CALIFORNIA STATE UNIVERSITY, FRESNO

Memorandum

Date: November 19, 2010

To: Michael Caldwell, Chair
Academic Senate

From: Marilyn Wilson, Chair
Graduate Committee

Re: **Option in Computer Engineering (CompE) for the Master of Science in Engineering (MSE) Degree Program**

The Graduate Committee discussed the Option in Computer Engineering (CompE) for the Master of Science in Engineering (MSE) Degree Program. As a result of the discussion the following motion was passed.

MSC to approve the proposed Option in Computer Engineering (CompE) for the Master of Science in Engineering (MSE) Degree Program and forward to the Executive Committee for approval.

Please do not hesitate to contact the New Chair Marilyn Wilson at ext. #5129, if you have any questions.

MW/sh

attachment

Office of the
A[illegible]mic Senate
5[illegible] Jackson Ave. M/S UC43
Fresno, CA 93740-8023
559.278.2743
Fax 559.278.5745

CALIFORNIA STATE UNIVERSITY, FRESNO

24 September, 2010

To: William Covino
Provost and Vice President for Academic Affairs

Karen Carey
Dean, Division of Graduate Studies

From: Ram Nunna
Interim Dean, Lyles College of Engineering

Re: Proposed Option in Computer Engineering (CompE) for the Master of Science in Engineering (MSE) degree program

I am writing to endorse the creation of a new option in Computer Engineering for the Master of Science in Engineering (MSE) degree program. The MSE program presently has two options: Electrical Engineering and Mechanical Engineering. The Computer Engineering option is being proposed by the Department of Electrical and Computer Engineering (ECE). The Lyles College of Engineering (LCOE) Graduate Committee has reviewed this proposal and recommends approval. In a memo to the Provost dated 4/10/2010, Dr. Michael Jenkins, former Dean of LCOE also endorsed the creation of the new option.

The ECE department has the largest graduate enrollment (about 47 students) in the Lyles College of Engineering. Many students pursuing the MSE degree have focused their studies in Computer Engineering – and as such have unofficially 'chosen' a Computer Engineering track. It is very likely that the creation of the new option in Computer Engineering will result in increased interest in the MSE graduate program. The Computer Engineering option will complement the existing Electrical Engineering Option in the ECE department. Both options will share the available graduate courses as core courses or electives. The ECE department already has sufficient courses in support of both the Options.

Please let me know if I can provide additional information.

CC: Dr. Nagy Bengiamin, Chair, Electrical and Computer Engineering

Lyles College of Engineering
Office of the Dean
2320 E. San Ramon Ave. M/S EE94
Fresno, CA 93740-8030
559.278.2500
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October 11, 2010

MEMORANDUM

TO: Sharon Hayes
Academic Senate Office

FROM: Augustine Perez
Division of Graduate Studies

SUBJ: Item for agenda and distribution to the University Graduate Committee

Please find enclosed 8 copies of the information regarding the proposed Option in Computer Engineering (CompE) for the Master of Science in Engineering (MSE) degree program. As submitted by the Lyles College of Engineering, Ram Nunna, Interim Dean.

Please include in the upcoming agenda and distribute the enclosed materials to the committee. Thank you.

Enclosures

ap

CALIFORNIA STATE UNIVERSITY, FRESNO

LYLES COLLEGE OF ENGINEERING

Electrical and Computer Engineering Department
Lyles College of Engineering
California State University, Fresno

To: Karen Carey, Dean
Graduate Division

From: N. Bengiamin, Chair Nagy Beng
Electrical and Computer Engineering

Subject: Proposal for a new option (Computer Engineering) in MS of Engineering (MSE) Program

Date: September 24, 2010

Pursuant to my memo of April 7, 2010 relative to proposing a new option in the MSE program, I am following up with the attached formal request. This request is endorsed by the ECE faculty and approved by the Lyles College of Engineering at all levels.

The present MSE program has two options, one in Mechanical Engineering (ME) and one in Electrical Engineering (EE). Adding the Computer Engineering (CompE) option stems from the following facts:

1) The undergraduate CompE program is housed in the ECE Department. This program is the only program in the two affected departments (ME and ECE) which doesn't have a graduate level option.
2) The two ECE undergraduate programs (EE and CompE) overlap significantly (by more than 70%) and students from both programs share elective courses in addition to working jointly on projects including the culminating experience (senior design projects). Furthermore, the EE program allows a concentration in computer engineering via technical electives in the digital subjects. All undergraduate courses have the ECE prefix which allows for a seamless selection of electives in both programs.
3) Many CompE engineers presently enroll in the MSE (EE option) program to complete their graduate degree in the digital area (CompE related). Presently, there are sufficient graduate course offerings in the digital area to accommodate that interest. The main drawback in this practice is the lack of declaring the digital program (CompE) officially on the transcript. These students are deprived from having the degree title that reflects clearly the nature of the completed program; that is MSE in CompE.
4) To accommodate students with interest in digital systems (CompE), the ECE department has been allowing substitute courses in the required core. The department submitted a blanket justification to the graduate division for these frequent substitutions.

5) About 50% of the present 46 graduate students in the EE option pursue the digital courses route and they are asking for an explicit title relevant to CompE.
6) Introducing the CompE option is long overdue. The reason it wasn't included since the start of the MSE program is that the BS in CompE program is relatively young and it wasn't in place when the MSE was initially developed. A new CompE option is a natural fit without any doubt. The present high enrollment justifies introducing this new option. There is sufficient evidence that the CompE option will attract even more students to the MSE program.

The attached document states the requirements for the two ECE related options. The only new course will be ECE 278. In this proposal we also request changing the prefix of EE courses to ECE to reflect the actual nature of the courses offered, similar to that of the undergraduate programs.

The ECE department presently strives to make available to students one course in analog (EE), one course in digital (CompE) and one core course every semester as an absolute minimum. The new CompE option shouldn't require a change in the frequency of offerings. We just must insure that the new core course (ECE 278) is offered once a year like other core courses.

I will be happy to discuss this request and answer any questions you or the raduate committee may have.

Thanks you.

C: Ram Nunna

CALIFORNIA STATE UNIVERSITY, FRESNO

10 April 2010

Memorandum

To: William Covino
Provost and Vice President, Academic Affairs

From: Michael Jenkins
Dean, Lyles College of Engineering

Subject: Notice of Proposed Option in **Computer Engineering (CompE)** for the **Master of Science in Engineering (MSE)** degree program

The following information is provided to alert you as Provost of the proposed option in Computer Engineering (CompE) for the Master of Science in Engineering (MSE) degree program, per the Procedure for Submitting Proposals for New Options, Concentrations, or Emphasis posted by the Division of Graduate Studies for AY2009-11.

Please see the attached copy of a memo sent by Dr. Nagy Bengiamin, Chair of Electrical and Computer Engineering, to Dr. Karen Carey, Dean, Graduate Division, regarding the proposed Computer Engineering option.

As Dean of the Lyles College of Engineering, I endorse the creation of a new option in Computer Engineering (CompE) for the Master of Science in Engineering (MSE) degree program.

Please contact me with any questions or comments regarding this matter (559-278-8743 or jenkinsm@csufresno.edu).

cc: Dr. Nagy Bengiamin, Chair, Electrical and Computer Engineering

Lyles College of Engineering
Office of the Dean
2320 E. San Ramon Ave. M/S EE94
Fresno, CA 93740-8030
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Electrical and Computer Engineering Department
Lyles College of Engineering
California State University, Fresno

To: Karen Carey, Dean
Graduate Division

From: N. Bengiamin, Chair
Electrical and Computer Engineering

Subject: Concept Proposal for a new option (Computer Engineering) in MS of Engineering (MSE) Program

Date: April 7, 2010

The Electrical and Computer Engineering faculty submit this concept proposal as the first step in the process to request a new option. This concept proposal has been endorsed by the ECE faculty and shared with the dean of the Lyles College of Engineering as well as the graduate committee of the college.

