foreign students.
• Enforce student advising and conduct student group meetings, use students as ambassadors for the Program and market BS students in other disciplines at SSU.
• Explore 4+1 program and nearby military bases and attracting veterans.

Response and Action Plan:
• Our course offerings have come down from six to four per semester due to low enrollment. With the addition of bioengineering track and increase in enrollment, we will try to improve it significantly.
• We have been hesitant in putting advising hold on adult professional. We will seek some other ways to accomplish effective advising, mentoring and getting the students engaged much more with the faculty and increase their role as our ambassadors.
• We will also explore the possibility of 4+1 program, which may take two to three years, and attracting students from the nearby military bases and veterans and attracting students from other BS disciplines within SSU.
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External Reviewer’s Report
I. Program Introduction and History

The Master of Science degree in Computer and Engineering Science (MS-CES) at Sonoma State University started in Fall 2001 to fulfill the technical education needs of the fast growing Telecom Industries in Sonoma County during the 1990’s with the support of these industries. It is a multidisciplinary degree offering specializations in two areas (or tracks): (i) Communications and Photonics, and, (ii) Computer Hardware and Software Systems and has recently added a third track in Bioengineering to be launched beginning Fall ‘10. The MS-CES curriculum is designed to further the working skills and practical knowledge of engineers, computer scientists and similar professionals and prepares the students for tackling real-world problems. The program is housed in the Department of Engineering Science of the School of Science and Technology (SST) and the url of its website is www.sonoma.edu/engineering.

The Program is a fully self-supported program underwritten by the endowment funds income, in-kind and cash donations/support from the local industries and student tuition revenue. Tuition and fees for this Program is $500 per unit for all students, residents and non-residents. The Program is administered through Special Sessions of the School of Extended Education (SEE) and pays about 45% of its tuition revenue to SSU and SEE for the use of campus facilities and cost of administering the program. When a faculty member teaches an MS-CES course, the Program reimburses SST the corresponding instructional cost.

Its faculty is composed of the faculty members of the Department of Engineering Science and professors from the departments of Computer Science, Physics and Astronomy and Mathematics whose interests traverse the fields of science and engineering, as well as professionals from the local community who have cutting-edge expertise in the various engineering disciplines of interest and are qualified to be adjunct faculty in SSU.

About 60% of the students in the MSCES program are working engineers and scientists from the local industries. About 20% are international students with engineering degrees and the rest are from Sonoma County area with degrees in non-engineering disciplines. The graduation time for a full time student admitted with no deficiencies is usually two years while part time students usually take three to four years to graduate. The employment rate for the MSCES graduates is nearly 100%.

A linkage with local industry in the form of an Industry Advisory Board (IAB) is an integral part of the program. While IAB does not have any role in the design of curriculum and defining
admission and degree requirements, it provides the Program with valuable input regarding the new scientific and technological developments and educational needs of the industry. It also facilitates internship opportunities for students, joint student research/project development and supervision, faculty-scientists/engineers joint project opportunities, equipment and financial support from the industries.

The MS-CES Program supports other graduate as well as undergraduate programs of the School without any charge back whenever needed and possible. A B.S.E.S. program was started in Fall 2005 on the strength of the MSCES Program’s resources with the minimal support from the State which is three faculty positions. Besides BSES Program, the MS-CES laboratories and facilities are being used by the faculty and students of computer science, mathematics, nursing, physics and biology.

II. The Program Specifics

A. PROGRAM AND LEARNING OBJECTIVES
The MSCES program is designed to develop independent research and development skills and become leaders in their field of interest while being a responsible citizen contributing for the well being of the society. The program educational objectives and the learning objectives to achieve the above are given below.

Program Educational Objectives
- Educate and prepare students to be independent investigators.
- Educate students to be leaders in their professions.
- Educate students to be socially responsible engineers, committed to community service.

Learning Objectives
The curriculum of MS-CES Program has been designed to meet the following learning objectives:
1. Learning analytical and simulation tools to model scientific and engineering problems and do system performance evaluation.
2. Learning theory of high performance computing, communications and/or networking.
3. Developing ability to apply theory to design and implement efficient computing and/or communications systems.
4. Developing ability to integrate knowledge from multiple interrelated disciplines to formulate, design and/or implement interdisciplinary projects.
5. Developing ability to identify, formulate and investigate research and/or development problems independently.
6. Developing written and oral communication skills.

Attachment A gives a matrix showing what learning objectives are met by the MSCES courses.

B. CURRICULUM STRUCTURE

Admission Requirements
For admission, the applicant must have:
1. A baccalaureate degree in a scientific or technical discipline from a U.S. institution accredited
by an appropriate accreditation body, or an equivalent baccalaureate degree from a foreign institution of high reputation.

2. Attained grade point average of at least 3.0 (A=4.00) in the last 60 semester (90 quarter) units attempted.

3. Applicants whose native language is not English and who have not spent at least three years of school at the secondary level (or beyond) where English is the principal language of instruction must present a minimum score of 212 on the computerized Test of English as a Foreign Language (550 on the paper form or 79-80 on internet version).

4. Demonstrated competency in writing by one of the Written English Proficiency Test criteria for MS-CES students given below. Generally, this requirement must be met before entering the program. One of the criteria is demonstrating competency in writing through an essay. Therefore, if the applicant plans to use this criteria, the essay should be submitted with the application for admission.

5. Completed the following SSU courses or equivalent at the undergraduate level with a GPA of 3.0 or higher:
   - 3 semesters of Calculus (MATH 161, 211, 241).
   - 2 semesters of Calculus-based Physics with laboratory (PHYS 114, PHYS 116 and 214).
   - 1 semester of Probability Theory (MATH 345).
   - 1 semester of Analog and Digital Electronics (ES 230 and 231).
   - 1 semester of Programming in an approved high-level Procedural Language (CS 115).
   - 1 semester of advanced programming, modeling and simulation (ES 314).
   - 2 semesters of Digital Systems and microprocessors and System Design (ES 210 and ES 310, or CS 252 and CS 351).

6. Conditional Admission
An applicant whose GPA is less than 3.0 but greater than 2.5, or who lacks not more than 18 units of prerequisite work (generally, 6 courses), may be accepted conditionally and must complete a program of study specified at the time of admission by the graduate coordinator before the applicant is given full admission.

Degree Requirements
Areas of Specialization
The program offers two tracks or areas of specialization:

- Track 1: Communications & Photonics - This area of specialization provides students with the expertise in the areas of (i) analog and digital electronics, (ii) semiconductor and photonics components and devices, (iii) communications techniques (wireless, wireline, and optical fiber media), (iv) local and wide area networking, and (v) broadband access technology.

- Track 2: Computer Hardware & Software Systems - This area of specialization is intended to deepen students’ ability to analyze and design computer systems. This specialization includes topics such as embedded systems, digital data compression, software engineering, and computer networks.

A student chooses one of the two tracks at the time of admission but can change it in the midstream. However, that may mean taking additional courses to meet the requirements of the new track.

Program of Study
A student’s program of study consists of the following five components: a common core, a track
core, culminating experience, technical electives and internship. Details of these components are as follows.

i. **Common Core**
   All students in the program must take three core courses (9 units). These courses are designed to give students the fundamentals necessary to master advanced-level academic work. These core courses are:
   - CES 400: Linear Systems Theory
   - CES 440: Data Communications
   - CES 432: Physics of Semiconductor devices or CES 530: Analog and Digital Microelectronics
   If any of the above core courses were part of a student’s undergraduate program, the student must take a 500-level course in its place approved by the student’s faculty advisor. Furthermore, only two 400-level courses can be used to satisfy degree requirements. A petition must be filed with the department for any exceptions.

ii. **Track Core**
   A student must take 12 units of courses from the list of courses for the chosen track. The list of the courses for each track is given in the Attachment B.

iii. **Culminating Experience Through Thesis/Design Project/Lab and Technical Report Experience**
   All students are required to complete a culminating experience which may take one of the following three forms:
   - Research and Thesis (Plan A).
   - Design Project (Plan B).

A supervisory committee is appointed for the students who choose Plan A or Plan B. A supervisory committee consists of three faculty members. One of the three members can be an adjunct faculty. A student interested in choosing Plan A or Plan B chooses a faculty member to be his/her thesis/project supervisor. Subsequently, the faculty supervisor becomes chairman of the student’s supervisory committee. In consultation with the faculty supervisor, two other members of the committee are selected. For a student choosing Plan C, an advisor is appointed by the Program Director to guide the student through this plan.

Under Plan A, as shown below, a student chooses to do thesis research and write a thesis under the guidance of the faculty supervisor and members of the supervisory committee.

**Plan A (Thesis, 30 units):**
- Common Core 9 units
- Track Core 12 units
- Electives 3 units
- Thesis 6 units.

Under Plan B, as shown below, a student chooses to prepare a design project focused on the design of devices, instruments, or systems. As in the case of Plan A, the project is mentored by the student’s faculty supervisor and members of the supervisory committee.

**Plan B (Project, 30 units):**
- Common Core 9 units
- Track Core 12 units
- Electives 6 units
- Design Project 3 units

Upon approval by the student’s supervisory committee, the thesis research or design project may
be carried out at the student’s company’s site (if the student is working) under the supervision of an approved senior scientist/engineer of the company. However, a SSU faculty supervisor must oversee the research/project and regularly examine the student’s progress. While not a requirement for graduation, it is expected that the results of the research/project will be presented in an appropriate technical conference and/or published in a relevant professional journal.

Plan C is Lab and Technical Report Experience (LTR Experience), as shown below, provides students with the opportunity for taking more courses to develop a deeper knowledge in their areas of interest instead of carrying out research or design projects, gives extensive exposure of the state-of-the-art equipment in various laboratories, and develops technical report writing skills.

Plan C (LTR Exp., 33 units):
- Common Core 9 units
- Track Core 12 units
- Electives 9 units
- LTR Experience 3 units.

iv. Technical Electives
A student must take 3 to 9 units of technical electives approved by his/her faculty advisor depending upon the culminating experience plan chosen. The purpose of technical elective courses is to provide a student with greater depth and/or breadth in his/her area(s) of interest. A technical elective course can be from any of the two lists of the track courses and must be at 500-level.

v. Internship Requirement
As a part of culminating experience, each MSCES student is required to do an internship in an industry, university, laboratory, utility company, government organization, etc. The objective of the internship must be to gain hand-on training in dealing with and solving real world engineering problems within the scope of the student's plan of study. The internship must be completed within one year. The number of hours worked as an intern should be at least 100 hours, preferably much more. Supervisory Committee's and Graduate Coordinator's approval must be obtained before starting the internship. After completion of the internship, a report of the work done and achievements certified by the intern-supervisor must be submitted to the supervisory committee and department for its acceptance.

The students with industrial experience can petition for waiver of the internship requirement. However, the petition may be considered by the student's supervisory committee and the Graduate Coordinator of the MSCES program only if the student can support the petition with proper supporting evidence that he/she fulfills this requirement based on his/her past industrial experience.

Teaching Strategies
To enable the working professionals enroll in this program, the graduate courses are scheduled after working hours. When ever possible, the courses are associated with appropriate laboratories and projects to be completed in labs are assigned as homework. Generally, the instructors require students to do independent research related to course material and make presentations in the class. The laboratories are available to the student 24/7 so that they can work in the labs when ever their schedule permits. The students are encouraged to come for technical discussions or guidance from the instructors freely when ever needed and/or desired.
**Crosslisted Courses**

The program interests cut across three other disciplines in the School, namely, Computer Science, Physics and Mathematics. This common interest has enabled the program to have several crosslisted courses as follow.

<table>
<thead>
<tr>
<th>MSCES Course</th>
<th>Crosslisted Course</th>
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<tr>
<td>CES 400: Linear Systems Theory</td>
<td>Math 430: Linear Systems Theory</td>
</tr>
<tr>
<td>CES 430: Photonics</td>
<td>Physics 445: Photonics</td>
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</table>

### III. The Faculty

Its MSCES faculty is composed of permanent engineering science faculty (Regular Faculty), some faculty members from the departments of Computer Science, Physics and Astronomy and Mathematics (Associated Faculty) whose interests traverse the fields of science and engineering and highly qualified professionals from the local community (Adjunct Faculty) who have cutting-edge expertise in the various engineering disciplines of interest. A list of current faculty is given in the Attachment C.

Besides teaching courses, the regular and associated faculty members participate in the governance of the department, school and the university through participation in various committees. Through scholarly activities, the faculty members generate new knowledge and advance the state-of-the art in their field of interest, present their work in various conferences and participate in the organizational activities of appropriate professional societies. These activities are part of the RTP requirements as given in the Attachment D. The Curriculum vitae presented in the Attachment P (at the end of this document) give the accomplishments of the regular faculty.

### IV. Institutional Support and Facilities

#### A. SPACE

The Department of Engineering Science is housed in the Cerent Engineering Science Complex in Salazar Hall. Initially, this space was allocated for laboratories and a storage area. Later, once the MSCES program was launched, this space was given to the MSCES program. Laboratory space was adequate for housing the eight MSCES laboratories. The designated storage area was remodeled for the program office and another student faculty interaction area was remodeled into three faculty offices. These offices are somewhat small but satisfactory, being in the proximity of the laboratories. However, there is no space available for adjunct faculty offices and student studies in between classes. Remodeling of one of the labs is being looked into to create these facilities.

#### B. LABORATORIES

The MSCES Program has eight laboratories well equipped with various types of electrical, electronic, telecom, optical and networking equipment. A list of these
laboratories is given in the Attachment E. Several of these labs are named after the industries that were/are major donors/supporters of the MSCES program. One of the useful features of these labs is that they are designed to hold laboratory sessions as well as lecture classes. Thus, an instructor of lecture classes also has instant access to the laboratory for any demonstration or discussion on any piece of equipment and instrument.

Equipment in some of the labs has become old and needs to be refreshed, particularly the computers in the labs and the equipment in the networking lab. A comprehensive list of equipment available in these labs in posted at the department’s website at [www.sonoma.edu/engineering](http://www.sonoma.edu/engineering). In spite of some of the equipment in these labs being a little old, these facilities are still an excellent resource for instruction, research and development and more than fulfill the needs of the MSCES as well as BSES program.

C. LIBRARY
The SSU library is well equipped with IT, media and reference resources to support the MSCES and ES programs. The funding for the department for acquisition of books has steadily increased with the increase in the enrollment in its programs (MSCES+BSES). The department uses the funds allocated to it primarily to enhance its book-holdings. This funding for each of the last two academic years was about $3600. The number of students as well as faculty in the department being quite small so far, the expense of IEEE periodicals and journals is not justifiable. Therefore, this need is met by individual subscriptions to the IEEE Digital Library. An additional resource available is ACM Digital Library which the SSU Library subscribes to on recommendation of the Department of Computer Science.

D. STAFF
The Department has office staff of one half time Administrative Coordinator, Ms. Jennifer Aaseth, to manage the office. At its present size, it is sufficient to fulfill the department’s needs. The department also has one full time Lab Manager/Network Analyst, Mr. Shahram Marivani, to manage and maintain labs, purchase and acquisition of equipment, instruments, components and parts and assist faculty and students in the laboratories. Mr. Marivani also maintains department and School’s website. The total amount of work is more than can be handled by one full time person, although Mr. Marivani has been able to manage it so far. Soon in the near future, need for additional help in the laboratories will become apparent. Hopefully, we will be able to meet that need by hiring some student assistants.

E. FACULTY DEVELOPMENT AND SUPPORT
The department encourages its faculty members not only to stay current but also to advance the state-of-the art in their fields of interest, to integrate the new results of their work and in the field into their instructional material and engage students in their R&D activities for mutual benefit. The department encourages them to attend conferences and short courses and engage in the activities of the professional societies that advance their professional interests and standings. The department provides funding for at least one travel per year for such activities and for additional travel if resources are available.
V. The Student Body, Its Recruitment, Enrollment and Graduation Status
The Program admits students with bachelor’s degrees in one of many disciplines. Therefore, the student body is very diverse. So far, the Program has attracted students with bachelor’s degrees in electrical engineering, computer engineering, mechanical engineering, civil engineering, computer science, physics, chemistry, mathematics and biochemistry. Therefore, preparation level of these students varies significantly. Those with deficiencies are required to take prerequisite courses varying from 3 units to 18 units. About 60% of the students are part time students who are employed full time in the local industries, about 20% are full time international students and 20% are the students from Sonoma County either full time of part time who are not employed full time. For these reasons, a cohort operation, as was envisioned when the program was proposed, could not become a reality. The academic load of the students varies from 3 units to 9 units of graduate-level work, or prerequisite work or a mix of the two. Therefore, graduation time of the students will also vary greatly; generally, from two years to four years. The student body is quite diverse in culture, ethnicity and nationality. By gender, 54% of the graduated and current students are male and 46% are female.

The to-date enrollment and graduation data of the MSCES students in the program is given below in Table 1. As seen in this table, since its inception in Fall 2001, a total of 205 students were admitted in the program of which only 88 (43%) students actually joined the program. Only 61 students, i.e., 70% of these 88 students (or only 30% of 205

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<td>n/a</td>
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<tr>
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<td><strong>Totals</strong></td>
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<td>50</td>
<td>24</td>
<td>27</td>
<td>15</td>
<td>91</td>
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<td>46</td>
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</table>
admitted) have actually continued in the program after joining. Of these 61 students, 46 students have graduated by December 2008 and 15 students are currently in the program. The column marked ‘Inactive’ gives the number of students who never responded one way or the other after being admitted. The above data is also presented in graphical form in the Attachment F to see the trend in enrollment and graduation.

Significant student recruitment effort has been made since the inception of the program which included creating department website giving all the programmatic information, making presentations in various local industries, mailing flyers to four year colleges and universities in USA, India and China offering engineering programs and advertising in the local newspaper. While the program attracted many students from the local industries in its beginning years, this clientele started declining rapidly first with the downturn of Telecom industries in the local area and then with the downturn of the economy in general. The program admits a significant number of international students most of whom do not join the program due the lack of financial assistance.

Recently, efforts have been started to develop a multi-level collaboration with institutions abroad that may also help in attracting more international students to our program. In this effort, a number of institutions listed in the Attachment G were visited in December 2008. As a result an MOU was signed with SJ College of Engineering, Mysore, India and several mutual visits and interactions took place between the faculty of the two institution and a program for continuous joint work has been chalked out. A copy of the MOU is given in the Attachment H.

Majority of the students choose design project option (Plan B) for their culminating experience and a minority of them lab and technical report experience (Plan C). Very few chose to go for thesis option (Plan A) in the early years of the program and none has in the last few years. A list of theses, project reports and technical reports from the graduated students along with their advisors’ names and employer information (if available) is given in the Attachment I.

VI. Industry and community support and resources

The MSCES program was started with the support from industries and community in the Sonoma County area. A list of these supporters, past and/or present donors and supporters is given in the Attachment J. The support has come in the form of cash and in-kind donations such as equipment, components and laboratory supplies. Highly qualified engineers and scientists from the area formed a pool of possible instructors to teach courses and guide master’s project. An Advisory Board, given in the Attachment K, advises the program on the educational needs of the industry and businesses, technological trends, new programs needed, etc. The local industries offer internships to the MSCES students and job opportunities upon graduation. Another example of such support is sponsorship of a lecture series by the Agilent Technologies of Santa Rosa, CA for the benefit of faculty, students and community as illustrated in the Attachment L. In the last few meetings of the Board, its members highlighted the rapidly growing field of biotechnology and emphasized on a need to have a master’s level program to address educational needs of this technology. This
recommendation was studied and such a need was assessed. As a result, the MSCES program is in the process of adding a new track in bio-engineering. It is expected that offering of this specialization will start in Fall ’09.

The above support was significant in the beginning years of the program but kept declining with down turn in the economy and telecom industries. Never-the-less, we are assured by the local industries about their interest in supporting this program as their economic situation improves.