The present MSE program has two options, one in Mechanical Engineering (ME) and one in Electrical Engineering (EE). Adding the Computer Engineering (CompE) option stems from the following facts:

1) The undergraduate CompE program is housed in the ECE Department. This program is the only program in the two affected departments (ME and ECE) which doesn't have a graduate level option.
2) The two ECE undergraduate programs (EE and CompE) overlap significantly (by more than 70%) and students from both programs share elective courses in addition to working jointly on projects including the culminating experience (senior design projects). Furthermore, the EE program allows a concentration in computer engineering via technical electives in the digital subjects. All undergraduate courses have the ECE prefix which allows for a seamless selection of electives in both programs.
3) Many CompE engineers presently enroll in the MSE (EE option) program to complete their graduate degree in the digital area (CompE related). Presently, there are sufficient graduate course offerings in the digital area to accommodate that interest. The main drawback in this practice is the lack of declaring the digital program (CompE) officially on the transcript. These students are deprived from having the degree title that reflects clearly the nature of the completed program; that is MSE in CompE.
4) To accommodate students with interest in digital systems (CompE), the ECE department has been allowing substitute courses in the required core. The department submitted a blanket justification to the graduate division for these frequent substitutions.
5) About 50% of the present 46 graduate students in the EE option pursue the digital courses route and they are asking for an explicit title relevant to CompE.
6) Introducing the CompE option is long overdue. The reason it wasn't included since the start of the MSE program is that the BS in CompE program is relatively young and it

wasn't in place when the MSE was initially developed. A new CompE option is a natural fit without any doubt. The present high enrollment justifies introducing this new option. There is sufficient evidence that the CompE option will attract even more students to the NSE program.

The attached document states the requirements for the two ECE related options. The only new course will be ECE 278. In this proposal we also request changing the prefix of EE courses to ECE to reflect the actual nature of the courses offered, similar to that of the undergraduate programs.

The ECE department presently strives to make available to students one course in analog (EE), one course in digital (CompE) and one core course every semester as an absolute minimum. The new CompE option shouldn't require a change in the frequency of offerings. We just must insure that the new core course (ECE 278) is offered once a year like other core courses.

I look forward to your initial comments and suggestions before we develop a final proposal. I am available to answer questions or meet with you at your request.

Thanks you.

C: Michael Jenkins
ECE Faculty
Lyles College of Engineering Graduate Committee

New Option in CompE

1. *Name of the school/department submitting the request, the full and exact title of the proposed aggregate of courses, and whether it is an option, concentration, or emphasis.*

College:	Lyles College of Engineering (LCOE)
Department:	Electrical and Computer Engineering Department (ECE)
New option:	Master of Science in Engineering - Computer Engineering option (MSE-CompE)

2. *Full and exact title of the degree major program under which the aggregate of courses will be offered, where applicable.*

The proposed option will be offered under the Master of Science in Engineering (MSE) program.

3. *Options, concentrations, or special emphases already existing under the degree major program for which the new aggregate of courses is proposed.*

Existing options under the Master of Science in Engineering:

- Electrical Engineering (EE)
- Mechanical Engineering (ME)

Note:

The Distance Learning component of the program is scheduled for termination effective Fall '11.

4. *Department(s) to offer the aggregate of courses. Include a letter of approval/support from any department other than the proposing department supplying coursework for the program.*

None of the required and elective courses for the CompE option have to be taken outside the ECE Department. ECE is the only department that will be affected by the proposed new option in CompE.

5. *Purpose of the proposed aggregate of courses.*

The present MSE program has two options, one in Electrical Engineering (EE) and one in Mechanical Engineering (ME). The desire to add the Computer Engineering (CompE) option stems from the following facts:

1) The undergraduate CompE program is housed in the ECE Department. This program is the only program in the ME and ECE departments that doesn't have a graduate level option.
2) The two ECE undergraduate programs (EE and CompE) overlap significantly (by more than 70%) and students from both programs share elective courses in addition to working jointly on projects including the culminating experience (senior design projects). Furthermore, the EE program allows a focus in computer engineering via technical electives in the digital subjects. The main difference between the CompE and EE programs is that in CompE students focus their program of study on digital electronics and computer architecture/design including hardware and software. All undergraduate courses have the ECE prefix which allows for a seamless selection of electives in both programs.
3) Many CompE engineers (with BS in Computer Engineering) presently enroll in the MSE-EE option to complete their graduate degree in the digital area (CompE related). Furthermore, several EE engineers (with BS in Electrical Engineering) decide to complete their graduate program in the digital area (CompE related). Presently, there are sufficient graduate course offerings in the digital area (about 40% of the graduate level courses; a similar ratio for undergraduate courses) to accommodate that interest. The main drawback in this practice is the lack of declaring the digital program (CompE) officially on the transcript. These students are deprived from having the degree title that reflects clearly the nature of the completed program; that is MSE-CompE.
4) To accommodate students with interest in digital systems (CompE), the ECE department has been allowing course substitutions in the required core. The department submitted a blanket justification to the graduate division for these frequent substitutions.
5) More than 40% of the present 50 graduate students in the EE option pursue the digital courses route and they are asking for an explicit title relevant to CompE. Some students haven't declared their interest yet. Advancement to candidacy is the time for declaring that interest.
6) Introducing the CompE option is long overdue. The reason it wasn't included since the start of the MSE program is that the BS in CompE program is relatively young and it wasn't in place when the MSE was initially developed and put in place. A new CompE option is a natural fit without any doubt. The present high enrollment in the EE-option justifies introducing the CompE option. There is sufficient evidence that the CompE option will attract even more students to the MSE program.

6. *State the desired student learning outcomes. Provide a supplement to the degree program's Student Outcomes Assessment Plan (SOAP) that addresses the outcomes and assessment measures for the new aggregate of courses. The SOAP template can be found at www.csufresno.edu/irap/assessment/SOAP/.*

The SOAP of the MS in Engineering EE Option (Appendix A) is applicable to the CompE option with the following underlined change to learning outcome 2:

"Demonstrate knowledge in advanced computer engineering subjects and utilize advanced engineering tools to solve engineering problems."

EE and CompE disciplines overlap significantly and there is usually a gray area between them even at the practice level. The fundamental difference is in the increased emphasis of computer engineering on digital systems as applied to computer architecture, design and applications versus the broader area of electrical engineering that includes controls, communication, energy, microwaves, ... etc; i.e. computer engineering is a more focused program.

The present EE-option SOAP is applicable in its entirety knowing that the core differs by one course which is ECE 278 in place of ENGR 206. This is in addition to the list of electives that is more digital systems oriented.

Since the difference between EE and CompE learning outcomes is in the technical content only, all assessment tolls will be the same.

7. *Need for the proposed aggregate of courses. (See the suggested resources and sample surveys on the DGS Web site. Feel free to adapt surveys to meet specific program needs.)*

Since computer engineers have been an integral part of the graduate students' population in the EE-option at Fresno State for numerous years, we have ample evidence of the need for the CompE option and its potential growth. Computer engineers who have completed the EE-option have been successful and they were able to gain the knowledge they have desired in the most part but they always missed the proper recognition of the digital systems knowledge they possessed.