VII. Assessment & Findings

The assessment of the MSCES program has been done based on one-to-one meetings with the students, exit interviews after their graduation and alumni surveys. Employer surveys have not been possible since none of the alumni gave us any contact information of their employers for this purpose. Of the two alumni surveys conducted, the responses were received only for the second one after multiple reminders and requests. The questionnaire for this survey is given in the Attachment M and consists of eight questions. The responses for questions 1 to 6 are given in the Attachment N and those for 7 and 8 are given in the Attachment O. The average results of the first four questions on the survey are:

1. Before entering the MSCES program, to what degree did you expect the program to meet your goals and objectives?
   73.6%
2. After completing the program, to what degree were your goals and objectives met?
   83.3%
3. To what degree has the MSCES program enhanced your technical ability at your work?
   65.27%
4. To what degree the MSCES program has aided in your professional advancement?
   73.6%.

These results indicate that in general, the program has been successful in its mission but can be improved further. Considering the fact that 60% of the students were working professional with several years of experience, relatively medium range scores on questions three and five quite significant. These match well with the findings of the one-on-one interviews with the students and exit interviews.

Similarly, the concerns expressed by the students and alumni in the interviews and survey were also, in general, the same. Some of these concerns are:

1. High turn-over of the regular faculty
2. Too high a percentage of courses being taught by the Adjunct Faculty
3. More realistic projects and hand-on work needed.
4. Not enough courses being offered in each area of interest.

With the hiring of two new faculty members and half-time transfer of two faculty members from other departments are expected to address at least the first three of the above concerns successfully. The fourth concern emanates from the fact that the student enrollment in the
program since last four years has been small and declining. As a result, the number of students populating each course is quite small (generally, 3 to 8) even when only four or five graduate courses are offered. Therefore, the program cannot sustain offering more than four or five graduate courses each semester until sufficient increase in the student enrollment.

VIII. External Review, Faculty Response and Action Plan

Dr. Ramkrishna (Ram) Nunna, Associate Dean, College of Engineering, and, Professor, Department of Electrical and Computer Engineering, California State University, Fresno, CA was the External Reviewer for the Program. The internal program review report was sent to Dr. Nunna on Feb. 12, ’09 and his visit for on-site review took place during March 26-27, ’09 period. Dr. Nunna’s report was received on June 18, ’09 and is given in Appendix Q. Dr. Nunna’s review was very thorough and in-depth and his recommendations very meaningful and useful for the improvement, growth and advancement of the MSCES Program. The MSCES faculty has accepted his recommendations and has revised the action plan accordingly. Given below is a summary of Dr. Nunna’s findings and recommendations and the Faculty’s response and action plan for the next five year.

a. Faculty

Findings and recommendations:

• Faculty needs to be actively involved in the program and their Professional development needs should be addressed.
• Have a faculty retreat to address various faculty responsibilities and how to share them.

Response:
• The new faculty has already begun taking a keen interest in the program activities.

Action Plan:
• A faculty retreat will be planned before the end of the current academic year to develop a strategy for a successful operation of the programs, sharing of the responsibilities professional development of the new faculty.

b. Curriculum

Findings and recommendations:

• The two existing tracks may not be sustainable due to low enrollment and adding a new track may be stretching too thin although it has potential to increase enrollment.
• Assessment of learning outcomes and program effectiveness needs to be addressed.
• Revise core curriculum with the addition of bioengineering track, add a business related course and formalize the internship requirement to make the program more effective as well as attractive.

Response:
• The two existing tracks are necessary to meet the needs of the hightech industries in the North Bay Region whose support was instrumental in starting the Program. Further, the current resources are sufficient to sustain the Program and the trend appears to be increasing enrollment.
• The addition of Bioengineering track will mean three additional courses per year to be offered. This need can be easily met by the current regular and adjunct faculty using the additional tuition revenue generated.
• We agree that there has been lack of an effective assessment strategy because manpower shortage as well as lack of expertise in this area.

**Action Plan:**
• The faculty is already preparing a proposal to revise the curriculum accordingly to be effective in Fall ’10.
• The Program will address assessment issues and design and implement an effective protocol for this purpose within the next two years.
• The above revision will allow the three tracks to be recognized as PSM Programs and give them significant publicity and make them eligible for special NSF funding. A proposal is being submitted to obtain this funding.

c. **Laboratory**

**Findings and recommendations:**
• The laboratory infrastructure has become old and needs to be refreshed.
• Computer in the labs need to be replaced immediately.

**Response:**
• These issues have been recognized and discussed several times with Dean Rahimi over the last two years. Dean Rahimi promised to do his best to address these needs. Recently, he provided funds to replace 50 of the about 120 old computer in our laboratories.

**Action Plan:**
• We will continue to bring this up with Dean Rahimi and also try to get support from the Industries to make equipment and computer refresh possible.

d. **Students and Enrollment**

**Findings:**
• Students want more course choices and separate degrees of Electrical engineering and Computer Science as opposed to Computer and Engineering Science.
• In the absence of financial support, it will be difficult to attract good graduate students, particularly foreign students.
• Enforce student advising and conduct student group meetings, use students as ambassadors for the Program and market BS students in other disciplines at SSU.
• Explore 4+1 program and nearby military bases and attracting veterans.

**Response and Action Plan:**
• Our course offerings have come down from six to four per semester due to low enrollment. With the addition of bioengineering track and increase in enrollment, we will try to improve it significantly.
• We have been hesitant in putting advising hold on adult professional. We will seek some other ways to accomplish effective advising, mentoring and getting the students engaged much more with the faculty and increase their role as our ambassadors.
• We will also explore the possibility of 4+1 program (which may take several years) and attracting students from the nearby military bases and veterans and attracting students from other BS disciplines within SSU.
## Attachment A

Matrix Showing Learning Objective Components of the CES Courses

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<thead>
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<th>CES Courses</th>
<th>Learning Objectives</th>
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<td><strong>Core courses</strong></td>
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<td>432</td>
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<td>440</td>
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<td><strong>Other courses</strong></td>
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<tr>
<td>599</td>
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</table>
Attachment B

List of Track Courses

Communications and Photonics Track Courses
• CES 430: Photonics
• CES 500: Queuing and Transform Theory
• CES 532: Advanced Semiconductor and Photonics Devices
• CES 540: Digital Data Transmission
• CES 542: Digital Signal Processing
• CES 543: Optical Fiber Communications
• CES 544: Wireless Communications
• CES 546: Data Compression
• CES 547: Digital Switching: Techniques and Architectures
• CES 550: Integrated Digital Networks
• CES 552: Network Architecture and Protocols
• CES 554: Broadband Access Technology
• CES 558: Multicasting on the Internet
• CES 590: Selected Topics in Communications and Photonics

Computer Hardware and Software Systems
• CES 500: Queuing and Transform Theory
• CES 510: Intelligent Systems Design
• CES 512: Theory of Software Systems
• CES 514: Data Mining
• CES 516: High Performance Computing
• CES 520: Embedded Systems
• CES 522: VLSI Design
• CES 524: Advanced Computer Architecture
• CES 530: Analog and Digital Microelectronics
• CES 546: Data Compression
• CES 592: Selected Topics in Hardware and Software Systems

The courses are selected with the approval of the student’s faculty advisor to ensure they form a cohesive plan of study in the desired subject area.
Attachment C

The Engineering Science Faculty at SSU

The Department of Engineering Science currently has six regular faculty members and four participating faculty members (Associated Faculty) from the departments of Computer Science, Mathematics and Physics and Astronomy. In addition, it has 14 adjunct faculty from the high tech industries, 12 in the local area and two in the South Bay area. A list of these faculty members is given below.

**Regular Faculty:**
Dr. Jagan P. Agrawal, Ph.D. (EE), Professor  
Dr. Farid Farahmand, Ph.D. (EE), Assistant Professor  
Dr. Mohammad Haider, Ph.D. (EE), Assistant Professor  
Dr. Bala Ravikumar, B.S.(EE) and Ph.D. (CS), Professor  
Dr. Saeid Rahimi, Ph.D. (Physics), Professor  
Dr. Shally Saraf, Ph.D. (EE), Assistant Professor

**Associated Faculty**
Dr. Elaine McDonald, Ph.D. (Math), Professor, Dept. of Mathematics.  
Dr. Hongtao Shi, Ph.D. (Physics), Assistant Professor, Dept. of Physics & Astronomy  
Dr. Lynn Stauffer, Ph.D. (CS), Professor, Dept. of Computer Science  
Dr. Sunil Tiwari, Ph.D. (Math), Professor, Dept. of Mathematics

**Adjunct Faculty:**
Dr. Gaurav Agrawal, Ph.D. (CST)  
Mr. Alan Bloom, M.S. (EE), Consultant  
Mr. Jim Brede, M.S.(EE), Tellabs  
Mr. Eric Drucker, M.S. (EE), Agilent Technologies  
Dr. Sazia Eliza, Ph.D. (EE), Consultant  
Dr. Donald Estreich, Ph.D. (EE), Agilent Technologies  
Dr. Atul Garg, Ph.D. (EE), Nvidia  
Dr. Tim Griesser, Ph.D. (EE), Agilent Technologies  
Dr. Leonid Grigorov, Ph.D. (Biophysics), Consultant  
Dr. Mark Johnson, Ph.D. (CS), Consultant  
Dr. Ali M. Kujoory, Ph.D. (EE), Alcatel  
Dr. Salam Marougi, Ph.D. (EE), Agilent Technologies  
Mr. Chris Miller, M.S. (EE), Agilent Technologies  
Dr. Mario Righi, Ph.D. (EE), Agilent Technologies  
Dr. Giampaolo Tardioli, Ph.D. (EE), Agilent Technologies
Attachment D

Retention, Tenure and Promotion (RTP) Criteria
of the
Department of Engineering Science

The University RTP Policy specifies expectations from a SSU faculty member, probationary or being considered for promotion, in broad and general terms in the following four categories:

I. Teaching Effectiveness
II. Scholarly and Professional Activities
III. University Service, and,
IV. Public Service.

This document specifies expectations in the above categories specifically for the faculty members of the Department of Engineering Science within the University guidelines. It also specifies additional expectations for promotion from Assistant Professor to Associate Professor and Associate Professor to Professor level. At the end, it specifies the supporting documents that need to be part of the RTP document.

The Engineering Science Department will follow these criteria in its employment of the university-wide RTP guidelines. This document is meant to be used in conjunction with the document outlining current university-wide RTP policies. Nothing in this document shall contravene the university-wide procedures.

I. Criteria for Teaching Effectiveness:

1. Teach a wide spectrum of undergraduate and graduate courses to meet the needs of the department.
2. Actively participate in developing instructional laboratories related to the undergraduate and graduate courses and wherever possible make use of the laboratories in the courses with no explicit laboratory component.
3. Supervise and guide undergraduate students on their senior design projects and graduate students on their theses or design projects.
4. Demonstrate excellence in teaching through a combination of metrics including student evaluations, peer evaluations and compelling self-evaluation. The expectation is that student evaluations average better than 3.75 in RTP-evaluated courses. Any criteria where scores are below 3.75 needs to be addressed in self-assessment, and future performance improvements.
5. Demonstrate a commitment to improving student outcomes beyond the classroom. For example having help sessions for students, monitoring their performance closely and mentoring, etc.
6. Peer observation of the courses must have at least ‘good’ rating in each category and ‘very good’ overall.
7. Collaborate with the local industries to strengthen the academic programs, for example, utilizing the expertise of adjunct faculty to develop labs, teach labs and/or courses, revise curriculum, design student projects, etc.

II. Criteria for Scholarly and Professional Activities:

1. Develop a research program to support the areas of interest to the department. This may include, among other things, developing necessary research laboratories (shared by instructional laboratories), writing grant proposals to obtain external/internal funding from a variety of public and private sources, writing and publishing papers, etc.

2. It is expected that over the period of six probationary years, the faculty member would have published at least two papers in recognized refereed journals and presented at least two papers in the related professional conferences. Multi-author papers will be weighted proportionately.

3. Involve undergraduate and graduate students in one’s research.

4. Design senior design projects for undergraduate students, help identify and define master’s projects and theses, supervise and guide students in completing these projects, preparing reports and, possibly, publishing the results in appropriate conference proceedings and/or journals.

5. Work towards developing collaboration with the local industries to stimulate their interest in research and utilize their expertise to strengthen and support research activities at SSU.

4. Criteria for University Service:

A. Development of the Department

a. Actively participate in keeping the BS and MS curriculum current and in developing new program(s) as and when desired.

b. Advise and mentor undergraduate and graduate students assigned by the department.

c. Actively participate in designing and implementing strategies to recruit students at bachelor’s as well as master’s level. This may include activities such as participating in MESA program, meeting with high school/JC counselors, visiting high schools, organizing activities to attract participation by the high school students, advising Engineering Science Student Club, developing collaboration with institutions abroad, etc.

d. Actively participate in planning for accreditation of the BSES program, maintaining accreditation once it is granted, program assessment, etc.

B. Service in the School-wide and Campus-wide Committees

It is considered important to contribute to the School and University through service in the School-wide and Campus-wide Committees. It is expected that during the first half of the probationary years the faculty member’s focus will be more on service to the department and less on School and University. But during the second half of the probationary years, the faculty member’s service to School and University will increase to be proportionate to the service to the department.
IV. Criteria for Public Service:

Giving voluntary service to the community (beyond SSU and academics) for the benefit and welfare of the community. Some examples of community service are: speaking at community organizations, preparing and holding community-accessible events such as “Engineering Science Fair”, serving on local nonacademic committees and advising, volunteering for teaching in schools, coaching, etc.

Expectations for Promotion from Associate Professor to Professor:
For promotion from Associate Professor to Professor, the faculty member will be expected that after being appointed to the rank of Associate Professor, the faculty member would have (i) published at least two papers in recognized refereed and presented at least two papers in the related professional conferences, (ii) actively sought funding from external agencies for research and/or curriculum and laboratory development, (ii) been a good mentor to his/her junior colleagues, (ii) displayed leadership role in developing the department and moving it to excellence, and, (iv) displayed leadership in developing industry collaboration.

Expected Supporting Documents:
The faculty member must address each point in the above four categories and submit supporting documents as evidence of the contributions and accomplishments. It is strongly recommended that a candidate going through the RTP process keep a folder (accessible only to the department RTP committee) that contains copies of research articles (published or submitted), grant proposals, proposals for collaboration or partnership etc. Alternatively, these documents may be maintained by the candidate online through his/her web site.
Attachment E

The MSCES Laboratories

The Program has the following eight state-of-the-art laboratories in various areas of interest located in the Cerent Engineering Sciences Complex in Salazar Hall.

- AFC Access Technologies Laboratory
- Agilent Technologies Communications Laboratory
- Rolf Ilsley Photonics Laboratory
- William Keck Microanalysis Laboratory
- Networking Laboratory
- Human-Computer Interaction Laboratory
- Software Engineering Laboratory
- Electronics Laboratory

These labs provide excellent facilities to our students and faculty for hands-on experience, research, project development, implementation and testing. Many of these labs are sponsored by the high tech industries in the North Bay region of the San Francisco area.
Attachment F

To date Enrollment and Graduation Data of the MS-CES Student

![Graph showing enrollment and graduation data over terms]

- **Applied**
- **Admitted**
- **Denied**
- **Declined**
- **Dropped**
- **Active**
- **Inactive**
- **Graduates**
Attachment G

Indian Institutions Being Considered for Collaboration

1. Thakur College of Engineering & Technology
   Kandivali East, Mumbai-400101   Maharashtra  INDIA
   Website:  www.thakureducation.org

2. Bharat Institute of Engineering & Technology
   Maganpally, Ibrahimpatnam,
   R.R. District – 501510,   A.P.   INDIA
   Website:  www.biet.ac.in

3. Easwari Engineering College
   Bharathi Salai, Ramapuram, Chennai – 600 089   INDIA
   Website:  www.easwariengineeringcollegesrmgroup.org

4. Sri Jayachamarajendra College of Engineering
   Mysore – 570 006  Karnataka  INDIA
   Website:  www.szjce.ac.in

5. M.S. Ramaiah Institute of Technology
   Vidya Soudha, M.S.R.I.T. Post
   Bangalore – 560 054   Karnataka  INDIA
   Website:  www.msrit.edu

6. PES Institute of Technology
   100 – ft Ring Road, BSK III Stage
   Bangalore – 560 085   Karnataka  INDIA
   Website:  www.pes.edu

7. Indian Institute of Technology Madras
   Chennai, Tamilnadu  INDIA
   Website:  www.iitm.ac.in

8. Meenakshi Sundararajan Engineering College
   363, Arcot Road, Kodambakkam, Chennai – 600 024 Tamilnadu  INDIA
   Website:  www.msec.edu.in

9. Amity University
   Super Express Highway
   Noida - 201303, UP    INDIA
   Website:  www.amity.edu

10. Dwarkadas J. Sanghvi College of Engineering
    Vile Parle (West), Mumbai 400 056  Maharashtra INDIA
    Website:  www.djscoe.org

11. Sri Venkateswara College of Engineering
    3 Pennalur, Sriperumbudur – 602 105, Tamilnadu   INDIA
    Website:  www.svce.ac.in
Attachment H

A Generic Copy of the MOU for Developing Collaboration with Other Institutions
A MEMORANDUM OF UNDERSTANDING (MOU)

between

Sonoma State University
School of Science and Technology
Rohnert Park, California, 94928
USA

&

XXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXX
India

XXXXXX, 2008
This MEMORANDUM OF UNDERSTANDING (MOU) is entered into this 1st day of April 2008, by and between the COLLEGE OF SCIENCE AND TECHNOLOGY, SONOMA STATE UNIVERSITY, hereinafter referred to as SSU, and XXXXXXXXXXXXXXXXXXXXX, hereinafter referred to as XXXX. The MOU is presented here in four parts: (i) Introduction, (ii) Goals and Objectives, (iii) Mechanism to Implement the MOU, and, (iv) Financial Support and, then, the MOU is duly signed by the appropriate officials of the two Institutions.

Introduction

The purpose of this MOU is to create a collaborative academic environment and mechanism between the two institutions that will encourage and support development of exchange programs between the Electrical/Electronics/Computer Engineering Departments of the two Institutions. The goals and objectives of the exchange programs will be to:

- enhance the quality of education and advance knowledge in these areas through joint research and development activities and sharing of resources in these areas,
- provide opportunity to the students and faculty of the two institutions for professional and cultural exchange and, thereby, exploit the benefits of globalization,
- provide advanced education opportunities to the students of one institution at the other (partner) institution, and,
- develop and offer joint short and/or long term joint academic programs which exploit academic strength of both the institutions.

A more detailed description of the MOU is given below.

Goals and Objectives

Depending upon mutual interest and resources available, the exchange program between SSU and XXXX may consist of some or all of the following elements.

1. Student Study Abroad:
   a. Graduating students from XXXX are encouraged to come to SSU to pursue their master’s degree. SSU will encourage its graduating students to explore higher education opportunities at XXXX.
   b. Students at one institution are provided with opportunity to study one or more semesters at the partner institution as a continuation of their degree/diploma programs at their home institution.

2. Faculty Exchange:
   c. Periodically, a faculty member from XXXX will be invited to visit SSU for a period of one or two semesters and participate in teaching and/or research with a SSU faculty. The same opportunity will be extended by XXXX to the SSU faculty.
d. Possibility of faculty exchange for a semester/academic year will be explored between the two institutions. If an exchange takes place, each exchange faculty will take-over the teaching and research responsibilities of his/her counterpart at the visiting institution.

3. Collaborative Research:
The institutions will encourage and support their faculty members to engage in joint research projects. This may be on an existing funded or unfunded project, writing a joint research proposal for external funding, visiting each other’s institutions for using research facilities at the institutions and doing intensive research.

4. Joint Academic Programs:
The institutions will explore developing joint degree/diploma/certificate programs. It will also include offering degree program of one institution in its original form at the partner institution in a collaborative manner. This may involve instructions in residence, distance learning or a combination of both.

Mechanism to Implement the MOU

A. Program Coordinators:
Each institution will name one person as the Coordinator of the exchange program between SSU and XXXX.

B. Adjunct Faculty Members:
Each Coordinator will identify appropriate and interested faculty members at his/her institution who could become adjunct faculty at the partner institution and carry it through the process of adjunct faculty appointment at the partner institution.

C. Information Distribution and Publicity:
Each Coordinator will be responsible to publicize the faculty exchange program among the appropriate faculty members and the student study abroad/student exchange program among the students of his/her institution. This may involve distribution of flyers, postings on bulletin boards, general announcements in the meetings, faculty/student associations, e-mail broadcasts, postings on institution’s and departments’ websites, newspaper announcements, postal mailings, etc. The institutions may also use these programs as a catalyst for the recruitment of students and faculty, obtaining grants and writing proposals for project funding.

D. Administrative Oversight:
Each Coordinator will periodically report the state of the exchange program to his/her Institution’s Administrator (the undersigned). The Administrators will then assess the situation and decide on the steps, if necessary, to strengthen the program.

Financial Support

Financial support to implement various elements of this MOU depends on the availability of funds at the two institutions. Neither institution is making any commitment to provide financial support by signing this MOU.
It is expected that in the case of the Study Abroad portion of the program, the participating students will be responsible for their respective expenses including tuition at the one or both the institutions. However, whenever funding is available, either or both the institution might provide partial or full support.

In the case of joint academic programs, the two institutions will have a separate MOU for each program which will include details of how the two institutions will share expenses and revenue generated by the program.

Duly signed by the Officers of:

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

______________________________       Date:______________
Name, Title

SONOMA STATE UNIVERSITY

______________________________       Date:______________
Name, Title
Attachment I

List of Project Reports, Theses and Technical Reports

The following is a list of design project reports, theses and technical reports prepared by the MSCES students who have graduated. The place of employment for these graduates is the last known to the department and may have changed.

PROJECT REPORTS

Advisor: Dr. Jingxian Wu
Employed by: Teknovus

Advisor: Dr. B. Ravikumar
Employed by: Unknown

Advisor: Dr. B. Ravikumar
Employed by: Model N Inc., Redwood City, CA

Advisor: Dr. B. Ravikumar
Employed by: Unknown

Advisor: Dr. Jingxian Wu
Employed by: Unknown

Advisor: Dr. Jingxian Wu
Employed by: Unknown

Advisor: Dr. Jingxian Wu
Employed by: Unknown

Srilatha Tangirala, "Finding Discrepancies on Citation of Author Names in Digital Bibliography," Spring 2007.
Advisor: Dr. B. Ravikumar
Employed by: Nortel Networks, Santa Clara, CA.
Advisor: Dr. Jingxian Wu
Employed by: Unknown

Advisor: Dr. B. Ravikumar
Employed by: CyberTran International, Oakland, CA

Advisor: Dr. B. Ravikumar
Employed by: Unknown

Advisor: Dr. B. Ravikumar
Employed by: Tellabs Inc., Petaluma, CA.

Advisor: Dr. Reza Khosravani
Employed by: L-3 Communications, Sonoma, CA.

Advisor: Dr. Saeid Rahimi
Employed by: Unknown

Advisor: Dr. Reza Khosravani
Employed by: Calix, Petaluma, CA.

Advisors: Dr. Jagan Agrawal and Mr. Jim Brede
Employed by: Unknown

Advisor: Dr. B. Ravikumar
Employed by: Calix, Petaluma, CA.

Advisor: Dr. B. Ravikumar
Employed by: PNI Corporation, Santa Rosa, CA.

Phuong Nguyen, "Design of a Micro-Processor Based Power Meter for a Switched Distributed Antenna Based on Radio Over Fiber Networks for Mobile Communications," Fall 2004.
Advisor: Dr. Jagan Agrawal
Employed by: Sigmatel, Austin, Texas.

Advisor: Dr. Reza Khosravani
Employed by: Raza Microelectronics, San Jose, CA.

Advisor: Dr. Reza Khosravani
Employed by: QUALCOMM Incorporated, San Diego, CA.

Advisor: Dr. B. Ravikumar
Employed by: Unknown

Jie Liu, "Relations Between System Performance Parameters In Ultra Long Distance Fiber Optic Communication Systems," Summer 2004.
Advisor: Dr. Reza Khosravani
Employed by: Calix, Petaluma, CA.

Advisor: Dr. Bryant Hichwa
Employed by: CalDive International

Advisor: Dr. Bryant Hichwa
Employed by: Unknown

Advisors: Dr. Atul Garg and Dr. Jagan Agrawal
Employed by: Caymus Corporation, Petaluma, CA.

Advisor: Dr. Reza Khosravani
School: Currently a Ph.D. student at the University of Southern California, Los Angeles.

Advisor: Dr. B. Ravikumar
Employed by: Cisco Systems, Petaluma, CA.
THESES

Advisors: Dr. Reza Khosravani
Employed by: Cisco Systems, Petaluma, CA.

Advisors: Dr. Bryant Hichwa
Employed by: Quickset, Chicago, Illinois

Advisors: Dr. Jagan Agrawal and Dr. B. Ravikumar.
Employed by: Nortel Networks, Irvine, CA.

Advisors: Dr. Jagan Agrawal
Employed by: Sprint-Nextel in Vancouver, B.C., Canada

Advisors: Dr. B. Ravikumar
School: Received her Ph.D. in Computer Science from the University of California, Davis in May 2008.

Advisors: Dr. B. Ravikumar
Employed by: Corman Technologies, Santa Rosa, CA.

TECHNICAL REPORTS

Megan Arnold, "Multicore Design," Fall 2007
Employed by: Unknown

Employed by: Cisco Systems, Petaluma, CA.

Employed by: Unknown
Employed by: Bio-Rad, Benicia, CA.

Employed by: Unknown

Ravi Sivalingam, "Fiber to the Premise (FTTP),” Spring 2005.
Employed by: Tellabs, Atlanta, Georgia.

Employed by: Unknown

Employed by: Cisco Systems, Research Triangle Park, N.C.
School: Currently pursuing his MBA at the University of North Carolina.
Attachment J

The Past and Present Donors of The Program

Community Members:
Ajaib and Sue Bhadare
Tom and Sherri Corker
Paul Elliott
Mike and Deborah Hatfield
Chip and Terri Lee Roberson
David and Virginia Scott
Michael K. Troy and Judy Shubin

Industries:
Advanced Fibre Communications
OCLI/JDS Uniphase
Agilent Technologies
ARM Systems
Client Services & Integration (CSI)
KnowledgePoint
Schurter Incorporated
Technologent
TrueTime
Westwave Communications
Xandex Inc.
Attachment K

Engineering Science Advisory Board (ESAB)

The local industries, businesses and community support and collaborate with the department in fulfilling its educational mission through an Engineering Science Advisory Board (ESAB). The mission of the ESAB is to advise and assist the Engineering Science Department in achieving excellence in teaching, research and development, promoting technology education in the North Bay region of San Francisco area at all educational levels and enhancing interaction and collaboration with the local industries, businesses and community.

The ES Advisory Board helps the ES Department plan and launch new degree programs such as a program in the area of biotechnology. Periodically, the Board will advise the ES Department regarding its future directions, educational needs of the industry, foster collaboration between academia and local industries to enhance R&D efforts, and other similar tasks of mutual interest. The following table lists the current members of ESAB.

<table>
<thead>
<tr>
<th>Members of the ES Advisory Board</th>
</tr>
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<tbody>
<tr>
<td><strong>Company</strong></td>
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**Community Members**

<table>
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<th>Community Members</th>
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<tr>
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<td>20</td>
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**Sonoma State**

<table>
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<th>Sonoma State</th>
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</thead>
<tbody>
<tr>
<td>21</td>
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<tr>
<td>22</td>
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</tbody>
</table>
Attachment L

Engineering Science Lecture Series

Sponsored by the Agilent Technologies

The ES Lecture Series has been designed to benefit the Sonoma State student and faculty in the School of Science and Technology, high tech and biotech industries and related businesses and community in the North Bay Region.

***

The Lecture Series will cover a broad range of topics with focus on recent developments and trends and will provide a platform for interaction and exchange of ideas among the audience.

***

Attendance is open to the students, faculty and staff of SSU and other academic institutions, engineers and scientists from the industries, members of the Business Community and members of the Community, in general.

***

Days & Dates: First and Third Thursday of every month
Venue: Cerent Engineering Science Complex, Salazar Hall Room #2009A
Reception: 4:00 to 4:30 p.m.
Lecture: 4:30 to 5:15 p.m.
Q&A: 5:15 to 5:30 p.m.

***

For more information, please contact the ES Department at (707) 664-2030 or engineering@sonoma.edu.
Program Assessment by the MSCES Alumni

The following note and questionnaire was sent to all the MSCES alumni for their assessment of the effectiveness of the MSCES program. The results obtained are presented in the Attachments N for questions 1 to 6 and in the Attachment O for questions 7 and 8.

*********************************************************************
Your input will help us determine the effectiveness of the MSCES program and in improving its quality. If you would like to review the current details of the program, please visit our website at www.sonoma.edu/engineering.

1. Before entering the MSCES program, to what degree did you expect the program to meet your goals and objectives?
   ___100%   ___75%   ___50%   ___25%   ___0%

2. After completing the program, to what degree were your goals and objectives met?
   ___100%   ___75%   ___50%   ___25%   ___0%

3. To what degree has the MSCES program enhanced your technical ability at your work?
   ___100%   ___75%   ___50%   ___25%   ___0%

4. To what degree the MSCES program has aided in your professional advancement?
   ___100%   ___75%   ___50%   ___25%   ___0%

1. Would you recommend others to join this program to obtain a master’s degree with specialization in Communications and Photonics or Computer Hardware and Software Systems?
   _____Yes     _____No

2. What, in your opinion, were the weaknesses of the program while you were in the program?

3. What, in your opinion, were the strong points of the program while you were in the program?

4. What recommendations would you make to improve quality of the MSCES program?
## Attachment N
### Alumni Questionaire Responses

<table>
<thead>
<tr>
<th>Time &amp; Date</th>
<th>Question numbers</th>
<th>1</th>
<th>2</th>
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<th>5</th>
<th>6</th>
<th>Comments</th>
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<td></td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>Yes</td>
<td></td>
<td></td>
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<tr>
<td>Wed Sep 26 11:39:58 2007</td>
<td></td>
<td>75%</td>
<td>100%</td>
<td>50%</td>
<td>100%</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wed Sep 26 11:39:59 2007</td>
<td></td>
<td>100%</td>
<td>75%</td>
<td>50%</td>
<td>50%</td>
<td>Yes</td>
<td>Less of industry involvement.</td>
<td></td>
</tr>
<tr>
<td>Wed Sep 26 11:50:57 2007</td>
<td></td>
<td>75%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>Yes</td>
<td>Projects for each course should include more Programming. This would help in real time for people who are seeking jobs in development.</td>
<td></td>
</tr>
<tr>
<td>Wed Sep 26 11:52:54 2007</td>
<td></td>
<td>50%</td>
<td>100%</td>
<td>25%</td>
<td>0%</td>
<td>Yes</td>
<td>The attrition rate of the dept. instructors</td>
<td></td>
</tr>
<tr>
<td>Wed Sep 26 12:13:02 2007</td>
<td></td>
<td>75%</td>
<td>75%</td>
<td>75%</td>
<td>75%</td>
<td>Yes</td>
<td>Professors coming and going too much.</td>
<td></td>
</tr>
<tr>
<td>Wed Sep 26 12:34:35 2007</td>
<td></td>
<td>100%</td>
<td>75%</td>
<td>50%</td>
<td>50%</td>
<td>Yes</td>
<td>some teachers were hard to access.</td>
<td></td>
</tr>
<tr>
<td>Wed Sep 26 12:37:29 2007</td>
<td></td>
<td>50%</td>
<td>75%</td>
<td>75%</td>
<td>75%</td>
<td>Yes</td>
<td>Didn't have many options in terms of course selection.</td>
<td></td>
</tr>
<tr>
<td>Wed Sep 26 13:30:09 2007</td>
<td></td>
<td>100%</td>
<td>100%</td>
<td>25%</td>
<td>75%</td>
<td>Yes</td>
<td>The number of courses offered is rather limited</td>
<td></td>
</tr>
<tr>
<td>Wed Sep 26 15:16:57 2007</td>
<td></td>
<td>50%</td>
<td>25%</td>
<td>25%</td>
<td>50%</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wed Sep 26 16:28:53 2007</td>
<td></td>
<td>50%</td>
<td>100%</td>
<td>75%</td>
<td>75%</td>
<td>Yes</td>
<td>Some lectures were lack of depth, such as the embedded system. Some lectures are very well prepared, but no text book or detailed paper or document to support the powerpoint slides, such as broadband communications. Lab support should be stronger with more hands-on help to students</td>
<td></td>
</tr>
</tbody>
</table>
I feel many subjects are out-dated and less choice to choose subjects relevant to current communications area.

should get more telecom company involved (providing intern opportunity)

the classes need to be more hands-on

Lesser choices for Computer Hardware and Software Systems track. Few of the courses were not updated to the current technology and materials followed. They followed the same material and same assignments every year.
Attachment O
Alumni Questionnaire Responses

<table>
<thead>
<tr>
<th>Time &amp; Date</th>
<th>Question Numbers</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fri Aug 31 13:59:17 2007</td>
<td>7</td>
<td>None</td>
</tr>
<tr>
<td>Wed Sep 26 11:39:58 2007</td>
<td>8</td>
<td>Latest industry driven technologies like, wireless, nano technology, video encoding and decoding technologies etc</td>
</tr>
<tr>
<td>Wed Sep 26 11:39:59 2007</td>
<td></td>
<td>Optics lab and cisco presence</td>
</tr>
<tr>
<td>Wed Sep 26 11:50:57 2007</td>
<td></td>
<td>Latest industry driven technologies like, wireless, nano technology, video encoding and decoding technologies etc</td>
</tr>
<tr>
<td>Networking lab, Broadband labs, the equipment from the companies (cisco, Alcatel etc.) really helped to implement what we learned from the subjects (theoretically)</td>
<td></td>
<td>Labs and Projects should be more realistic, should adapt to the latest technology that is used in the real world. Like wireless technologies is a good course but it would've been really useful if we could learn the latest tech like blue tooth while also learning the old ones.</td>
</tr>
<tr>
<td>Wed Sep 26 11:52:54 2007</td>
<td></td>
<td>While on staff, the dept. instructors were top notch.</td>
</tr>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wed Sep 26 12:13:02 2007</td>
<td></td>
<td>Job placement. A more solid core of professors. I had a lot of professors coming in from other departments, and it made me feel as though the class may have been compromised. I think all around it would be better for all departments at SSU if it expanded it's MSCES faculty even if they were mainly teaching in other departments. I'm hoping that the addition of the undergrad program will do this.</td>
</tr>
<tr>
<td>Networking lab, Bringing in people from the field to teach, but it could use some work.</td>
<td></td>
<td>More practical project opportunities or ideas as graduation project or thesis. Latest tech trend in telecomm and other industry.</td>
</tr>
<tr>
<td>Wed Sep 26 12:34:35 2007</td>
<td></td>
<td>Practical training on networking equipment was very useful. The programming assignments helped alot to improve my coding skills.</td>
</tr>
<tr>
<td>Wed Sep 26 13:30:09 2007</td>
<td></td>
<td>Offer more courses</td>
</tr>
<tr>
<td>Flexibilities and it is very easy to approach the teaching staff at SSU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wed Sep 26 15:16:57 2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practical to industrial needs.</td>
<td></td>
<td>More practical project opportunities or ideas as graduation project or thesis. Latest tech trend in telecomm and other industry.</td>
</tr>
<tr>
<td>Connection with local employers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wed Sep 26 16:28:53 2007</td>
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<td></td>
</tr>
</tbody>
</table>
Apart from internal faculty getting external faulty and offering topics in their professional area was the great strength of the program. Always re-evaluate courses to have relevance to industry needs. Take feedback from tech leads from Industry in the form of conference or meetings.

Small group study

Professors are nice make the class more practical

Communications track was very solid with adequate lab facilities and course work. This makes it easier to get a job in our county. We have some of the greatest professors who are dedicated and are willing to go the length by updating their materials and providing challenging assignments. This keeps the students interested and hard-working. Lab or programming work or other hands on experience for all of the courses will give a better grasp on the subject. Maybe some field trips related to the course work. More instructors will give opportunity to different perspectives and more options.

Coordination and cooperation of all professors.
Attachment P

Curriculum Vitae of the Following Regular and Adjunct Faculty

Regular Faculty:
Dr. Jagan Agrawal
Dr. Farid Farahmand
Dr. Mohammad Haider
Dr. Saeid Rahimi
Dr. Bala Ravikumar
Dr. Shailendhar Saraf

Adjunct Faculty:
Dr. Sazia Eliza
Dr. Ali Kujoory
Mr. Gordon Stuck
Jagan P. Agrawal

Department of Engineering Science
School of Science and Technology
Sonoma State University
1801 E. Cotati Ave.
Rohnert Park, Ca 94928-3609

Office Telephone: (707)664-2030 or 4438
Office Fax: (707)664-2361
E-mail: jagan.agrawal@sonoma.edu

EDUCATION:
Ph.D., Electrical Engineering, North Carolina State University, 1972.
M.S., Electrical Engineering, University of Cincinnati, 1969.
B.E., Electrical Engineering, University of Allahabad (India), 1966.

EMPLOYMENT:

Academic
Professor and Chairman of Engineering Science Department and Director, MSCES Program, Sonoma State University, 2001 - present.
Chairman, Department of Telecommunications Networking, UMKC, July ‘95- Dec. ’96.
Professor, University of Louisiana , Lafayette, 1984-1985.
Associate Professor, University of Louisiana, Lafayette,1980-1984.
Visiting Assistant Professor, North Carolina State University, 1978-1980.
Assistant Professor, Indian Institute of Technology, Madras, 1972-1978.
Associate Lecturer, MLNR Engineering College (India), 1966-1967.

Industrial
United Telecom (Sprint Corp.), Kansas City, MO., Summer of 1986.
Bell Northern Research (NORTEL), Richardson, TX, Summer of 1990.

AREAS OF INTEREST:
ATM Networking and Switching, Broadband and Narrowband ISDN, Legacy and ATM Local Area Networks, Network Architecture and Protocols, Multicasting in the Internet, Fixed and Mobile Wireless Networking and Communications, Network Interconnection, Multiprocessor Interconnection Networks, Special Purpose Hardware, Digital Communications.

PATENTS:


SYSTEM DEVELOPMENT:
• Low bit rate video encoder, N.C. State, 1970-72.
• 8-point FFT processor at IIT Madras, 1975-76.
• Low bit rate ADPCM coder for log-PCM speech (on AMD system 29), N.C. State, 1978-80.

MAJOR RESEARCH PROJECTS:
Principal Investigator of the project, "Design and Analysis of an Efficient and Economical Integrated Services Digital Network (ISDN)," sponsored jointly by United Telecommunications, Inc. and the State of Missouri (Missouri Research Assistance Act), July 1986-June 1988 ($185,257).
Principal Investigator of the project, "Designing Efficient Integrated Local Area Networks (ILAN) in the ISDN Environment Supporting Signaling System No. 7," sponsored jointly by United Telecommunications, Inc. and the State of Missouri (Missouri Research Assistance Act), Jan. 1988-June 1989 ($60,000).
NSF CISE equipment grant #CDA-9422092 of $55,000 (with Medhi, Sohraby, Place & Shen), May 1995.
Principal Investigator of the project, “An Efficient Multicasting Architecture for Internet and Broadband Networks,” Faculty Research Grant, UMKC Research Board, July 1, 1998-June 30, 1999 ($5,500).