The survey of **Appendix B** was administered to 85 students (38 graduate students and 47 undergraduate students) in the ECE Department. The results of the survey provide the following data:

1) 58% of the graduate students would have chosen the CompE option over the EE option.
2) About 80% of the undergraduate students expressed interest in an MS degree (very and moderately).
3) 65% of the undergraduate students would enroll in the CompE option if available.
4) 82% of interested students shall be full time students.

The survey of **Appendix C** was administered to the graduating MS class of Spring '10 (8 students total). The following data was received:

1) 75% have chosen a CompE related subject for a focus area in their program of study.
2) 50% ended up doing CompE related work in their program while 25% mixed EE and CompE.

Furthermore, out of 50 students enrolled in the EE-option last year (Spring '10) about 20 students were identified to be clearly working on CompE culminating experience projects. These are students who have been advanced to candidacy and assigned technical advisors known to be core computer engineering professors.

All evidence indicates that the CompE option will attract many students of those who enroll at Fresno State. The present EE-option enrolls over 50 students who may split evenly between EE and CompE. It is expected that enrollment will grow and the graduate program will be strengthened if the CompE option became available upon admission into the MS program. Upon instating the CompE option, students who prefer to have the title of CompE on their diploma will find a viable option to pursue.

Appendix D gives some support information relative to the need of the job market in California and the nation for computer engineers.

8. *List of the courses (required and elective) for the proposed aggregate of courses, by catalog number, title, and units of credit, as well as total units to be required for the degree major in which the proposed aggregate of courses is to be included. Indicate which program requirements provide common educational experiences for students in this program.*

   Note: For convenience, this may be submitted in proposed catalog copy format with appropriate forms attached.

The following table provides a summary of the CompE option requirements.

* New Course

** Common education experience with EE and ME

*** Common education experience with EE. Also, most of the elective courses have the potential of common education experience with EE.

Note: **Changing the courses prefix from EE to ECE is part of this proposal.**

	Computer Engineering Option (30 units Program)
Core	ENGR 200: Seminar in Engineering (1)** ENGR 201 Systems Modeling and Realization (3)***,** ECE 278: Embedded Systems (3)*
Thesis Option	*Major Courses: 9 units* Select from the list of 200-level CompE courses; at least 2 courses from the CompE list *Elective Courses: 9 units* Select from 200-level ECE courses, 100-level ECE courses, or 200-level courses, and other courses approved by Graduate Advisor *Thesis(ECE 299): 6 units*
Project Option	**Major Courses: 12 units** Select from the list of 200-level ECE courses; at least 3 courses from the CompE list below. **Elective Courses: 8 units** Select from 200-level ECE courses, 100-level ECE courses, or 200-level courses, and other courses approved by Graduate Advisor. **Project(ECE 298): 3 units**
Exam Option	*Major Courses: 9 units* Select from the list of 200-level CompE courses; at least 2 courses from the CompE list *Elective Courses: 9 units* Select from 200-level ECE courses, 100-level ECE courses, or 200-level courses, and other courses approved by Graduate Advisor *Comprehensive Exam (0 unit)*

Electives***: (All the following courses are already in the catalog. The ECE prefix is used here instead of the EE prefix because we have submitted a request for a prefix change.)

ECE 224: Advanced Signal and Systems
ECE 240: VLSI Circuits and Systems (3)
ECE 242: Digital Systems Testing (3)
ECE 243: Modern Methods in Synch. Sequential Design (3)
ECE 255: Digital Signal Processing (3)
ECE 274: High Performance Computer Architecture (3)
ECE 291T: Topics in ECE (1-3; max total 6)
ECE 290: Independent Study (1-3; max total 6)
ECE 132: Design of Digital Systems (3)
ECE 135: Wireless Communication Systems (3)
ECE 136: Electromagnetics Theory and Applications (3)
ECE 140: VLSI System Design (3)
ECE 146: Computer Networking and Distributed Proc. (3)
ECE 152: Power Systems Protection (3)
ECE 153: Power Electronics (3)
ECE 162: Integrated Circuits and Applications (3)
ECE 166: Microwave Devices and Circuits Design (3)
ECE 168: Microwave Amplifier and Oscillator Design (3)
ECE 171: Quantum Electronics (3)
ECE 172: Sequential Machine and Automata Theory (3)
ECE 173: Robotics Fundamentals (3)

Due to the close interaction between the EE and CompE options, The core for the EE option will be adjusted as follows to differentiate clearly between the two options:

	Electrical Engineering Option (30 units Program)
Core	ENGR 200: Seminar in Engineering (1)** ENGR 201 Systems Modeling and Realization (3)***,** ECE 224: Advanced Signals and Systems (3)
Thesis Option	*Major Courses: 9 units* Select from the list of 200-level ECE courses; at least 2 courses from the EE list below. *Elective Courses: 8 units* Select from 200-level ECE courses, 100-level ECE courses, or 200-level courses, and other courses approved by Graduate Advisor. *Thesis (ECE 299): 6 units*
Project Option	**Major Courses: 12 units** Select from the list of 200-level ECE courses; at least 3 courses from the EE list below. **Elective Courses: 8 units** Select from 200-level ECE courses, 100-level ECE courses, or 200-level courses, and other courses approved by Graduate Advisor. **Project(ECE 298): 3 units**
Examination Option	*Major Courses: 15 units* Select from the list of 200-level ECE courses; at least 3 courses from the EE list below. *Elective Courses: 8 units* Select from 200-level ECE courses, 100-level ECE courses, or 200-level courses, and other courses approved by Graduate Advisor. *Comprehensive Exam: 0 units*

Electives***: (All the following courses are already in the catalog. The ECE prefix is used here instead of the EE prefix because we have submitted a request for a prefix change.)

ECE 206: Stochastic Theory in Engineering Analysis
ECE 230: Nonlinear Control Systems
ECE 231: Digital Control Systems
ECE 232: Optimal Control Systems
ECE 240: VLSI Circuits and Systems
ECE 241: Applied Electromagnetics
ECE 245: Communications Engineering
ECE 247: Modern Semiconductor Devices
ECE 249: Advanced Comm. Engr.
ECE 251: Antennas and Propagation
ECE 253: Power Systems Dynamics
ECE 255: Digital Signal Processing
ECE 257: Optical Comm. and Lasers
ECE 259: Radar System Design
ECE 274: High Performance Computer Architecture
ECE 291T: Topics in ECE
ECE 290: Independent Study
ECE 132: Design of Digital Systems (3)
ECE 135: Wireless Communication Systems (3)
ECE 136: Electromagnetics Theory and Applications (3)
ECE 140: VLSI System Design (3)
ECE 146: Computer Networking and Distributed Proc. (3)
ECE 152: Power Systems Protection (3)
ECE 153: Power Electronics (3)
ECE 162: Integrated Circuits and Applications (3)
ECE 166: Microwave Devices and Circuits Design (3)

ECE 168: Microwave Amplifier and Oscillator Design (3)
ECE 171: Quantum Electronics (3)
ECE 172: Sequential Machine and Automata Theory (3)
ECE 173: Robotics Fundamentals (3)

9. *Submit all new catalog copy describing the new aggregate of courses, including new course proposals for each of the new courses in the proposed option, on the proper forms (available on Informed Filler®). Note: New course request forms require a complete course syllabus be attached.*

Attached.