ACADEMIC PROGRAM DEVELOPMENT:
• Developed MSCES and BSES programs at Sonoma State University
• Major role in the development of the B.S. and M.S. in Computer Science with Telecommunications emphasis, and, Interdisciplinary Ph.D. programs in Telecommunications Networking and Computer Networking Disciplines at UMKC.
• Major role in the development of the B.S., M.S. and Ph.D. programs in computer engineering at USL
• Developed (i) digital techniques, and, (ii) digital signal processing laboratories at IIT, Madras.
• Developed and taught undergraduate/graduate courses at various institutions, some of which are:

  Integrated Digital Networks (BISDN/NISDN)
  Digital Switching: Techniques and Architectures
  Multicasting in the Internet
  Network Architecture
  Digital Cellular Communications
  Advanced Telecommunications Networking
  Fiber Optics Communications
Local Area Networks
Computer Organization/Architecture
Digital System Design
Digital Signal Processing
Communications Engineering
Information Theory
Computer Communications

• Participated in distance learning program at UMKC.
• Participated in ABET accreditation process of the BSEE program at USL
• Developed, organized and conducted the following short courses for professional development at several institutions, IEEE IPCCC (Phoenix) and for ICA (Dallas):
  - Digital Signal Processing
  - FFT: Theory, Hardware, and Application
  - Radar Signal Processing
  - Digital Computer Design
  - Telecommunications Networking
  - Voice Communications
  - Broadband ATM Networking and Switching.

DOCTORAL AND MASTERS' STUDENT GUIDANCE
Supervised/co-supervised master's (more than 50) and doctoral students (about 8) since 1972 at IIT, Madras, N.C. State, USL, UMKC and Sonoma State.

ADMINISTRATIVE EXPERIENCE:
• Chairman, Dept. of Engineering Science and Director, MS-CES Program, Sonoma State University (May 2001 -present)
• Chairman, Dept. of Telecommunications Networking, UMKC (July 1995-Dec. 1996)
• Graduate Coordinator/Officer (USL, UMKC and SSU)
• Graduate Committee Chairman (USL, UMKC and SSU)
• Member, Council of Chairs, School of Science and Technology, SSU
• Member Engineering Science Advisory Board, Sonoma State University
• Member, Adhoc committee for the development of Interdisciplinary Ph.D. program, UMKC
• Member, Adhoc committee for formation of UM Research Board, UM System
• Member, Search committee for Dean, Graduate School, UMKC
• Member, Ph.D. Executive Committee, UMKC (6 years)
• Member, Graduate Officers' Committee, UMKC (3 years)
• Member, CSTP Appointment, Promotion, Tenure and Review Committee, UMKC
• Member, Graduate Council, UMKC (3 years)
• Member, UMKC Scholar and Chancellor's Awards Committee
• Member Faculty Senate, UMKC (3 years)
• Member COPE Review Committee, UMKC (3 years)
• Member, Parking Task Force Committee, UMKC (3 years)
• Member, Undergraduate Council (3 years)
• Member, University Committee on Academic Affairs and Standards, USL
• Member, Adhoc Committee on Research Institute Formation, USL
• Member, College of Engineering Graduate Committee, USL
• As Principle Investigator, responsible for management of the funded projects at IIT Madras, Univ. of Southwestern Louisiana, and Univ. of Missouri-KC.
• Coordination, conducting and administration of several short courses at IIT & UMKC.
• Member, Facility Planning Committee, CSTP, UMKC
• Group Leader (Signal Processing): Responsible for recruitment and management of the scientists and staff, equipment and component procurement at IIT Madras.
• Served on many other adhoc committees from time to time at various institutions.
GRADUATE/DOCTORAL FACULTY:
Member of the Graduate/Doctoral Faculty at IIT Madras (1972-78), N.C. State University (1978-80), Univ. of Southwestern Louisiana (1980-85), and UMKC (1985-2001).

PROFESSIONAL ACTIVITIES:
• Senior Member, Institute of Electrical and Electronics Engineers (IEEE).
• Member, IEEE Communications Society.
• Presented invited seminars and series of lectures on advanced technical topics at a number of organizations in USA, India, China, Japan and Philippines.
• Consulted with GTE Labs, United Telecom (Sprint), BNR (NORTEL) Center for Development of Telematics (India), Intel.
• Co-Program chair for ACM CSC '92.
• Member, Technical Program Committee and session chair in several conferences.
• Member of the IEEE NETWORK editorial Board, 1993-96.
• Program Committee Member for IEEE IPCCC’97.
• Tutorials Chair for IEEE IPCCC’98.
• Member of the editorial Board, International J. of Communications Systems, since Jan. ‘98.
• Program Co-Chair, IEEE IPCCC’99.

HONORS AND AWARDS:
Bell Northern Research (BNR) Summer sabbatical, 1990.
Member, National Radar Council subcommittee on radar signal processing, Department of Electronics, Govt. of India, 1978.
Recipient of Merit Scholarship throughout school and college career.

PERSONAL:
DOB: 6/14/45                      Home address: 8006 Mammoth Dr.
Citizenship: USA                 Rohnert Park, Ca 94928-8178
Marital Status: Married           Home Telephone: Tel: 707-793-9380
PUBLICATIONS:


# Dr. Farid Farahmand

**Department of Engineering Science**  
Sonoma State University  
1801 East Cotati Ave.  
Rohnert Park, CA 94928  
USA  

**E-mail:** farid.farahmand@sonoma.edu  
**Web:** [http://www.sonoma.edu/users/f/farahman](http://www.sonoma.edu/users/f/farahman/)  
**Work:** (707) 664-3491  
**Fax:** (707) 664-2361

## EDUCATION

<table>
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<tr>
<th>Degree</th>
<th>Institution</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ph.D. Electrical Engineering</td>
<td>The University of Texas at Dallas, Texas, USA</td>
<td>May 2005</td>
</tr>
<tr>
<td>M.S. Electrical Engineering</td>
<td>The University of Texas at Dallas, Texas, USA</td>
<td>May 1997</td>
</tr>
<tr>
<td>B.S Electrical Engineering</td>
<td>The University of Texas at Dallas, Texas, USA</td>
<td>May 1993</td>
</tr>
</tbody>
</table>

## RESEARCH INTERESTS

General research interests include:

- Optical Networks: Architecture and protocol design for optical burst-switched networks, focusing on network performance.
- SONET Network: SONET rings and protection mechanisms; hitless switching and restoration; multi-ring SONET Networks; stack architectures; system synchronization; clock recovery schemes.
- Wireless and Sensor Networks: Applications; architecture; power reduction; protocols.
- Radio Burst Switching: Data plane design and protocols; architecture; quality of service; network performance.

## ACADEMIC EXPERIENCE

<table>
<thead>
<tr>
<th>Institution</th>
<th>City, State</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sonoma State University</td>
<td>Rohnert Park, CA</td>
<td>2008-Present</td>
</tr>
<tr>
<td>Central Connecticut State University</td>
<td>New Britain, CT,</td>
<td>2005 – 2008</td>
</tr>
<tr>
<td>Brookhaven College</td>
<td>Farmers Branch, Texas,</td>
<td>2003 – 2005</td>
</tr>
<tr>
<td>Roya Academy</td>
<td>Dallas, Texas,</td>
<td>2002 – 2003</td>
</tr>
<tr>
<td>The University of Texas at Dallas</td>
<td>Richardson, Texas,</td>
<td>2003 – 2004</td>
</tr>
</tbody>
</table>
Research Assistant; Center of Advanced Telecommunications Systems and Services. Duties included:
- Design, analysis, and simulation of architectures and protocols for the next generation optical Internet including the optical burst-switched networks
- Design, software simulation, and hardware implementation of scheduling techniques for optical burst switching
- Design of energy-efficient routing algorithms and secure communication protocols for sensor networks

Richland College | Richardson, Texas, | 2000 – 2001
Adjunct Faculty; Courses include:
- Electronics I & II
- Introduction to SONET (non-credit)

INDUSTRY EXPERIENCE

ALCATEL USA, Plano, Texas
Research Scientist | 2000 – 2003
- Responsible for system development, design, and evaluation of a 2.5 Tbit WDM optical packet system.
  - Developed, designed, simulated, and evaluated the packet scheduler unit.
  - Studied and simulated a variety of contention resolution schemes and feedback schemes for optical packet switching.
  - Conducted a comprehensive survey on Network Processor technology, architecture, capacity, and emerging advances.
  - Conducted a detailed study of multi-ring SONET networks, stack architectures, and their performance.
  - Studied, simulated, and prototyped a fast scheduler unit for the Satellite system.

System Synchronization Design Engineer | 1997 – 2000
- Defined system synchronization requirements for the OC-192 system.
  - Designed a stratum 3E master clock module for the OC-192 system.
  - Designed a digital phase locked loop (PLL) utilizing Altera FPGA.
  - Designed an E1/T1 sub-board to manipulate the SSM in BITS clocks.
  - Characterized the system synchronization characteristics in different timing modes.

DSC CORPORATION, Plano, Texas
- Designed several tributary modules including DS3, STS, OC-3, OC-12 boards for different transmission systems such as OC-48 and OC-192.
- Developed, designed, and characterized PLL circuits at different rates for different modules.
- Developed a micro-controller sub-board and power supply circuit common for various modules.
- Utilized Cadence and Mentor frameworks for schematic capture, simulation, layout, timing, and thermal analysis.
- Designed and developed automated tests using Labview and HP Basic for manufacturing.
# SELECTED RESEARCH PUBLICATIONS

## Book Chapters

<p>| | |</p>
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## Book Review

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## Journals

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## Conferences

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<tbody>
<tr>
<td>15.</td>
<td>Farid Farahmand, Qiong Zhang, and Jason Jue, “Relay-Node Placement in Vehicular Wireless Burst Switching Networks,” <em>Proceedings, IEEE Globecom 2008</em></td>
</tr>
</tbody>
</table>

22. Farid Farahmand, Qiong Zhang, and Jason P. Jue, “A Closed-Loop Rate-based Contention Control for Optical Burst Switched Networks,” Proceedings, BroadNets 2005
Non-technical Publications

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>35.</td>
<td>Farid Farahmand, Cell Phone-Based Distance Learning: Technical challenges and impacts, 2008 conference on Service-Learning in Engineering.</td>
</tr>
</tbody>
</table>

Invited Presentations and Industry Talks

<p>| | |</p>
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<tbody>
<tr>
<td>2-</td>
<td>Farid Farahmand, Delay Tolerant Networks: Architecture; Applications, and Challenges; Farid Farahmand - School of Technology, Polytechnic Institute of Castelo Branco, Branco, Portugal; June 2008</td>
</tr>
<tr>
<td>3-</td>
<td>Farid Farahmand, Vehicular Wireless Burst Switching Networks; Farid Farahmand - North Florida University, March. 2007</td>
</tr>
<tr>
<td>4-</td>
<td>Farid Farahmand, Burst Switching: Advantages and Challenges; Farid Farahmand - Louisiana Tech, Feb. 2007</td>
</tr>
<tr>
<td>5-</td>
<td>Farid Farahmand, “Vehicular Wireless Burst Switching Networks,” The University of Texas at Dallas, June, 2007.</td>
</tr>
<tr>
<td>8-</td>
<td>Farid Farahmand, “Characterizing the System Timing in SONET Networks, ANT symposium,” Alcatel USA, Richardson, TX, January 2003.</td>
</tr>
<tr>
<td>11-</td>
<td>Farid Farahmand, “Network Processor and its Applications in High-speed Routers,” Alcatel USA, Richardson, TX, September 2002.</td>
</tr>
</tbody>
</table>
SELECTED PATENTS

PROFESSIONAL INVOLvements
- 2009 International Workshop on Network Assurance and Security Services in Ubiquitous Environnments (NASSUE-2009); 2009 TCP
- Journal of Communications (JCM); Special Issue on Delay Tolerant Networks, Architecture, and Applications; guest editor - 2009
- Director of the Advanced Internet Technology in the Interests of Society Laboratory (AITIS Lab)
- Member of CCSU Climate Action Coalition – focusing on teaching and research related to renewable energy sources
- Co-chair of International Conference on Communication Theory, Reliability, and Quality of Service (CTRQ 2008), June 29 - July 5, 2008 - Bucharest, Romania.
- Member of Engineers Without Borders / Advisor to the student chapter at CCSU (2008)
- Co-Director of Roosting Engineering, Science, and Technology (BEST) at CCSU (2006)
- Board member of Roya Academy
- Technical Advisor to EMTech Solutions, Dallas, TX
- Supervising various graduate and undergraduate capstone and research/scholarly activities
- Co-Director of Affordable Internet Access Project for Under Developed Communities (Africa) Project
- Member of CCSU’s Middle East Studies Committee
- Member of CCSU’s Future Classroom Project
- Member of Connecticut State University Information Technology Committee
- Active reviewer for a number of journals and conferences, including

<table>
<thead>
<tr>
<th>Journals</th>
<th>Journals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IEEE Journal of Networking (JON) 2007</td>
</tr>
</tbody>
</table>
## COLLABORATORS

- Dr. Jason P. Jue, University of Texas at Dallas  
- Dr. Timucin Ozugur, AT&T  
- Dr. Qiong Zhang, Arizona State University  
- Dr. Joel Rodrigues, University of Beira Interior, Portugal  
- Dr. Kejie Lu, University of Puerto Rico  
- Dr. Tao Zhang, NY Institute of Technology  
- Dr. Hossein Bidgoli, California State University  
- Dr. Vinod M. Vokkarane, University of Massachusetts, Dartmouth  
- Dr. Peter LeMaire, Central Connecticut State University  
- Dr. Mate-Kole, Central Connecticut State University

## AWARDED GRANTS

- Verizon Wireless Research Grant, 2006  
- Faculty Research Grant, summer 2006  
- Student Faculty Research Grant, 2006  
- Student Faculty Research Grant, 2007  
- Curriculum Development Grant, 2007  
- Minority Recruitment & Mentoring Grant, 2007  
- Connecticut State University Assessment of Learning for Educational Improvement Grant, 2007

## PERSONAL

- World Traveler  
- Domestic Cyclist  
- Local Runner  
- U.S. Citizen
Mohammad Rafiqul Haider
Assistant Professor
Department of Engineering Science
Sonoma State University
E-mail: haider@sonoma.edu

Contact Information

<table>
<thead>
<tr>
<th>Home Address:</th>
<th>School Address:</th>
</tr>
</thead>
<tbody>
<tr>
<td>4949 Snyder Lane</td>
<td>Dept. of Engineering Science</td>
</tr>
<tr>
<td>Apt No. 64</td>
<td>2010B Salazar Hall</td>
</tr>
<tr>
<td>Park Ridge Apartment Homes, Rohnert Park, CA 94928</td>
<td>1801 E Cotati Avenue</td>
</tr>
<tr>
<td>Phone: 865-621-7083 (cell)</td>
<td>Rohnert Park, CA 94928</td>
</tr>
<tr>
<td></td>
<td>Phone: 707-664-3462 (off)</td>
</tr>
</tbody>
</table>

Research Interests

- Analog and RF Circuit Design for Sensors and Biomedical instrumentation.
- Inductive power-link for battery less operation of implanted sensors.
- Low-power frequency divider for wireless applications.
- Low-power injection-locked transmitter for Wireless Sensor Network (WSN) and Wireless Body Area Network (WBAN).

Education

Ph. D., Electrical Engineering, The University of Tennessee, Knoxville, December 2008
M. Sc., Electrical Engineering, Bangladesh University of Engineering and Technology, April 2004
B. Sc., Electrical Engineering, Bangladesh University of Engineering and Technology, 2002 (positioned 8th among 116 students)

Professional Affiliation

- Student Member of IEEE
- Member of IEEE Circuits and Systems Society
- Member of Eta Kappa Nu

Professional Experience

- January 2009 to date
  — Assistant Professor, Department of Engineering Science, Sonoma State University, Rohnert Park, CA 94928
- August 2006 to present
  — Research Assistant – Center for Musculoskeletal Research Center (CMR), The University of Tennessee, Knoxville, TN 37996
- August 2005 to August 2006
  — Teaching Assistant – Department of Electrical Engineering and Computer Science, The University of Tennessee, Knoxville, TN 37996
- August 2005 to November 2005
  — Research Assistant - Image Processing and Pattern Recognition Group, The University of Tennessee, Knoxville, TN 37996
March 2005 to date (On leave now)
— **Assistant Professor** – Department of Electrical and Electronic Engineering, Bangladesh University of Engineering and Technology, Bangladesh

August 2002 to March 2005
— **Lecturer** – Department of Electrical and Electronic Engineering, Bangladesh University of Engineering and Technology, Bangladesh

**Involvement in Funded Project Works**

- **CMOS Read-out Circuit for MEMS-based Capacitive Pressure Sensor used in Orthopedic implant**

This project focuses on the design and development of a high resolution, wide dynamic range, multi-channel CMOS read-out circuit for MEMS-based capacitive pressure sensor designed for orthopedic implant. I have designed and implemented a capacitance to voltage converter that will be incorporated with an already developed custom ADC to generate digital pulses. The capacitance to voltage converter circuit consists of charge amplifier, rectifiers, filters and instrumentation amplifier. Differential structure provides elimination of even order harmonics. The developed circuit has a sensitivity of 1mV/500aF. The recent goal of this project focuses on the incorporation of 1000 sensors and multi-channel operation of the system.

- **CMOS Read-out Circuit for implantable Glucose Sensor**

This project focuses on the development of a low-power current signal processing circuit for an implanted glucose sensor. The developed read-out circuit consists of current controlled oscillator, frequency divider and potentiostat. The circuit is capable of processing a sensor current (in range of 0.2 μA to 2 μA) and generating digital pulses depending upon the sensor current. The recent goal of this project focuses on the development of wireless link and multi-channel operation of the system.

**Technical Skills**

**A. CAD Tools Experience**

- CADENCE – (Spectre, SpectreRF, HSPICE, EldoRF) For Integrated Circuit Design
- ORCAD – (Capture) For Circuit Simulation
- EasyPC, PCB Artist – For Printed Circuit Board Design
- ASITIC – For Design and Modeling of RF passive components; mainly inductor, capacitor and transformer for integrated circuit design.
- ADS RF Tool – For RF Circuit Design.
- LABVIEW – For real time data processing and visualization.
- SENTAURUS and MEDICI – For Simulation of Device Characteristics.

**B. Computer Skills and Programming Languages**

- WindowsXP, Linux, Unix, Office2007
- MATLAB, Simulink, MATHCAD
- C/C++, FORTRAN, JAVA, Visual Basic
- Verilog, VHDL
- Assembly Language

**C. Skill of Tools**

- RF probing and s-parameter measurement using Vector Network Analyzer (VNA) in Oak Ridge National Lab (ORNL)
- MEMS Capacitance Measurement using LCR Meter
- Phase Noise Measurement using Spectrum Analyzer
- And other general equipments for electrical testing.
Curriculum Vitae

Mohammad Rafiqul Haider

Research Experience

Analog and RF Circuit Design for Biomedical Instrumentation

- Optimal MOSFET dimension formulation for a self-cascode structure with capacitive feedback
- Calculation of oscillation frequency and required transconductance to startup for a self-cascode oscillator structure
- Mathematical formulation of Phase Noise variation with capacitance ratio for a self-cascode oscillator structure
- Development of Low-Voltage Low-Power injection-locked transmitter using back-gate coupling and self-cascode structure
- Simulink implementation of the behavioral model of a back-gate coupled injection-locked oscillator
- Study suitable RF band for wireless medical telemetry
- Development of a low-power CMOS read-out circuit with FSK/OOK telemetry option for an inductively powered implant system
- Development of a CMOS read-out circuit for a MEMS-based capacitive pressure sensor with high resolution and high degree of linearity
- Simulink implementation of the behavioral model of the CMOS read-out circuit for MEMS-based capacitive pressure sensor

Optical Signal Processing and Pattern Recognition

- Shifted phase-encoded fringe adjusted Joint Transform Correlation with efficient space band-width product for multiple target detection
- Enhanced class-associative generalized fringe-adjusted Joint Transform Correlation for multiple target detection
- Class-associative Color Pattern Recognition using shifted phase-encoded Joint Transform Correlation
- Morelet wavelet filter based Joint Transform Correlator with phase-encoding and post-processing techniques
- Intensity invariant pattern recognition using normalized Joint Transform Correlation

Teaching Experience

- **Assistant Professor** in the department of Electrical and Electronic Engineering, Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh
  — Offering **Electronic Course** for Computer Engineering Students (**Course Summary**: Band Diagram, pn junction theory, Diode, Rectifier, Transistors, Transistors Configuration, Biasing, Amplifiers, Frequency Response, JFET, MOSFET, Oscillators, OpAmps applications, SCR, TRIAC, DIAC, 3-phase Rectifiers, Familiarization of basic pn junction fabrication process)
  — Supervising Undergraduate Students for Project Works

- **Lecturer** in the department of Electrical and Electronic Engineering, Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh
  — Offering **Laboratory Courses** for Undergraduate Students (Basic VLSI Design, Telecommunication, Electronics I & II, Electrical Machines and Control Theory)
  — Supervising Undergraduate Students for Project Works
  — Preparation of Instruction Manual for Laboratory Course (Electronics II and Telecommunication)

- **Graduate Teaching Assistant (GTA)** in the department of Electrical Engineering and Computer Science, The University of Tennessee, Knoxville, TN 37996-2100, USA.