10. *List of all present faculty members, with rank, appointment status, area of expertise, who would teach in the proposed aggregate of courses. Note: A minimum of three tenured or tenure-track faculty required for each option, concentration, or emphasis.*

Dr. Charles Won (Assistant Prof., Tenure Track, Computer Engineering)

Dr. Reza Raeisi (Associate Professor, Tenure Track, Computer Engineering)

Dr. Alber Heaney (Full Professor, FERP, Computer Engineering)

Dr. Ram Nunna (Full Professor, Associate Dean, Computer Engineering)

Dr. Nagy Bengiamin (Full Professor, Tenured, Electrical Engineering with some digital systems emphasis; contributes through the allowed 9 units of 100-level courses and the ENGR 201 core course.)

Dr. Daniel Bukofzer (Full Professor, Tenured, Electrical Engineering with some digital systems emphasis; contributes through the allowed 9 units of 100-level courses and the 200-level Digital Signal Processing course)

Dr. Gregory Kriehn (Associate Professor, Tenured, Electrical Engineering with some digital systems processing emphasis; contributes through the allowed 9 units of 100-level courses)

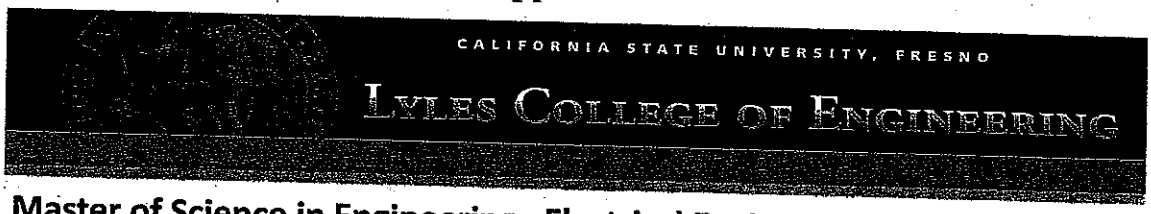
Dr. Kim (Assistant Professor, Tenure Track, Electrical Engineering) is on the graduate faculty and he would contribute to the CompE-option via 100-level electives.

11. Additional instructional resources (faculty, space, equipment, library volumes, etc.) needed to implement and sustain the proposed aggregate of courses. List all resources needed for the first five years beyond those currently projected, including specific resource, cost, and source of funding. **Provide completed budget analysis required by the Budget Committee as outlined in the UBC Budget Analysis Guidelines.**

The ECE Department presently accommodates graduate students with emphasis in digital electronics and computer related research (CompE). No additional space, specific equipment or laboratory volumes are needed to make the CompE option a formal option rather than being a hidden area of emphasis under the EE option. Whether the CompE option is declared formally or not, there is a continued need within ECE for an additional half-position at least to accommodate the high graduate enrollment in the EE option. It is expected that the present enrollment of the EE option will be shared with the CompE option to reflect the actual focus of students program of study. A moderate increase in enrollment is expected once the new option is declared. The ECE department's approved action plan for the next five years calls for a moderate increase in faculty positions to be able to accommodate the moderate growth in the programs within the ECE Department including the graduate program. This plan includes the needs of the graduate program.

The ECE faculty is supportive of limiting the graduate enrollment in favor of admitting most qualified students to improve quality and provide an educational environment most conducive to effective scholarly activities. The present enrollment in the EE-option is about 50 students. The ECE Department will strive to limit enrollment in the graduate program to no more than 60 students during the next 5 years. This enrollment figure may be adjusted according to the undergraduate enrollment which is expected to grow only moderately during the next few years.

Appendix A



Master of Science in Engineering - Electrical Engineering Option (MSE-EE)

Student Outcomes Assessment Plan (SOAP)

Updated August 4, 2010

Mission Statement

The objective of MSE-EE Program is to provide advanced engineering education in Electrical Engineering to resident students as well as practicing engineers working in the high-tech industries surrounding the Fresno metropolitan area. Graduates of this program should be able to advance their career and work on complex engineering problems dictated by continuing advances in technology. Additionally, the program seeks to prepare graduates for advanced research and engineering applications to fulfill the technical needs of local industry in the region and beyond.

MSE-EE Program Goals

The Master of Science in Electrical Engineering program builds upon a previously acquired foundation in basic science, mathematics, and electrical engineering to advance skills in research and applied engineering science. The objective of MSEE Program is to **enhance the students' ability to be successful and advance in their chosen careers in industry, academia, and public institutions.** The MSE-EE program prepares students for today's technology driven careers with the following program goals:

- To enhance the students' analytical skills by developing a deeper understanding of major theoretical and practical engineering concepts.
- To improve students' written and oral technical communication skills.
- To increase the level of competence of the students for solving practical yet increasingly complex discipline specific engineering problems.
- To develop students' creative thinking skills required in understanding and solving complex engineering problems.
- To allow students to acquire and demonstrate a sufficient depth of knowledge in a substantive area of electrical engineering.

These program goals are consistent with the essential components of the mission and vision of California State University, Fresno:

- Support and develop high quality graduate programs appropriate to the needs of the region
- Engage in high quality research, with particular emphasis on applications that support the region.
- Build upon existing academic programs and create new academic programs to help transform and develop the region

The ECE faculty members of the MSE-EE program offer courses and conduct scholarly work in the broader area of electrical engineering including communication, control systems, VLSI/digital systems, computer networks, embedded systems, robotics, power systems, and high frequency electronics. These areas overlap and they provide opportunities for integration and cross-areas projects. This facilitates providing students with broad backgrounds and programs of study that prepare them best for practice as well as more advanced studies.

The minimum number of units required to complete the MSEE degree is 30 units including the culminating experience. The possible options for culminating experience are Comprehensive Exam (0 units), Directed Project (3 units) and Directed Thesis (3-6 units). Through academic advising, students choose the option that fits their career goals most. The thesis option is usually recommended for those who have interest in pursuing doctorate studies. Students who intend to practice upon graduation are advised to pursue the project or the comprehensive exam option. The project option is usually preferred for those who desire to prepare themselves for development projects with technical emphasis.

Student Learning Outcomes

The graduate of the program should be able to,

1. Apply advanced mathematics and engineering science to practical problems.
2. Demonstrate knowledge in advanced electrical engineering subjects and utilize advanced engineering tools to solve engineering problems.
3. Conduct experiments and analyze collected data.
4. Communicate effectively orally and in writing.
5. Conduct literature searches and formulate ideas via critical thinking practices.

Learning Outcomes versus Program Requirements

Learning Outcome	*ENGR 200 (core)*	*ENGR 201 (core)*	*ENGR 202 (core)*	*ENGR 206 (core)*	*ECE Electives*	*EE Electives*	*EE 290*	*EE 298/299*
1			I	I	I	R		M
2		I		R	I	R		M
3		I					R	M
4	I	R					R	M
5	I				I	R	R	M

I=introduces *R=Reinforced* *M=Mastery*

Assessment Tool

a. Student Learning Outcome (1)
   - Evaluation of students' work in course assignments, exams (embedded questions), projects, thesis, and/or culminating experience. [Direct Measure]
   - Course assessment survey. [Indirect Measure]
   - Culminating experience technical presentation evaluation. [Direct Measure]

b. Student Learning Outcome (2)
   - Evaluate students' course and exams (embedded questions) work and culminating experience reports/papers. [Direct Measure]
   - Exit survey [Indirect Measure]
   - Analysis of program of study [Indirect Measure]

c. Student Learning Outcome (3)
   - Evaluate performance in the lab. [Direct Measure]
   - Evaluate lab reports and culminating experience activities. [Direct Measure]

d. Student Learning Outcome (4)
   - Evaluate student performance in fulfilling the department writing requirement. [Direct Measure]
   - Exit survey [Indirect Measure]
   - Evaluate performance in project/thesis presentation and other required course presentations. [Direct Measure]

e. Student Learning Outcome (5)
   - Culminating experience technical presentation evaluation. [Direct Measure]
   - Course Assessment Survey. [Indirect Measure]

Learning Outcomes versus Assessment Tools

Learning Outcome	*Course work (direct)*	*Embedded questions (direct)*	*Evaluation of culminating experience (direct)*	*Course survey*	*Exit survey*	*Program of study*	*Performance in lab (direct)*	*Writing requirement (direct)*
1	X	X	X	X				
2	X	X	X		X	X		
3			X				X	
4			X		X			X
5			X	X				

Time Schedule and Closing the Loop

- Due to the short nature of the program, all learning outcomes shall be assessed every year; which means that all assessment tools will be implemented annually.
- Collected data from the direct and indirect assessment tools will be analyzed by the ECE faculty every year to determine areas for improvement and the corresponding means for corrective action including curriculum changes.
- Findings of assessment activities will be shared with students and the ECE Industry Advisory Council for input before implementing changes.
- Program goals and learning outcomes will be assessed by the ECE faculty every other year (starting Spring, 2012) in consultation with the ECE Industry Advisory Council.
- Alumni survey [Direct Measure] will be administered once every three years (starting Spring, 2012) to assess graduates' career development and the level of success in fulfilling career goals.

During the Fall '10 semester, The ECE graduate faculty will develop the following assessment tools and apply them at the end of the semester:

- Rubric for competence in applied math and engineering science applied science (outcome 1) to be used in courses to evaluate embedded questions, course projects, and culmination experience papers.
- Rubric to assess knowledge of advanced electrical engineering and use of engineering tools (outcome 2) to be used to evaluate course projects and culminating experience papers.
- Rubric for hands-on experiences (outcome 3) to be used in ENGR 201 and to evaluate culminating experience report/thesis.
- Rubric for writing skills (Outcome 4) to be used in ENGR 200 and to evaluate culminating experience papers.
- Rubric for literature search and formulation of ideas (outcome 5) to be used in ENGR 200, course projects, and to evaluate culminating experience papers.
- Revise the Exit Survey Form to emphasize learning outcomes more explicitly.
- Course Assessment survey form.

The Alumni Survey Form will be developed in Fall '11.

Attached are the assessment tools that are presently in use and will be revised and expanded upon.

Graduate Project/Thesis Assessment Form

MS in Engineering – EE Option

To be completed by faculty members attending the project/thesis presentation

Student Name _____ Date of Presentation _____

○ Thesis ○ Project

On a scale of 1 to 5; rate the following skills (1 for poor and 5 for excellent)

Oral Communication and quality of slides:

Clarity of pronunciation ___ Eye contact ___ Ability the express ideas ___

Ability to answer questions ___ Clarity of slides ___ Organization of presentation ___

Comments _____

_____

Technical Content:

Clarity of methodology ___ Use of engineering tools ___ Use of scientific tools ___

Soundness of argument ___ Significance of conclusions ___

Suitability of work for a graduate Level ___

Comments _____

_____

Written Report:

Organization ___ Sentence structure ___ Spelling and Grammar ___

Transition between paragraphs ___ Literature search and use of references ___

Comments _____

_____

Overall recommendation:

○ Pass with no corrections ○ Pass with corrections ○ Needs major changes

Faculty member _____

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
STUDENT-FACULTY FORUM - Spring 2010

Program of Study: *Computer Engineering* ____ *Electrical Engineering* ____

Class Standing: *Freshman* __ *Sophomore* ___ *Junior* __ *Senior* __ *Graduate* ___

Transfer Student: *Yes* __ *No* __ *(If yes, from a Calif. Jr. Coll? Yes* __ *No* __*)*

Knowing that engineering is an evolving field, how important to you to engage in professional development activities (IEEE membership, workshops, technical courses, learning new subjects, graduate education,... etc.) after graduation?

Very important ___ *Moderately important* ____ *Have no interest in that* ____

Please rate your level of satisfaction with regards to the following Educational Objectives in the course of working toward a degree in Computer Engineering or Electrical Engineering.

	High	Average	Low	Unsure	Average
Acquiring breadth in discipline					
Acquiring depth in discipline					
Acquiring breadth in engineering topics					
Preparation for engineering practice					
Preparation for graduate study					
Opportunities for hands-on experience					
Opportunities for self-learning					
Opportunities for team work					
Acquiring written and oral communication skills					
Becoming aware of contemporary issues					
Independent work					

Development of problem solving skills					
Preparation for life-long learning					
Awareness of ethical conduct obligations					

Please rate your level of satisfaction with the following program requirements/activities:

	High	Average	Low	Unsure	Average
Fundamentals in basic science					
General Education					
Use of modern computational tools					
Quality of ECE department laboratories					
Access to ECE department laboratories					
Academic advising					
Faculty accessibility during office hours					

How many times have you consulted your academic advisor to discuss your academic progress and other curriculum related matters during the last one year?

Once _____ Twice ____ More than twice _____ Never _____

Use the back of this sheet to offer suggestions and/or comments on the curriculum and the programs of study offered by the department -- what is working, what is not, what needs to be done differently, etc. Please use the backside of this sheet if necessary.

Graduate Student Exit Survey

Department of Electrical and Computer Engineering

Spring 2010

Thank you for filling out this survey. Your input is extremely valuable to the ECE department. This is an anonymous survey; therefore, you do not have to sign your name on the survey. For each question below, you may select multiple boxes as needed.

How long did it take you to complete your MS degree program?

- ☐ Four semesters
- ☐ Five semesters
- ☐ Six semesters
- ☐ other _____

Why did you choose to come to Fresno State for your graduate education?
Select one or more from below.

- ☐ The EE program offers courses related to my area of interest
- ☐ The EE program has faculty members in my area of interest
- ☐ The fee structure at Fresno State is affordable
- ☐ Cost of living in Fresno is cheaper than at other places
- ☐ I heard good things about the program from other students/family/etc
- ☐ Other reason _____

Select from below, the areas that <u>you wanted to focus</u> on when you first enrolled at Fresno State. By checking a box, you are stating that you would have liked to have taken courses in these areas.

- ☐ Control and Power Systems
- ☐ Communications, Optics, and Digital Signal Processing
- ☐ VLSI, Embedded Systems, Computer Architecture
- ☐ Computer Networks, Telecommunications
- ☐ A mix of the above (broad background)
- ☐ Other _____
- ☐ Undecided

What area(s) did you end up focusing on?

Now that you are completing the MS degree program, please indicate to what extent the following are valid statements by selecting one or more from the list below:

- ☐ The EE program offers courses related to my area of interest
- ☐ The EE program has faculty members related to my area of interest
- ☐ Cost of living in Fresno is cheaper than at other places
- ☐ Other reason _____

Do you think that Fresno State's EE program offers sufficient courses in the areas that you are interested in?

- ☐ Yes
- ☐ No

If you answered No, what courses would you have liked to see more of?

Do you think that your undergraduate academic preparation was sufficient for you to succeed in the graduate/undergraduate courses taken here at Fresno State?

- ☐ Yes
- ☐ No

If you answered No, what are the subject areas that you needed help in?

What is your career goal?

- ☐ Work in industry as an Electrical Engineer
  Do you have a job offer in hand? ____ Yes ____ No
  If you checked yes, where will you be working? _____
- ☐ Pursue a PhD Degree
  Admitted to a PhD program? ____ Yes ____ No
  If you checked yes, state the name of the University _____

and your PhD start date: _____

☐ Work as a consultant or engineer in a field other than Electrical Engineering

☐ Other _____

Do you feel that you are prepared to begin the next phase of your academic or professional life?