Integrated Circuit (IC) Design Experience

- Familiar with design, simulation and testing of analog, digital and RF integrated circuits.
Familiar with PDK installation (TSMC 0.35 μm process and IBM7RF process)

The following is the list of some of my designed integrated circuits (ICs):

1. **Design of a low-power current signal processing circuit for MEMS-based capacitive pressure sensor using TSMC 0.35 μm bulk CMOS process (2007).**

A CMOS read-out circuit has been implemented in 0.35 μm process for a MEMS based capacitive pressure sensor. The circuit can produce a dc output depending upon the sensor variation. The system manifests two charge amplifiers, two diode rectifiers, two RC filters and one instrumentation amplifier. The circuit has a resolution of 1mV/500aF.

2. **Two Stage Operational Transconductance Amplifier (OTA) with Miller Compensation realized in AMI 0.5 μm bulk CMOS process (2007).**

A two stage OTA with single ended output has been realized in 0.5 μm process. Miller compensation has been used increase the stability of the OTA. The OTA has been simulated for different temperatures and process corners with different load conditions. The designed OTA has the following performance criteria: Supply voltage 5 volt, total current 250 μA, Gain > 75 dB, GBW >10 MHz, PM 55°, ICMR 0 to 4V, Input offset voltage 300 μV, PSRR^+ > 95 dB, PSRR^- > 80 dB, SW 6V/µS, CMRR > 83 dB, Input Noise < 20 nV/√Hz.

3. **Bandgap Voltage Reference Circuit using Weak Inversion MOSFET realized in AMI 0.5 μm bulk CMOS process (2007).**

The bandgap reference has been formed by using CTAT and PTAT reference. The PTAT reference current is generated by using a MOSFET operating in the weak inversion region. The generated PTAT current is driven into a resistive load and a diode. $V_{REF}$ is in the range of 1.25+11%, Total supply current $I_T < 30μA$, $T_{VREF} < 200ppm/°C$.

4. **Design of a 915 MHz Injection-Locked oscillator using AMI 0.5 μm bulk CMOS process (2007).**

5. **Design of a Sensor Signal Read-out Circuit and Telemetry unit using AMI 0.5 μm bulk CMOS process (2006).**

6. **915 MHz Low Noise Amplifier (LNA) using AMI 0.5 μm bulk CMOS process (2006).**


7. **Design of an Analog Counter using AMI 0.5 μm bulk CMOS process (2006).**

8. **4-bit Digital Counter using AMI 0.5 μm bulk CMOS process (2006).**

4 bit synchronous up counter using T flip flop. T flip flop comprises of transmission gate and D flip flop. The counter can operate with an input clock frequency of 1 MHz and 10 pF load.

**Printed Circuit Board (PCB) Design Experience**

- Familiar with design and implementation of both analog and digital circuits on printed circuit boards.
- Familiar with efficient routing, soldering components and providing shielding on the board.
- Familiar of designing circuits on flexible substrate (polyimide) PCB to place the circuit on the conformal plane of an orthopedic implant.

The following is the list of some of my designed PCBs.

- Differential Capacitance to Voltage Converter (FR4 Board) - version 1, 2, 3
Curriculum Vitae

Mohammad Rafiqul Haider

Experience in Book Writing

I am a co-author of an accepted proposal of book writing entitled “Sensors and Low-Power Signal Processing” which will be published by Springer. An overview of the book is as follows:

Low-power sensors and their applications in various fields ranging from military to civilian lives have made tremendous progress in the recent years. Low-power and extended battery life are the key focuses for long term, reliable and hassle-free operation of these sensors. In this monograph, a general concept of a sensor’s working principle and how it could be used for various applications will be covered. A discussion of the emerging sensor technologies including chemical, electro-chemical and MEMS-based sensors will also be included. We will present some of the design challenges of low-power analog circuits and the schemes to overcome them. Monolithic integration and short-range wireless telemetry will also be covered in this monograph. We hope to provide the reader with a basic understanding of sensors and some of the emerging technologies in the related field.

Proposal Writing

- **(MMPC Proposal)** Miniaturized Low-power Wireless Transdermal Sensor for Metabolic Monitoring in Mice
  
  I have the active participation in the writing of a MMPC proposal with the joint collaboration of the university of Tennessee and the university of Connecticut. The proposal got excellent points from the reviewers and there was a potential chance of this proposal to be funded but due to a conflict among the collaborators, the proposal had to be withdrawn at the last moment.

- **(MEP Proposal)**

- **(SiGe Proposal)** A Σ-Δ Fractional-N Frequency Synthesizer Using Wideband Injection Locked Frequency Divider for GSM/WCDMA/WLAN/Bluetooth Applications

Short List of Courses Undertaken

- **Advanced CMOS RF Circuit Design** (RF system theory, Impedance Matching Network, RF MOS devices, RF Passive Components, LNA, VCO, PLL, RF Standards, Receiver Architectures)
- **Advanced Analog Electronics I** (Crystal Structure, pn junction theory, Drift & Diffusion Current, JFET, MOS capacitor, MOSFET, MOSFET models, LED and LASER, LED design)
- **Advanced Analog Electronics II** (Current Mirrors, Current Sources and Sinks, EKV Model, Voltage Reference, Bandgap Voltage Reference Design, OTA Design, Output Buffer)
- **Introduction to Basic VLSI Design** (MOSFET theory, Logic Gates, Delay, Rise and Fall Time, Adder, Flip Flop, Counter, Familiarization with Cadence Tool)
- **Computer Aided Design of VLSI System I** (Custom Cell Layout, Data Path, Loading Effects, Soft Macro, Custom Analog Circuit, Floor Planning, Automatic Cell Generation, Signal Integrity and Cross talk)
- **Basic Electronics I, II & III** (pn junction, Diode, BJT, JFET, MOSFET, Device working principle, IV characteristics, Small Signal Analysis, Biasing, Amplifier, Frequency Response)
- **Power Electronics** (Power MOSFET, IGBT, SCR, TRIAC, DIAC, DC-DC converter, Switch Mode Power Supply (SMPS), INVERTER, Cyclo-Converter, RECTIFIER)
- **Control Theory**
- **Digital Signal Processing**
- **Telecommunications**
- **Digital Image Processing**
- **Biomedical Signal Processing**
- **Optical Fiber Communication**
Curriculum Vitae

Mohammad Rafiqul Haider

Thesis Works

➢ B. Sc. Thesis in 2002

<table>
<thead>
<tr>
<th>Title</th>
<th>Microprocessor-based Controller design using Kalman Filter.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institution</td>
<td>Bangladesh University of Engineering and Technology (BUET)</td>
</tr>
<tr>
<td>Advisor</td>
<td>Dr. Kazi Mujibur Rahman, Associate Professor, Department of Electrical and Electronic Engineering, Bangladesh University of Engineering and Technology, Dhaka, Bangladesh.</td>
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</table>

➢ M. Sc. Thesis in 2004

<table>
<thead>
<tr>
<th>Title</th>
<th>Three Dimensional Distortion Invariant Optical Pattern Recognition using Projection-slice Synthetic Discriminant Function.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institution</td>
<td>Bangladesh University of Engineering and Technology (BUET)</td>
</tr>
<tr>
<td>Advisor</td>
<td>Dr. Mohammed Nazrul Islam, Associate Professor, Department of Electrical and Electronic Engineering, Bangladesh University of Engineering and Technology, Dhaka, Bangladesh.</td>
</tr>
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➢ Ph. D. Dissertation (December 2008)

<table>
<thead>
<tr>
<th>Title</th>
<th>System-on-Package Low-Power Telemetry and Signal Conditioning unit for Biomedical Applications.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institution</td>
<td>The University of Tennessee (UTK)</td>
</tr>
<tr>
<td>Advisors</td>
<td>Dr. Syed K. Islam (Professor, Department of Electrical Engineering and Computer Science) and Dr. Mohamed R. Mahfouz (Assistant Professor, Department of Mechanical, Aerospace and Biomedical Engineering) The University of Tennessee, Knoxville, TN 37996-2100, USA.</td>
</tr>
</tbody>
</table>

List of Publications

❖ Publications on Analog and RF Circuit Design

Journals


Curriculum Vitae


Conferences


◇ Publications on Optical Signal processing and Pattern Recognition

Journals


Conferences


Conference Paper Presentation


Poster Presentation


Self Assessment

- Able to set priorities and routine tasks.
- Optimistic, confident and friendly as a person.
- Assertive and perspicuous in action and thoughts.
- High ethical standards and high sense of self-esteem.

Other Achievements and Honors

- **University Travel Award** for IEEE Sensors Conference, Atlanta, 2007 from GSS of the University of Tennessee, Knoxville, U. S. A.
- **Reviewer** of MWSCAS Conference 2008, Knoxville, Tennessee, U. S. A.
- **Reviewer** of ICECE Conference 2006, Dhaka, Bangladesh.
- **University Merit Scholarship** all through the eight semesters of my undergraduate study.
- I was in all the four **DEAN’S LISTs** published during my study period for academic excellence.
- Awarded all the **BUET Technical Scholarships** (Talent pool).
- **Dhaka Board Scholarship** for being scored 85.9% marks in HSC (Higher-secondary School Certificate) Examination.
- **Dhaka Board Scholarship** for being scored 88.1% marks in SSC (Secondary School Certificate) Examination.
- All pre SSC scholarships offered by the Bangladesh government.
- **Best Orator** prize in the District level during my study of secondary school.
- **Best Extemporaneous speech** prize in Sub-District Level during my study of secondary school.

List of Referees

- Dr. Jagan Agrawal
  Professor and Chair, Dept of Engineering Science
  Sonoma State University, Rohnert Park, CA 94928
  Phone: 707-664-4438
  E-mail: jagan.agrawal@sonoma.edu

- Dr. Syed K. Islam
  Associate Professor, Dept. of EECS
  The University of Tennessee, Knoxville, TN 37996-2100
  Phone: 865-974-8531 (Off)
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- Dr. Benjamin J. Blalock
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  The University of Tennessee, Knoxville, TN 37996-2100
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  E-mail: brittoncl@ornl.gov

• M. Nazrul Islam, PhD
  Research Scientist
  Old Dominion University Research Foundation
  4111 Monarch Way, Suite 203
  Norfolk, Virginia 23529
  Ph: 757-683-5451 (work), 757-583-1592 (home)
  Email: mislam@odu.edu
CURRICULUM VITAE

SAEID RAHIMI

Current Rank: Dean, School of Science and Technology
Tenured Professor of Physics, and Engineering Science
Field of Expertise: Semiconductor Physics, Optics & Electronics

Address: Work: School of Science & Technology
Sonoma State University
Rohnert Park, California 94928
Tel: (707) 664-2128; E-mail: saeid.rahimi@Sonoma.edu

Home: 4000 Susan Lane
Penngrove, CA 94951
Tel: (707) 795-9363; Mobile: (707) 328-1459

Birthdate/Citizenship: April 16, 1949/USA

Education
1981 Ph.D. in Solid State Physics, Department of Physics - Materials Research Laboratory- Pennsylvania State University, University Park, PA
1973 M.S. in Physics, Shiraz University, Shiraz, Iran
1971 B.S. in Physics, Shiraz University, Shiraz, Iran

Administrative and Academic Appointments
2000-Present Dean, School of Science and Technology, SSU. The school includes nine departments of biology, chemistry, computer science, engineering science, geology, kinesiology, mathematics, nursing, and physics & astronomy. In addition to its $6.5 million budget, Science and Technology has an average annual volume of $2.5 million in grants and contracts. The school has about 1,800 FTES, and over 170 full-time and part-time faculty and staff. The dean oversees 125,000 s.f. laboratories, classrooms and office space and manages the 470 acre Fairfield Osborne and the 3,600 acre Galbreath Wildlands Preserves

1999-2000 Interim Director, Masters Program in Computer and Engineering Science (MS-CES), School of Natural Sciences, SSU

1997-2000 Liaison of the SSU School of Natural Sciences with the North Bay region industries
Academic Appointments

2008-Present  Professor, Department of Engineering Science, SSU

Spring 1996  Acting Chair, Department of Physics and Astronomy, SSU

Fall 1992  Visiting professor, Lightwave Division, Hewlett Packard, Santa Rosa, CA

1990-Present  Professor, Department of Physics and Astronomy, SSU

1985-1990  Associate Professor, Department of Physics and Astronomy, SSU

1982-1985  Assistant Professor, Department of Physics and Astronomy, SSU

1981-1982  Postdoctoral Research Associate, Oregon Graduate Institute of Science and Technology, Beaverton, Oregon

1976-1981  Teaching and Research Assistant, Department of Physics, Materials Research Laboratory (MRL), Pennsylvania State University, University Park, PA.

1975-1976  Physics Instructor, National University of Iran, Tehran, Iran

1973-1975  Physics Instructor and Director of the Students' Affairs Office, Razi University, Kermanshah, Iran

1971-1973  Physics TA and Laboratory Instructor, Shiraz University, Shiraz, Iran

Fundraising and Grants (over $18 million)

- $60,000  CSU Engineering Academies for improving engineering student recruitment and curricular innovations (2008)

- $10,000 summer internship stipends for ten high school juniors to work with SSU faculty on research projects (2007). A joint effort with Sonoma County Office of Education (SCOE)

- $60,000 CSU Engineering Academies for improving engineering student recruitment and curricular innovations (2007)

- Agilent Technologies, $350,000 electronics and photonics test and measurement instruments. (May 2007)

- Agilent Technologies, $40,000 grant for scholarship and mentoring of 10 engineering science students and continuing the Engineering Science lecture series. (2006-2007)

- Secured $700,000 donation as matching fund for building an observatory on the Galbreath Wildlands Preserve. (January 2006)

- Agilent Technologies, $40,000 grant for scholarship and mentoring of 10 engineering science students and for establishing the new Engineering Science lecture series. (2005-2006)
• Agilent Technologies, $150,000 electronics and photonics test and measurement instruments. (June 2004)

• In collaboration with the SSU Vice President of Development, secured donation of 3,500 acres of a wild land preserve to SSU for the use of faculty and students of the biology, geology, physics & astronomy, geography, and environmental studies & planning. In addition to the $8 million property, the donors have agreed to provide SSU with $1 million endowment. The CSU Board of Trustees approved the project in March 2004. Raised $47,500 for the cost of due diligence. (2004)

• PI of a $300,000 Federal grant from the US Department of Education for further development of the new Communications and Photonics laboratory at the SSU Cerent Engineering Science complex (awarded Aug. 2003)

• PI of a $400,000 grant from the W.M. Keck Foundation, $400,000 for the Microanalysis Laboratory within the Cerent Engineering Science Complex at SSU (2002)

• Through establishing a private-public partnership between SSU and the local high tech industries and community, raised over $7 million for the School of Science and Technology and the self-supporting Masters of Science program in Computer and Engineering Science (MS-CES). The following donations resulted in over $4,000,000 endowment for the MS-CES program
  o Agilent Technologies, $1,000,000 gift in kind for the Lightwave Communications laboratory (2002). (MS-CES)
  o OCLI/JDSU, over $1,100,000 cash and gift in kind for the Photonics laboratory (2001-2002)
  o Advanced Fiber Communications, $1,100,000 for the Wireless/Broadband Communications (2000-2004). (MS-CES)
  o Six former Cerent (acquired by Cisco Systems) employees, $4,000,000 for the Engineering Science complex at SSU (2000-2004). (MS-CES)
  o Members of the North Bay community, industries, and companies, for the MS-CES program, $400,000 (2000-2004). (MS-CES)

Other Grants

• Lockheed/Martin student research grant ($4000) for a Study of Extreme Atmospheric Conditions on Wireless Communications, SSU (1999)

• Lockheed/Martin student research grant ($4800) for Development of Computer-Controlled Fiber Optic Interferometer Sensors, SSU (1998)

• SSU, FIPSE grant ($6500) for developing new and innovative courses (1997)

• SSU, Curriculum Innovation Grant ($2000) for developing Physics of Toys laboratory
• NSF grant ($34,000) for Further Development of the Solid State Laboratory in the Department of Physics and Astronomy, Sonoma State University (1985-1987)

• Joint Sonoma State University/Pennsylvania State University grant ($7,000) for the study of Space Charge Controlled Capacitance in Semiconductors (1987-1988)

• Hewlett-Packard Foundation Equipment grant ($15,300). A Low Frequency Impedance Analyzer was granted for the study of Frequency Dependence of Metal-Semiconductor-Metal Devices’ Capacitance (1989)

• Sonoma State Sponsored Programs grant ($4,500) for study of Effects of Deep Level Impurities on Differential Capacitance of Metal-Semiconductor-Metal Structures (spring 1989)

Honors, Recognition, and Nominations

• Spirit of Sonoma Award, North Bay Technology Roundtable, 2005

• SSU nominee, CSU Wang Family Award in the administrator category, 2002 – 2003

• CSU Bautzer Faculty Award for University Advancement, 2000

• Excellence in Education, Santa Rosa Chamber of Commerce, Aug. 1999

• Excellence in Teaching, SSU, May 1999

• Faculty Merit Increase, 1998, 1999

• Performance Salary Step Increase (PSSI), 1997

• Meritorious Performance and Professional Promise, SSU, 1985, 1986, and 1989

• Outstanding and Invaluable Service to the Community by Mike Thompson, Member of the U.S. House of Representatives, 1999

• Excellence in Education by Lynn Woolsey, Member of the U.S. House of Representatives, 1999

• Commitment, Enthusiasm, and Inspiration of Students at the University Level by Pat Wiggins, Member of the Seventh Assembly District, California State Legislature, 1999

• Excellence in Teaching, Graduate Teaching Assistant, Department of Physics, Pennsylvania State University, 1981

Leadership Experience in Academic, Budget, and Infrastructure

2008 Initiated and implemented a High School Summer Internship Program in collaboration with the Sonoma County Office of Education (SCOE). Ten top high school students from fifteen local high schools are selected to work on
research projects with ten Science & Technology faculty mentors in the fields of Science, Technology, Engineering and Mathematics (STEM)

2007 Initiated a formula-based process for budget and resource allocation to all nine departments within Science and Technology

2004-2006 $29,000,000 Darwin Hall Renovation Project: Oversaw and coordinated the academic planning processes for the design and transition phases of the complete remodel of the main SSU science building. Oversaw transition of faculty and staff of six departments out of the 100,000 sq. ft. Darwin Hall to temporary facilities at on-campus and off-campus locations. Coordinated the transition back to the renovated Darwin Hall. Making enrollment target during the construction period. Oversaw expenditure of $1.2 million equipment funds for biology, chemistry, computer science, geology, and physics & astronomy

2005 Strategic Planning for the School of Science and Technology 2005-2006

2004 Secured approval to establish the new department of Engineering Science as the ninth department within the School of Science and Technology

2004 In 2002 Co-proposed an undergraduate program in engineering science (BS-ES) with a concentration in electronics and communications. Secured approval of the proposal at the School of Science and Technology, SSU Academic Planning Committee, SSU Educational Policies Committee, and SSU Faculty Senate. The CSU Board of Trustees approved the proposal in March 2004

2003 Established the Academic Planning Committee for the School of Science and Technology

2002 Proposed creation of the Center for Research and Education in Science and Technology (CREST) within the school of Science and Technology. Approved, Dec. 2002

2002 Initiated and led the process of changing the name of the school from Natural Sciences to Science and Technology

2001 Organized and charged a group of faculty to design a Science Teacher Education Program (STEP) proposal. The proposal was approved at the SSU level, but encountered the recent Standards changes by the California Commission of Teacher Credentialing

1999-2001 Provided architects with the concept and helped them design an approximately $4 million, 16,000 sq. ft. engineering science complex for the MS-CES program and the School of Science and Technology

1997-1999 Initiated the concept and helped design the curriculum and secured the approval of a Masters of Science program in Computer and Engineering Science (MS-CES) based on the existing curricula of three departments of computer science, mathematics, and physics and astronomy. This program was tailored to the needs of the San Francisco North Bay high tech community
1996-1997 Initiated the process and secured approval of a new applied physics option in the Department of Physics and Astronomy at SSU

Current Academic Planning Projects

- Planning for new joint programs (majors and minors) with the Schools of Business and Economics (Engineering Management), Social Sciences (Environmental Science), and Arts and Humanities (Technology & Art)
- Co-planner for a Bioengineering graduate program as a new track in Engineering Science department. The program is currently under review by Science & Technology Curriculum Review Committee
- Initiated planning for securing funds and building a remotely operable $5 million Observatory at the Galbreath Wildlands Preserve (GWP)

Major SSU and Community Activities

- Member of a new task force for improving student retention rates at SSU
- Chaired: Search Committee for SSU Dean of School of Business and Economics
- Member, SSU Foundation Board
- Member, SSU Foundation Board Finance Committee
- Member, Sonoma County Innovation Council
- Member, Sonoma County Workforce Investment Board (WIB)
- As a member of the North Bay Technology Roundtable (NBTR), has been involved in fostering partnerships among SSU, other K-14 institutions, and companies and businesses to benefit the K-18 education in the North Bay (1999-2006)
- Chair of a committee mediating curricular differences between two groups of faculty from SSU schools of education and social sciences regarding the new CCTC standards for teacher education (2003)
- Chair of the Students' Career Services Committee (2001). The committee was charged with transforming part-time and full-time student employment, student internships, and other students' career related activities in the local community, into a well-defined and easily accessible format
- In response to the requests of the North Bay community and industries, led the unanimous approval of the graduate MS-CES proposal through various university channels and committees, (1999) and was later appointed the Chair of the MS-CES Program Board
Teaching Experience

Developed several new elementary and advanced physics courses and laboratories on semiconductors, optics, and electronics. Taught more than 24 different elementary and advanced physics, optics and electronics courses and laboratories at Sonoma State University and other institutions of higher education.