☐ Yes

☐ No

What were the main challenges (academic/social/financial/) that you faced since you enrolled in the MS-EE program here at Fresno State?

How many pre-requisite courses were you assigned when you first started here?

☐ Zero ☐ One ☐ Two

☐ Three ☐ Four

Have you used the ECE department laboratories for educational purposes?

☐ Yes

☐ No

Were you aware that the following software design and analysis tools are available for student use in the ECE department? Select Yes or No for each case. If you selected yes, check the box if you have used the software.

Opnet	☐ Yes	☐ No	☐ Used
Altera Maxplus	☐ Yes	☐ No	☐ Used
Labview	☐ Yes	☐ No	☐ Used
Modelsim	☐ Yes	☐ No	☐ Used
Matlab	☐ Yes	☐ No	☐ Used
Xilinx ISE	☐ Yes	☐ No	☐ Used
Mentor Graphics IC Design	☐ Yes	☐ No	☐ Used
Leonardo Spectrum	☐ Yes	☐ No	☐ Used

Precision Synthesis	☐ Yes	☐ No	☐ Used
C/C++ Development	☐ Yes	☐ No	☐ Used
Spice/Electronics Workbench	☐ Yes	☐ No	☐ Used
Microwave Office	☐ Yes	☐ No	☐ Used
Motorola Embedded Systems	☐ Yes	☐ No	☐ Used
Texas Instruments DSP	☐ Yes	☐ No	☐ Used
Powerworld	☐ Yes	☐ No	☐ Used
SKM	☐ Yes	☐ No	☐ Used
Mathcad	☐ Yes	☐ No	☐ Used
Custom IC Layout	☐ Yes	☐ No	☐ Used
Verilog/VHDL Design	☐ Yes	☐ No	☐ Used

What additional software/hardware tools would you like to see being in the department?

Were you aware that the following resources are available for student use in the ECE department? Select Yes or No for each case. If you selected yes, check the box if you have used the resource.

FPGA/CPLD Prototyping Tools and Boards	☐ Yes	☐ No	☐ Used
PLC development system	☐ Yes	☐ No	☐ Used
Microprocessor development system	☐ Yes	☐ No	☐ Used
DSP development system	☐ Yes	☐ No	☐ Used
Optics and Optoelectronics	☐ Yes	☐ No	☐ Used
Microwave Systems	☐ Yes	☐ No	☐ Used
Logic analyzers	☐ Yes	☐ No	☐ Used
Spectrum Analyzers	☐ Yes	☐ No	☐ Used

Do you feel that you received adequate advising in the ECE department?

☐ Yes ☐ No

If you answered No, state your reasons.

Would you recommend the MS program in EE to other students?

☐ Yes ☐ No

If you answered No, state your reasons.

Are you satisfied with the MS degree program here at Fresno State? If yes, state why. If no, how can the program be improved?

Any additional comments?

Rate the following

	Excellent	Very Good	Good	Fair	Poor
Academic standards in the program	○	○	○	○	○
Integration of current developments in my field	○	○	○	○	○
Program space and facilities	○	○	○	○	○
Overall program quality	○	○	○	○	○
Intellectual quality of faculty	○	○	○	○	○
Intellectual quality of fellow graduate students	○	○	○	○	○
Interaction between faculty and graduate students	○	○	○	○	○

	Strongly Agree	Agree	Ambivalent	Disagree	Strongly Disagree
Program activities foster a sense of intellectual community	○	○	○	○	○
Program content supports my research or professional goals	○	○	○	○	○
Program structure encourages teamwork	○	○	○	○	○
Program structure provides opportunities for	○	○	○	○	○

interdisciplinary work					
Amount of coursework required seems appropriate to degree	○	○	○	○	○
Amount of work required seems consistent across the department faculty.	○	○	○	○	○

Appendix B

STUDENT INTEREST SURVEY

The ECE Department is proposing a new Computer Engineering option as part of the MS in Engineering program in addition the two present options in EE and ME. Based upon the attached description of a proposed ***MS in Engineering (Computer Engineering option)****, please help us to assess the value and need for establishing such an option by completing this survey.*

1. Your present status ❑ student ❑ employed ❑ other _____
2. Present employer or school _____ Location _____
3. Highest degree earned _____ Field _____ School _____
4. If you are presently pursuing (or completed) an MS graduate degree, would you have had chosen Computer Engineering if it was available when you first started?

   ❑ yes ❑ no ❑ not applicable
5. To what extent are you interested in pursuing graduate studies (this one or some other one)?

   ❑ Very ❑ Moderately ❑ Not at all
6. If you enroll in the Computer Engineering option, what would you hope to gain from completing this program? *(Check all that apply)*

   ❑ upward career mobility ❑ increased research experience

   ❑ upgraded knowledge ❑ additional personal development

   ❑ other (specify) _____
7. Would you enroll in the proposed Graduate Degree Program if one were to be established?

   ❑ yes ❑ no ❑ already pursuing a graduate degree
8. Would your current employer provide any of the following? *(Check all that apply)*

   ❑ tuition and fees ❑ mentored support

   ❑ release time to attend classes ❑ paid leave

   ❑ research facilities ❑ not employed
9. Do you anticipate being a full-time or part-time student?

   ❑ full-time ❑ part-time

19 Make any comments or suggestions regarding this proposed Computer Engineering option.

_____

_____

_____

MS in Electrical and Computer Engineering

	Computer Engineering Option	Electrical Engineering Option
Core	ENGR 200: Seminar in Engr. (1) ENGR 201 Systems Modeling and Realization (3) ECE 278: Embedded Systems (3)	ENGR 200: Seminar in Engineering (1) ENGR 201: Systems Modeling and Realization (3) ECE 224: Advanced Signals and Systems (3)
Thesis option	*Major Courses:* 9 units Select from the list of 200-level ECE courses; at least 2 courses from the CompE list below. *Elective Courses:* 3 units Select from 200-level ECE courses, 100-level ECE courses, or 200-level courses in a relevant field approved by Graduate Advisor. *Thesis (ECE 299):* 6 units	*Major Courses:* 9 units Select from the list of 200-level ECE courses; at least 2 courses from the EE list below. *Elective Courses:* 3 units Select from 200-level ECE courses, 100-level ECE courses, or 200-level courses in a relevant field approved by Graduate Advisor. *Thesis:* 6 units
Project Option	*Major Courses:* 12 units Select from the list of 200-level ECE courses; at least 3 courses from the CompE list below. *Elective Courses*: 8 units Select from 200-level ECE courses, 100-level ECE courses, or 200-level courses in a relevant field approved by Graduate Advisor. *Project(ECE 298):* 3 units	*Major Courses:* 12 units Select from the list of 200-level ECE courses; at least 3 courses from the EE list below. *Elective Courses*: 8 units Select from 200-level ECE courses, 100-level ECE courses, or 200-level courses in a relevant field approved by Graduate Advisor. *Project(ECE 298):* 3 units
Exam	*Major Courses:* 15 units	*Major Courses:* 15 units

Option	Select from the list of 200-level ECE courses at least 3 courses from the Comp. list below *Elective Courses: 9 units* Select from 200-level ECE courses, 100-level ECE courses, or 200-level courses in a relevant field approved by Graduate Advisor *Comprehensive Exam: 0 units*	Select from the list of 200-level ECE courses, at least 3 courses from the EE list below *Elective Courses: 9 units* Select from 200-level ECE courses, 100-level ECE courses, or 200-level courses in a relevant field approved by Graduate Advisor *Comprehensive Exam: 0 units*