Initiated New Courses and Laboratories

- Physics of Semiconductors (1 unit lecture, 1 unit laboratory). Created the course, designed and wrote complete laboratory experiments, (1983). Physics 475
- Conceptual Physics Laboratory, Physics of Toys (1 unit). Created a new course and designed and wrote a complete set of laboratory experiments, (1996). Physics 102
- Introductory Electronics (lecture, 3 units). Created the course based on the old electronics course, (1997). Physics 313
- Introductory Electronics Laboratory (1 unit). Designed and wrote a complete set of laboratory experiments (1997). Physics 313L
- Proposed and led the formation of a new Applied Physics program (1997)
- Advanced Electronics (lecture, 3 units). Created the course, (1998). Physics 413
- Advanced Electronics Laboratory (1 unit). Created the course, designed and wrote a complete set of laboratory experiments, (1998). Physics 413L
- Lasers and Holography Laboratory (1 unit). Updated old experiments, designed and wrote new experiments, (1998). Physics 447
- Lasers, Fiber Optics, and Detectors (3 units). Created a new course, (1998). This course was later modified and renamed "Photonics". Physics 445
- Graphical Programming (1 unit). Created the special topics course, (1998)
- Human-Computer Interaction Laboratory
Recent Student-Involved Research and Other Activities

2004 Supervised a graduate Design Project on Developing an Interactive Infrared Motion Detector

2003 Supervised a computer science undergraduate student in a computer-controlled instrumentation project using graphical programming

2000 Supervised an applied physics student’s Design Project on Development of an Automated Color Sensor Instrument, and three Special Studies projects on Computer Controlled Instrumentation

1999 Supervised five student research projects in the areas of fiber optics sensors, computer controlled lasers and fiber optic experiments, Microcontroller programming and virtual instrumentation, and graphical programming

1985-present Faculty advisor to the International students Soccer Club, SSU

Academic Fields of Interest

Fiber optics and photonic devices and sensors; semiconductor characterization techniques; electrical, optical and thermal properties of semiconductors

Professional Membership

The International Society for Optical Engineering (SPIE)

Panel Membership

Panelist for review of College Science Instrumentation Program proposals for National Science Foundation, Washington DC, January 1986

Journal Article and Book Reviews

*From Alchemy to Quarks* by Sheldon L. Glashow, Brooks/Cole (1993)

Continuing Education

Optical Thin Film Design, at OCLI, Inc., January 6-8, 1999

InGaAsP Ridge Lasers and Edge Emitting LEDs, fall 1992 sabbatical leave, Light Wave Division, Hewlett-Packard (Santa Rosa, CA.)
Optoelectronic Materials and Devices, June 10-15, 1990 University of New Mexico, Albuquerque, NM

Semiconductor Materials and Device Characterization, March 19-21, 1990, Arizona State University, Tempe, Arizona

A Short Course on Deep Level Transient Spectroscopy, Materials Research Society, April 4, 1988, Reno, Nevada

Publications


**Presentations**

Numerous university and public presentations, and newspaper, radio and television interviews

**Personal, Sports and other interests**

Married, two sons (ages 17 and 14); soccer and tennis player; interested in gardening and hiking

**References**

Dr. William Babula  
Dean, School of Arts & Humanities  
Sonoma State University  
Rohnert Park, California, 94928  
william.babula@sonoma.edu  
(707)  664 - 2147

Dr. Tom Ormond  
Dean, College of Education & Human Services  
Lock Haven University  
Lock Haven, Pennsylvania, 17745  
tormond@lhup.edu  
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Ms. Barbara Butler  
Dean, SSU Library  
Sonoma State University  
Rohnert Park, California, 94928  
barbara.butler@sonoma.edu  
(707)  664-4004

Dr. Carl Wong  
Superintendent, Sonoma County School District  
Santa Rosa, California, 95403  
cwong@scoe.org  
(707)  524 - 2603

Dr. Brian Jersky  
Dean, School of Science  
St. Mary’s College of California  
Moraga, California, 94575  
Brian.jersky@stmarys-ca.edu  
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Vitae

B. Ravikumar, Professor
Computer Science Department
116 I Darwin Hall
E-mail: ravi.kumar@sonoma.edu
(707) 664-3335

Education:
B.E. (Electronics and Communication Engg.) Indian Institute of Science,
Bangalore, 1981
M.S. (Computer Science), Indian Institute of Technology, Madras, 1983.
Ph.D. (Computer Science), University of Minnesota, 1987.

Recent Professional Activities:
- Invited speaker, Workshop on Benford Distribution and Applications, Santa
  Fe, New Mexico, December 17-18, 2008.
- Invited speaker, Workshop on Descriptional Complexity of Formal Systems,
- Program Co-chair, Conference on Implementation and Application of
- Member of Program Committee, Conference on Implementation and
  Application of Automata, Prague, Czech Republic, July 2007.
- Member of the program committee, Descriptional Complexity of Formal
- Member of the program committee, Developments in Language Theory,
- External reviewer, Tenure committee of Dr. Mark Daley, University of
  Western Ontario, CA.
- External member of Thesis Committee of Dr. Nick Santean, University of
  Western Ontario, CA.

Teaching:

Recent courses taught:
- CS 415 Algorithm Analysis
- CS 454 Theory of Computation
- CS 480 Artificial Intelligence
- CS 460 Programming Languages
- CS 351 Computer Architecture
- CS 370 Software Design and Development
Graduate Courses:

- CES 514 Data Mining
- CES 516 High-Performance Computing
- CES 512 Theory of Software Systems
- CES 524 Advanced Computer Architecture

**Undergraduate Directed Study Projects Supervised**

- A graph-theoretic tool for sequence analysis (Bob Thomas)
- A visualization tool for BLAST algorithm (Steve French)
- Game development on a PDA (Mike Heaviside)
- A regular expression synthesis tool

**Graduate Theses supervised:**

Some graduate students who recently completed their thesis with me are:

- **Ethan Stone** (Parallel Sorting on a Coarse-grained Parallel Computer)
- **Xiao-ming Lu**, A new DFA minimization algorithm and its application to some counting problems
- **Mari Rajakumari** (A Tablet PC Application)
- **Madhavi Danduluri** (A clustering algorithm and its application to web document processing)
- **Betty Zhang** (Implementation of Periodic Balanced Sorting on a Linux Cluster)
- **Krithika Krishnarajan** (Design and implementation of an automated software testing tool)
- **Kevin Nishinaga** (Real-time recognition of Japanese hand-writing on a tablet PC environment)
- **Renato Vasquez** (An independent protocol suite design for wireless networks)
- **Srilatha Jandhyala** (A fast approximate multiplication algorithm and its implementation)
- **Rama Muthukumaraswamy** (Recognizing hand-written mathematical expressions using a tablet PC).

Current students working on their Masters thesis or project are: **Bruce Beauchamp, Steve Bottarini, Raksha Gundarahalli, Jeba Sanchin and Antonio Navarro** and **Steve Olson**.

**Recent papers**

*A simple multiplication game and its analysis*, accepted for publication in the International Journal of Combinatorial Number Theory.
Benford-Newcomb distribution and unambiguous context-free languages, accepted for publication in Journal of Foundations of Computer Science.

Decimation of formal languages and state complexity, (with Kreiger, Shallit, and Ramparsad), accepted for publication in Theoretical Computer Science.

On unique operations and the state complexity of regular languages, (with Santean, Ramparsad and Shallit), accepted for publication in Theoretical Computer Science.

Quality-Aware Service Delegation in Automated Web Service Composition, (with Ibarra, Gerede and Su), accepted for publication in Theoretical Computer Science.


Row completion problem for SUDOKU, (with Kananaa), accepted for publication in Utilitas Mathematica.

On some variations of probabilistic finite automata, accepted for presentation at the international conference on Developments in Language Theory, Santa Barbara, June 2006.


Some connections between the lying oracle problem and Ulam's search problem, in the proceedings of the Australasian Workshop on Combinatorial Algorithms, September 21-24, 2005, University of Ballarat, Victoria, Australia. Revised version submitted for journal publication.

QoS-aware Delegation in Automated Web Service Composition, (with O. Ibarra and Gerede), accepted for publication in the Journal of Automata, Languages and Combinatorics.


On the approximation of non-regular languages by regular languages, (with G.Eisman), accepted for presentation at the Australian Computer Science Conference, New Castle, Australia, January 31, 2005 to February 4, 2005. (revised version submitted to Theoretical Computer Science.)


Implementation of optimized periodic balanced sorting algorithm on a Linux cluster, (with Betty Zhang), submitted to J PDC.

A generating function approach to fast computation of the n-th term of a linear recurrence equation and some applications. Submitted to Math Magazine.


Counting simple paths in a restricted grid. (unpublished manuscript).

Efficient algorithms for prefix grammars (with Liang Quan) submitted for publication.


Selected Journal Publications: (prior to 2004)


Selected Refereed Conference Publications (prior to 2003)


Parallel algorithms for finite automata problems. (invited presentation), Workshop on Randomized Parallel Algorithms, IPPS, March 1998, Orlando, Florida.


Minimal NFA problems are hard. In Javier Leach Albert and Burkhard Monien and Mario Rodríguez-Artalejo, editors, Automata, Languages and Programming, 18th International Colloquium, volume 510 of Lecture Notes in Computer Science, pages 629-640, Madrid, Spain, 8-12 July 1991. Springer-Verlag. (co-author: T. Jiang)


Proceedings published by Springer-verlag as a volume of Lecture Notes in Computer Science series.


Grants and Awards:

- National Science Foundation Grant. $ 36000 for the period 1991-1994 for a proposal titled "New Directions in the Study of Finite Automata".
- URI Foundation Research Grant $ 6000 for the summer of 1989 for proposal titled "New Techniques for proving Hardness of Combinatorial problems".
- Feinstein Foundation Grant (state of Rhode Island) $ 5000 for the period Summer 1999 and Fall 1999 for a proposal titled "Interactive Graphics Enhancement to the courseware Math 108".
- Two research grants from URI Research office for $ 3700 in Fall 1999 to acquire head-mounted display (HMD) and other peripherals (data-glove) for a graphics workstation.
- Award of $ 1400 by URI Foundation for a proposal to upgrade computer science department library.
- Travel grant of $ 1500 from the Provost's office at the University of Rhode Island during Summer 1991 to attend a conference and a workshop.

Professional Activities (prior to 2004):
Session Chair, Conference on Implementation and Applications of Automata, July 2003, Santa Barbara.

Session chair, Sixth Annual Parallel and Distributed Processing, New Orleans, 1996.
Member of program committee, North-Atlantic Workshop on Testing, 1995-97.

Refereed papers for numerous conferences including: FOCS, ICALP, FST & TCS, FCT, MFCS, International Conference on Algorithms and Computation, COCOON, Conference on Implementation of Automata, ISAAC, Developments in Language Theory etc.

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**Book Chapters**


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**List of Ph.D. students Supervised (at the University of Rhode Island)**

- Timothy Henry (completed 2001) Foveated Texture Mapping from Wavelet Compressed Images. Current position: Lecturer, Department of Computer Science, University of Rhode Island, Kingston, RI 02881.
- Shlomo Neeman (completed, October 2000) Application of Wavelets in Image Query and Mammography. Current position: Assistant Professor, Division of Engineering, Johnson-Wales University, Providence, Rhode Island.
- Xuefeng Xiong (completed 1996) Parallel algorithms for finite automata problems. Current position: Member of Technical Staff, Parallel system design group, Compaq-DEC, Massachusetts.
• Duncan Innes (ABD) Synchronization sequence for automata and prefix codes.
DR. SHAILENDHAR ("SHALLY") SARAF  
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2010C Salazar Hall, Sonoma State University  
Rohnert Park, CA 94928  
Telephone: 707-664-4020, email: saraf@sonoma.edu

EDUCATION

9/1997 – 8/2005  Stanford University, Stanford, California  
Ph.D. in Electrical Engineering

9/1981-12/1983  University of Hawaii, Manoa, Hawaii  
M.S. in Electrical Engineering

8/1976 – 6/1981  Indian Institute of Technology, New Delhi, India  
B.Tech. in Electrical Engineering

TEACHING EXPERIENCE

Sonoma State University
Fall 2008  CES543 Optical Fiber Communications (Grad)  
ES330  Electronics 2  
ES221  Electric Circuits Laboratory  
Es220  Electric Circuits

Spring 2008  ES430  Electromagnetic theory and applications  
ES230  Electronics 1  
ES231  Electronics 1 Laboratory

Fall 2007  CES590 Modern optics for Engineers (Grad)  
ES230  Electronics 1  
ES231  Electronics 1 Laboratory

Rochester Institute of Technology
Spring 2007  EE474  Electromagnetic Fields 2  
EE772  Quantum Electronics (Grad)

Winter 2006  EE805/601 Modern Optics for Engineers (Grad/Undergrad)

Fall 2006  EE473  Electromagnetic Fields 1  
EE805/601 Modern Optics for Engineers (Grad/Undergrad)

Spring 2006  EE 474  Electromagnetic Fields 2

Winter 2005  EE473  Electromagnetic Fields 1

Fall 2005  EE474  Electromagnetic Fields 2  
EE205  Freshman Practicum
Stanford University
Fall 1999- Spring 2002 Teaching Assistant: Advanced lasers laboratory and nonlinear optics laboratory

University of Hawaii
Fall 1981-Fall 1983 Teaching Assistant: Circuit design laboratory, power engineering laboratory and robotics.

RESEARCH INTERESTS

Lasers and Optics:
- High average power solid-state diode-pumped diffraction-limited lasers
- Nonlinear optics
- Noise and quantum-optical measurements
- Laser interferometry

Electronics:
- Analog and RF circuit design
- Control system design especially applicable to optical systems
- Ultrasonics

Biomedical Engineering:
- Electrophysiology and ultrasound instrumentation
- DNA amplification and detection
- Lasers for ophthalmology and dentistry

DOCTORAL DISSERTATION, STANFORD UNIVERSITY

Power Scaling and Quantum Noise Measurements in Nd:YAG Slab Laser Amplifiers

Principal Advisor: Prof. Robert L. Byer, Associate Advisor: Prof. Martin M. Fejer

In my dissertation, power scaling of single frequency continuous wave Nd:YAG slab lasers to the 100-W class with exceptional mode quality was demonstrated. The primary application of these lasers is for gravitational wave detectors, remote sensing and precision machining. Additionally, the quantum noise behavior of unsaturated and saturated laser amplifiers was demonstrated by saturating the gain of the amplifier using a high power beam and measuring the power noise detected by a single spatial mode probe beam traversing the same optical path through a zigzag-slab amplifier. The experimental results were in excellent agreement with theory.

MAJOR RESEARCH CONTRIBUTIONS AT STANFORD

High Power Lasers: Power scaling of high average power diode-pumped solid-state laser with high spectral and spatial coherence was investigated. Demonstrated scaling to the 100 W level for LIGO (Laser Interferometer for Gravitational Wave Detection) using the Master Oscillator Power Amplifier
(MOPA) topology in Nd:YAG slabs with almost 90 % power in the TEM$_{00}$ mode. High power laser system was developed using Nd:YAG rods, an edge-pumped slab amplifier and finally a state-of-the-art, highly efficient end-pumped slab geometry.

**Laser Slab Mass Fabrication:** The high cost of slab fabrication has been an impediment to the widespread use of slabs in solid-state lasers. Developed a patented slab mass fabrication technique to substantially reduce the fabrication cost of slabs.

**Parasitic Suppression:** Parasitic oscillations are a major problem in high gain lasers especially in the slab geometry. Developed a parasitic suppression technique using an index-differential coating that preferentially transmits transverse-parasitic modes while maintaining confinement of the pump light for superior extraction from slabs.

**Quantum Optics:** Experimentally measured the quantum noise in unsaturated and saturated free-space laser amplifiers. Set up a first-time experiment using Fabry-Perot cavities to perfectly overlap a high-power beam and a single-modal shot-noise-limited probe beam and after amplification precision separated the beams and measured the quantum noise on the probe beam.

**Fabry-Perot Cavities:** Designed, fabricated and implemented a system of monolithic Fabry-Perot cavities to generate shot-noise-limited laser sources, overlap and separate laser beams with a high contrast in power levels. These cavities locked at resonance using the Pound-Drever-Hall technique act as spectral, spatial filters and resonant polarizers with extinction ratios that can exceed 125 dB.

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**REFEREED JOURNAL PUBLICATIONS**


CONFERENCE PUBLICATIONS


SELECTED INDUSTRY WORK

• Designed the architecture of a high-average-power eye-safe Cr$^{4+}$YAG regenerative amplifier laser system operating at 1550 nm for machining applications. Raydiance Inc., Orlando, FL. 2005

• Developed system architecture and designed patented ultrasonic circuitry for GeneXpert®, a fully automated DNA analysis instrument. This instrument performs the entire genetic identification process automatically and gives a positive or negative answer for the presence of a targeted nucleic acid sequence. The system is used by the US postal service for screening mail for anthrax spores and other biothreats. Cepheid Corporation, Sunnyvale, CA. 1999-2001

• Designed control electronics for a real-time position management system (RPM™) for diagnostic mapping of complex arrhythmias by providing a 3D graphical display of the heart’s electrical activity. This revolutionary system provides non-fluoroscopic visualizations for guiding electrogram and ablation catheters in the heart. Boston Scientific Corporation, San Jose, CA. 2001-2002

• Designed high voltage RF and DSP electronics for delivering and controlling radio frequency energy to quadropoles used in a mass spectrometer. Finnigans Corporation, Santa Clara, CA. 1998-1999

• Designed a frequency synthesizer using phase locked loop techniques for input to a chirp generator for a wafer scanner used in the semiconductor industry. System involved RF circuit design and high density FPGA design for digital signal processing. KLA Tencor, Milpitas, CA. 1997-1998
• Developed high reliability, radiation-hard digital communication buses for the gyroscope suspension system of the Gravity Probe B Project.  
  
  *Stanford University/Lockheed Martin, Sunnyvale, CA. 1996-1997*

• Designed a PC based exercise-machine control system to measure heart rate and control resistance of a stationary bicycle and stairmaster. Heart rate was computed after signal processing the cardiac signal picked off the exerciser’s palms. The heart rate monitor was rated as the most accurate and with the best immunity to electrical-noise in a gymnasium.  
  
  *Netpulse Communications, San Francisco, CA. 1996-2000*

• Designed a high-speed, high-voltage and mixed-signal circuit boards for NASA used for testing mission-critical communications equipment aboard the space shuttle.  
  
  *Hewlett-Packard, Sunnyvale, CA. 1995-1996*

• Developed an integrated dual-drain MOSFET sensor for magnetic field sensing as a replacement for a reed switch. Highly reliable sensor was used for initiating remote telemetry with implantable pacemakers.  
  
  *Siemens Pacesetters, Sylmar, CA. 1992*

**PATENTS**


**GRANT PROPOSALS:**

• **PPC Corporation:** MEMS band stop filter (Authored). Funded at $94.5K for 2006-2008.

• **ARMY:** High Average Power Diode-Pumped Solid State Lasers, Power Scaling with High Spectral and Spatial Coherence (Coauthored). Funded at $2.4M for 2002-2007

• **NATIONAL SCIENCE FOUNDATION:** Stanford Advanced Gravitational-Wave Laser Interferometer Program (Coauthored). Funded at $4.3M for 2002-2005

• **NATIONAL SCIENCE FOUNDATION:** The Stanford Advanced Gravitational Wave Detector Research Program (Coauthored). Funded at $3.99M for 2005-2008
PERSONALITY

Hands-on person. Enjoy the challenges of experimental work, teaching and motivating young people.

PROFESSIONAL AFFLIATIONS

Institute of Electrical and Electronics Engineers (IEEE), Optical Society of America (OSA), International Society for Optical Engineering (SPIE).

CITIZENSHIP

US
Sazia Afreen Eliza
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Apt. # 064, Rohnert Park, CA 94928 E-mail: saziaeliza@gmail.com

Research Interests
Semiconductor Devices, Analog and Digital CMOS Integrated Circuits, Sensors and Nanotechnology

Education
• Ph. D., Electrical Engineering, The University of Tennessee, Knoxville, TN, December 2008
• M. Sc., ( GPA 3.84/4.0), Electrical Engineering, Bangladesh University of Engineering and Technology, Dhaka, Bangladesh, 2005
• B. Sc., ( GPA 3.86/4.0), positioned 11 out of 111 students, Electrical Engineering, Bangladesh University of Engineering and Technology, Dhaka, Bangladesh, 2003

Work Experience
• Graduate Research Assistant (August 2005 to August 2008)
  o Analog, VLSI and Devices Research Laboratory, Department of Electrical Engineering and Computer Science, The University of Tennessee, Knoxville, TN 37996-2100
  o Center for Musculoskeletal Research, Department of Mechanical, Aerospace and Biomedical Engineering, The University of Tennessee, Knoxville, TN 37996-2100
• Oak Ridge National Laboratory (August 2005 to August 2008)
  Worked as a graduate student with Monolithic System Group and Molecular Bioscience & Biotechnology Group in Oak Ridge National Laboratory (ORNL), Oak Ridge, TN 37831-6194
• Full time Lecturer (March 2003 to July 2005)
  Department of Electrical and Electronic Engineering, Bangladesh University of Engineering and Technology, Dhaka, Bangladesh

Teaching Experience
  I. Teaching experience at the University of Tennessee, Knoxville, Tennessee
  A special lecture on IC-CAP (Integrated Circuit Characterization and Analysis Program) has been delivered as the part of a graduate course (Advanced Analog Electronics I, ECE531). In addition, a laboratory manual has been designed for the IC-CAP project. The link for the project manual is as follows:
  http://www.ece.utk.edu/~islam/ECE531/iccap.pdf

  II. Full time Lecturer - Bangladesh University of Engineering and Technology, Dhaka, Bangladesh
  • Courses taught:
    o Electronics (Diode, BJT, JFET, MOSFET, Feedback Amplifiers, Oscillators and Operational Amplifiers) in the department of Electrical and Electronic Engineering (EEE)
    o Electrical Machines and Electronics in the department of Metallurgy
  • Demonstrated laboratory classes for the departmental (EEE) and interdisciplinary courses: Electrical Circuits, Electronics, Machines, Control and Power Systems
Research Experience

1. Device Modeling and Characterization

i) **Analytical Modeling of AlGaN/GaN High Electron Mobility Transistor (HEMT):** The dissertation research includes temperature dependent physics based modeling of AlGaN/GaN HEMT for applications in high power microwave circuits and sensors. AlGaN/GaN HEMT is a better substitute for LDMOS or GaAs based FET’s currently used for high frequency power amplifiers in base stations due to the advantageous intrinsic properties of widebandgap material, GaN and the device structure of HEMT. With the increase in output power, channel temperature increases. Hence, temperature dependent accurate small and large signal modeling of AlGaN/GaN HEMT is essential to predict and optimize the overall performance. The control and the telemetry in high temperature industries require such a model of AlGaN/GaN HEMT to predict the performance for high power and high frequency operations at varying temperatures. On the other hand, AlGaN/GaN HEMT shows great potential as CHEMFET compared to other field-effect devices. The physics based analytical model of AlGaN/GaN HEMT has been applied to predict the performance of the CHEMFET.

ii) **SPICE Modeling of Vertically Aligned Carbon Nanofiber:** A SPICE model has been developed for the vertically aligned carbon nanofiber (VACNF) applying the physics of Fowler Nordheim Tunneling. This model has been effectively used to predict the performance of CMOS based control circuits for the VACNF based e-beam lithography system.

iii) **Analysis of Strain Relaxation Effects in GaInAsP Quantum Wire Laser:** Finite element analysis using FEMLAB has been done to calculate the strain distributions and the shifts in bandgap and lasing frequencies of the membrane and the buried type quantum wire lasers. Thus the performances between the two structures of the quantum wire laser have been compared.

2. Analog and Digital Circuit Design

i) **Design of Dose Control Circuit for Lithography:** For the uniform exposure of e-beam resist, a dose control circuit has been designed and fabricated using AMI 0.5 µm process to interface with each of vertically aligned carbon nanofiber (VACNF) based field emission devices during massively parallel maskless lithography. The control circuit precisely allows each of the VACNFs in the array to emit a fixed number of electrons and bypasses the transient effects arises due to parasitic capacitances of each of the field emission devices.

ii) **Design of Integrated Circuit for Measurement of Electrochemical Current:** A circuit has been designed and fabricated using AMI 0.5 µm process to measure the electrochemical current from vertically aligned carbon nanofiber based electrochemical sensor. The circuit converts the current directly to the frequency for remote processing of the nanofiber signal.

iii) **Design of Integrated Circuit for Measurement of MEMS based Capacitance:** A circuit has been designed and fabricated using AMI 0.5 µm process to measure the MEMS based sensor capacitance for biomedical application. This circuit transforms the sensor signal to the frequency for remote processing.

3. Sensors

i) **Characterization of Photosystem I (PS I) Reaction Centers:** PS I reaction centers are potential green sources of solar energy. Photon capture triggers rapid charge separation and the conversion of light energy into an electrostatic potential across the nanometer-scale (~6 nm) PS I reaction centers. An AlGaN/GaN HEMT CHEMFET based characterization method for the reaction centers has been developed to construct the molecular micro device and to suitably replace the heavy equipment based laboratory techniques of Kelvin force microscopy (KFM) and Scanning tunneling Spectroscopy (STS).
ii) **Real Time Monitoring of Signals from MEMS Capacitance based Pressure Sensor:** Analog Devices AD7745 is a capacitance to digital converter chip with the resolution of ~aF. This commercially available IC has been interfaced with PC using a high speed data acquisition card for the real time monitoring of the changes in MEMS capacitance with the varying pressure.

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**Technical Skills**

- CAD Tools: Cadence Tools (Virtuoso, Schematic Editor, Spectre), HSpice, Sentaurus, IC-CAP, FEMLAB, Maxwell, Labview
- High temperature characterization of devices using DC probe station
- S parameter measurement of devices using RF probe station and Network Analyzer
- HP 4056 Parameter Analyzer
- Wire Bonder for packaging
- Spectrophotometer for the measurement of light absorption characteristics
- Fluorometer for measuring the photochemical activity in Photosystem I reaction centers
- Extraction technique of Photosystem I reaction centers
- Extensive PCB Design (FR4 and Polyimide)
- Cleanroom Training (Photo Resist Spinner, Contact Aligner, Stepper, Reactive Ion Etcher, Profilometer, etc.) in Oak Ridge National Laboratory

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**Short List of Courses in Ph. D.**

- **Operational Amplifier Circuits:** Linear and non-linear active circuits using commercial operational amplifiers, Noise fundamentals and calculations in op amp circuits, Design for specified pole-zero functions and laboratory design projects
- **Advanced Analog Electronics I:** Crystal Structure, PN junction theory, Drift & Diffusion Current, JFET, MOS capacitor, MOSFET, MOSFET models, LED and LASER, LED design
- **Advanced Analog Electronics II:** Current Mirrors, Current Sources and Sinks, EKV Model, Voltage Reference, Bandgap Voltage Reference Design, OTA Design, Output Buffer
- **Introduction to Basic VLSI Design:** MOSFET theory, Logic Gates, Delay, Rise and Fall Time, Adder, Flip Flop, Counter, Familiarization with Cadence Tool
- **Computer-Aided Design of VLSI Systems II:** Custom Cell Layout, Data Path, Loading Effects, Soft Macro, Custom Analog Circuit, Floor Planning, Automatic Cell Generation, Signal Integrity and Cross talk

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**Dissertation, Thesis and Project**

- **Ph. D. Dissertation (November, 2008)**
  
  Title: *Modeling of AlGaN/GaN High Electron Mobility Transistor for Sensors and High Temperature Circuit Applications*

  Institution: The University of Tennessee, Knoxville, TN

  Supervisor: Syed Kamrul Islam, Ph. D.  
  Professor, Department of Electrical Engineering and Computer Science  
  The University of Tennessee, Knoxville, TN 37996-2100, U. S. A.

- **M. Sc. Thesis (August, 2005)**

  Title: *Analysis of Strain Relaxation Effects in GaInAsP Quantum Wire Laser Using Finite Element Technique*

  Institution: Bangladesh University of Engineering and Technology (BUET)
Resume

Supervisor : Anisul Haque, Ph. D.
Chair, IEEE Electron Devices Bangladesh Chapter
Professor and Chairperson, Department of Electrical and Electronic Engineering
East West University, Dhaka, Bangladesh

- B. Sc. Project (December, 2002)
Title : Networking and Development of Hospital Management Software using Visual Basic and Oracle
Institution : Bangladesh University of Engineering and Technology (BUET)
Supervisor : Pran Kanai Saha, Ph. D.
Professor, Department of Electrical and Electronic Engineering
Bangladesh University of Engineering and Technology, Dhaka, Bangladesh

Publications

Refereed Journals

Conference Proceedings

Field of Devices:

Field of Sensors:

Field of Circuits and Systems:


Invited Talk

Professional Activities and Honors
- Student Member, IEEE (Institute of Electrical and Electronics Engineers)
- Member of IEEE Women in Engineering (WIE) and the Society of Women Engineers (SWE)
- Reviewer
  - IEEE MWSCAS Conference, 2008
  - ICECE conference, Dhaka, Bangladesh, 2006
- Volunteer, IEEE MWSCAS Conference, 2008, The University of Tennessee, Knoxville
- Honored with Bangladesh Government Scholarship at High school
- ‘Government Scholar’ from 1997 - 2002 at undergraduate level
- Placed in Dean’s List in several semesters during undergraduate study
- Appointed as full time Lecturer due to academic excellence in B. Sc.
Referees

1. **Syed K. Islam**, Ph. D.
   Professor
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   Electrical Engr & Computer Science
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2. **Benjamin J. Blalock**, Ph. D.
   Associate Professor
   The University of Tennessee
   Electrical Engr & Computer Science
   404 Ferris Hall, 1508 Middle Drive
   Knoxville, TN 37996-2100
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3. **Leon M. Tolbert**, Ph. D.
   Associate Department Head
   The University of Tennessee
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   Knoxville, TN 37996-2100
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   Phone: (865)974-2881 (off)

4. **Ida Lee**, Ph. D.
   Research Assistant Professor
   The University of Tennessee, Knoxville
   Electrical Engr & Computer Science
   Staff Member
   Nanoscale Science, Biophysical Chemistry
   & Molecular Electronics Group
   Oak Ridge National Laboratory
   Oak Ridge, TN 37831
   Email: leei@ornl.gov
   Phone: (865)241-6695 (off)

5. **Milton N. Ericson**, Ph. D.
   Senior R&D Staff Member
   Monolithic Systems Group
   Oak Ridge National Laboratory
   Oak Ridge, TN 37831
   Email: ericsonmn@ornl.gov
   Phone: (865)574-5637 (off)
SUMMARY OF EXPERTISES

- Over 25 years of academic experience at various universities in US and abroad – have taught various courses in electrical and computer engineering including data networking and communications, Internet protocols and architecture, secured VOIP and multimedia over IP, analog and digital electronics design, linear systems theory, switching theory, introduction to engineering, wireless communications.

- Over 25 years of industrial and research experience on network and systems engineering and technical training in real-time applications and services including voice and video over IP, broadband access (DLC, xPON/FTTx, xDSL, Ethernet), LAN, MAN, WAN, Internet, traffic engineering, quality of service and performance, reliability, feature/device evaluation, and the related standards.

ACADEMIC & RESEARCH EXPERIENCE

- 2003-present - Adjunct Professor at the Sonoma State University, Engineering Science Department, Rohnert Park, CA, teaching
  - Graduate courses: "Data Communications + lab", “Network Architecture and Protocols + lab" covering the technologies for the physical layer, wireless, Ethernet/IEEE802.3, switching and routing algorithms, IPv4/6, TCP/UDP, DNS, FTP, SNMP, web/HTTP, and security, plus “Linear Systems Theory”.

- 1993-2000 - Adjunct Professor at Stevens Institute of Technology, Dept. of EE and CS, Hoboken, NJ, taught the graduate courses "Information Networks I" & "Information Networks II" that covered similar topics as the Data Com and Network Architecture courses as above.

- 1983-84 - Associate Professor, Dept. of ECE, Drexel University, Philadelphia, PA, taught the undergraduate courses “Microprocessors + lab” and “Logic Design and Digital Electronics + lab”.

- 1974-83 - Associate Professor (with tenure), Dept. of EE, Shiraz University, Shiraz, Iran, taught the undergraduate courses "Electronics Systems and Devices + lab", “Logic Design and Digital Electronics + lab”, “Switching Theory”, and “Electric Circuits”.

- Summer 1976 - Invited Scholar, Institute fur Physikalische Elektronik, Universitat Stuttgart, West Germany, research on “Coded apertures for 3-dimentional imaging-and computed tomography for medical diagnostics”. German DAAD organization funded the project.

INDUSTRIAL AND RESEARCH EXPERIENCE

- 2006-Present - Consultant with Detecon in U.S.A. for T-Com/Deutsche Telecom. Developed comprehensive documents and an extensive set of slides on the following topics:
  - Toward a Unified DT IdM/AAA Strategy: Developed the strategy for Identity Management and Authentication, Authorization, & Accounting for Deutsche Telecom national and international single-sign-on e-commerce and online services. Also provided a set of recommendations and plan of work.
  - Improving Access Networks for IPTV: Addressed the state of broadband access, provisioning concepts, and deployment of Ethernet and passive optical network and in-house cabling used in USA.
  - Increasing the Reach of VDSL2: Addressed the state of dynamic spectrum management, VDSL2 DSLAMS, VDSL2 planning principles for in-house cabling in USA.
  - “SIP & IMS Fundamentals for Cingular Wireless” Developed a training slide set on SIP-IMS targeted for Cingular in USA. SIP is the future signaling protocol for voice/video/data over IP, and IMS will be the future open service development architecture for any fixed or wireless networks, IP-based, secure public Internet or managed enterprise LANs. IMS will converge a variety of network services and architectures.

- 2000-2003 - Lead Systems Architect, Alcatel USA, Petaluma, CA: Did systems engineering and forward looking work in the following areas:
  - Lead a group to do the market research & feasibility study for the Alcatel access product (Litespan) to provide VOIP, and developed a comprehensive report. Compared the available chips for VOIP and designed a gateway card for Litespan. Analyzed the scalability issues for Litespan to replace the local PSTN switch.
- Developed the architecture for IPTV (broadcast and video on demand).
- Did the feasibility study for BPONs and GPON (Broadband/Gigabit Passive Optical Network) for their implementation in Litespan.
- Did the reliability model and calculated the reliability for major components and Litespan.
- Wrote the responses to the customers’ RFIs and RFPs for service-provider clients.
- Developed/presented many technical presentations/tutorials on the BPON, GPON, VOIP, GFP technologies.
- Presented Litespan with VOIP capability for Class 5 replacement with the VOIP-capable-Litespans together with a softswitch and discussed the scalability issues to the customer (SBC).
- 1984-2000 - Distinguished Member of Technical Staff / Principal Technical Staff Member, AT&T Bell Laboratories, Holmdel, NJ: Did forward looking work on the following projects and lead the teams for the AT&T network implementations:
  - IP QOS for real-time applications against bursty non-critical data, independent of the underlying link technology using packet labeling, differentiation/prioritization techniques, and reservation request protocol.
  - Enterprise Frame Relay Network QOS Management to guarantee the response time of critical applications at network access links. This project needed performance and bandwidth measurements.
  - Use of router queuing and bandwidth manager to provide QOS for Internet packets.
  - Multi-Protocol Label Switching (MPLS) and Traffic Engineering.
  - Use of Request Reservation Protocol to control QOS for Multimedia Conferencing applications.
  - AT&T Principal Representative to the ATM Forum for ATM/Broadband ISDN Standardization.
  - Developed ten technical short courses on different areas of Data Networking and taught the courses to the AT&T software and hardware developers, systems engineers, data network designers, account executives.
- 1967-1970 - IBM Field Engineer: Maintained and troubleshooting the IBM Main Frame System 360 Models 2065 and 2030 and all their many I/O devices.

EDUCATION
- B.S. in EE, American University of Beirut, Lebanon, June 1966.

PATENTS
- Patent 2: "Method of establishing a redundant mesh network using minimum number of links," US/12.05.98/USA 76444, provides network redundancy with minimum link costs in an ATM network against failures.
- Patent 3: "Automatic Router Configuration Based on Real-Time Traffic Measurements and Service Level Agreement (SLA)," United States Patent 7,145,871 issued on, 12/5/2006, and US/02.03.02/USA 90138, allows automatic configuration of network elements based on real-time traffic measurements and SLA.

AWARDS AND HONORS
- IEEE Millennium Award for contributions to IEEE, 2000.
- IEEE Section awards for contributions to IEEE in 1996, 7, 8, 9, and 2000.
- AT&T Standards Recognition Award in 1997, one of the ten award recipients at AT&T.
- Full US Scholarship during the undergraduate work at the American University of Beirut.
- IBM Service Award in 1969.
On the university Honor List during the undergraduate study at the American University of Beirut.