	CompE List	EE List
	ECE 224: Advanced Signals and Systems	ENGR 202: Applied Engineering
	ECE 240: VLSI Circuits and Systems	ECE 206: Stochastic Theory in Engineering Analysis
	ECE 242: Digital Systems Testing	ECE 230: Nonlinear Control Systems
	ECE 243: Modern Methods in Synch. Sequential Design	ECE 231: Digital Control Systems
	ECE 255: Digital Signal Processing	ECE 232: Optimal Control Systems
	ECE 274: High Performance Computer Architecture	ECE 240: VLSI Circuits and Systems
	ECE 291T: Topics in ECE	ECE 241: Applied Electromagnetics
	ECE 290: Independent Study	ECE 245: Communications Engineering
		ECE 247: Modern Semiconductor Devices
		ECE 249: Advanced Comm. Engr.
		ECE 251: Antennas and Propagation
		ECE 253: Power Systems Dynamics
		ECE 255: Digital Signal Processing
		ECE 257: Optical Comm. and Lasers
		ECE 259: Radar System Design
		ECE 274: High Performance Computer Architecture
		ECE 291T: Topics in ECE
		ECE 290: Independent Study

100-level courses

ECE 135: Wireless Communication Systems

ECE 136: Electromagnetics Theory and Applications

ECE 140: VLSI System Design

ECE 146: Computer Networking and Distributed Proc.

ECE 151: Power Systems

ECE 152: Power Systems Protection

ECE 153: Power Electronics

ECE 162: Integrated Circuits and Applications

ECE 166: Microwave Devices and Circuits Design

ECE 168: Microwave Amplifier and Oscillator Design

ECE 171: Quantum Electronics

ECE 172: Sequential Machine and Automata Theory

ECE 173: Robotics Fundamentals

ECE 176: Computer Aided Engr. and Digital Design

Appendix C

Graduate Student Exit Survey

Department of Electrical and Computer Engineering

Spring 2010

Thank you for filling out this survey. Your input is extremely valuable to the ECE department. This is an anonymous survey; therefore, you do not have to sign your name on the survey. For each question below, you may select multiple boxes as needed.

How long did it take you to complete your MS degree program?

- ☐ Four semesters
- ☐ Five semesters
- ☐ Six semesters
- ☐ other _____

Why did you choose to come to Fresno State for your graduate education?
Select one or more from below.

- ☐ The EE program offers courses related to my area of interest
- ☐ The EE program has faculty members in my area of interest
- ☐ The fee structure at Fresno State is affordable
- ☐ Cost of living in Fresno is cheaper than at other places
- ☐ I heard good things about the program from other students/family/etc
- ☐ Other reason _____

Select from below, the areas that <u>you wanted to focus</u> on when you first enrolled at Fresno State. By checking a box, you are stating that you would have liked to have taken courses in these areas.

- ☐ Control and Power Systems
- ☐ Communications, Optics, and Digital Signal Processing
- ☐ VLSI, Embedded Systems, Computer Architecture
- ☐ Computer Networks, Telecommunications
- ☐ A mix of the above (broad background)
- ☐ Other _____
- ☐ Undecided

What area(s) did you end up focusing on?

Now that you are completing the MS degree program, please indicate to what extent the following are valid statements by selecting one or more from the list below:

- ☐ The EE program offers courses related to my area of interest
- ☐ The EE program has faculty members related to my area of interest
- ☐ Cost of living in Fresno is cheaper than at other places
- ☐ Other reason _____

Do you think that Fresno State's EE program offers sufficient courses in the areas that you are interested in?

- ☐ Yes
- ☐ No

If you answered No, what courses would you have liked to see more of?

Do you think that your undergraduate academic preparation was sufficient for you to succeed in the graduate/undergraduate courses taken here at Fresno State?

- ☐ Yes
- ☐ No

If you answered No, what are the subject areas that you needed help in?

What is your career goal?

- ☐ Work in industry as an Electrical Engineer
  Do you have a job offer in hand? ____ Yes ____ No
  If you checked yes, where will you be working? _____
- ☐ Pursue a PhD Degree
  Admitted to a PhD program? ____ Yes ____ No
  If you checked yes, state the name of the University _____
  and your PhD start date: _____
- ☐ Work as a consultant or engineer in a field other than Electrical Engineering
- ☐ Other _____

Do you feel that you are prepared to begin the next phase of your academic or professional life?

- ☐ Yes
- ☐ No

What were the main challenges (academic/social/financial/) that you faced since you enrolled in the MS-EE program here at Fresno State?

How many pre-requisite courses were you assigned when you first started here?

☐ Zero ☐ One ☐ Two
☐ Three ☐ Four

Have you used the ECE department laboratories for educational purposes?

- ☐ Yes
- ☐ No

Were you aware that the following software design and analysis tools are available for student use in the ECE department? Select Yes or No for each case. If you selected yes, check the box if you have used the software.

Opnet	☐ Yes	☐ No	☐ Used
Altera Maxplus	☐ Yes	☐ No	☐ Used
Labview	☐ Yes	☐ No	☐ Used
Modelsim	☐ Yes	☐ No	☐ Used
Matlab	☐ Yes	☐ No	☐ Used
Xilinx ISE	☐ Yes	☐ No	☐ Used
Mentor Graphics IC Design	☐ Yes	☐ No	☐ Used
Leonardo Spectrum	☐ Yes	☐ No	☐ Used
Precision Synthesis	☐ Yes	☐ No	☐ Used
C/C++ Development	☐ Yes	☐ No	☐ Used
Spice/Electronics Workbench	☐ Yes	☐ No	☐ Used
Microwave Office	☐ Yes	☐ No	☐ Used
Motorola Embedded Systems	☐ Yes	☐ No	☐ Used
Texas Instruments DSP	☐ Yes	☐ No	☐ Used
Powerworld	☐ Yes	☐ No	☐ Used
SKM	☐ Yes	☐ No	☐ Used
Mathcad	☐ Yes	☐ No	☐ Used
Custom IC Layout	☐ Yes	☐ No	☐ Used
Verilog/VHDL Design	☐ Yes	☐ No	☐ Used

What additional software/hardware tools would you like to see being in the department?

Were you aware that the following resources are available for student use in the ECE department? Select Yes or No for each case. If you selected yes, check the box if you have used the resource.

FPGA/CPLD Prototyping Tools and Boards	☐ Yes	☐ No	☐ Used
PLC development system	☐ Yes	☐ No	☐ Used
Microprocessor development system	☐ Yes	☐ No	☐ Used
DSP development system	☐ Yes	☐ No	☐ Used
Optics and Optoelectronics	☐ Yes	☐ No	☐ Used
Microwave Systems	☐ Yes	☐ No	☐ Used
Logic analyzers	☐ Yes	☐ No	☐ Used
Spectrum Analyzers	☐ Yes	☐ No	☐ Used

Do you feel that you received adequate advising in the ECE department?

☐ Yes ☐ No

If you answered No, state your reasons.

Would you recommend the MS program in EE to other students?

☐ Yes ☐ No

If you answered No, state your reasons.

Are you satisfied with the MS degree program here at Fresno State? If yes, state why. If no, how can the program be improved?

Any additional comments?