AFFILIATION
- IEEE Life Senior Member

PERSONAL
- Nationality: US Citizen
- Foreign Languages: German, Persian
- Activities: Bike riding, jogging, volleyball, swimming, mountain climbing

TITLE OF PAPERS, PUBLICATIONS
- Available upon request

Available upon request
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Santa Rosa, CA 95403
707-577-4375

Work Background

1997 - Present
Manufacturing Electrical Engineer, HP/Agilent
- New product development in manufacturing of Agilent performance spectrum analyzers and sources.
- FPGA/HDL development, skills, and experience: Xilinx Microblaze soft core processor embedded systems, VHDL language, ISE/XPS tool chain, DSP design flow, Synplicity/Pro, Premier synthesis tool chain.
- Microcontroller and PLD course taught to new manufacturing engineers: system design and programming the NEC 78K4 16-bit microcontroller using assembly and C. PLD programming using Verilog/AHDL with Altera tools. Course used microprocessor/PLD learning board.
- Mentorship and successful design development of a Xilinx Microblaze soft process and supporting VHDL hardware elements on a Spartan-3 based RS232/USB control system.
- Manufacturing process transfer of production systems: VEE programming language test development, EMI and other electrical qualifications, manufacturing issues resolution, and specification setting.
- Test process, hardware transfers, and training of overseas manufacturing partners in the area of VSA testing, PSA CPU, digital IF, wideband digital IF, and USB/Compact Flash.
- N5530/1S measurement receiver derived AM/PM/FM analog demodulation specifications using extensive modeling from measurement theory and production data.
- PSA LCD replacement project: design, implementation, testing, completion.
- Gee whiz projects: Parallel port for the 6x, microprocessor and PLD learning board to train manufacturing engineers and technicians, Alarm Clock mentorship project using VHDL code.

1993 - 1997
Design Engineer, Amprobe Instrument, Inc.
- Harmonic and power meters research and design
- Digital/analog circuit design and PCB board layout
- Embedded microprocessor and DSP system design, hardware interfacing, and programming in C and assembly.
- Three-phase power systems theory and implementation
1989 - 1993

**Computer Specialist, Columbia Savings and Loan.**
- PC networking specialist
- Corporate site-wide reorganization and mapping of network infrastructure.
- OS/app support

**Teaching Experience**
- Microprocessor/PLD course to new engineers
- Mentorship in FPGA design and VHDL programming
- Guest lecturing: University of Colorado at Denver microprocessor course

**Interests/skills**
- Digital circuits. Extensive work/experience with microprocessors and DSPs.
- FPGA/PLD hardware design experience and skill. Xilinx tool chain ISE/XPS for compilation/implementation. Synplify Pro synthesis, Modelsim simulation. Altera tool chain experience and familiarity.
- Hardware design programming: VHDL and Verilog.
- Signal processing, communications theory, equalization knowledge and research.
- RF and microwave theory, circuits, and measurements. Solid EE skills.
- Computer and embedded systems Programming: C, C++, VEE, extensive MATLAB.

**Education**

2002 M.S.E.E, University of Colorado at Denver
- Signal Processing and Communications
- Master's Thesis: "Adaptive Blind Equalization with Applications in Communication Systems"

1992 B.S.E.E.T., Metropolitan State College of Denver
- Electronics Engineering Technology
- Digital and Computer Systems Emphasis
- Senior Project: digital voice recorder

**Interests**
- Member of Toastmasters to improve public speaking and leadership skills. Competent toastmaster (CTM) award July 2007.
- Variety of sports, recreation, and outdoors activities: rock climbing, ultimate frisbee, soccer, golf, bowling.
Attachment Q

External Reviewer’s Report
Program Review Report

Master of Science in Computer and Engineering Science

Sonoma State University

Site Visit: March 27, 2009

Prepared by

R. Nunna, Ph.D
California State University, Fresno
1. **Introductory Section**

The comments and recommendations in this report are based on review of the Self Study document prepared in Spring 2009 by the Engineering Science Faculty and the reviewer’s observations from the campus site visit on March 27, 2009.

The Master of Science degree in Computer and Engineering Science (MS-CES) at Sonoma State University was developed in 2001 to meet the needs of the growing telecommunications and other allied industry in Sonoma County. The development and offering of such a program clearly demonstrated Sonoma State University’s willingness and commitment to meet the needs of the region. The program is currently led by Dr. Jagan Agrawal, an experienced academician, researcher, and department chair. The bold leadership demonstrated by the University, Dean of the School of Science and Technology (SST) and Director of the MS-CES program in developing this program led to numerous companies investing cash and equipment into the program and its laboratories – which in itself is extremely commendable – specially in the California State University system. The combination of campus leadership, industry needs and financial market conditions in early 2000s was ideal for the design and development of a unique self-supporting Master’s degree program in Computer and Engineering Science at Sonoma State University. By design, the program focused on telecommunications and computer hardware and software systems. Over the years, the program has experienced the collapse of the primary industry that it was focusing on, a decline in student enrollment, and a shift in student and regional needs. The program is however still relevant and does meet industry and student needs. The program has recently under the leadership of the Dean of SST, the Director of the MS-CES program, and the program faculty begun the process of adding a new option in Bio-Engineering/Technology to meet the increasing needs for professionals in these areas – particularly in northern California. The comments below are however mainly focused on the program as it has existed from 2001 to the present.

2. **The Curriculum**

The MS-CES program is a 30-unit graduate program with two tracks

- Communications and Photonics
- Computer Hardware & Software Systems.

Both the tracks are well defined and have sufficient breadth and depth. Students in the program are required to take 9 units of a common core (400 level CES courses), 12 units of track core, one or two electives and a culminating experience. From a program management perspective, such a prescriptive program is simultaneously both an advantage and disadvantage - an advantage because all students are expected to take the same set of courses, and a disadvantage because all students are required to take the same set of courses (regardless of their interest). [The Director of the MS-CES program did however confirm that there is list of
courses for each track from which the students must choose four courses. Students have flexibility in the selection of courses]. The program is commended for offering courses in-spite of low enrollment so that students can graduate in a timely manner, and for arranging for the cross listing of the common core courses (eg., with Math, Physics, and CS), thereby maximizing the potential for enrollment. Feedback from students suggested they would prefer a much more flexible program in terms of track-core course selections.

3. Program Assessment

The program’s assessment protocols need further refinement. The program has defined three “Program Educational Objectives” and six “Learning Objectives”. The “Learning Objectives” are probably the “Learning Outcomes”. These ‘outcomes’ should be recast in a form such that they are measurable. It is unclear how the program will measure some of these outcomes. The process that the program used to determine the objectives and outcomes was not documented. The process by which the program periodically uses assessment data to refine the program and/or courses was not documented.

A table showing relationships between courses and “Learning Objective” was provided in the self-study. It was not clear if courses were designed and offered keeping these objectives in mind, and if syllabi included these ‘Learning Objectives’. It was also not clear if faculty members teaching the courses actually bought into these “Learning objectives”. Current assessment methods include: one-on-one meetings with students, exit interviews, and alumni surveys. The program has not been successful with employer surveys (a common problem at other campuses as well).

The program will benefit from a refined assessment process – that includes both direct and indirect assessments, along with a stronger faculty buy-in on assessment. Though the program has mapped learning outcomes to courses, data is not available to show that the students are achieving these outcomes. Faculty members should assist in the collection and analysis of such data. There was no documentation provided to show that the culminating experience was being assessed.

Assessment processes cannot be robust unless there is buy-in and participation by all the faculty members in the department. The Department Chair/Director cannot and should not do it all alone. Faculty members need to participate and in a consistent manner in order for this process to be useful.

4. Student Enrollment

The program currently has about 15 students enrolled in the MS-CES program. Additional 60 or so students are enrolled in the BS degree programs that the same faculty teaches. Applications
for admission to the MS program are declining. Much of the new enrollment seems to be international student admission – which is very unpredictable. During the early years of program, much of the enrollment came from local industry. However, this has changed due to the industry downturn. However, because the program is academically sound, the program has the potential for new enrollment.

Recruitment efforts of late have primarily been in the form of advertisements in local newspapers, presentations at local companies, web site, and mailing flyers and brochures to other universities in the US, India and China. Given the current enrollment numbers, and recent enrollment trends, this recruitment strategy is not yielding sufficient results. The proposed option in Bioengineering track will most likely bring in new students into the MS-CES program.

Consistent with the majority of universities in the United States, the MS-CES program also has a large foreign student population. However, such a population is unpredictable in numbers, and is also demanding of certain types of courses, experiences, and financial aid. The program at this point is not in a position to offer large numbers of research and/or teaching assistantships – and this in turn leads to lower enrollment.

The memorandum of understanding between Sonoma State and some foreign universities is a positive development that has the potential for some new student enrollment. Typically such enrollment is tied to the availability of financial incentives – and in the current fiscal climate, unless the program is so unique that students will enroll regardless of financial incentives, new significant enrollment is not likely to happen. Furthermore, as is common with such memoranda of understanding, interest fizzles out soon – unless there is a strong and sustained campus-to-campus mutual relationship that is also tied to some fiscal resources. Therefore it is imperative that the program look elsewhere for new enrollment – and it could be that the source of enrollment might be right there in Sonoma and surrounding counties. The recommendations section of this report lists some potential sources of new enrollment.

5. Laboratories

In 2001 when the MS-CES program began, it is very likely that SST and the program had perhaps some of the best laboratory resources for graduate level education in the CSU (specially in the photonics and telecommunications areas). Students had access to instrumentation that they will typically see in industry (eg., optical spectrum analyzers, signal conditioners, telecommunications routers, bridges, switching networks etc). The SST and program leadership and the regional industry leaders are to be commended for making this happen. These laboratories are a unique feature of the program and they are extremely important for offering the curriculum. They should continue to be supported and maintained.

As time has passed, the laboratories have aged and some pieces of equipment are failing – and if some of the labs are not immediately upgraded, they soon will be quite obsolete. The laboratory technician mentioned that he was still using Windows 2000 as the operating system in some labs. While Windows 2000 might still be sufficient for older editions of Microsoft Office
products, it is no longer sufficient to run current releases of engineering design and analysis tools satisfactorily. The computer labs need immediate upgrade of the CPU and the operating system – at the very least. With computer companies offering aggressive pricing, such an upgrade might end up being very cost-effective.

6. **Library Resources**

The university library appears to have base line resources to support the MS-CES program. The availability of the online ACM Digital Library is a good sign. However, it is critical for the library to also subscribe to IEEE Xplore (the IEEE Digital library). The program is currently managing using individual faculty subscriptions. It is uncertain whether the use of individual licenses (assuming they are personal faculty licenses) in a program environment is appropriate. The faculty are to be commended for helping out in this manner.

7. **Faculty and Staff**

The MS-CES faculty group is a collection of some ‘permanent’ MS-CES core faculty, and faculty from allied disciplines such as Computer Science, Physics, Mathematics etc. There appear to be four core MS-CES faculty members and two adjunct faculty members. Given the current enrollment, this number is adequate. These individuals all have the requisite background and experience to teach and conduct research in the core areas of the MS-CES program. Three of these faculty members are relatively new (arrived in 2009) to the program and will need SST support for career and professional development (travel funds, research/teaching assistants, assigned time etc). The proposed BioEngineering option may require either the addition of new faculty members (full time or part time) or shift some teaching responsibilities of current faculty to the new area. Without an addition, it would be challenging for current faculty to take on an expanded curriculum.

The two staff members assigned to the MS-CES program appeared to be committed to seeing the program succeed. The administrative support coordinator works half time for the program, and half time somewhere else. Given the number of students currently enrolled, this half time position may be adequate, but as the program grows, this position should be converted to a full time position (especially to support accreditation and assessment processes). The technician is knowledgeable with the diverse and complex laboratory infrastructure and is providing excellent service to the program. Both students and faculty were complimentary of his contributions.

8. **Meetings with faculty and campus leadership**
   a. **Meeting with faculty:**

   The meeting was attended by the following MS-CES faculty members:
   
   Dr. Farid Farahmand (2009)
   Dr. Mohammad Haider (2009)
Dr. Bala Ravikumar
Dr. Shailendhar Saraf (2007)
Dr. Saiza Afreen Eliza (2009) (adjunct)
Dr. Ali Kujoory (adjunct)
Dr. Lynn Stauffer (CSCI) and a couple of other faculty members (names not available) also participated for a short duration. Much of the time was spent with the core MS-CES faculty members.

Other than Dr. Ravikumar, all the other full time faculty members are relatively new faculty members. Dr. Farahmand and Dr. Haider came onboard only in January 2009. Dr. Eliza is an adjunct faculty member and she came onboard in 2009 too. Dr. Saraf, also a recent faculty member (2007) evidently commutes from San Jose. Dr. Ravikumar appeared to be the most experienced of the group – and has responsibilities in Computer Science as well.

The faculty appeared to be clear about the impact of the program on the region. Based on feedback from the Dean and the Director of the MS-CES program, all the newly recruited faculty members have been very clearly apprised of the program’s mission, objectives, and operational framework. Faculty expressed a desire to focus not only on teaching – but also on research. One faculty member felt that his research agenda was not progressing as well as expected – mostly because of how the MS-CES program was structured and run. It was however not clear if the faculty members were making use of the extensive laboratory infrastructure that the program already has for research. Faculty in general expressed the need for good graduate students, support for graduate students, and laboratory upgrades.

The faculty also feel that the program should be called “MS in Electrical Engineering” rather than “MS-CES”. They feel that this change might attract additional students into the program – particularly foreign students who are looking not only for good programs, but also the ‘right’ program titles.

The faculty also did not seem to be well versed with academic program assessment, need for rubrics, continuous feedback loop etc. It seemed that they were really not looking at the big picture of the curriculum and/or program. Their interest was just in the course(s) they taught. They would benefit from a workshop on assessment – both for graduate, and undergraduate education.

Though the faculty members talked about their desire to be involved with strategic planning and long term development of the MS-CES program, it was not evident from their comments that they are proactively seeking such involvement. One faculty member’s perception was that faculty were not included in the decision making process on program matters. No evidence was provided to support this. The same faculty
member also felt that SST stifles tenure track faculty with its various expectations in the RTP process. (The current RTP guidelines however seem consistent with what is being expected at other CSUs – therefore, there appears to be something else underlying that this faculty perceives as problems). A faculty retreat with some open dialog between all might help alleviate some of these matters – at least to some extent.

b. Meeting with students:

Five students attended the reviewers session with students. They were articulate and forthcoming with their views. Students had good things to say about Dr. Ravikumar, industry partnerships, internships, small classes, and Mr. Sharam (the technician). They were however not pleased due to the lack of access to some faculty (part time), not enough course offerings, the commuter school experience, lack of courses in new areas. The students offered the following suggestions:

i. add more software engineering courses to the program
ii. change the core – linear systems should not be required – especially to those students with interest in software engineering and software systems
iii. offer summer courses
iv. make labs available to other programs/universities
v. increase the number of courses offered each semester
vi. program needs better marketing – nobody knows about the program

c. Meeting with Dean Saeid Rahimi

The meeting with Dean Rahimi was useful because he provided the context of the program, its beginnings, and the challenges, and some of the plans for the future (Bioengineering). There was a discussion on the feedback provided by the faculty and the Dean assured the reviewer that he would work with the faculty on these matters. The Dean is to be commended again for his leadership in bringing this program to campus and working on ways to make it stronger.

d. Meeting with the Dean, School of Extended Education

As a relatively new employee of Sonoma State, Dr. Mark Merickel, Dean of Extended Education brings new ideas and sees new opportunities for the MS-CES program – and this is good for the program. He appears to be willing to work closely with the leadership of SST and the program to develop a plan to morph the program into a more attractive one for students to enroll in. There was a discussion on expanding the market for the MS-CES program – perhaps to also include the military base north of Sonoma, and other untapped regions.
e. Meeting with the Provost

The meeting with the Provost, Dr. Eduardo Ochoa provided an opportunity to learn about the University’s interest and commitment to supporting the MS-CES program. There was a discussion on the structure of the MS-CES program and its various options, the possibility of making it a MS-EE program etc. The Provost appeared to favor a generalist approach for the program, so that it remains nimble. His preference seems to be for a program that can support STEM and not just engineering.

The Provost also remained open to discussion on making the program state funded – rather than self-supporting, though he did mention that it was not a pressing issue.

Reacting to comments made by students, faculty, and others on the campus (as part of this review process), Provost assured the reviewer that he would work with SST Dean to address the needs and concerns.

9. Recommendations

The following recommendations are being offered to the SST Dean and MS-CES program leadership.

f. Faculty:

i. A retreat with faculty will most likely be useful. Topics could include SST vision, development of a strategic plan for MS-CES, relationship of this plan with the University and SST strategic plan, university commitment to MS-CES etc. The new faculty members (four out of the current total of five) will need to become more involved with program matters, including program development, curriculum development, assessment etc.

ii. All faculty should be required to attend a workshop (or series of workshops) on assessment. The process of designing program mission, objectives, outcomes, and assessment protocols will bring the faculty together, and bring about a sense of ownership for the entire program and not just the courses that each one teaches. It would be preferable for a faculty member to take on the role of assessment coordinator for the program.

iii. The newer faculty need some professional development. They also need to be connected stronger with the university as a whole (committee service etc).

g. Curriculum:

i. Evaluate the appropriateness of the current tracks in the program. Is there still a real need for the two tracks? Is the need sustainable? Can the current faculty support the two (and soon to be three) tracks adequately? Should the existing core-course structure be modified – such that the program becomes more ‘flexible’ and attractive to students.
ii. New option in BioEngineering: Given that this option is quite different from the other current options, the faculty should consider looking into new core courses for the Bioengineering option. The current core is not suitable for a bio-engineering option. If the current core is retained, enrollment in the program will be extremely limited. Faculty may also want to consider adding courses in business administration, intellectual property, or entrepreneurship etc as required courses in the program. These subject areas are important for practicing professionals in the areas of bio-engineering/bio-informatics etc.

iii. Redesign the assessment protocols for the MS-CES program. Program assessment cannot be the responsibility of just the Director of the MS-CES program. It is important that all the faculty members in the program buy into this process. In fact, it is preferable for a faculty member to take on the role of ‘Assessment Coordinator’ for the program.

iv. The internship requirement seems like an add-on to the program; while its intent is good, there is no evidence provided that this internship program is working. Recommend to develop an assessment protocol for the internship experience, have a structured relationship between intern and industry mentor, require students to write a report following the internship, and make an oral presentation to fellow students and faculty. This can be an excellent environment for ‘direct assessment’.

h. Laboratory:
   i. Review laboratory needs in context of new option development, and current option review.
   ii. Upgrade computer labs immediately. The computing infrastructure is extremely outdated.
   iii. Maintain existing laboratories and space. The program needs this for effective offering of the curriculum.

i. Students:
   i. Enforce mandatory advising. One way to achieve this is to place advising holds on all students so that they will not be able to register for courses in any given semester prior to an advising session with an advisor.
   ii. Regular group meetings (perhaps once per semester) with students is recommended with an aim to keeping them involved, to seek their feedback on various matters relating to their education at Sonoma State.
   iii. Use students as program ambassadors for recruiting - especially in local firms.
   iv. Market the program to the current students pursuing BS degrees in related fields at Sonoma State.

j. Enrollment:
   i. To improve enrollment numbers, consider the development of an accelerated BS-MS degree program – also known as a 4+1 program (or blended program); Cal Poly San Luis Obispo has several such programs in their College of Engineering. With a clever system of ‘double-counting’ of courses, CalPoly
makes it possible for its undergraduate students to begin graduate level work in their senior year and complete the MS degree within a year of completing the BS degree. This approach might be useful for Sonoma State, and might attract Sonoma undergraduate students to pursue the MS-CES program.

ii. Explore new sources of students – such as the military base north of Sonoma, and other untapped areas (returning Veterans) etc.