Rate the following

	Excellent	Very Good	Good	Fair	Poor
Academic standards in the program	○	○	○	○	○
Integration of current developments in my field	○	○	○	○	○
Program space and facilities	○	○	○	○	○
Overall program quality	○	○	○	○	○
Intellectual quality of faculty	○	○	○	○	○
Intellectual quality of fellow graduate students	○	○	○	○	○
Interaction between faculty and graduate students	○	○	○	○	○

	Strongly Agree	Agree	Ambivalent	Disagree	Strongly Disagree
Program activities foster a sense of intellectual community	○	○	○	○	○
Program content supports my research or professional goals	○	○	○	○	○
Program structure encourages teamwork	○	○	○	○	○
Program structure provides opportunities for interdisciplinary work	○	○	○	○	○
Amount of coursework required seems appropriate to degree	○	○	○	○	○
Amount of work required seems consistent across the department faculty.	○	○	○	○	○

Appendix D

http://www.jobjournal.com/article_full_text.asp?artid=2912

CAREER SNAPSHOT: Computer Software Engineer

Published: March 7, 2010

Job Prospects: *Excellent*
Typical Annual Compensation (Level I)

- Bay Area $59,469 - $75,176
- Central Valley $51,827 - $65,077
- Sacramento $54,837 - $67,269

Source: Salary.com

In 2008, the median annual earnings of computer software engineers were **$95,400 in California and $85,400 nationwide.** Median annual wages in industries employing the largest number of applications software engineers are highest among professional and commercial equipment and supplies merchant wholesalers. Mid-level wages are paid by software publishers, management firms and computer systems designers. Insurance industry wages are among the lowest for this type of work. In industries employing the largest number of systems software engineers, median annual wages are highest among scientific research and development services and manufacturers of computer and peripheral equipment. Other major employers include software publishers, navigational/measurement/control instrument manufacturers, and computer systems design firms.

Job Outlook

Computer software engineers are among the occupations projected to **grow the fastest and add the most new jobs over the 2008-18 decade.** Employment is expected to increase by 32 percent from 2008-2018, with more than 295,000 new jobs opening up. Job prospects should be best for those with a bachelor's degree and relevant experience.

Demand for computer software engineers will increase as computer networking continues to expand and new growth areas arise from rapidly evolving technologies. Increasing Internet, website, and mobile technology applications have created demand for a wide variety of new products. As more software is offered over the Internet, and businesses demand customized software to meet their specific needs, applications and systems software engineers will be needed in greater numbers. With handheld devices becoming standard business tools, current computer systems must be integrated with this new, more mobile technology.

Concerns over 'cyber security' have spurred investment in software that protects digital networks and electronic infrastructures. The expansion of this technology over the next ten years will drive the need for more software engineers to design and develop secure applications and systems, and to integrate them into older systems.

Employers will continue to seek computer professionals with strong programming, systems analysis, interpersonal, and business skills. Consulting opportunities also should continue to grow as businesses seek help to manage, upgrade, and customize their systems.

http://education-portal.com/articles/Computer_Engineer%3A_Occupational_Outlook_for_the_Computer_Engineering_Fields.html

1. Computer Engineer: Occupational Outlook...

Computer Engineer: Occupational Outlook for the Computer Engineering Fields

Computer engineering is a fast-growing field with **no signs of slowing down** as computers help us in many differing areas of our lives. If you are interested in becoming a computer engineer, read on to discover what computer engineers do, what education they need, and what the job outlook is.

http://degreedirectory.org/articles/Computer_Engineer_Career_Profile_Employment_Outlook_and_Educational_Requirements.html

DegreeDirectory.org

Computer Engineer: Career Profile, Employment Outlook, and Educational Requirements

Computer Engineer Career Profile

Combining computer, engineering and electrical skills and training, computer engineers are responsible for developing and designing new software programs and making them ready for public or business use. They are also responsible for testing the programs before and during use to ensure they are running efficiently and without error. When problems arise, computer engineers identify the problem and develop a solution to fix it. They also market programs to possible buyers.

Employment Outlook for Computer Engineers

According to the U.S. Bureau of Labor Statistics,www.bls.gov, the demand for computer engineers is expected to ***grow at a rate of 38 percent between 2006 and 2016****, which is much faster than the average position. Growth is anticipated due to the high demand for computer technology, the competitive nature of the field and a need to maintain those high standards and develop new technologies and programs. Those with a bachelor's degree or higher should be able to find excellent career opportunities, especially if they keep up-to-date with new advances in technology. In 2006, the median annual salary for computer engineers was 85,370. That amount is expected to grow as demand increases.*

Appendix E

Budget Analysis

1. Projected changes in enrollment

a) Enrollment

The EE-option enrolled 33 students on the average in 2005-06, 31 in 2006-07, 45 in 2007-08, 53 in 2008-09, and 42 in 2009-10. The total headcount (undergraduate and graduate) is about 370 students.

Since the computer engineering subject has been an integral part of the EE-option and many of the present students may just declare the new option rather than the EE-option, we don't expect a significant increase in enrollment. However, the formal availability of the new option may attract few more students. The present capacity of the ECE department doesn't permit much more than 50 graduate students. With the increase in applications, the department will use the admission process as a vehicle to improve quality rather than increase enrollment. Furthermore, **the termination of the distance learning component of the program starting Fall '11 is expected to reduce enrollment and offset any expected increase due to the new option**.

b) FTEs

The ECE Department (undergraduate and graduate) generated 160 FTEs/semester in 2006-07, 138 in 2007-08, and 143 in 2008-09. The graduate program EE-option generates 3 FTEs/semester in 2005-06, 10 in 2006-07, 11 in 2007-08, 12 in 2008-09, and 11 in 2009-10. This is about 8% of the department's FTEs per semester. This low FTEs is because many of the graduate students work full time with the local indusries and they enroll in one or two courses only per semester.

We don't anticipate a significant change in FTEs because the enrollment is not expected to increase significantly and it will be just a matter of students declaring the proper degree on transcripts. The graduate FTEs generated doesn't constitute a high percentage of the ECE departments total FTEs of about 140. Furthermore, **the termination of the distance learning component of the program starting Fall '11 is expected to reduce FTEs and offset any expected increase due to the new option**.

c) Expected change

Enrollment may increase slightly but it will be managed through the admission process and offset by the effect of terminating the distance learning program (see part a).

2. Projected changes in existing curriculum

a) Changes to cost

No change in cost of delivery. We are proposing one new course to replace one of the existing core courses. The rest of the courses required for the new option are already in place and have been offered through the EE-option.

b) New courses

We are proposing one new course to replace one of the core courses for the EE-option. This course will be offered once a year with an anticipated enrollment of 15-20 students. It is a lecture course. This course may be taken for an elective by students in the EE-option.

3. Projected changes in faculty

a) Faculty Assignment:

We don't anticipate any change in faculty assignments. All courses will be offered as usual and the new course will be taught by one of the computer engineering faculty members as part of his/her regular teaching load in place pf one of the elective courses which are usually rotated over three to four semesters.

b) Faculty Number:

No change in faculty number or distribution is necessary for this new-option.

c) New Positions:

No new positions will be added due to the new option.

4. Projected changes in budget

a) Operating Budget:

The department's operating budget is about $11,000 from the state side.

b) Current faculty positions:

3 Tenured; 3 Tenure Track; 2 FERP; 5 Part-Time; 2 Staff

5. Budgetary impact over time

We don't expect any budgetary impact since the new option is practically in place and adding the title of the new option will be the only significant change that will take place.

6. Budget Requirement

We don't anticipate any change in the present budget requirements because the new option is practically in place currently under the EE-option. The college budget committee and office of the dean have reviewed this proposal for a new option.

7. Effect on support and programs in other colleges/schools

No additional support services are needed for this option. The existing department labs are shared between electrical and computer engineering as well as all other resources in the department. No other colleges would be affected by adding this option.